The AIRCRAFT YEAR BOOK *For 1955*

TERRESA SMITH

The
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1955

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Editors

FRED HAMLIN ELEANOR THAYER MILLER

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The 1955 Aircraft Year Book represents the combined editiorial talent of the industry. Only through the generous collaboration of company public relations officials, writers in other branches of aviation and aircraft executives, has this edition been possible. To these people we should like to express our thanks. We should like, also, to express our special gratitude to the Aircraft Year Book Editorial Board of the Public Relations Advisory Committee of the Aircraft Industries Association, who gave much valuable time in suggesting the handling of the material. The Committee included Mr. Carlyle Jones, Director of Public Relations, Sperry Gyroscope Co.; Mr. Jack Smith, Assistant Director of Public Relations, United Aircraft Corp.; and Mr. Joe Rowland, Manager, Information Services, Martin Co. Coordinating the work of the Committee were Mr. Avery McBee, Director of Public Relations of the Aircraft Industries Association, and Mr. Burton E. English, Public Relations, AIA, to whom we are also deeply grateful.

THE EDITORS

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FOREWORD

No year in the history of the American aircraft industry has been marked by more manifestations of aeronautical progress than 1955. Not only has there been tangible evidence of this progress, but advanced and accelerated research and development have opened the doors to unexplored avenues of progress in such fields as earth satellite, the thermal barrier, atomic-powered aircraft and the inter-continental ballistics missile.

Guided missile development and production have forged ahead and the programs of the armed services for these weapons clearly reflect the high order of importance attached to them. All types of jet and rocket power plants of vastly greater output are in production or under development.

Experimental convertiplanes, combining the advantages of helicopters and airplanes, have made their appearance. The principle of wingless vertical flight, both ducted fan and jet, has been introduced. Progress in the development and operational use of helicopters continues at a gratifying pace. Turbojet and turboprop powered commercial airliners of American manufacture are now entering production.

Delivery of substantial numbers of supersonic jet fighters to the Air Force and Navy began in 1955 with the production rate for aircraft of this capacity scheduled to incerase sharply. A new official world's speed record of 822 mph was established during the past year. The medium bomb wings of the Strategic Air Command were completely equipped with multi-engined jet bombers. Initial deliveries of longer-range, multi-engined jet bombers to the heavy bomb wings of SAC were begun during the year.

In effect, 1955 was the first year during which the expanded research and development effort undertaken at the time of outbreak of war in Korea came to fruition. We are in a grim international race for aeronautical supremacy, and the finish line is not in sight.

This edition of the Aircraft Year Book reports not only on the aircraft industry, but on many other aspects of major aviation achievement. The activities of the Air Force, Naval Aviation, the Marine Air Arm, and Army Aviation are included. The Year Book likewise deals with the work of other government departments and agencies. It reviews the great progress of the commercial airlines, which flew some 42-million passengers 24,409,-470,000 passenger miles. It gives coverage to utility aircraft and their progress as servants of business, industry and agriculture, and on the development of the helicopter, both in its military role and its bright commercial future.

The Aircraft Industries Association believes that the 1955 edition of the Aircraft Year Book will contribute, as have the 36 which have preceded it, to a more complete public understanding of aviation and its relation to the general welfare, prosperity and security of our country.

ADMIRAL DEWITT C. RAMSEY (USN, Ret.)
President, Aircraft Industries Association


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AVIATION BOOKS PUBLISHED IN THE UNITED STATES IN 1955[1]

The following bibliography was compiled by Arthur G. Renstrom, Library of Congress

AIRPORTS AND AIRWAYS

AVIATION WEEK AIRPORT DIRECTORY. 23rd 1955-56 ed. New York, McGraw-Hill Book Company. 250p. $4.00

BRYAN, LESLIE A. Airport Shop Operations. Urbana, Ill., University of Illinois. 51p. (Institute of Aviation. Aeronautics Bulletin No. 15.)

BRYAN, LESLIE A. College and University Airport Management. Urbana, University of Illinois. 36p. (University of Illinois. Institute of Aviation. Aeronautics Bulletin No. 16.)

PORT OF NEW YORK AUTHORITY. AVIATION DEPARTMENT. Heliport Location and Design. New York, The Authority, 33p.

U. S. CIVIL AERONAUTICS ADMINISTRATION. Air Traffic Rules. April 1955. Washington, U. S. Govt. Print. Off. 33p. (Civil Aeronautics Manual 60.) $.75

U. S. COMMISSION ON INTERGOVERNMENTAL RELATIONS. A Staff Report on Federal Aid to Airports, Submitted to the Commission on Intergovernmental Relations. Washington, U. S. Govt. Print. Off. 137p. $.50

ZWENG, CHARLES A. Control Tower and Dispatcher Ratings. 2d rev. ed. North Hollywood, Calif., Pan American Navigation Service. 352p. $5.00

COMMERCIAL AVIATION

AIR LINE PILOTS ASSOCIATION. The ALPA Story: a History of the Background, Functions, and Organization of the Air Line Pilots Association, Intl. Chicago, The Association. 44p.

AIR TRANSPORT ASSOCIATION OF AMERICA. Annual Report. 1954. Washington, The Association. 32p.

AMERICAN AIRLINES. A Study of the Effect of Air Transportation Upon Profits Resulting from Changes in Costs at Various Levels of Volumes when Prices Remain Constant. New York, American Airlines, 1954. 30p.

BEECKEN, HENRY, & ASSOCIATES. Financial Study of the Domestic Airline Industry and American Airlines, Inc. Washington, Henry Beecken & Associates, 1954. 104p. $20.00

FORD, NORMAN D. Air Routes of the World; the Passenger's Directory to the World's Airways, Airplanes, Airlines. Greentown, N. Y., Harian Publications; Trade Distributor, Greenberg, New York. 96p. $1.00

FREDERICK, JOHN H. Commercial Air Transportation. 4th Ed. Homewood, Ill., Richard D. Irwin, Inc. 547p. $6.00

MOORE, BYRON. The First Five Million Miles. New York, Harper & Brothers. 276p. $3.75

PORT OF NEW YORK AUTHORITY. AVIATION DEPARTMENT. New York's Air Travelers. September 1954. Report of a Survey Conducted in Collaboration with the Domestic Scheduled Air Lines. New York, The Authority. 100p.

RADIO TECHNICAL COMMISSION FOR AERONAUTICS. Anticipated Volume and Distribution of Rotary Wing Transport Operations in the New York Metropolitan Area, 1965. January 6, 1955. Final Activity Report of Traffic Subcommittee S. C. 63. Washington, The Commission. 9p. and appendices.

SPEAS, R. DIXON. Technical Aspects of Air Transport Management; Operations, Engineering, Maintenance, and Economic Factors of Airline Service. New York, McGraw-Hill Book Company, Inc. 316p. $8.50

A SURVEY OF AIR TRANSPORTATION REQUIREMENTS FOR THE IDAHO-OREGON-WASHINGTON AREA. Prepared for the Idaho Department of Aeronautics, Oregon State Board of Aeronautics, Washington State Aeronautics Commission. Seattle, Washington State Aeronautics Commission. 155p.

TILLETT, PAUL. The Army Flies the Mails. University, Ala., University of Alabama Press. 80p. (Inter-University Program Case Series No. 24.)

TRANSWORLD AIRLINES, INC. Thirty Years of Service. New York, Transworld Airlines, Inc. 66p.

U. S. CIVIL AERONAUTICS ADMINISTRATION. Air Commerce Traffic Pattern, Calendar Year 1954. June 1955. Washington, Department of Commerce, Sales and Distribution Division. 33p. $.50

U. S. CIVIL AERONAUTICS ADMINISTRATION. Airplanes at Work for Business and Industry, 1954 Survey Covering 1953 Activity with Estimates for 1954. Washington, U. S. Govt. Print. Off. 81p. $1.00

U. S. CIVIL AERONAUTICS ADMINISTRATION. Civil Air Traffic Forecasts, 1960-1965. Washington. 63p.

U. S. CIVIL AERONAUTICS BOARD. Annual Report of the Civil Aeronautics Board. 1954. Washington, U. S. Govt. Print. Off. 67p. $.70

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U. S. CIVIL AERONAUTICS BOARD. Economic Decisions of the Civil Aeronautics Board. September 1950 to April 1951. Vol. 12. Washington, U. S. Govt. Print. Off. 1017p. $3.50

U. S. CIVIL AERONAUTICS BOARD. Origination-Destination Airline Revenue Passenger Survey, March 1-14, 1954. Washington, Airline Finance and Accounting Conference, Air Transportation of America, 1954. 4v. $25.00

U. S. CIVIL AERONAUTICS BOARD. Origination-Destination Airline Revenue Passenger Survey. September 1954. Washington, Airline Finance and Accounting Conference, Air Transport Association of America. 4v. $25.00

U. S. CONGRESS. HOUSE INTERSTATE AND FOREIGN COMMERCE COMMITTEE. Permanent Certificates for Local Service Air Carriers. Hearings . . . on H. R. 526 and 2225, February 23—March 1, 1955. Washington, U. S. Govt. Print. Off. 251p.

U. S. CONGRESS. SENATE INTERSTATE AND FOREIGN COMMERCE COMMITTEE. Aviation Study Prepared by the Staff . . . on Hearings held on S. 2647 (an Omnibus Aviation Bill by Mr. McCarran) to Create an Independent Civil Aeronautics Authority and an Independent Air Safety Board. Washington, U. S. Govt. Print. Off. 150p. (83d Congress, 2d Session. Senate Document No. 163.)

U. S. CONGRESS. SENATE INTERSTATE AND FOREIGN COMMERCE COMMITTEE. Permanent Certificates for Local Service Air Carriers. Hearings . . . on S. 651, February 21 and 24, 1955. Washington, U. S. Govt. Print. Off. 278 p.

WORLD AIRLINE RECORD. 5th ed., 1955. Chicago, Roadcap & Associates. 500p. $17.50

DESIGN

AERONAUTICAL ELECTRONICS DIGEST: A COMPENDIUM OF TECHNICAL PAPERS EXEMPLIFYING PROGRESS IN THE FIELD OF AERONAUTICAL ELECTRONICS, PRESENTED AT THE NATIONAL CONFERENCE ON AERONAUTICAL ELECTRONICS, MAY 9-11, 1955, DAYTON, OHIO. Dayton, Ohio, Dayton Section, Institute of Radio Engineers. 422p. $4.00

BISPINGHOFF, RAYMOND L., HOLT ASHLEY and ROBERT L. HOFFMAN. Aeroelasticity. Cambridge, Mass., Addison-Wesley Publishing Company, Inc. 860p. $14.50

CONFERENCE ON HIGH-SPEED AERONAUTICS, POLYTECHNIC INSTITUTE OF BROOKLYN, JANUARY 20-22, 1955. Proceedings, Edited by Antonio Ferri, Nicholas J. Hoff, and Paul A. Libby. Brooklyn, New York, Polytechnic Institute of Brooklyn. 392p.

DANIEL & FLORENCE GUGGENHEIM AVIATION SAFETY CENTER AT CORNELL UNIVERSITY. Design for Safety; a Collection of Design Notes and Human Engineering Bulletins Showing Design Factors for Improving Safety. New York, Aviation Age. 1v.

DANIEL & FLORENCE GUGGENHEIM AVIATION SAFETY CENTER AT CORNELL UNIVERSITY. Survey of Research Projects in the Field of Aviation Safety. 4th Annual Supplement. January 1955. New York, The Center. 98p. $2.00

DUKE, NEVILLE and EDWARD LANCHBERY. Sound Barrier, the Story of High-Speed Flight. 6th ed. rev. New York, Philosophical Library. 129p. $4.75

FIKE, WILLIAM J. Practical Lightplane Design and Construction for the Amateur. Anchorage, Alaska, The Author, P. O. Box 683. 50p.

FUNG, Y. C. The Theory of Elasticity. New York, John Wiley & Sons. 490 p. (Galcit Aeronautical Series) $10.50

LOCKE, ARTHUR S. Guidance. New York, D. Van Nostrand Co., Inc. 729p. (Principles of Guided Missile Design Series) $12.50

MORWOOD, JOHN. Sailing Aerodynamics. New York, Philosophical Library, 1954. 124p. $7.50

NATIONAL TURBINE-POWERED AIR TRANSPORTATION MEETING, SEATTLE, WASHINGTON, AUGUST 8-10, 1955. Proceedings. New York, Institute of the Aeronautical Sciences, Inc. $6.00

POPE, ALAN. Wind Tunnel Testing. 2nd ed. New York, John Wiley & Sons, Inc. 511p. $8.50

ROSSINI, FREDERICK D., ed. High Speed Aerodynamics and Jet Propulsion. Vol. 1. Thermodynamics and Physics of Matter. Princeton, N. J., Princeton University Press. 812p. $15.00

SCHLICHTING, HERMAN. Boundary Layer Theory. Translated by J. Kestin. New York, McGraw-Hill Book Company. 555p. $15.00

SYMPOSIUM ON THE THERMAL BARRIER PRESENTED BY THE AVIATION DIVISION OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS AT THE ANNUAL MEETING, NOVEMBER 28-DECEMBER 3, 1954. New York, American Society of Mechanical Engineers, 1954. 80p. $4.50

U. S. AIR FORCE-NAVY-COMMERCE AIRCRAFT DESIGN CRITERIA COMMITTEE. Sandwich Construction for Aircraft. Part II. 2nd ed. Washington, U. S. Govt. Print. Off. 116p. (ANC-23) $.60

U. S. AIR FORCE-NAVY-COMMERCE AIRCRAFT DESIGN CRITERIA COMMITTEE. Strength of Metal Aircraft Elements. 2nd ed. Washington, U. S. Govt. Print. Off. 180p. (ANC-5) $1.75

U. S. ARMY-NAVY-COMMERCE AIRCRAFT DESIGN CRITERIA COMMITTEE. Plastics for Aircraft. Part 1. Reinforced Plastics. Washington, U. S. Govt. Print. Off. 85p. (ANC-17) $.50

U. S. BUREAU OF AERONAUTICS (NAVY DEPT.) Fatigue of Metals and Structures, by H. J. Grover, S. A. Gordon, and L. R. Jackson, Washington, U. S. Govt. Print Off. 394p. (NAVAER 00-25-534) $2.50

U. S. NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS. NACA Conference on Some Problems of Aircraft Operation, November 17-18, 1954 at Lewis Flight Propulsion Laboratory. Washington, The Committee. 195p.

U. S. NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS. NACA-University Conference on Aerodynamics, Construction, and Propulsion, Cleveland, Ohio, October 20, 21, 22, 1954. Washington, The Committee, 1954. 3v.

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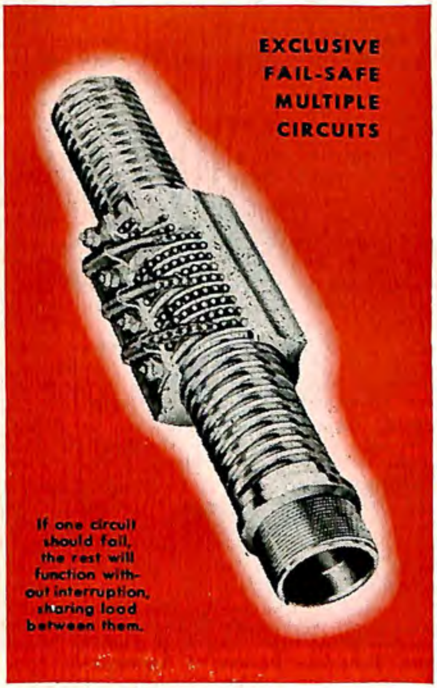

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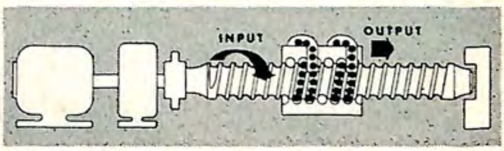

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WOOD, KARL D. Technical Aerodynamics. 3rd ed. Ann Arbor, Distributed by Ulrich's Book Store. 1v.

WOODHAM, R. M. and JEROME LEDERER. Safety Through Steep Gradient Aircraft; a Survey of the Status and Effects of Verical and Near-Vertical Take-Off and Landing. New York, The Daniel & Florence Guggenheim Aviation Safety Center at Cornell University. 75p. $1.00

FICTION

BEATY, DAVID. Four Winds. New York, William Morrow and Company. 320p. $3.50

BLAIR, CLAY. Beyond Courage. Foreword by Nathan F. Twining. New York, David McKay Co., Inc. 247p. $3.50

BRENNAN, FREDERICK H. One of Our H Bombs is Missing. Greenwich, Conn., Fawcett Publications. 159p. (Gold Medal Books, 498) $.25

CHRISTIE, AGATHA. Death in the Air. New York, Avon Publications, Inc. 158p. (Avon 658) $.25

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LEINSTER, WILLIAM F. Space Tug, by Murray Leinster [*pseud.*] New York, Pocket Books. 154p. $.25

MICHENER, JAMES A. The Bridges at Toko-ri. New York, Bantam Books. 106p. (Bantam Book, 1269) $.35

MILLER, HELEN T. April to Remember. New York, Appelton-Century-Crofts, Inc. 250p. $3.00

NIELSEN, HELGA. Deep in the Sky; a Science Fiction Novel. New York, Exposition Press. 161p. $3.00

OBODIAC, STAN. Cashmir of the R. C. A. F. New York, Pageant Press. 221p. $3.00

ROY, JULES. The Navigator. Translated from the French by Mervyn Savill. New York, Alfred A. Knopf. 177p. $3.00

SCOTT, ROBERT L., Jr. Look of the Eagle. New York, Dodd, Mead & Company. 278p. $3.50

THOMEY, TEDD. Jet Pilot. New York, Avon Publications, Inc. 157p. (Avon 632) $.25

WILDING, PHILIP. Spaceflight Venus. New York, Philosophical Library. 190p. $2.75

WILSON, RICHARD. The Girls from Planet Five. New York, Ballantine Books. 184p. $2.00; paper $.35

FLYING SAUCERS

ALLINGHAM, CEDRIC. Flying Saucers from Mars. New York, British Book Centre. 153p. $2.75

CRAMP, L. G. Space, Gravity, and the Flying Saucer. New York, British Book Centre. $3.00

FRY, DANIEL W. The White Sands Incident. Los Angeles, New Age Publishing Company, 1954. 66p. $1.50

JESSUP, MORRIS K. The Case for the UFO, Unidentified Flying Objects. Introduction by Frank Edwards. New York, Citadel Press. 239p. $3.50

JESSUP, MORRIS K. The Case for the UFO, Unidentified Flying Objects. Introduction by Frank Edwards. New York, Bantam Books. 218p. (Bantam Giant, A 1374). $.35

KEYHOE, DONALD E. The Flying Saucer Conspiracy. 315p. New York, Henry Holt and Company. $3.50

WILKINS, HAROLD T. Flying Saucers Uncensored. New York, Citadel Press. 356p. $3.50

GENERAL

AIR PROGRESS 1955-1956 ISSUE. New York, Street & Smith Publications, Inc. $.50

ANGEL, J. L. Careers in Aviation. New York, World Trade Academy Press. 21p. $1.00

DESOUTTER, DENIS M. All About Aircraft. New York, John de Graff. 479p. $5.00

KYSOR, HARLEY D. Aircraft in Distress; Manual of Air Safety. Philadelphia, Chilton Company. $6.00

ROSS, FRANK X. Experimental Planes; Subsonic and Supersonic, by R. Frank, Jr. [*pseud.*] Illustrated by William F. Jackson. New York, Thomas Y. Crowell. 146p.

SUTTON, OLIVER G. The Science of Flight. Rev. ed. Baltimore, Penguin Books. 231p. (Pelican Book A 209). $.85

TANNEHILL, IVAN R. The Hurricane Hunters. New York, Dodd, Mead & Company. 271p. $3.00

TAYLOR, JOHN W. R., *ed.* Aircraft Today. New York, Philosophical Library. 103p. $4.75

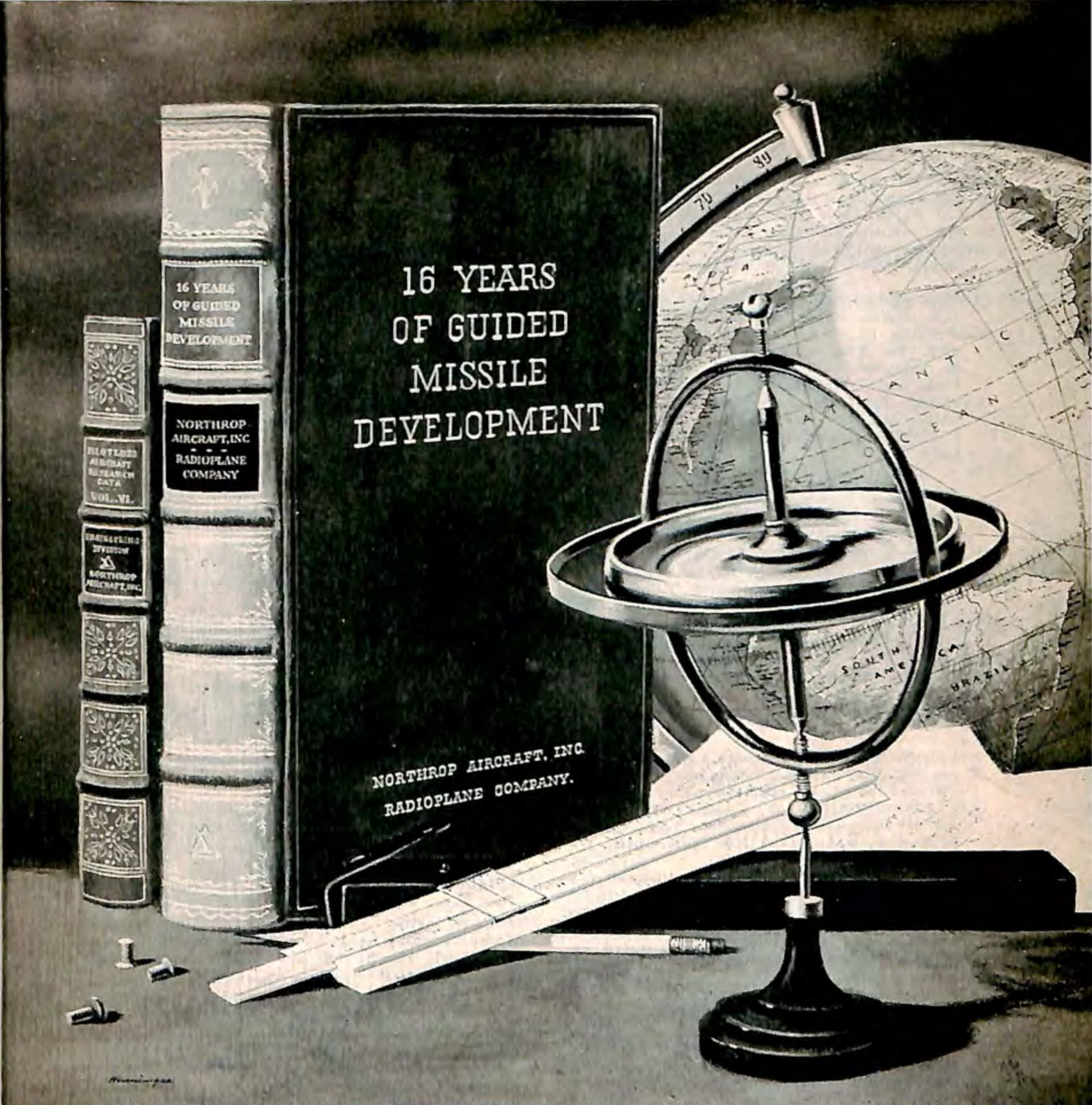
TENNESSEE. BUREAU OF AERONAUTICS. Tennessee Aviation in the State Economy; a Preliminary Study with Pertinent Comparative Data in Other States, by E. S. Fabian. Nashville, Tennessee Bureau of Aeronautics. 49p.

U. S. CIVIL AERONAUTICS ADMINISTRATION. Hours Flown in General Aviation by Aircraft Type and Location. Washington, The Administration. 72p.

U. S. DEPARTMENT OF AGRICULTURE. Studies of Airplane Spray Deposit Patterns at Low Flight Levels. Washington, U. S. Govt. Print. Off. (Department of Agriculture Technical Bulletin 1110) $.25

HISTORY

BLOUGH, GLENN O. Masters of the Air. Washington, Smithsonian Institution, 1954. 31p. (Smithsonian Publication No. 4183) $.50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BROWER, CHARLES D. and others. Fifth Years Below Zero; a Lifetime of Adventure in the Far North. New York, Grosset & Dunlap. 318p. (Great Adventure Library) $1.95

DUNBAR, JOHN L. Escape Through the Pyrenees. New York, W. W. Norton. 176p. $2.95

KUTER, LAURENCE S. Airman at Yalta. New York, Duell, Sloan and Pearce. 180p. $3.00

RUMBOLD, RICHARD and MARGARET STEWART. The Winged Life; a Portrait of Antoine de Saint-Exupery, Poet and Airman. New York, David McKay Co., Inc. 224p. $3.50

SNYDER, EARL. General Leemy's Circus; a Navigator's Story of the 20th Air Force in World War II. New York, Exposition Press. 175p. $3.00

U. S. AIR FORCE. HISTORICAL OFFICE. The Army Air Forces in World War II. Vol. VI. Men and Planes. Edited by W. F. Craven and J. L. Cate. Chicago, University of Chicago Press. 808p. $8.50

U. S. DEPARTMENT OF THE AIR FORCE. Historical Data, Chronology of American Aviation Events. Washington, U. S. Govt. Print. Off. 114p. (Air Force Pamphlet 210-1-1)

WILSON, EUGENE E. Wings of the Dawn; a Study of Air Power as a Contribution to Civilization. Hartford, Conn., Connecticut Printers, Inc. 171p. $3.50

JUVENILE

ALLISON, DOROTHY KINSELLA. Helpful Helicopters. Los Angeles, Melmont Publishers, 1954. 23p. (Look, read, learn). $1.35

APPLETON, VICTOR II, [*pseud.*] Tom Swift and His Outpost in Space. New York, Grosset & Dunlap. 210p. (*His* New Tom Swift, Jr., Adventure No. 6). $.95

ARCHIBALD, JOSEPH. Aviation Cadet. New York, Longmans, Green and Company. 167p. $2.50

BRANLEY, FRANKLYN M. Experiments in the Principles of Space Travel. Illustrated by Jeanyee Wong. New York, Thomas Y. Crowell. 119p. $2.00

BROWN, SLATER. Spaceward Bound. New York, Prentice-Hall. 213p. (Lodestar books) $2.75

COLONIUS, LILLIAN and GLENN W. SCHRODER. At the Airport. New rev. ed. Los Angeles, Melmont Publishers, 1954. 23p. $1.35

DE LEEUW, ADELE LOUISE. The Story of Amelia Earhart. Illustrated by Harry Beckhoff. New York, Grosset & Dunlap. 181p. (Signature books, 33). $1.50

FELSEN, HENRY G. The Boy Who Discovered the Earth. Illustrated by Leonard Shortall. New York, Charles Scribner's Sons. 140p. $2.25

FROST, FRANCES M. Rocket Away! Foreword by Robert R. Coles. Pictures by Paul Galdone. New York, Whittlesley House. 48p. $2.00

HALLAM, ATLANTIS. Star Ship on Saddle Mountain. New York, The Macmillan Company. 182p. $2.50

HILL, MARGARET. Hostess in the Sky. Boston, Little, Brown and Co. 241p. (Atlantic Monthly Press Book). $2.75

HOGEBOOM, AMY. Planes and How to Draw Them. New York, The Vanguard Press. 39p. $2.00

JOSEPH, ALEXANDER. Rockets into Space. Consulting Editor, Paul F. Brandwein. Sketches by Don Merrick. Chicago, Science Research Associates. 48p. (Modern world of science series).

KNIGHT, CLAYTON. The Big Book of Real Helicopters. Text and Pictures by Clayton Knight. New York, Grosset & Dunlap. 28p. (Big Treasure Books) $1.00

LEWELLEN, JOHN B. Jet Transports. Illustrated by Bob Barker. New York, Thomas Y. Crowell Company. 151p. $2.50

MILLS, LOIS. Three Together; the Story of the Wright Brothers and Their Sister. Illustrated by William Moyers. New York, Chicago, Follett Publishing Company. 160p. $2.95

MORRILL, MADGE HAINES and LESLIE MORRILL. The Wright Brothers, First to Fly. Illustrated by Lee J. Ames. Nashville, Abingdon Press. 128p. (Makers of America Series) $1.50

PRATT, FLETCHER. All About Rockets and Jets. Illustrated by Jack Coggins. New York, Random House. 139p. (Allabout Books). $1.95

REINER, WILLIAM. The Flying Rangers. Illustrated by Ralph Ramstad. New York, Julian Messner, Inc. 62p. (Everyday Science Series) $1.60

REISS, MANFRED. Flying the Atlantic. Text and Pictures by Manfred Reiss. New York, Abelard-Schumann, Inc. 36p. $2.25

SCHNEIDER, LEO and MAURICE U. AMES. Wings in Your Future; Aviation for Young People. Illustrated by Jere Donovan. New York, Harcourt Brace. 151p. $2.75

SILVERBERG, ROBERT. Revolt on Alpha C. New York, Thomas Y. Crowell. 148p. $2.00

STINE, G. HARRY. Rocket Man, by Lee Correy [*pseud.*] Illustrated by William Wagoner. New York, Henry Holt and Company. $2.75

STINE, G. HARRY. Starship Through Space, by Lee Correy [*pseud.*] Illustrated by Bill Llewellyn. New York, Henry Holt and Company, 1954. 241p. $2.75

THAYER, JANE. Sandy and the Seventeen Balloons. Illustrated by Meg Wohlberg. New York, William Morrow. 46p. $2.00

TODD, RUTHVEN. Space Cat Visits Venus. Illustrated by Paul Galdone. New York, Charles Scribner's Sons. 87p. $2.00

VERRAL, CHARLES S. High Danger. Illustrated by Clayton Knight. New York, Sterling Publishing Co. 192p. $2.50

WIDNEY, STANLEY A. Elevator to the Moon. Illustrated by Earle Goodenow. New York, Follett Publishing Company. 128 p. $2.80

ZAREM, LEWIS. The Green Man from Space. New York, E. P. Dutton & Co., Inc. 160p. $2.50

LAW

DOHM, JOHN. Rules of the Air. North Hollywood, Calif., Pan American Navigation Service, 1954. 185p. $2.00

POGUE, L. WELCH. Helicopters and State Aeronautical Statutes. Memorandum to Helicopter Council, Aircraft Industries Association of America. Washington, Pogue and Neal, Attorneys. 42p.

U. S. GENERAL SERVICES ADMINISTRATION. FEDERAL REGISTER DIVISION. Code of Federal Regulations and Cumulative Pocket Supplements. Title 14: Civil Aviation. Parts 400 to End as of January 1, 1955. Washington, U. S. Govt. Print. Off. 189p. $.65

MAINTENANCE AND REPAIR

NORTHROP AERONAUTICAL INSTITUTE. TECHNICAL DEVELOPMENT STAFF. Aircraft Maintenance and Repair. Rev. ed. New York, McGraw-Hill Book Company, Inc. 452p. (*Its* Series of Aviation Texts) $8.00

RICE, RALPH P. Aero Mechanic's Questionnaire; Practical Questions & Answers for Airframe & Powerplant Mechanics with Explanatory Notes. 3rd rev. ed. Los Angeles, Aero Publishers, Inc. 206p. $5.00

MANUFACTURE

SAE PRODUCTION FORUM ON AIRCRAFT; Discussions at the Aircraft Production Forum at Los Angeles, October 5, 6, 1954. New York, Society of Automotive Engineers, Inc., 1954. 160p. $2.00

MEDICINE

BENFORD, ROBERT J. Doctors in the Sky; the Story of the Aero Medical Association. Springfield, Ill., Thomas C. Thomas. 326p. $8.75

BOOTHBY, WALTER M., ed. Respiratory Physiology in Aviation. Randolph Field, Texas, Air University School of Aviation Medicine, 1954. 189p.

U. S. AIR FORCE MEDICAL SERVICE. 2nd Report, USAF Medical Service, July 1, 1952-June 30, 1954. Washington, U. S. Govt. Print. Off. 401p.

U. S. BUREAU OF MEDICINE AND SURGERY. Aviation Medicine Practice. Washington, U. S. Govt. Print. Off. 288p. (NAVPERS 10839-A) $1.00

U. S. DEPARTMENT OF THE AIR FORCE. Medical Support of the Army Air Forces in World War II. Washington, U. S. Govt. Print. Off. 1027p. $7.00

MILITARY AERONAUTICS

THE AIR OFFICER'S GUIDE; A READY-REFERENCE ENCYCLOPEDIA OF MILITARY INFORMATION PERTINENT TO COMMISSIONED OFFICERS OF THE UNITED STATES AIR FORCE. 8th ed. Harrisburg, Pa., Military Service Publishing Company. 545p. $4.00

THE AIRMAN'S HANDBOOK. A READY REFERENCE OF HELPFUL INFORMATION AND COUNSEL FOR ALL AIRMEN OF THE UNITED STATES AIR FORCE. 4th ed. June 1954. Harrisburg, Pa., The Military Service Publishing Company, 1954. 531p. $2.75

AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE. Air Power and National Security. Edited by Robert Strausz-Hope and Stefan T. Possony. Philadelphia, The Academy. 208p. (*Its* Annals v. 299). $2.50; paper $2.00

BRADDON, RUSSEL. New Wings for a Warrior; The Story of Group-Captain Leonard Cheshire. New York, Rinehart. 240p. $3.50

BRICKHILL, PAUL. The Dam Busters. With a Foreword by Lord Tedder. New York, Ballantine Books. 185p. $2.00; paper $.35

GATLAND, KENNETH W. Development of the Guided Missile. 2nd ed. New York, Philosophical Library, 1954. 292p. $4.75

SMITH, DALE O. U. S. Military Doctrine—a Study and Appraisal. Foreword by General Carl Spaatz. New York, Duell, Sloan & Pearce. 256p. $3.50

SQUADRON ADMINISTRATION. 3rd ed. January 1955. Harrisburg, Pa., The Military Service Publishing Company. 476p. $4.00

U. S. BUREAU OF NAVAL PERSONNEL. Atomic Warfare Defense. Washington, U. S. Govt. Print. Off. 182p. (NAVPERS 10097) $.65

U. S. BUREAU OF NAVAL PERSONNEL. Aviation Ordnance-Man 3 & 2. Vol. 1. Washington, U. S. Govt. Print. Off. 332p. (Navy Training Courses. NAVPERS 10345)

U. S. DEPARTMENT OF THE AIR FORCE. Air Force Register, 1955. Washington, U. S. Govt. Print. Off. 681p. $3.75

U. S. DEPARTMENT OF THE AIR FORCE. Bombing and Gunnery Ranges. Washington, U. S. Govt. Print. Off. 55p. $1.50

U. S. DEPARTMENT OF THE AIR FORCE. You and Air Force Reserve. Washington, U. S. Govt. Print. Off. 38p.

VACULIK, SERGE. Air Commando. Translated from the French by Edward Fitzgerald. New York, E. P. Dutton. 320p. $4.00

MODEL FLYING

HOFFMAN, R. J. Model Aeronautics Made Easy. Chicago, Hoffman Products. $1.00

RIGBY, WALLIS. Rigby's Flying Model Supersonic Planes. Garden City, N. Y., Garden City Books. 12p. $1.50

PILOTING

BRIDGEMAN, WILLIAM. Lonely Sky, by William Bridgeman and Jacqueline Hazard. New York, Henry Holt and Company. 316p. $3.95

LUNDGREN, WILLIAM R. Across the High Frontier; the Story of a Test Pilot—Major Charles E. Yeager. New York, William Morrow & Company. 288p. $3.75

U. S. BUREAU OF AERONAUTICS (NAVY DEPT.) Practical Methods of Weather Analysis and Prognosis, by James F. O'Connor. Washington, U. S. Govt. Print. Off. 193p. (NAVAER 50-1P-502) $2.00

U. S. BUREAU OF NAVAL PERSONNEL. Aerographer's Mate 3 & 2. Washington, U. S. Govt. Print. Off. 419p. (NAVPERS 10363) $1.50

U. S. CIVIL AERONAUTICS ADMINISTRATION. Commercial Pilot Examination. Washington. U. S. Govt. Print. Off. 27p. $.75

U. S. CIVIL AERONAUTICS ADMINISTRATION. Pilot's Weather Handbook, by J. T. Lee and Carl M. Reher. Washington, U. S. Govt. Print. Off., 1954. 143p. (*Its* Technical Manual No. 104) $1.25

U. S. DEPARTMENT OF THE AIR FORCE. Air Navigation. Vol. 2. Washington, U. S. Govt. Print. Off. 440p. (Air Force Manual 51-40) $3.25

U. S. DEPARTMENT OF THE AIR FORCE. Instrument Flying, Techniques and Procedures. Washington, U. S. Govt. Print. Off. 94p. (Air Force Manual 51-36) $1.25

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U. S. DEPARTMENT OF THE AIR FORCE. Theory of Instrument Flying. Washington, U. S. Govt. Print. Off., 1954. 322p. (Air Force Manual 51-38)

U. S. WEATHER BUREAU. Manual of Surface Observations (WBAN). 7th ed. January 1955. Washington, U. S. Govt. Print. Off. 1v. (Loose-Leaf) (*Its* Circular N). $.75

WEEMS, PHILIP V. H. Air Navigation. 4th ed. Annapolis, Weems System of Navigation. 473p. $6.00

ZWENG, CHARLES A. and ALLAN C. ZWENG. Aeronautical Training; a Practical Guide to the CAA Commercial, Private, and Student Pilot Ratings. 12th rev. ed. North Hollywood, Calif., Pan American Navigation Service. 294p. $4.00

ZWENG, CHARLES A. Flight Engineers Manual; with Typical Multiple-Choice Questions and Answers for the Flight Engineering Examination. 3rd rev. ed. North Hollywood, Calif., Pan American Navigation Service, 1954. 304p. $5.00

ZWENG, CHARLES A. Flight Instructor. 11th rev. ed. North Hollywood, Calif., Pan American Navigation Service. 262p. $5.00

ZWENG, CHARLES A. and JOHN DOHM. Flying the Omnirange; a Pilot's Guide to the Omnidirectional Radio Range Distance, Measuring Equipment, and the Course-Line Computer. North Hollywood, Calif., Published jointly by the Pan American Navigation Service and the Weems System of Navigation. 153p.

ZWENG, CHARLES A. and ALLAN C. ZWENG. Radio and Instrument Flying; a Guide to the Instrument Rating. 14th rev. ed. North Hollywood, Calif., Pan American Navigation Service. 299p. $5.00

POWER PLANTS

BENDIX AVIATION CORP., SCINTILLA MAGNETO DIVISION. The Aircraft Magneto. 6th ed. Sydney, New York, Scintilla Magneto Division, Bendix Aviation Corp., 1954. 61p.

DRIGGDS, IVAN H. and OTIS E. LANCASTER. Gas Turbines for Aircraft. New York, Ronald Press. 364p. $10.00

FINCH, VOLNEY C. Jet Propulsion Turbojets. Rev. ed. Palo Alto, The National Press. 327p.

GENERAL ELECTRIC COMPANY. Aircraft Gas Turbine Data Book. Cincinnati, Ohio, Aircraft Gas Turbine Division, General Electric Company. 145p.

MANGHAM, ERIC and A. PEACE. Jet Engine Manual. New York, Philosophical Library. 133p. $3.75

1954 AIRCRAFT SPARK PLUG AND IGNITION CONFERENCE REPORT, TOLEDO, OHIO, OCTOBER 5-7, 1954. Toledo, Ohio, Champion Spark Plug Co., 1954. 190p.

NORTHROP AERONAUTICAL INSTITUTE. TECHNICAL DEVELOPMENT STAFF. Aircraft Power Plants. Rev. ed. New York, McGraw-Hill Book Company, Inc. 392p. (*Its* Series of Aviation Texts) $7.00

ROSEN, MILTON W. The Viking Rocket Story. New York, Harper & Brothers. 242p. $3.75

SMITH, C. W. Aircraft Gas Turbines. New York, John Wiley & Sons. 470p. (General Electric Series) $8.50

SMITH, G. GEOFFREY. Gas Turbines and Jet Propulsion. Rev. and enl. ed. by F. C. Sheffield. 6th ed. New York, Philosophical Library. 412p. $15.00

U. S. DEPARTMENT OF THE AIR FORCE. Aircraft Performance Engineering for Reciprocating Engines. Washington, U. S. Govt. Print. Off., 1954. (AF Manual 51-9) 367p. $2.75

VAETH, J. GORDON. 200 Miles Up; the Conquest of the Upper Air. 2nd ed. New York, Ronald Press Co. 274p. $5.00

WILKINSON, PAUL H. Aircraft Engines of the World, 1955. 13th ed. New York, The Author, 225 Varick St. 320p. $12.00

REFERENCE WORKS

AERONAUTICAL ENGINEERING CATALOG. Eleventh 1955 edition. Editor: Wellman A. Schrader. New York, Institute of the Aeronautical Sciences, 1955. 346p. $7.50

THE AIRCRAFT YEAR BOOK 1954. Official Publication of the Aircraft Industries Association. Thirty-sixth annual edition. Washington, Lincoln Press, Inc., 1955. 472p. $6.00

AMERICAN AIR MAIL CATALOGUE OF AIR LETTER SHEETS. 1955 ed. Albion, Pa., American Air Mail Society. $3.00

AMERICAN AVIATION WORLD WIDE DIRECTORY. Vol. 16. Nos. 1 and 2. Spring-Summer and Fall-Winter 1955. Washington, American Aviation Publications, Inc. 2v. Per issue $7.50

AVIATION FACTS AND FIGURES, 1955. Compiled by Rudolf Modley and Thomas J. Cawley. Edited by Ben S. Lee. Official Publication of the Aircraft Industries Association of America, Inc. Washington, Lincoln Press, Inc. 103p. $1.00

FLIGHT HANDBOOK. 5th ed. Compiled by the Staff of Flight. Edited by Maurice A. Smith. New York, Philosophical Library, Inc. 282p. $6.00

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

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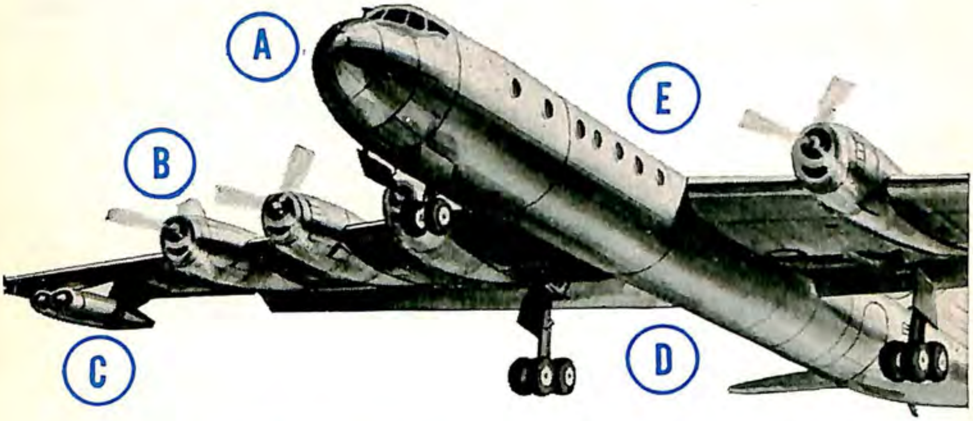

The airplane illustrated is a composite since, obviously, no single plane carries all of the Bendix equipment on these pages. However, many Bendix products fly with every U. S. fighting plane and are used extensively on commercial, executive and private planes as well.

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Airborne "Weather" Radar
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Vacuum Operated Instruments
Filters for Aircraft Heaters (Auxiliary, Engine, Cabin)
Pneumatic System Filters
Dynamotors
Blower Motors
Band-Change Motors
Booster Dynamotors
Actuator Motors
Special Inverters
Aircraft Interphone Systems
Radar
Radio Transmitters
Radio Receivers

Radio Communication Systems
Electronic Navigational Equipment
Automatic Radio Compass
VHF Omni-Directional Range Equipment
Automatic Pilot and Flight Path Control Equipment
Autosyn* and Magnesyn* Remote Indicating Systems For
Fuel Flow • Fuel Pressure • Hydraulic Pressure • Liquid Level • Manifold Pressure • Oil Pressure • Position • Temperature • Torque Pressure • Water Pressure
Fuel Flow Totalizing Systems

Distance Measuring Equipment
Manifold Pressure Gauges
Electric Tachometer Systems
Warning Units
Accelerometers
Airspeed Indicators
Attitude Horizon Indicators
Driftmeters
Dual Radio and Magnetic Compass Indicators
Gyro Flux Gate* Compasses
Gyro Horizon Indicators
Magnetic Compasses
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ODR Components
Sextants
Control Panels

in Aviation

B

Bendix* Starter Drives
Magnetos
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Radio Shielding Harnesses
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Reservoir—Line Type Filters
Vent—Line Type Filters
Fuel System Filters
De-Icing System Filters

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Fault Protection Systems
Generators
Inverters
Line Relays
Overvoltage Protectors
Reverse Current Cutouts
Voltage Booster Dynamotors
Voltage Regulators
Power Failure Indicators
Engine Starting Equipment, including Booster Coils • Induction Vibrators • Relay Switches • Starters

Automatic Engine Power Controls
Automatic Engine Boost Controls
Propeller Governor Controls
Supercharger Regulator Controls
Injection and float type carburetors
Direct injection fuel systems, including
Distributing Pumps • Regulator Units • Injector Nozzles • Fuel Supply Pumps
Speed-Density Fuel Metering Systems for Jet and Reciprocating Engines
Water Injection Systems

C

Ignition Systems for Jet and Turbine Engines
Igniter Plugs for Jet and Turbine Engines
Jet Engine Starters and Generators
Speed-Density Fuel Metering Systems
Duplex Nozzles
Fuel Metering Systems for Starting Conditions
Fuel Flow Dividers
Fuel Supply Pumps

D

Brake Lining
Hydraulic Actuating Cylinders
Power Brake Valves
Shock Absorbing Struts
Shoe and Segmented Rotor Type Brakes
Wheels
Master Cylinders
Hydraulic Brake Control Valves

E

Electrical Connectors
Small Electric Actuators
4-Way Hydraulic Valves
Hydraulic Accumulators
Hydraulic Hand Pumps

Position Light Flashers
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Long Range Search and Surveillance Radar
G. C. A. Ground Controlled Approach System
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Oxygen Regulators
Gear Boxes
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In addition to the products listed above, Bendix makes many meteorological instruments which are the source of much of the weather data governing flight schedules for all types of planes.

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GREEN, WILLIAM and RAY CROSS. The Jet Aircraft of the World. Garden City, N. Y., Hanover House. 176p. $6.95

GREEN, WILLIAM and GERALD POLLINGER. The World's Fighting Planes. Garden City, N. Y., Hanover House. 237p. $3.50

HARVEY, D. G. T. British Civil Aircraft. New York, John de Graff, Inc. 168p. $3.00

JANE'S ALL THE WORLD'S AIRCRAFT. 1955-1956 ed. New York, McGraw-Hill Book Company, Inc. $25.00

PEREIRA, HAROLD. Aircraft Badges and Markings. New York, John de Graff, Inc. $1.50

U. S. BUREAU OF FOREIGN AND DOMESTIC COMMERCE. Foreign and International Aviation . . . Basic Information Sources. Prepared by N. W. Kendall. Washington, U. S. Govt. Print. Off. 21p. (*Its* World Trade Information Service. Part 4, No. 55-7) $.20

U. S. CIVIL AERONAUTICS ADMINISTRATION. Statistical Handbook of Civil Aviation, 1955. Washington, U. S. Govt. Print. Off. 119p. $.50

U. S. DEPARTMENT OF THE AIR FORCE. Index of Specifications and Related Publications Used by the Air Force. Military Index, Vol. 4 April 1955. Wright Air Force Base, Dayton, Ohio, Air Research and Development Command. 507p. $2.00

U. S. LIBRARY OF CONGRESS. REFERENCE DEPARTMENT. Aeronautical Sciences and Aviation in the Soviet Union; a bibliography compiled by Bertha Kucherov. Washington, Card Division, Library of Congress. 274p. $2.00

U. S. NATIONAL ARCHIVES. Preliminary Inventory of the Records of the Joint Congressional Aviation Policy Board, 1947-1948. Compiled by W. G. Caudill and G. P. Perros. Washington, U. S. Govt. Print. Off. 26p. (*Its* Publication No. 55-5. Preliminary Inventories No. 74).

WHO'S WHO IN WORLD AVIATION. Washington, American Aviation Publications, Inc. 345p. $10.00

ROTOR AIRCRAFT

AMERICAN HELICOPTER SOCIETY. Proceedings of the 11th Annual Forum of the American Helicopter Society, Inc., Washington, April 27-30, 1955. New York, The Society. 172p. $6.75

CAMPBELL, HARRIS S. Mechnical Design and Description. Washington, Office of Technical Services, 1954. 275p. (Rotary Wing Aircraft Handbook and History. v. 8) $7.00

LIBERATORE, EUGENE K. Special Types of Rotory Wing Aircraft. Washington, Office of Technical Services, 1954. 131p. (Rotory Wing Aircraft Handbook and History. v. 11) $3.50

SPACE FLIGHT

ADAMSKI, GEORGE. Inside the Space Ships. New York, Abelard-Schumann, Inc. 256p. $3.50

BURGESS, ERIC. Frontier to Space; with a Foreword by Sir Harold Spencer Jones. New York, The Macmillan Company. 174p. $4.50

BURNETT, RAYMOND W. Operation Moon; Facts We'll Need to Know When We Travel to Other Worlds. Paul Brandwein, Consulting Editor. Chicago, Science Research Associates. 48p. (Science Research Associates Modern World of Science Series).

EPSTEIN, BERYL WILLIAMS. The Rocket Pioneers on the Road to Space, by Beryl Williams and Samuel Epstein. Foreword by Andrew G. Haley. New York, Julian Messner, Inc. 241p. $3.75

RICHARDSON, ROBERTS S. Exploring Mars. New York, McGraw-Hill Book Company. 261p. $4.00

SMITH, RALPH ANDREWS. The Exploration of the Moon. Text by Arthur C. Clarke. New York, Harper and Brothers. 112p. $2.50

TEMPLE, WILLIAM F. The Prentice-Hall Book About Space Travel. Illustrated by Henry Billings. New York, Prentice-Hall, 1954. 142p. $2.75

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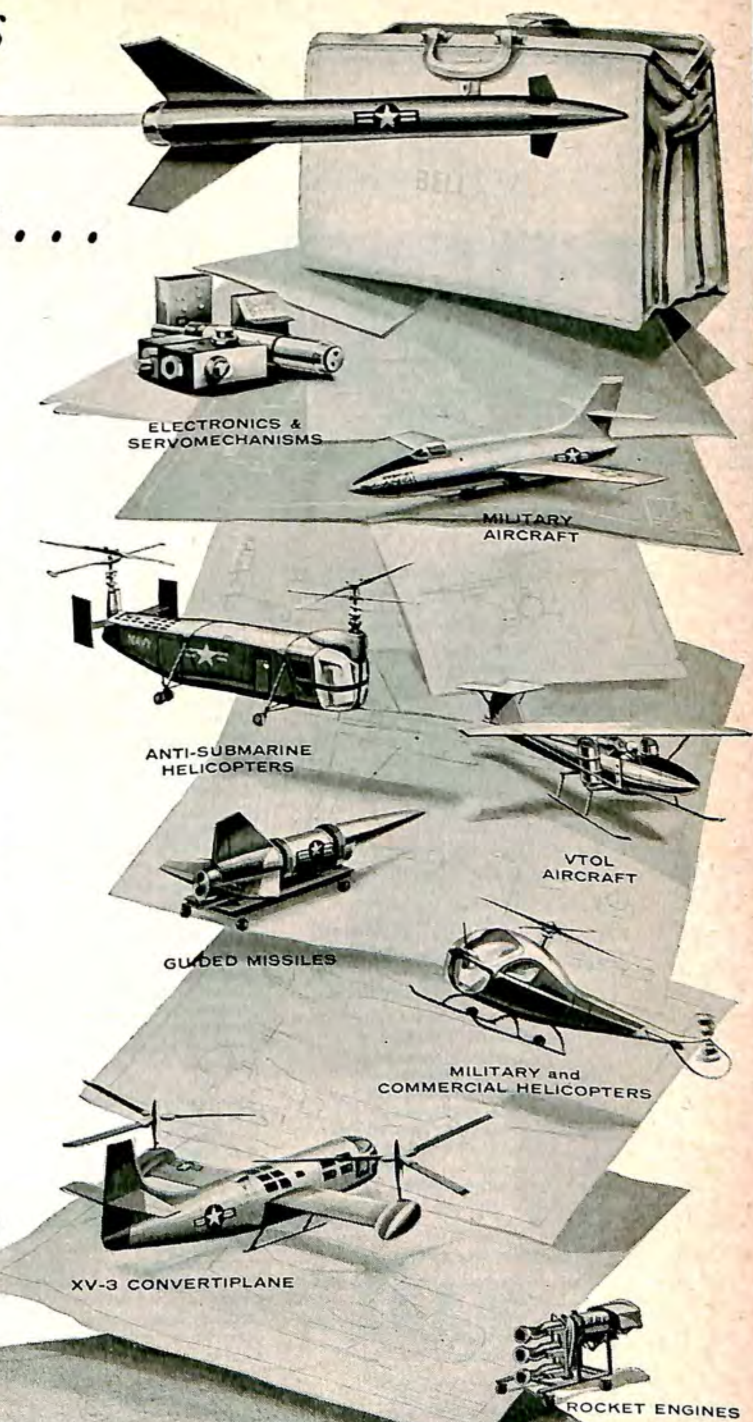

LEAR PRODUCES

This roster of Lear aviation products is, of necessity, incomplete. Many of these products are frequently combined to form an infinite variety of additional products or systems. Only enough typical devices are shown here to demonstrate Lear's mastery of a field of science and technology that uses thousands of such building blocks for meeting the highly specialized requirements of modern aircraft and missiles.

δ *flight control systems*

Automatic altitude controllers
Automatic approach couplers
Automatic Mach number controllers
Automatic pilots (lightplane)
Automatic pilots (high-performance)
Automatic pitch, yaw, and roll dampers
Automatic rudder controllers
Automatic wing flap systems
Missile control systems
Test equipment

σ *flight reference systems*

No-gimbal-lock vertical gyro indicators
Stable platforms
Test equipment
Three-axis gyro indicators
Vertical gyro indicators

γ *navigational systems*

Automatic radio direction finders
Glide slope receivers
High-latitude gyro compass systems
Integrated ADF-magnetic compass systems
Localizer receivers
Marker beacon receivers
VHF Omnirange receivers

ξ *electro-mechanical systems*

Artificial feel systems
Camera positioners
Canopy control systems
Carburetor air door controllers
Convertiplane rotor positioning systems
Cowl flap positioners
De-icing valve positioners
Engine throttle controllers
Gas, hydraulic, fuel, valve positioners
Inlet screen retraction systems
Inlet vane angle controllers
Jettison systems
Landing gear lock systems
Mechanical advantage ratio changers
Oil cooler flap controllers
Parachute door systems
Precision remote positioning systems
Supercharger blower shifters
Test equipment
Throttle friction controllers
Trim tab positioners
Turbo-prop clutch valve controllers
Wing flap positioning systems

λ *electro-mechanical components*

Linear actuators
Rotary actuators
Servo actuators
Power units
Actuator controls
Alternators
Capstans
Freewheeling clutches
Friction clutches
Magnetic clutches
Slip overload clutches
Electromagnetic brakes
Flex drive H's, hex's, L's, and T's
Flexible shafts
Gearboxes
Handcranks
Motors (AC and DC)
Enclosed fan motors
Explosion proof motors
Gearhead motors
High frequency motors
High temperature motors
Miniature motors
Pneumatic motors
Servo motors
Torque motors
Screwjacks
Load limit switches
Position limit switches
Programming switches

ζ *instruments*

ADF indicators
Attitude indicators, 2-axis
Attitude indicators, 3-axis
Directional indicators
ILS indicators
Integrated ADF-magnetic indicators
Trim indicators
Tuning meters
Omnirange indicators

μ *instrument components*

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SUMMARY STATISTICS

The following statistics are as nearly up-to-date as was practicable at the time the Year Book went to press. Wherever possible, last-minute, 1955 figures were included in the main text of the book, and may be found under appropriate chapter headings.

The Editors

AVERAGE WEEKLY HOURS IN THE AIRCRAFT, ENGINE, PROPELLER, AND PARTS INDUSTRY

(Source: Aircraft Industries Association)

Year and Month	Aircraft and Parts	Aircraft	Aircraft Engines and Parts	Aircraft Propellers and Parts	Other Aircraft Parts and Equipment
1953	41.9	41.3	43.0	41.9	42.8
1954	40.9	40.9	40.7	39.4	41.2
1955					
January	41.4	41.6	41.1	40.0	41.5
February	41.1	41.3	40.7	39.8	40.9
March	41.3	41.5	41.0	39.8	40.9
April	40.7	40.8	40.4	39.9	40.5
May	41.0	41.0	40.7	39.8	41.2
June	41.0	41.0	40.5	40.7	41.5
July	41.2	41.1[a]	41.3[a]	40.5[a]	41.5[a]
August	41.0	41.1	39.5	43.0	42.0

AVERAGE WEEKLY EARNINGS

1953	83.80	82.19	87.29	85.90	85.17
1954	85.07	85.07	85.06	82.35	85.70
1955					
January	88.81	89.44	87.54	83.60	88.40
February	87.95	88.80	86.69	84.28	86.71
March	88.38	89.23	87.74	84.77	86.71
April	87.10	87.72	85.65	84.99	85.86
May	88.15	88.56	87.10	84.38	87.76
June	88.15	88.15	86.67	87.91	89.64
July	89.40[a]	89.19[a]	89.62[a]	88.70[a]	90.06[a]
August	88.97	89.19	85.72	95.89	91.98

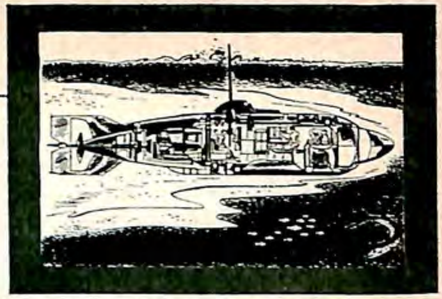
AVERAGE HOURLY EARNINGS

1953	2.00	1.99	2.03	2.05	1.99
1954	2.08	2.08	2.09	2.09	2.08
1955					
January	2.14	2.15	2.13	2.09	2.13
February	2.14	2.15	2.13	2.12	2.12
March	2.14	2.15	2.14	2.13	2.12
April	2.14	2.15	2.12	2.13	2.12
May	2.15	2.16	2.14	2.12	2.13
June	2.15	2.15	2.14	2.16	2.16
July	2.17	2.17	2.17[a]	2.19	2.17[a]
August	2.17	2.17	2.17	2.23	2.19

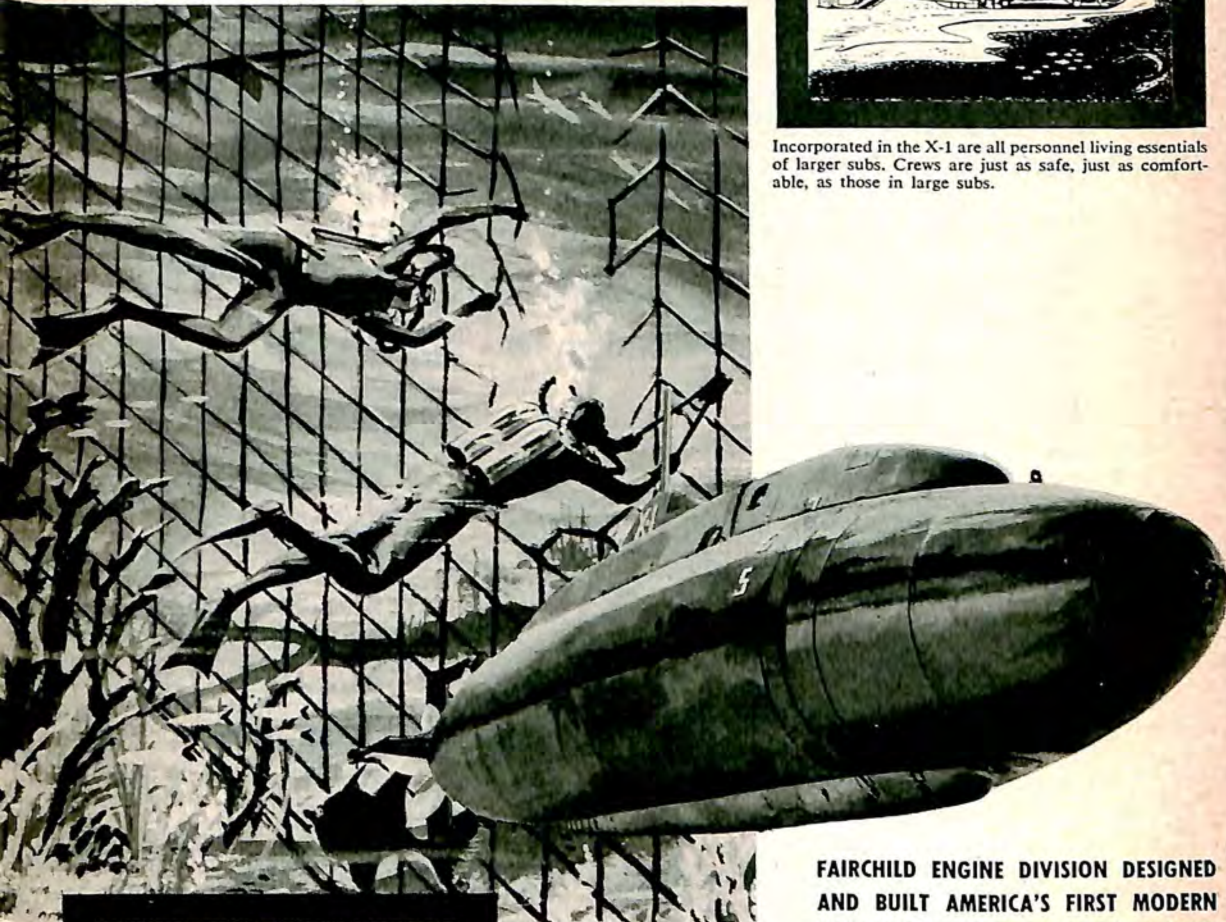
[a] **Revised**

PRIVATE EYE FOR THE U. S. NAVY

NUMBER 10 OF A SERIES



Incorporated in the X-1 are all personnel living essentials of larger subs. Crews are just as safe, just as comfortable, as those in large subs.



Because of its maneuverability in shallow water, and its agility in finding secure hiding places, the X-1 is a highly versatile addition to our Navy.

FAIRCHILD ENGINE DIVISION DESIGNED AND BUILT AMERICA'S FIRST MODERN MIDGET SUBMERSIBLE FOR THE U. S. NAVY

New tactical mobility is brought to many U.S. Navy operations by the Fairchild X-1, a revolutionary underwater weapons system for close-in reconnaissance of harbors and inlets. The X-1 is the first of its kind ever produced in America, and the first naval vessel of any kind to be designed and constructed by a U.S. aircraft manufacturer.

Fairchild designed and built the 25-ton, 50-foot X-1 with an unconventional underwater propulsion system, and with airplane-like controls. The new "pocket" sub has a four-man crew—operates quietly and stealthily, performing missions that large craft could never do.

Once again, Fairchild design and engineering ingenuity has produced a vital new instrument of defense for our armed forces.

...WHERE THE FUTURE IS MEASURED IN LIGHT-YEARS!

FAIRCHILD

ENGINE DIVISION • DEER PARK, L. I., N. Y.

A Division of Fairchild Engine and Airplane Corporation

NUMBER OF ENGINES PRODUCED

1917-1955

	Total	Military	Civil
1917-1919	N.A.	44,453	N.A.
1932	1,896	1,085	813
1933	1,980	860	1,120
1934	2,736	688	2,048
1935	2,965	991	1,974
1936	4,237	1,804	2,433
1937	6,084	1,989	4,095
1938	N.A.	N.A.	N.A.
1939	11,172	N.A.	N.A.
1940[a]	N.A.	22,667	N.A.
1941[a]	N.A.	58,181	N.A.
1942[a]	N.A.	138,089	N.A.
1943[a]	N.A.	227,116	N.A.
1944[a]	N.A.	256,911	N.A.
1945[a]	N.A.	109,650	N.A.
1946	43,407	2,585[b]	40,822
1947	21,178	4,808	16,370
1948	N.A.	N.A.	9,039
1949	N.A.	N.A.	3,982
1950	N.A.	N.A.	4,314
1951	N.A.	N.A.	4,580
1952	34,382[c]	29,000[c]	5,382
1953	41,647[c]	35,000[c]	6,647
1954	30,519[c]	25,000[c]	5,519[c]
1955	32,639	25,000	7,639

[a]Excludes aircraft engines produced for other than aircraft use.
[b]Excludes experimental engines, engines classified by the armed forces as secret or confidential, engines for non-man-carrying, pilotless aircraft, jet assist mechanisms.
[c]AIA estimate.

Source: 1917-1747—AIA Aircraft Year Book, 1948, P. xxl.
1948-1955—Bureau of Census Facts for Industry Series M42A.

SHIPMENTS OF CIVIL AIRCRAFT ENGINES

1955

(Source: Bureau of Census, Facts for Industry, Series M42A.)

Month	Number of Engines	Horsepower (in thousands)	Total Value (Thousands of Dollars)
January	626	321	5,996
February	626	328	6,115
March	680	341	6,319
April	657	288	5,169
May	704	280	4,780
June	706	258	4,329
July	552	235	4,146
August	464	184	3,177
September	577	228	3,807
October	614	251	4,285
November	688	272	4,677
December	775	352	6,347

WITHOUT EQUAL IN THEIR CLASS

SIMMONDS PRECISION PRODUCTS

ELECTRONIC • HYDRAULIC • MECHANICAL

LIGHTWEIGHT PACITRON FUEL GAGE SYSTEMS: Fuel measurement and fuel management systems, of both the "two unit" and "three unit" types are now available in the famous Pacitron systems. With its gages now flying on more than 90 advanced type aircraft and on 40 U.S. and foreign flag airlines, Simmonds continues to be "first in electronic fuel gaging." Write for booklet "Fuel Gage Systems for Transport Aircraft."

SIMMONDS SU FUEL INJECTION SYSTEMS: The only advanced type fuel injection system now in production for medium h.p. gasoline engines, the SU System has been proven in field tests to give fuel economies up to 35%. Eliminates icing conditions, and gives improved cold starts. Detailed information available on request.

PRECISION PUSH-PULL CONTROLS: Simmonds Push-Pull Controls are positive, precise and versatile. Capable of heavy loads and accurate operation under vibration, continuous cycling, temperature extremes, etc. Proven in millions of miles of reliable service on aircraft engines, pressurized doors, helicopter controls, etc. Write for design literature.

COWLING AND ACCESS LATCHES: Heavy duty flush fitting aircraft latches for installation on cowlings and access panels. Two-piece toggle type construction, available to fit a wide range of structural curvatures. Portfolio of latch designs available on request.

EXPLOSION SUPPRESSION SYSTEMS: Designed to provide protection against the most common single cause of the loss of combat aircraft — explosions resulting from the ignition of fuel/air mixtures. Now flying on U.S. combat aircraft, this is another Simmonds first. Further information on request.

HYDRAULIC FUSES: Quantity measuring fuses that act as automatic safety shut-offs for aircraft hydraulic systems. Close whenever more than a predetermined amount of liquid passes through the line. Detailed information available on request.

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Sole Canadian Licensee:
Simmonds Aerocessories of Canada Limited, Montreal

General Offices: Tarrytown, New York
Branch Offices: Detroit, Mich.
Dayton, Ohio • St. Louis, Mo. • Dallas, Tex.
Wichita, Kans. • Glendale, Cal. • Seattle, Wash.

TOTAL EMPLOYMENT IN AIRCRAFT AND PARTS INDUSTRY[1]

(In thousands)

Source: Aircraft Industries Association

Years and Months	Total	Aircraft	Aircraft Engines & Parts	Aircraft Propellers & Parts	Other Aircraft Parts & Equipment
1953					
January	763.0	473.4	167.2	17.5	104.9
February	774.5	475.6	173.9	17.9	107.1
March	784.1	478.8	176.6	18.0	110.7
April	773.8	475.1	169.4	17.9	111.4
May	772.6	472.3	171.0	17.8	111.5
June	776.0	469.9	175.4	17.7	113.0
July	781.4	471.7	177.0	17.6	115.1
August	788.5	476.2	176.8	17.5	118.0
September	795.0	479.6	178.6	17.8	119.0
October	790.3	476.4	179.1	17.7	117.1
November	766.3	452.9	176.2	17.6	119.6
December	783.6	467.0	175.5	17.6	112.0
1954					
January	799.0	483.9	172.8	17.4	124.9
February	789.8	476.5	171.4	17.1	124.8
March	786.2	475.6	170.2	16.7	123.7
April	779.3	476.1	166.5	13.2	123.5
May	769.0	472.9	161.5	12.5	122.1
June	765.6	470.2	158.4	16.7	120.3
July	764.7	474.5	154.9	16.6	118.7
August	754.4	474.9	146.5	16.5	116.5
September	756.7	471.2	153.3	16.4	115.8
October	748.0	466.2	151.6	16.1	114.1
November	751.4	468.2	149.9	15.7	117.6
December	753.5	470.9	150.0	15.3	117.3
1955					
January	752.6	472.8	149.0	14.3	116.5
February	753.2	477.0	148.6	14.1	113.5
March	752.0	477.1	148.8	13.9	112.2
April	749.1	478.0	146.6	13.6	110.9
May	740.9	476.8	143.1	13.4	107.6
June	738.7	476.3	142.1	13.3	107.0
July	742.3	481.9	140.7	13.2	106.5
August	741.4	482.1	140.5	13.2	105.6
September	749.3	485.5	143.2	13.5	107.1
October	754.3	488.3	144.5	13.6	107.9
November	765.1	493.4	148.3	13.9	109.5

[1]As of pay period ending nearest 15th of the month.

Note—These data have been revised on the basis of the 1954 benchmark.


N70700
N70700

U. S. CIVIL AIRCRAFT

By States

(Source: Civil Aeronautics Administration)

State	Number of civil aircraft[1] Jan. 1, 1954	Jan. 1, 1955	State	Number of civil aircraft[1] Jan. 1, 1954	Jan. 1, 1955
TOTAL	91,102	92,067	Montana	1,179	1,168
			Nebraska	1,763	1,737
Alabama	747	718	Nevada	471	476
Arizona	1,262	1,259	New Hampshire	215	221
Arkansas	1,093	1,104	New Jersey	1,931	1,960
California	10,369	10,635	New Mexico	772	830
Colorado	1,256	1,250	New York	4,497	4,598
Connecticut	629	685	North Carolina	1,600	1,615
Delaware	210	210	North Dakota	1,148	1,148
District of Columbia	567	512	Ohio	4,309	4,436
Florida	2,686	2,743	Oklahoma	1,996	1,958
Georgia	1,242	1,255	Oregon	1,760	1,723
Idaho	870	855	Pennsylvania	3,910	3,830
Illinois	5,030	5,152	Rhode Island	197	203
Indiana	2,757	2,786	South Carolina	592	567
Iowa	2,064	2,066	South Dakota	1,130	1,075
Kansas	2,503	2,433	Tennessee	923	928
Kentucky	704	721	Texas	6,740	6,829
Louisiana	1,284	1,338	Utah	481	503
Maine	527	515	Vermont	158	158
Maryland	864	913	Virginia	1,237	1,244
Massachusetts	1,431	1,406	Washington	2,260	2,297
Michigan	3,899	3,940	West Virginia	602	574
Minnesota	2,164	2,242	Wisconsin	1,967	1,908
Mississippi	868	936	Wyoming	506	514
Missouri	2,050	2,123	Outside U. S. A.	1,682	1,770

[1]Includes gliders.

CIVIL AIRCRAFT PRODUCTION

Number of Units

(Source: Bureau of the Census, Facts for Industry, Series M42 A)

Month	1951	1952	1953	1954	1955
January	255	224	365	278	350
February	239	227	382	240	357
March	272	248	358	312	478
April	247	291	402	359	438
May	248	330	417	309	486
June	216	335	339	316	538
July	207	353	402	293	354
August	171	349	350	265	241
September	184	337	359	265	......
October	124	293	235	174	......
November	162	268	275	288	......
December	152	254	250	290	......
TOTAL	2,477	3,509	4,134	3,098	......

AIRPORTS AND LANDING FIELDS

1927-1954

(Source: Civil Aeronautics Administration)

Calendar Year	Total	Commercial	Municipal	CAA intermediate	All others
1927	1,036	263	240	134	399[2]
1928	1,364	365	368	210	421[2]
1929	1,550	495	453	285	317[2]
1930	1,782	564	550	354	314[2]
1931	2,093	829	780	404	80
1932	2,117	869	777	352	119
1933	2,188	938	827	265	158
1934	2,297	872	980	259	186
1935	2,368	822	1,041	291	214
1936	2,342	774	1,037	296	235
1937	2,299	727	1,053	283	236
1938	2,374	760	1,092	267	255
1939	2,280	801	963	266	250
1940	2,331	860	1,031	289	151
1941	2,484	930	1,086	283	185
1942	2,809	1,069	1,129	273	338
1943	2,769	801	914	240	814
1944	3,427	1,027	1,067	229	1,104
1945	4,026	1,509	1,220	216	1,081
1946	4,490	1,930	1,424	201	935
1947	5,759	2,849	1,818	178	914
1948	6,414	2,989	2,050	161	1,214
1949	6,484	2,585	2,200	139	1,560
1950	6,403	2,329	2,272	76	1,726
1951	6,237	2,042	2,316	57	1,822
1952	6,042	N.A.	N.A.	N.A.	N.A.
1953	6,760	N.A.	N.A.	N.A.	N.A.
1954	6,977	N.A.	N.A.	N.A.	N.A.

N.A. Not Available.

[2]Include auxiliary marked fields, later classified as to ownership, commercial or municipal.

ALLOCATIONS AND APPROPRIATIONS FOR AERONAUTICS, U. S. ARMY

1899	Langley experiments.	$25,000
1900	Langley experiments.	25,000
1908	Baldwin dirigible, revoked and later applied toward payment for Wright plane.	25,000
1909	Herring & Scott airplanes. Later for Wright plane.	21,000
1910	Wright plane.	9,000
1912	Signal Service of Army.	125,000
1913	Signal Service of Army.	100,000
1914	Signal Service of Army.	125,000
1915	Signal Service of Army.	50,000
		$505,000

AVERAGE SPEED
(Miles Per Hour)

Domestic Scheduled Air Carriers
(Source: CAA Statistical Handbook)

Year	Average speed (miles per hour)
1947	168.2
1948	171.9
1949	179
1950	181.2
1951	184.6
1952	190.8
1953	197.8
1954	205.8

The Navy's "Crusader" Carries a Zenith Plastic Shield

This shield is the nose radome of the Chance Vought F8U, protecting the latest contributions of science to its fighting efficiency in the air.

These ultra-sensitive electronic devices help to make it possible for this fastest of Navy fighters to stab through the sonic barrier in level flight straight to the heart of an enemy intruder.

Zenith Aircraft is proud of the part its specialized skill in radome construction has enabled it to play in our country's defense.

For the latest and most effective developments in reinforced plastic applications in aircraft, fuel tanks and guided missiles, consult the Engineering Research Division of

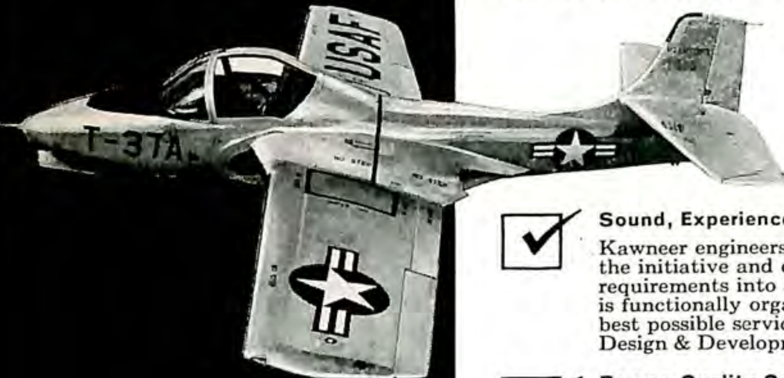
ZENITH AIRCRAFT Z **gardena, calif.**

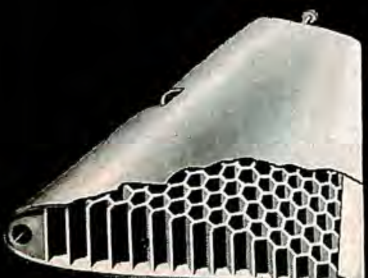
division of Zenith Plastics Company

WORLD'S LARGEST PLANT PRODUCING REINFORCED PLASTICS FOR AIRCRAFT

✓ check the Kawneer "package" service

- Cockpit Enclosures • Major Airframe Assemblies
- Metal Bonded and Honeycomb Assemblies • Acrylic Forming and Fabrication • Jet Engine Sheet Metal Parts and Assemblies • Heliarc Welding





Sound, Experienced Engineering

Kawneer engineers have broad experience coupled with the initiative and desire to efficiently translate your requirements into a finished product. The department is functionally organized in groups to give you the best possible service: Project Engineering, Design & Development.

Proven Quality Control Methods

Kawneer Quality Control is constant—machines and instruments are periodically checked more often than required by specification to achieve *plus* quality. Kawneer's processing, fabrication, welding, anodizing, metal bonding and heat treating are all certified to Air Force Quality Control Standards. All procedures conform to MIL SPEC 5923B.

Efficient Production Line

Kawneer aircraft production is under one roof. The economy of well-planned production lines to integrate all functions is a cost-saving factor to you. The special plant has 104,000 square feet of floor with a 16′ clear ceiling. The modern equipment includes routers, mechanical presses, milling machines, spray painting, hydro press, autoclave, platen press and associated new high quality equipment.

Extensive Research and Development

Kawneer research is backed by over 50 years of experience in metal working; years that have seen Kawneer discover new processes that have revolutionized metal shaping methods. Kawneer maintains complete equipment necessary for chemical and physical research. Possibly this development work can be used to your advantage.

Adequate Supply of Skilled Labor

Kawneer's skilled labor force is thoroughly trained in the latest application techniques of modern machines. These men come from an abundant pool of skilled labor located in the Niles, Mich., and South Bend, Indiana area, 90 miles from Chicago.

Write for the new Aircraft Division books describing complete facility details

ENGINEERS! Kawneer offers excellent opportunities for growth and advancement. Bring your family to Niles and enjoy vacationland living. Work in new, modern facilities.

50TH ANNIVERSARY

Kawneer
General Offices
NILES, MICHIGAN

AIRCRAFT PRODUCTS DIVISION

1906–1956

avco builds for the future as it builds America's defense

Defense and industry are closely interrelated. Because new advances in one area may vitally affect long-range developments in the other, the scope of recently formed Avco Defense and Industrial Products encompasses both. Avco Defense and Industrial Products is an integrated organization, backed by Avco's entire resources, with outstanding facilities for research and development, product engineering, and manufacturing in these areas:

Power Plants. Over 50,000 aircraft engines in past quarter century. Advanced turbine development and long record of piston-engine leadership.

Electronics. Communications. Complete radar and fire-control systems. Pioneering in miniaturization and unitization.

Air-Frame Components. Precision-built for a broad variety of military aircraft.

Precision Parts. Hardened and ground parts for almost every conceivable use.

At the disposal of Avco Defense and Industrial Products are 22,000 experienced, diversely skilled people, 20 installations in 16 cities in 9 different states, and 8,500,000 sq. ft. of floor space. Presently, 40% of these resources are engaged in meeting today's defense needs. The balance is readily convertible in case of national emergency.

avco defense and industrial products

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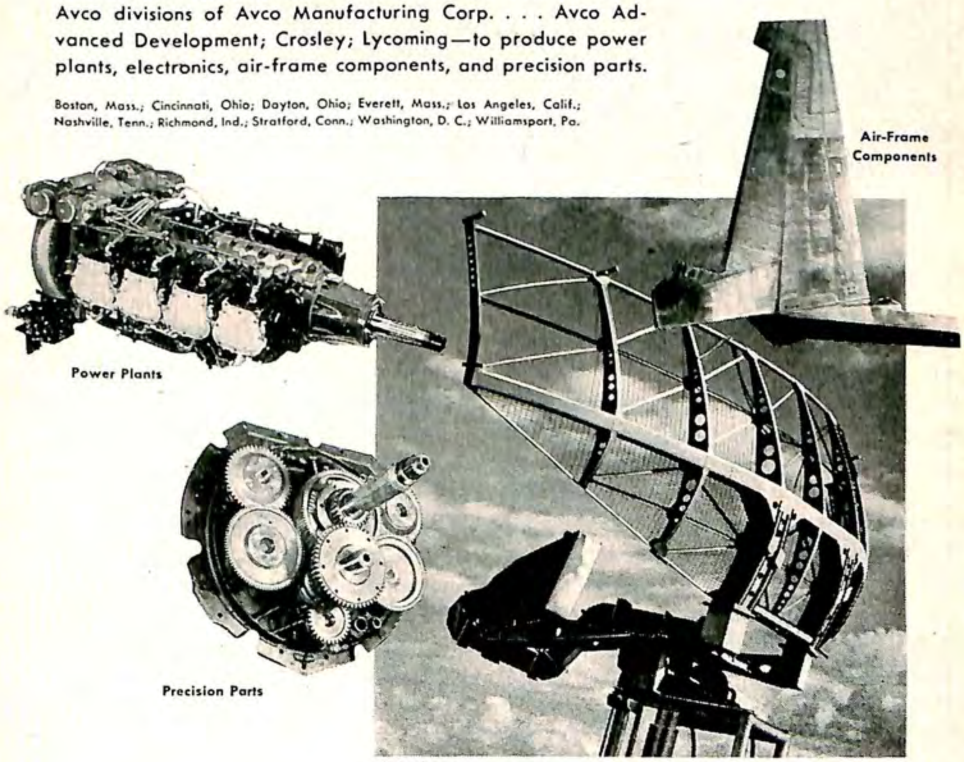
combine the scientific skills, and production facilities of 3 Avco divisions of Avco Manufacturing Corp. . . . Avco Advanced Development; Crosley; Lycoming—to produce power plants, electronics, air-frame components, and precision parts.

Boston, Mass.; Cincinnati, Ohio; Dayton, Ohio; Everett, Mass.; Los Angeles, Calif.; Nashville, Tenn.; Richmond, Ind.; Stratford, Conn.; Washington, D. C.; Williamsport, Pa.



Air-Frame Components

Power Plants

Precision Parts

Electronics.

U.S. AIRCRAFT PRODUCTION
(units)
1914-1955
(Source: Aircraft Industries Association)

Year	Total	Military Aircraft	Civil Aircraft
1914	49	15	34
1915	178	26	152
1916	411	142	269
1917	2,148	2,013	135
1918	14,020	13,991	29
1919	780	682	98
1920	328	256	72
1921	437	389	48
1922	263	226	37
1923	745	689	56
1924	377	317	60
1925	789	447	342
1926	1,186	532	654
1927	1,995	621	1,374
1928	4,346	1,219	3,127
1929	6,193	677	5,516
1930	3,437	747	2,690
1931	2,800	812	1,988
1932	1,396	593	803
1933	1,324	466	858
1934	1,615	437	1,178
1935	1,710	459	1,251
1936	3,010	1,141	1,869
1937	3,773	949	2,824
1938	3,623	1,800	1,823
1939	5,856	2,195	3,661
1940	12,804	6,019[a]	6,785[b]
1941	26,277[c]	19,433[a]	6,844[b]
1942	47,836[c]	47,836[a]	[d]
1943	85,898[c]	85,898[a]	[d]
1944	96,318[c]	96,318[a]	[d]
1945	49,761[c]	47,714[a]	2,047
1946	36,670	1,669	35,001
1947	17,717	2,100	15,617
1948	9,586[e]	2,284[e]	7,302
1949	6,089[e]	2,544[e]	3,545
1950	6,520[e]	3,000[e]	3,520
1951	7,277[e]	4,800[e]	2,477
1952	12,600[e]	9,000[e]	3,600[e]
1953	16,700[e]	12,000[e]	4,700[e]
1954	12,989[e]	9,600[e]	3,389[e]
1955	12,900	8,400[e]	4,500[e]

[a]Includes military aricraft for Lend-Lease shipments.
[b]Represents domestic civil production only.
[c]Includes United States-financed aircraft manufactured in Canada.
[d]No production except military.
[e]Estimate.

CIVIL AIRPLANE OUTPUT

By Power and Types

(Source: Bureau of the Census, Facts for Industry Series M42A)

1937-1955[1]

		1937	1938	1939	1940	1941	1945
Total		2,289	1,823	3,715	6,785	6,844	2,047
				By number of engines			
Single-engine		2,171	1,770	3,613	6,562	6,629	1,946
Multi-engine		118	53	102	167	165	101
Unclassified		0	0	0	56	50	0
				By horsepower			
50 hp. and under		1,393	1,350	1,686	490	7	0
51-70 hp.		44	23	1,349	4,529	4,303	1,828
71-100 hp.		183	61	311	935	1,805	105
101-165 hp.		193	149	120	211	206	13
166-225 hp.		47	16	9	318	309	0
226-300 hp.		199	122	86	37	15	0
301-600 hp.		142	54	76	72	31	28
601-800 hp.		88	48	78	137	118	63
		0	0	0	0	0	10
Unclassified		0	0	0	56	50	0
				By types			
Landplanes:							
1-2-place	....	1,668	1,487	3,118	5,527	6,060	1,929
3-5-place	....	460	258	465	1,031	573	17
6-20-place	....	48	26	21	8	3	63
21-place and over	....	57	17	55	132	112	10
Seaplanes	....	41	26	51	18	16	0
Amphibians	....	15	10	5	3	30	28
Unclassified	0	0	0	0	66	50	0

	1949	1950	1951	1952	1953	1954	1955
Total Civil	3,545	3,520	2,477	3,507	4,134	3,389	4,753
Personal	3,379	3,391	2,279	3,057	3,825	3,098	4,508
Transport	166	129	198	452	309	291	245
By Place:							
2-place	996	1,029	2,275	3,056	3,822	2,982	4,305
3- to 5-place	2,383	2,362					
Over 5-place	166	129	202	453	312	407	448
By Horsepower:[2]							
1-74	930	597					
75-79			2,273	3,056	3,822	2,968	4,149
100-399	2,440	2,789					
400-3,999	174	134	204	453	312	421	604
4,000 and over							

[1]1946 excluded.

[2]Exports excluded 1938-1941; no civil production during 1942-44; exports included 1945-50.

[3]Total rated horsepower of all engines.

UNITED STATES AIRCRAFT EXPORTS

Number and Value

(Source: Aircraft Industries Association)

Year[1]	Aircraft exported[2] Number	Aircraft exported[2] Value	Value of all aeronautical exports[3]
1913	29	$81,750	$107,552
1914	34	188,924	226,149
1915	152	958,019	1,541,446
1916	269	2,158,395	7,002,005
1917	135	1,001,542	4,135,445
1918	20	206,120	9,084,097
1919	85	777,900	13,166,907
1920	65	598,274	1,152,649
1921	48	314,940	472,548
1922	37	156,630	494,930
1923	48	309,051	433,558
1924	59	412,738	798,273
1925	80	511,282	783,659
1926	50	303,149	1,027,210
1927	63	848,568	1,903,560
1928	162	1,759,653	3,664,723
1929	348	5,484,600	9,125,345
1930	321	4,819,669	8,818,110
1931	140	1,812,809	4,867,687
1932	280	4,358,967	7,946,533
1933	406	5,391,493	9,180,328
1934	490	8,195,484	17,662,938
1935	333	6,598,515	14,290,843
1936	527	11,601,893	23,143,203
1937	628	21,076,170	39,404,469
1938	875	37,977,324	68,227,689
1939	1,220	67,112,736	117,807,212
1940	3,522	196,260,556	311,871,473
1941	6,011	422,763,907	626,929,352
1942	10,448	879,994,628	1,357,345,366
1943	13,865	1,215,848,135	2,142,611,494
1944	16,544	1,589,800,893	2,825,927,362
1945	7,599	663,128,543	1,148,851,587
1946	2,302	65,257,749	115,320,235
1947	3,125	74,476,912	172,189,502
1948	2,259	66,354,000	153,629,000
1949	1,264[4]	37,388,553[4]	282,984,025
1950	759[5]	44,292,222[5]	242,362,699
1951	894[5]	18,606,528[5]	301,424,786
1952	1,180[5]	27,500,121[5]	603,181,876
1953	1,378[5]	91,137,326[5]	880,634,000
1954	1,151[5]	129,785,000[5]	619,384,000

[1]1913-18, fiscal years; 1919-54, calendar years. Data for the second half of 1918 is included with calendar year 1919.

[2]Exclusive of gliders and barrage balloons.

[3]Total value of aircraft, engines, parts, etc. 1913-21 include values of aircraft and aircraft parts. Prior to 1922, engine values were not reported separately, but were probably included with either "other" internal combustion engines or with "parts" of aircraft. Values for parachutes and their parts have been included only since 1932.

[4]For security reasons the 1949 figures do not include exports after April on military and cargo aircraft and engines of 400 hp and over. Right hand column includes military.

[5]For security reasons the 1950 figures do not include military, cargo and used transport aircraft, engines of 400 hp and over, propellers, instruments nor any other parts or accessories. Right hand column includes military.

Airline Statistics

AIRLINE REVENUE PASSENGER MILES

U. S. Domestic Air Carriers By Months
(Source: Air Transport Association)

	Millions of Passenger Miles							
Month	**1947**	**1948**	**1949**	**1950**	**1951**	**1952**	**1953**	**1954**
January	380,757	401,214	429,935	481,428	742,598	877,482	1,070,830	1,208,066
February	372,276	356,859	432,226	479,650	683,196	823,887	1,030,858	1,149,695
March	493,864	440,106	533,548	568,162	861,466	953,855	1,188,332	1,292,355
April	526,188	483,233	577,852	636,440	860,750	1,026,739	1,243,900	1,376,170
May	563,771	539,431	608,302	684,940	888,380	1,006,840	1,257,142	1,407,357
June	546,685	588,677	676,842	784,870	958,610	1,153,923	1,363,953	1,575,161
July	543,541	561,075	640,718	746,463	949,311	1,121,926	1,351,668	1,566,451
August	611,838	569,583	627,127	775,238	995,394	1,187,847	1,381,237	1,452,181
September	609,756	549,539	634,088	741,777	967,436	1,160,558	1,303,595	1,484,162
October	578,889	534,758	608,837	757,721	952,359	1,159,536	1,266,785	1,462,354
November	435,083	452,441	504,939	639,826	840,837	100,4,905	1,099,775	1,323,749
December	441,231	486,355	478,164	705,953	862,682	1,050,820	1,202,208	1,470,829
Total	6,103,879	5,963,271	6,752,578	8,002,468	10,563,019	12,528,318	14,760,28[illegible]	16,768,530

AIR CARRIER OPERATING EXPENSES

Domestic
(Source: Air Transport Association)

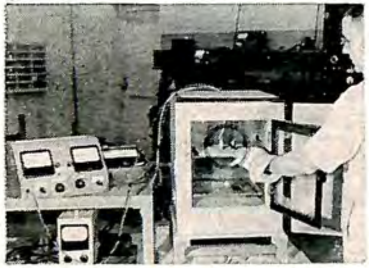
Year	Aircraft Operating Expenses	% of Total	Ground and Indirect Expenses	% of Total	Total Operating Expense
1944	45,150,125	36.26	79,371,967	63.74	124,522,092
1945	69,222,625	38,32	111,403,704	61.68	180,626,329
1946	129,645,346	40.24	192,573,836	59.76	322,219,182
1947	169,164,673	43.80	217,034,447	56.20	386,199,120
1948	199,990,706	46.33	231,643,571	53.67	431,634,277
1949	223,193,168	48.34	238,539,727	51.66	461,732,895
1950	228,503,346	48.18	245,797,635	51.82	474,300,981
1951	287,157,305	48.37	306,559,357	51.63	593,716,662
1952	360,862,000	49.96	361,500,000	50.04	722,362,000
1953	436,906,000	51.50	411,467,000	48.50	848,373,000
1954	485,874,000	51.75	453,070,000	48.25	938,944,000

BREAKDOWN OF DIRECT AIRCRAFT OPERATING EXPENSES

	Flying Operations	% of Total	Direct Maintenance Flight Equip.	% of Total	Depreciation Flight Equip.	% of Total
1944	28,238,316	22.68	11,892,963	9.55	5,018,846	4.03
1945	43,421,033	24.04	16,392,654	9.07	9,408,938	5.21
1946	70,805,391	21.98	33,272,916	10.33	25,567,039	7.93
1947	88,839,885	23.00	42,902,710	11.11	37,422,078	9.69
1948	109,636,528	25.40	49,034,659	11.36	41,319,519	9.57
1949	127,397,922	27.59	54,028,364	11.70	41,766,882	9.05
1950	131,086,952	27.64	55,768,177	11.76	41,648,217	8.78
1951	172,677,416	29.08	71,364,212	12.03	43,115,677	7.26
1952	208,404,000	28.85	92,483,000	12.80	59,975,000	8.31
1953	252,843,000	29.80	101,920,000	12.02	82,143,000	9.68
1954	279,389,000	29.76	109,758,000	11.69	96,727,000	10.30

Includes Trunks, Local Service and Territorial

Tester built to JAN specification provides shock of over 100G's. Contact reactions are indicated on special equipment.



Relays operating in especially constructed ovens are subjected to temperatures exceeding 400° Fahrenheit.

There's Nothing Like Experience

To $ave You Money

Potter and Brumfield with a quarter century of relay design and manufacturing experience gives you high quality at the lowest possible cost.

Many thousands of relays engineered for special applications to meet the highest possible quality levels.

But still thousands of other designs built to meet highly competitive prices.

For quick delivery, over 350 different standard relays stocked by 500 Franchised Electronic Parts Distributors throughout the United States and Canada.

Potter & Brumfield
PRINCETON, INDIANA
SUBSIDIARY OF AMERICAN MACHINE AND FOUNDRY

Servo controlled shaker and rotary power supply located in sound-proof room has frequency range of 0 to 2,000 C.P.S.

Small watch size parts of P&B subminiature relays are inspected and assembled under ten power magnification.

All sealed relays are thoroughly cleaned of dirt, solder flux and other contaminants by the ultrasonic cleaning process.

Some sealed relays have as many as 90 possible voltage breakdown points. This tester checks them automatically.

PASSENGER MILES, MAIL, EXPRESS AND FREIGHT TON-MILES

U. S. Domestic and American Flag Carriers

(Source: Air Transport Association)

Year	Total Passenger Miles (000)	Passenger Load Factor	Air Mail Ton Miles	Express Ton Miles	Freight Ton Miles
			DOMESTIC[1]:		
1942	1,417,526	72.21	21,166,024	5,258,551	....
1943	1,634,135	88.00	36,068,309	11,901,793	....
1944	2,264,495	89.38	51,145,402	17,702,932	....
1945	3,362,456	88.12	65,100,133	22,196,852	1,350,048
1946	5,947,956	78.71	32,962,122	23,788,392	14,822,325
1947	6,103,879	65.12	33,089,696	28,766,659	35,911,554
1948	5,981,603	57.59	37,925,396	30,092,833	71,283,727
1949	6,744,425	57.78	41,418,156	27,773,669	95,057,219
1950	8,002,792	61.25	47,008,947	37,279,035	114,072,045
1951	10,566,139	67.87	63,848,335	41,268,219	102,356,646
1952	12,528,318	65.60	69,261,570	41,324,306	119,501,666
1953	14,760,283	63.43	72,783,329	43,470,633	134,459,089
1954	16,768,530	62.45	81,487,000	41,166,000	147,089,000
			INTERNATIONAL:		
1950	2,206,423	59.66	21,188,090	44,501,521	16,049,809
1951	2,599,915	59.98	21,970,111	44,512,759	68,566,689
1952	3,019,860	62.28	27,712,000	....	72,627,275
1953	3,381,124	61.90	30,836,000	....	74,643,683
1954	3,743,296	59.56	42,658,000	....	82,101,000

[1] Includes Trunks, Local Service and Territorial Carriers.

U. S. AIR CARRIER OPERATING REVENUES

Domestic and International

(Source: Air Transport Association)

Year	Passenger Revenues	% of Total	Mail Revenues	% of Total	Express & Freight	% of Total	Other Revenues	% of Total	Total Revenues
				DOMESTIC:					
1944	116,440,690	72.36	33,317,399	20.70	8,306,288	5.16	2,863,848	1.78	160,928,225
1945	166,519,923	77.59	33,557,040	15.63	10,835,140	5.05	3,694,562	1.73	214,606,665
1946	275,593,712	86.88	21,953,759	6.92	13,620,295	4.29	6,037,245	1.91	317,205,011
1947	308,575,954	84.58	29,444,746	8.07	19,377,949	5.31	7,440,928	2.04	364,839,577
1948	343,289,730	79.05	59,309,343	13.66	24,372,395	5.61	7,323,916	1.68	434,295,384
1949	385,509,049	78.69	68,569,538	13.99	26,928,631	5.50	8,923,223	1.82	489,930,441
1950	443,852,000	79.66	63,772,233	11.45	35,109,399	6.30	14,428,708	2.59	557,162,340
1951	591,186,365	84.17	57,421,687	8.18	36,914,107	5.26	16,842,347	2.39	702,364,506
1952	695,456,000	85.16	57,854,000	7.09	42,828,000	5.24	20,501,000	2.51	816,639,000
1953	803,859,000	85.99	61,937,000	6.62	47,787,000	5.11	21,294,000	2.28	934,877,000
1954	905,777,000	87.11	62,603,000	6.02	49,800,000	4.80	21,493,000	2.07	1,039,783,000
	Domestic Lines include Trunks, Territorial and Local Service.								
				INTERNATIONAL:					
1950	156,427,209	58.85	68,348,283	25.71	20,620,858	7.75	20,448,009	7.69	265,844,359
1951	184,691,825	64.14	63,343,846	22.00	25,244,764	8.77	14,655,226	5.09	287,935,661
1952	212,458,000	67.46	61,720,000	19.60	26,817,000	8.52	13,923,000	4.42	314,918,000
1953	232,539,000	68.94	63,303,000	18.77	27,331,000	8.10	14,113,000	4.19	337,286,000
1954	254,233,000	70.85	58,882,000	16.41	29,681,000	8.27	16,052,000	4.47	358,848,000

PLANES IN USE

Domestic Airlines

(Source: Air Transport Association)

		1945		1946		1947		1948		1949	
Aircraft	No. of Engines	No. Planes	Miles Per Day	No. Planes	Miles Per Day	No. Planes	Miles Per Day	No. Planes	Miles Per Day		
Beechcraft	2	0.8	66	0.4	502	5.3	721	6.4	648	....	....
Boeing											
247-D	2	....	....	1.0	607	4.0	654	0.6	818	....	....
SA-307B	4	3.6	2,094	5.0	1,695	5.0	1,344	5.0	1,362	5.0	1,365
377	4	....	....	....	....	....	....	....	....	10.0	410
Convair 240	2	....	....	....	....	....	....	16.2	899	93.0	853
Douglas											
DC-2	2	....	....	....	....	....	....	....	....	....	....
DC-3	2	314.3	1,756	426.6	1,638	446.7	1,303	442.4	1,190	398.0	1,077
DST	2	....	....	....	....	....	....	....	....	....	....
DC-4	4	....	....	85.8	1,758	149.6	1,546	150.8	1,318	160.0	958
DC-6	4	....	....	....	....	21.1	1,462	54.4	1,864	104.0	1,655
Lockheed											
Electra	2	1.3	727	3.0	587	....	....	3.9	591	....	....
Lodestar	2	17.7	1,545	16.7	1,285	11.5	1,086	12.0	335	11.0	975
Constellation	4	....	....	6.6	1,190	21.3	1,742	32.0	2,067	55.0	1,596
Sikorsky S-38	2	2.0	184	0.1	100	....	....	....	....	....	....
Stinson											
Single Motor	1	10.9	404	11.0	445	7.8	420	7.0	447	....	....
Tri-Motor	3	4.0	61	....	....	....	....	....	....	....	....
Waco	1	....	....	....	....	....	....	....	....	....	....
Martin 202	2	....	....	....	....	2.0	782	17.6	859	24.0	1,255
404	2	....	....	....	....	....	....	....	....	....	....
Curtiss C-46	2	....	....	....	....	....	....	0.2	802	2.0	224

		1950		1951		1952		1953		1954	
Beechcraft	2	....	....	....	....	....	....	....	....	....	....
Boeing											
247-D	2	....	....	....	....	....	....	....	....	....	....
SA-307B	4	5.0	656	....	....	....	....	....	....	....	....
377	4	10.0	1,283	16.0	1,630	16	2,202	16	2,370	11	2,057
Convair 240	2	103.0	940	102.0	1,102	99	1,254	90	1,373	92	1,218
340						24	624	98	1,225	116	1,358
Douglas											
DC-2	2	....	....	....	....	....	....	....	....	....	....
DC-3	2	388.0	972	425.0	1.014	363	938	316	948	283	839
DST	2	....	....	....	....	....	....	....	....	....	....
DC-4	4	150.0	1,324	137.0	1,614	124	1,666	126	1,751	109	1,484
DC-6	4	111.0	1,751	139.0	2,207	161	2,321	175	2,394	185	2,235
DC-7						....	....	10	2,348	61	2,286
Lockheed											
Electra	2	....	....	....	....	....	....	....	....	....	....
Lodestar	2	11.0	969	11.0	1,152	11	1,184	11	1,212	11	748
Constellation	4	83.0	1,264	101.0	1,976	125	2,103	135	2,239	141	2,370
Sikorsky S-38	2	....	....	....	....	....	....	....	....	....	....
Stinson											
Single Motor	1	....	....	....	....	....	....	....	....	....	....
Tri-Motor	3	....	....	....	....	....	....	....	....	....	....
Waco	1	....	....	....	....	....	....	....	....	....	....
Martin											
202	2	33.0	954	12.0	786	21	1,017	25	966	25	1,003
404	2	....	....	18.0	1,089	96	1,206	100	1,373	100	1,393
Curtiss C-46	2	....	....	....	....	....	....	....	....	....	....

COMPARATIVE TRANSPORT SAFETY RECORD

Passenger Fatalities per 100,000,000 Passenger Miles

(Source: Air Transport Association)

	1946	1947	1948	1949	1950	1951	1952	1953	1954
Domestic Scheduled Air Lines									
Fatalities	75	199	83	93	96	142	46	86	16
Rate	1.24	3.21	1.30	1.30	1.10	1.30	.4	.60	.09
Buses									
Fatalities	140	1.40	120	120	100	130	100	NA	60
Rate	.19	.21	.18	.20	.17	.22	.16	NA	.11
Intercity Railroads									
Fatalities	116	74	52	32	184	126	14	31	23
Rate	.18	.16	.13	.09	.58	.41	.04	.10	.08
Pass. Autos & Taxicabs									
Fatalities	15,400	15,300	15,200	15,300	17.600	21,000	22,600	NA	22,500
Rate	2.5	2.3	2.1	2.1	2.2	2.4	2.8	NA	2.6

N. A. Not available.

ASSETS AND LIABILITIES

Domestic Trunk Airlines 1948-1953

(Source: Air Transport Association)

	1949	1950	1951	1952	1953	1954
Current Assets	$175,472,186	$204,018,828	$286,240,499	344,115,976	333,527,000	$358,375,000
Flight Equipment—Net	188,619,849	201,630,303	226,223,625	309,355,329	345,455,000	388,524,000
Other Op. Property	61,476,977	58,149,892	61,152,504	75,793,917	98,909,000	90,179,000
Non-Operating Property	2,704,375	1,117,230	758,591	714,939	258,000	192,000
*Other Assets	58,668,273	77,624,812	794,160	398,678	41,704,000	47,246,000
Total Assets	486,941,660	542,541,065	648,550,195	775,764,980	819,853,000	884,516,000
Current Liabilities	98,428,787	130,111,887	218,363,023	231,757,632	259,890,000	241,942,000
Long Term Debt	148,017,443	135,842,945	134,006,470	168,246,905	154,701,000	185,093,000
Capital Stock	123,710,057	123,467,063	120,286,647	145,132,929	139,615,000	139,360,000
Capital Surplus	56,289,876	57,499,411	63,698,098	81,882,841	88,455,000	91,845,000
Earned Surplus	35,285,887	64,365,672	96,249,920	130,653,833	121,455,000	149,346,000
Operating Reserves	3,635,427	3,970,701	3,682,245	4,169,446	4,252,000	5,796,000
**Other Liabilities	21,574,183	27,283,386	12,263,792	13,921,394	51,495,000	71,134,000
Net Worth & Liabilities	$486,941,660	$542,541,065	648,550,195	775,764,980	819,853,000	884,516,000

*Investments and Special Funds and Deferred Charges.

**Deferred Credits, Capital Account, General and Appropriated Earned Surplus.

HELICOPTER INSTRUMENTS AND CONTROLS DEMAND SPECIAL DEVELOPMENT

... they've been getting it at Sperry's Flight Research Center, MacArthur Field

▪ One aircraft of the fleet in Sperry's flight research program is the Sikorsky S-55 you see above. This flying laboratory is completely equipped with the latest in helicopter instruments and controls. It is flown by Sperry test pilots, and its crew consists of Sperry engineers who note and record the performance of the instruments and controls under all flying conditions.

▪ As a result of over 10 years' constant flight research in this field, Sperry has now perfected a new flight control system which gives precise automatic stabilization and control of helicopters even under the most exacting condition of hovering. In addition to providing precise control, a new automatic stabilization system relieves the pilot of constant, fatiguing manual manipulations.

▪ A helicopter integrated instrument system including a flight director has been developed—and, also, a new engine rpm control.

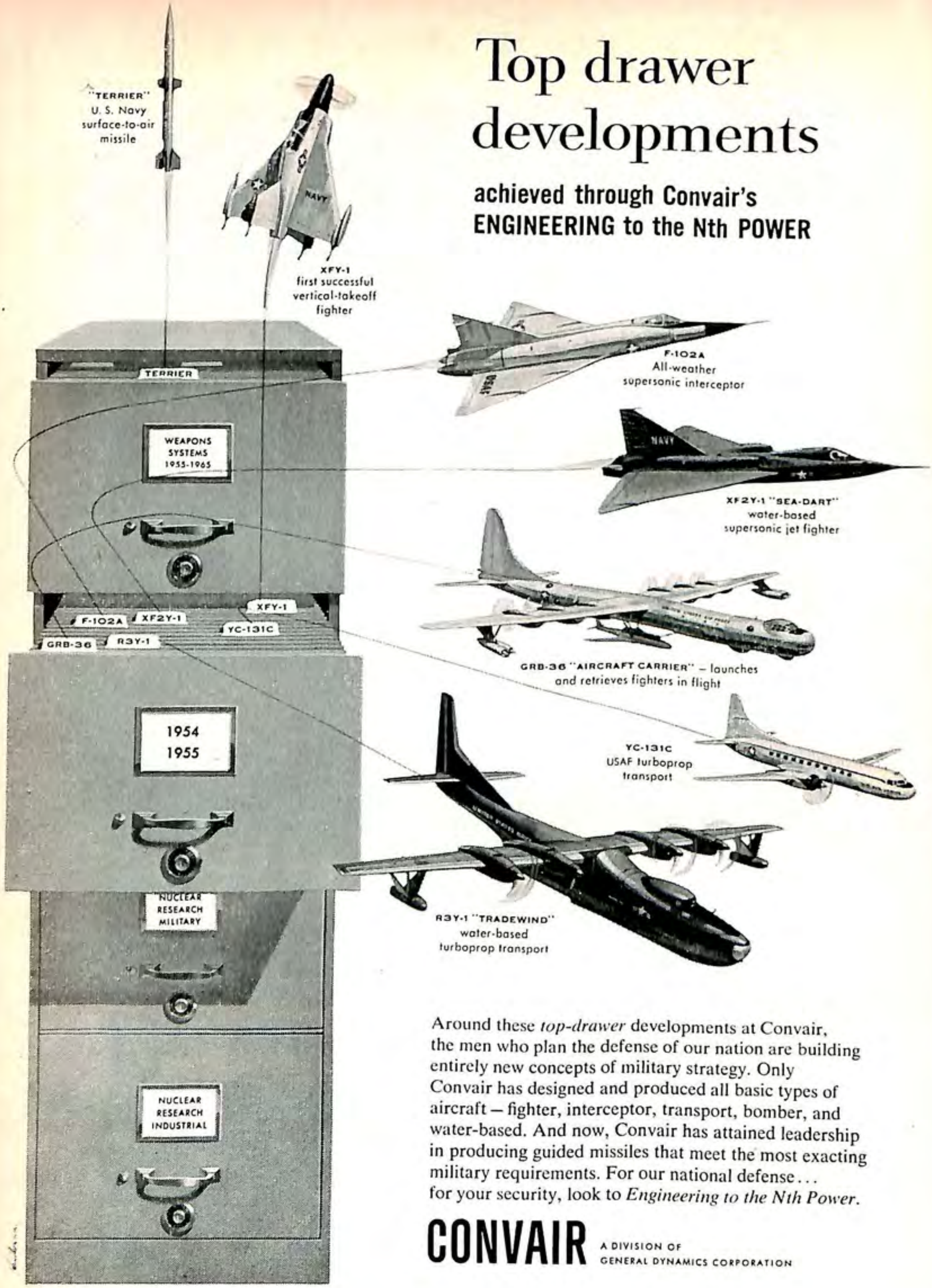
▪ Write our Aeronautical Equipment Division concerning your helicopter instrumentation and control requirements.

SPERRY GYROSCOPE COMPANY
Great Neck, New York
DIVISION OF SPERRY RAND CORPORATION

A portfolio of aviation advertising for 1955

Top drawer developments

achieved through Convair's ENGINEERING to the Nth POWER



Around these *top-drawer* developments at Convair, the men who plan the defense of our nation are building entirely new concepts of military strategy. Only Convair has designed and produced all basic types of aircraft – fighter, interceptor, transport, bomber, and water-based. And now, Convair has attained leadership in producing guided missiles that meet the most exacting military requirements. For our national defense... for your security, look to *Engineering to the Nth Power.*

CONVAIR A DIVISION OF GENERAL DYNAMICS CORPORATION

A portfolio of aviation advertising for 1955

Freedom Has a New Sound!

ALL OVER AMERICA these days the blast of supersonic flight is shattering the old familiar sounds of city and countryside.

At U.S. Air Force bases strategically located near key cities our Airmen maintain their *round the clock* vigil, ready to take off on a moment's notice in jet aircraft like Convair's F-102A all-weather interceptor. Every flight has only one purpose—your personal protection!

The next time jets thunder overhead, remember that the pilots who fly them are not willful disturbers of your peace; they are patriotic young Americans affirming *your New Sound of Freedom!*

PUBLISHED FOR BETTER UNDERSTANDING OF THE MISSION OF THE U.S.A.F. AIR DEFENSE COMMAND

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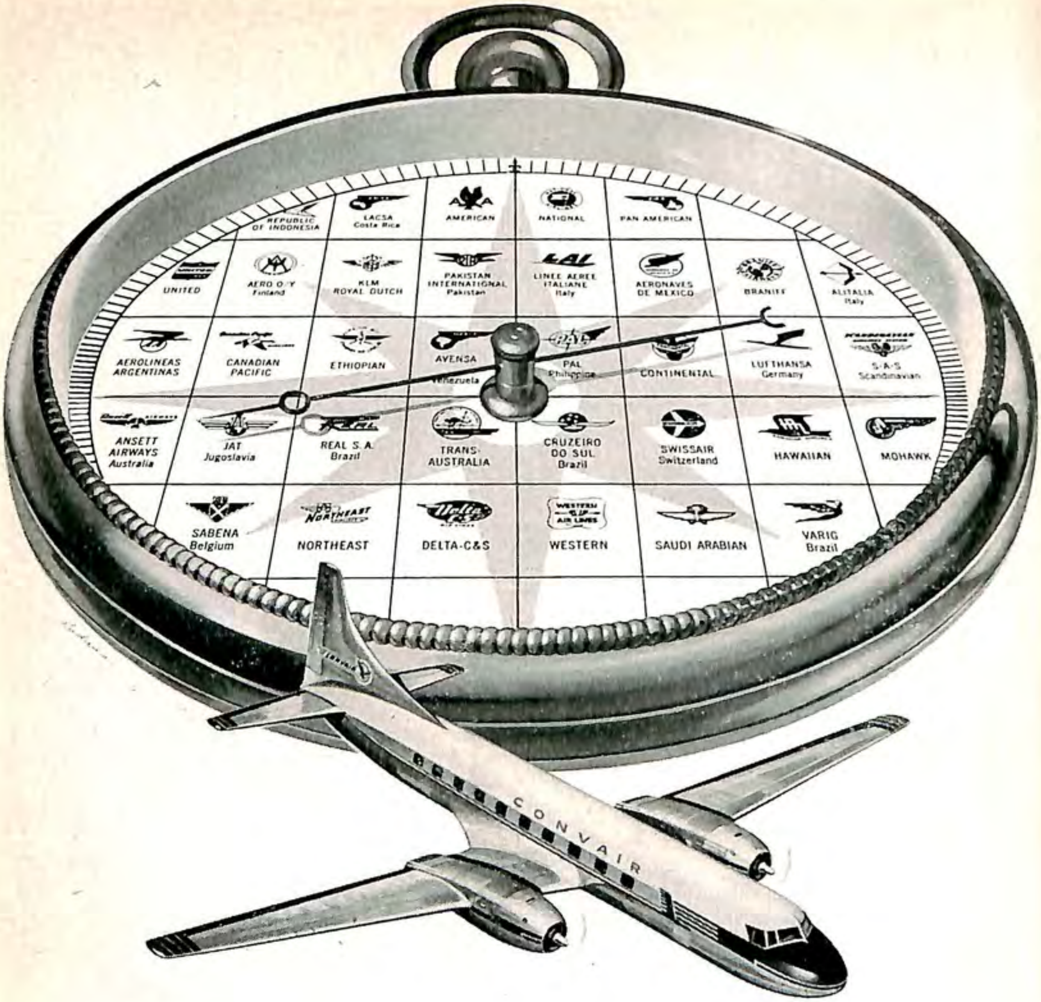

Travel Pointer: 35 leading airlines on all six continents now offer you the speed, comfort, and dependability of the Convair!

More airlines have chosen the Convair than any other modern passenger plane! Wherever you are, you'll find the Convair's performance is a model of engineering efficiency and dependability! For your comfort there are built-in steps, self-service luggage racks, and many other features that are now being planned for the passenger planes of tomorrow.

The Convair offers you these advantages — *today!* Ask your favorite airline or travel agent to make your next flight a Convair — first choice all over the world!

CONVAIR

A DIVISION OF GENERAL DYNAMICS CORPORATION

As a trainer, or a transport for the U.S. Air Force and Navy, the Convair is setting new records for versatility and performance... another evidence of Convair's Engineering to the Nth Power!

A portfolio of aviation advertising for 1955

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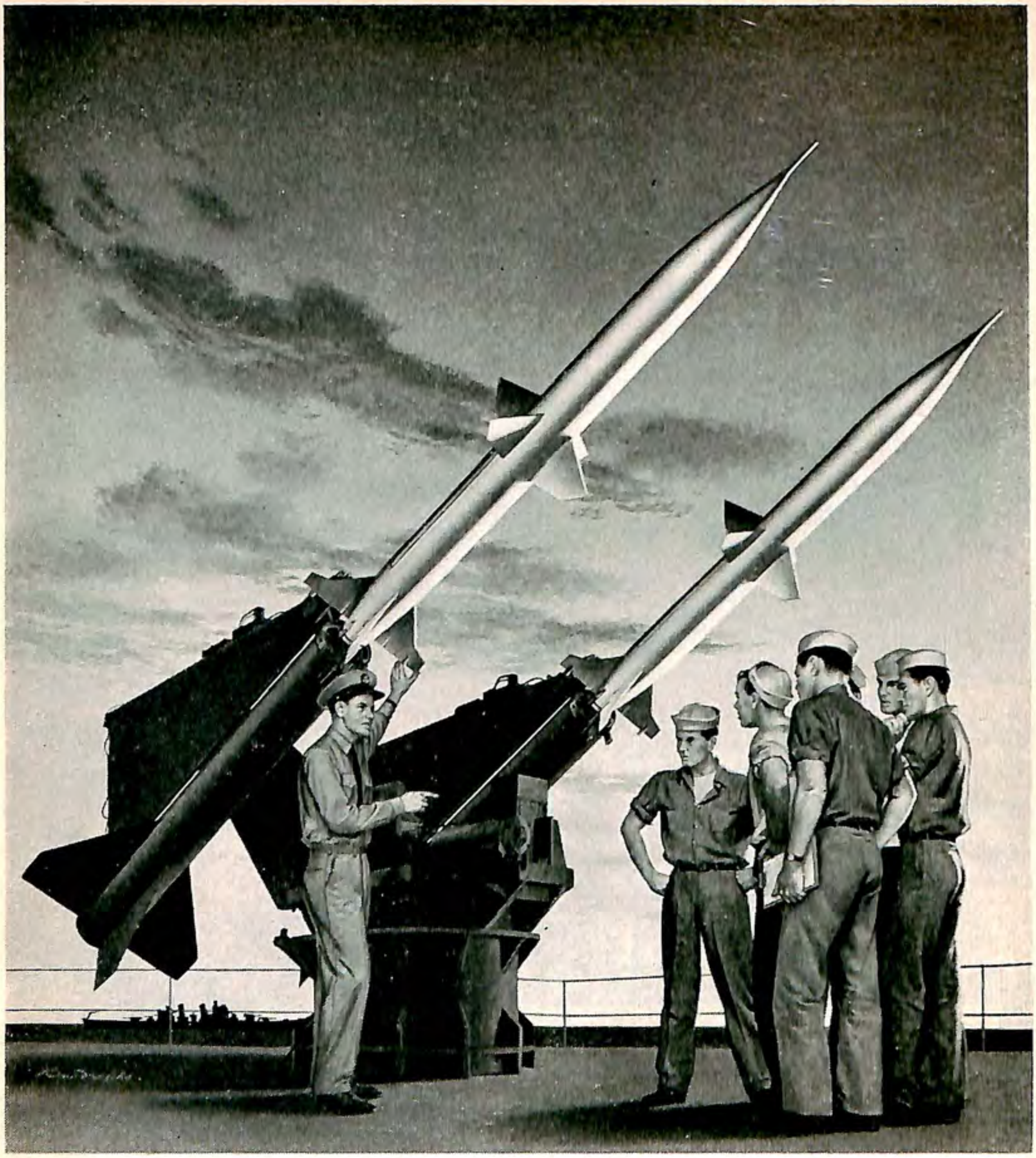


ORDNANCE EXTRAORDINARY! The Terrier, the Navy's new all-weather anti-aircraft missile, is now being produced in quantity by Convair in the Naval Industrial Reserve Ordnance Plant of the U.S. Navy's Bureau of Ordnance. Responsible for supplying our Navy with the most effective weapons, the Bureau of Ordnance participates in vast programs of research, development, testing, and procurement. The Bureau of Ordnance facility at Pomona, California, managed and operated by Convair, is an outstanding example of government and industry working together to produce weapons systems for the defense of our country.

CONVAIR

A DIVISION OF GENERAL DYNAMICS CORPORATION

A portfolio of aviation advertising for 1955

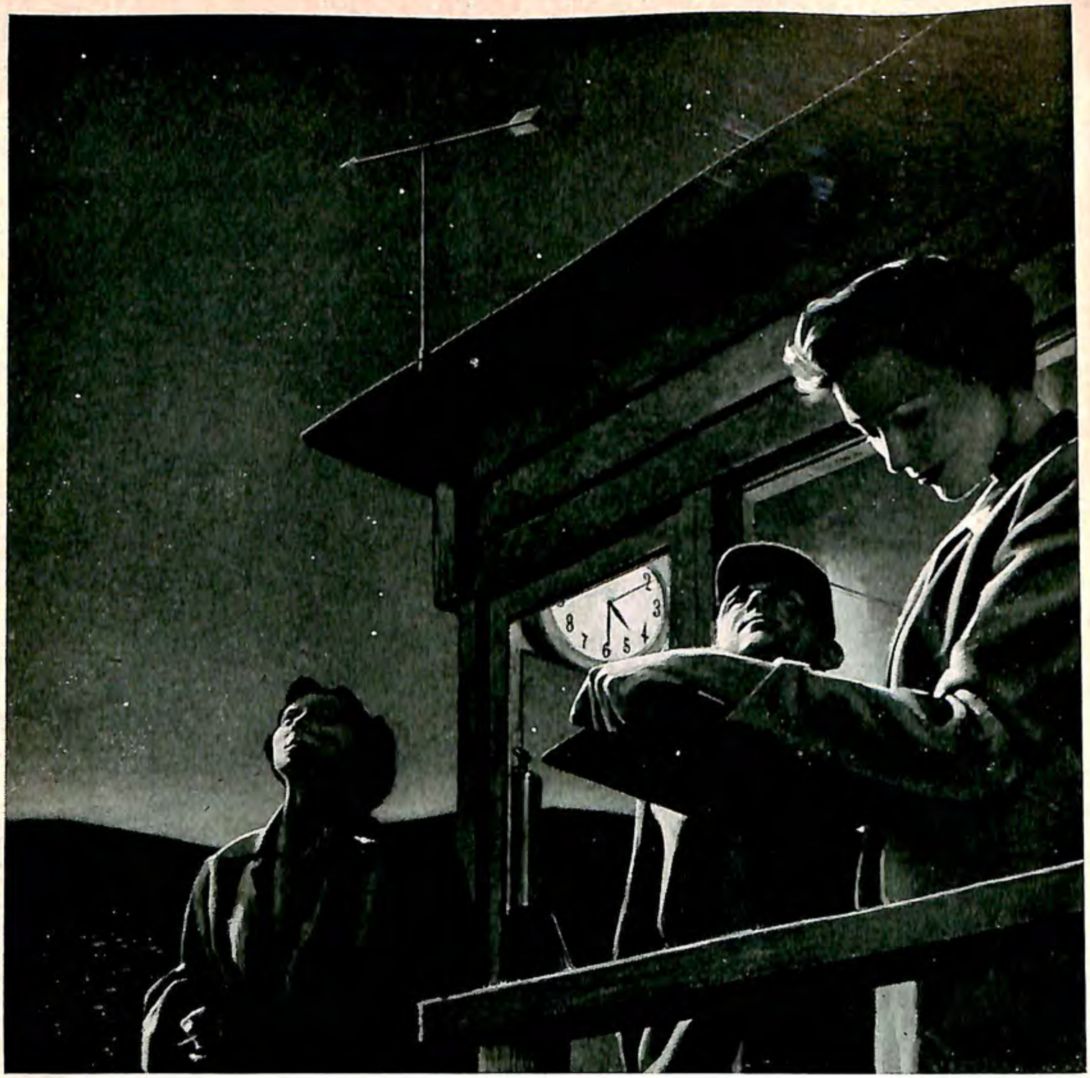
The New American Tradition...

Be Prepared

Convair is now producing in quantity the supersonic, delta-wing F-102A. With this day-or-night, all-weather Interceptor the U.S.A.F. Air Defense Command will *be prepared* to better fulfill its mission – the discouraging of attack through the effective protection of America! Through **engineering to the Nth power** Convair continues to *be prepared* to help assure peace and freedom by producing aircraft with the capabilities of the F-102A.

CONVAIR A DIVISION OF GENERAL DYNAMICS CORPORATION

A portfolio of aviation advertising for 1955



Another town is safer tonight because these trained civilian members of the Ground Observer Corps are scanning the skies to warn against possible enemy attack. But all over America there are many areas, perhaps your own, that do not have this protection because the G.O.C. is seriously understaffed.

In extending its vital work to all 48 states the Ground Observer Corps needs many thousands of new observers. You'll find the G.O.C. both interesting and exciting! A few hours a week of your spare time will help keep your home and country safe. Volunteer today...contact Civil Defense!

CONVAIR A DIVISION OF GENERAL DYNAMICS CORPORATION

Through the assistance of the Ground Observer Corps, the U.S.A.F. Air Defense Command is prepared for any alert with aircraft such as the Convair-built F-102A all-weather supersonic interceptor.

A portfolio of aviation advertising for 1955

AVIATION EVENTS 1955

A pictorial review of some of the outstanding events in aviation during 1955

AVIATION EVENTS, 1955

Science led aviation literally out of this world in 1955.

Top story of the year was the announcement in July by President Eisenhower that plans had been approved by this country to launch a small, unmanned, earth-circling satellite. The Martin Company, Baltimore, was awarded the prime contract for building the multi-stage satellite launching vehicle.

Anti-gravitation studies were launched by at least two companies, Martin, Baltimore, and Convair, San Diego, and widespread research went forward toward overcoming the thermal barrier by use of cermets — part metal and part-non-metal — superalloys, and titanium.

Hundreds of secret projects were underway toward improving the nation's defenses. Most notable in 1955 were intercontinental ballistic missile activities at Convair, home of the Hustler YB-60.

And durng the year science teamed with industry in a multi-million-dollar program toward sound-abatement, particularly of jets.

• AREA RULE

NACA and the industry shared world wide acclaim for the area rule formula, resulting in the so-called "coke bottle" low drag fuselage design. Developed by NACA engineer Richard C. Whitcomb (See Awards), the formula was first applied to the Grumman F11F-1 Tiger and the Convair F-102. Success with this design led to the announcement that it would be applied to future high speed planes, both military and civilian.

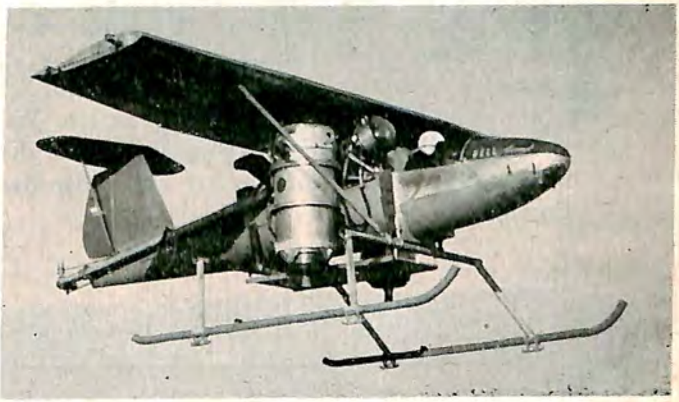
• FLYING PLATFORM

Revolutionary was the word for the Flying Platform, built by Hiller Helicopter for the Office of Naval Research, a wingless, propless ducted fan vertical takeoff experimental aircraft which made its first flight and national headlines early in the year.

• BELL X-2

Designed to outrun the X-1A, Bell Aircraft's rocket powered, stainless steel X-2 was also airborne during the year. Its specialty will be to make thermal tests at high speeds.

Convertiplanes came out of the laboratories into the news. Bell flew its VTOL test vehicle, with two jet engines that rotate from vertical to horizontal for takeoff, landing and flight. The same company announced its XV-3, with rotor props for vertical lift which tilt forward for normal flight.



• CONVERTIPLANES

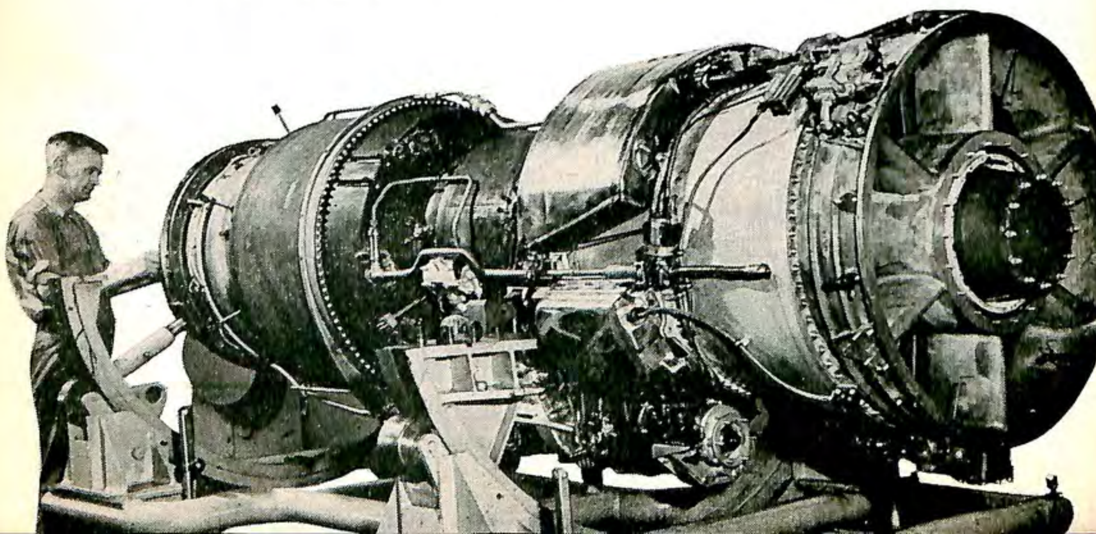
McDonnell Aircraft Corporation flew the XV-1, with an overhead rotor for vertical takeoff and a pusher type propeller aided by wings for horizontal flight. The plane, built for the Air Force, smashed the world's speed record for helicopters on its first conversion flight with a speed of more than 180 mph.

• PANTOBASED AIRCRAFT

New ideas for conventional aircraft turned up, notably with the summer demonstration of the Fairchild YC-123 "Panto(all)base" gear developed by Stroukoff Aircraft Corporation. The gear is designed for landings on land, water, snow, sand or ice. Wing tip floats and heavily stressed land and water skis were features of the equipment. The Pantobase was developed for the Air Force Air Research and Development Command.

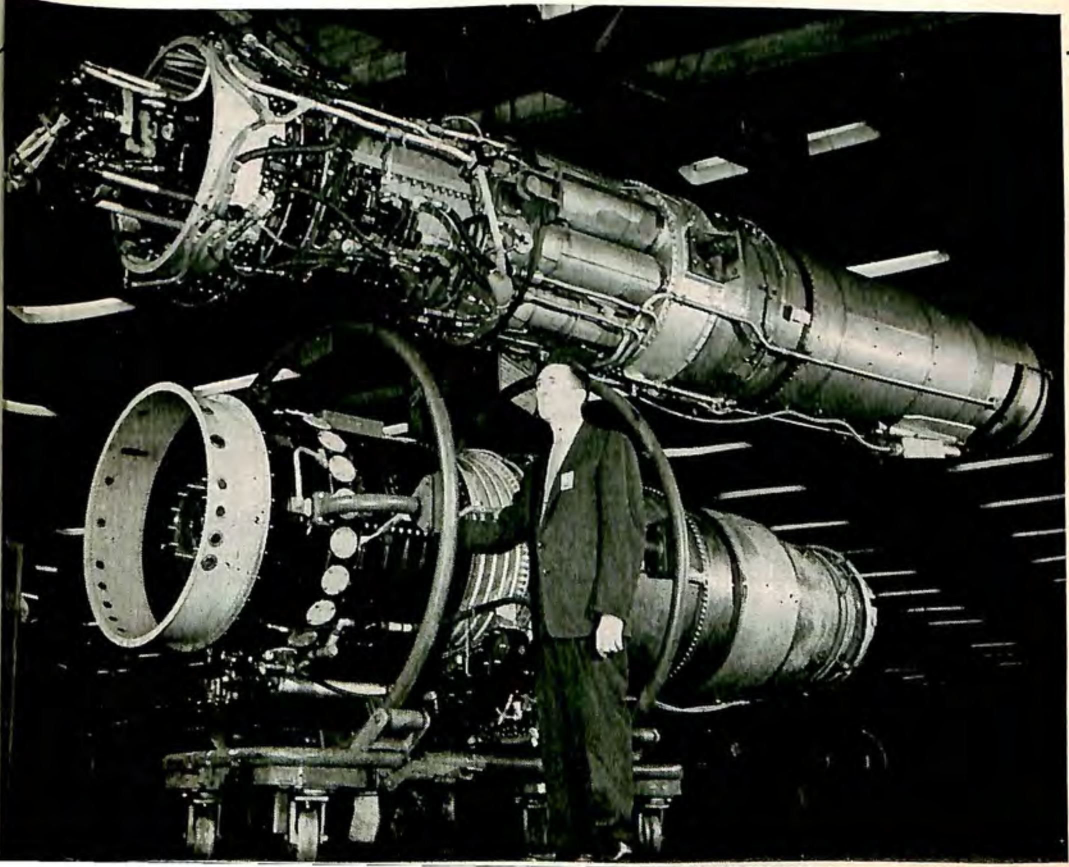
• HIGH THRUST ENGINES

Although top thrust figures were still blanketed with security, it became generally accepted during 1955 that a number of the big ones were in the plus-10,000-pound thrust class. Pictured here are Pratt & Whitney's giant J57 which is in heavy production and the General Electric J73 (right).



• TACAN

TACAN — a tactical air navigation aid — came out from under security into a world of controversy late in the summer. With strong supporters for and against it, the system nevertheless was a symbol of the long strides being taken by electronic devices toward realizing the age old dream of automatic, all weather air navigation. TACAN represents ten years of research by the International Telephone and Telegraph Corporation for the Navy and the Air Force.

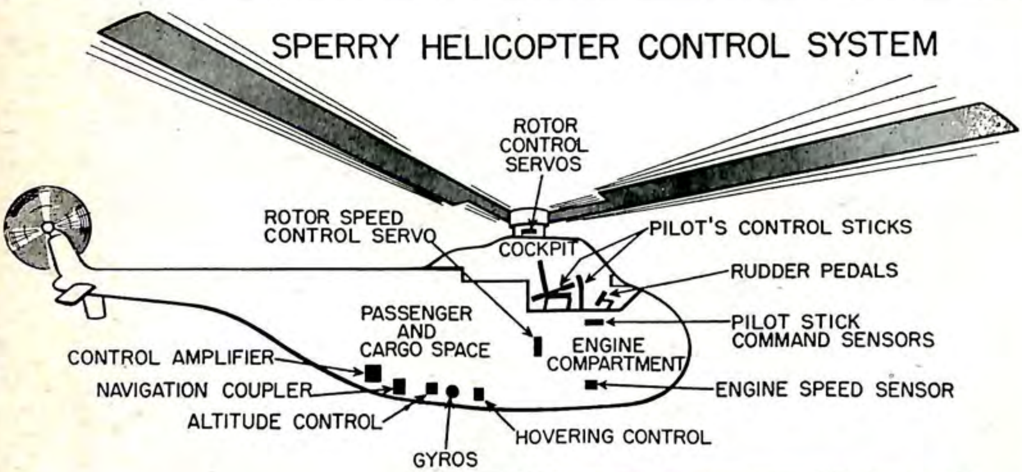


• SEAMASTER

The 600 mph XP6M-1 Martin SeaMaster was unveiled to the public on January 5 by the Martin Company, Baltimore. The world's first multi-jet seaplane, built for the Navy, the SeaMaster made its first flight July 14.

• 'COPTER STABILIZATION

Electronics was on its way to solution of another knotty problem—helicopter flight control—during the year. Notable was the first production model of a Sperry Gyroscope Company control system for helicopters, fall-safe and miniaturized. The system provides automatic stabilization at all times, even during engine-out glides, and opens up the needed all weather capability for rotor craft of every size.



• NEW AIRLINERS

Close on the heels of Capital Airlines' announcement that they were purchasing 60 Vickers Viscount turboprop airliners and that the first of them would go into service during 1955, Lockheed Aircraft Corporation brought the U.S. into turboprop competition with its four engine (Allison 501's) 410 mph Electra propjet. Also started into production during the year was the Convair Metropolitan 440, an improved version of the famed Convair-Liner 240-340 series.

• COMMERCIAL JET TRANSPORTS

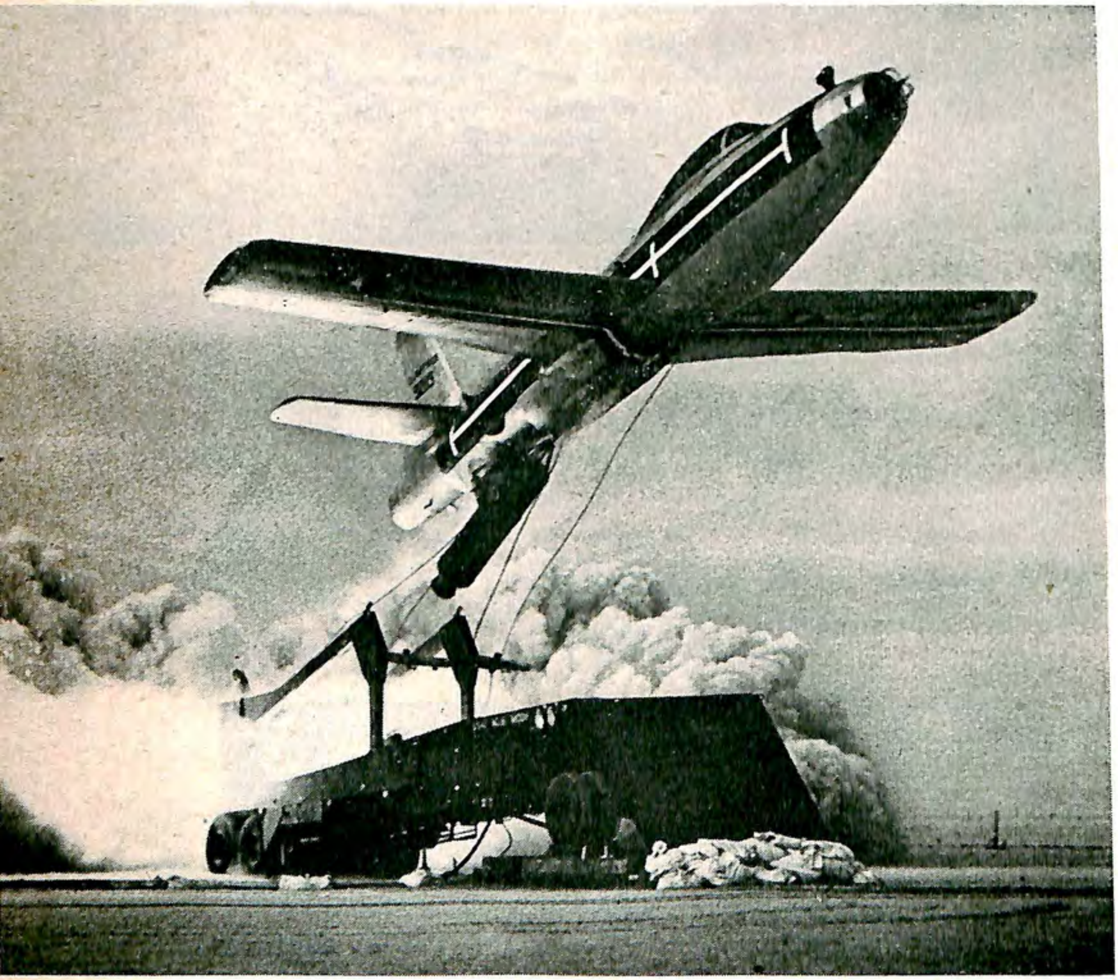
At the same time, the nation's aircraft manufacturers and airline operators gave the first concrete indications that they were going to shoot the works on straight jet transports for U. S. air travelers of the future. Boeing's 707, which figured in the headlines in 1954, continued to make history with nonstop transcontinental flights around the five-hour mark. Douglas announced its DC-8 jetliner (right). Both will be powered with Pratt & Whitney engines. Major airlines responded with large-number orders.

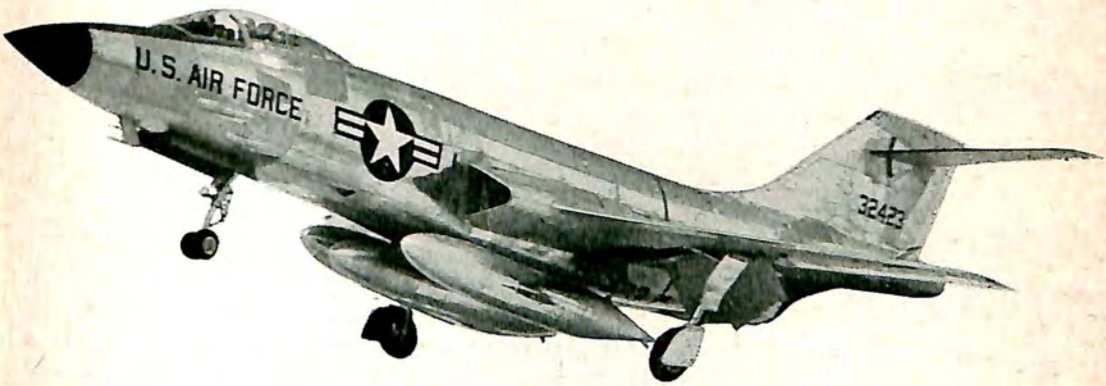
• FALCON IN PRODUCTION

Guided missile progress was as widespread as it was classified. Straw-in-the-wind was the news from Hughes Aircraft Company that its Falcon air-to-air missile was in production. Also outstanding because it is the smallest of the missiles now in development (6 ft. long, 6 in. in diameter), the Falcon is capable of tracking and bringing down any plane now known to be in production the world over.

• ZERO LENGTH LAUNCHING

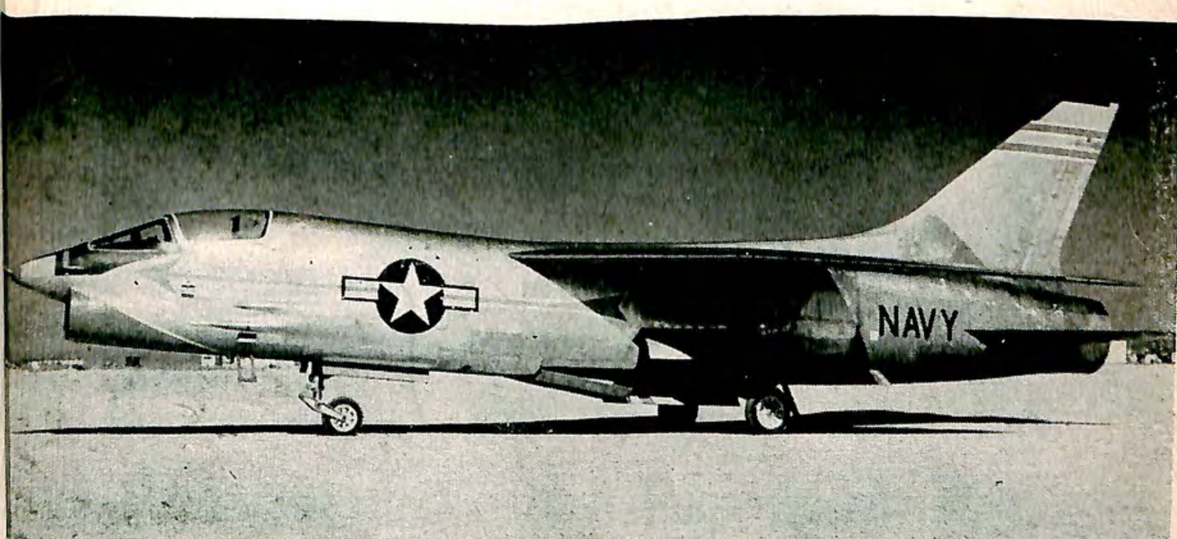
The world's first zero length launching of piloted fighter airplanes took place on January 13 at Edwards Air Force Base, Calif., using techniques and launching equipment developed by the Martin Company, Baltimore.





• BATTLE JETS

Nearly half a score battle planes flashed from behind the security curtain and, often, disappeared from the news with equal speed. Others still remain top secret. Those on which some news became available included the highly-classified and top speed Lockheed F-104, the McDonnell F-101A Voodoo (above), and Chance Vought's plus-1000-mph F-8U1 Navy Crusader (below), a medium sized day fighter.



• BUSINESS FLYING

Dramatized by the patronage of President Eisenhower and sparked by a demand for fast transportation that led to more hours in the air with passengers than those run up by the airlines, business aircraft had their biggest year in history. The President chose an Aero Commander for commuting from Washington to his Gettysburg, Pa., farm. The plane is built by Aero Design & Engineering Co.

• HELICOPTERS IN ACTION

In the workaday aviation world, helicopters also made history, notably in rescue work during disastrous floods in 1955, when hundreds of persons were rescued from the air or given emergency supplies by the whirlybirds. Pictured here the Piasecki HUP-2 makes a dramatic rescue in a badly-flooded area.

• AWARDS

In recognition of outstanding contributions to aviation during the year many awards were given. Among these:

• HARMON TROPHY

The Harmon Trophy was presented to Lt. Col. James F. Coleman, USMCR (left) for piloting the Convair Navy XFY-1 vertical-rising and landing aircraft on its first flight November 2, 1954, and to Capt. Marion E. Eppes, USN (right) for piloting the Navy Airship ZPG-2 on an eight-day record flight simulating an anti-submarine patrol. Pictured here the award winners are congratulated by Adm. Arleigh A. Burke, USN.

• H. H. ARNOLD TROPHY

For contributing "the leadership necessary to bring the Air Force to its present state of maturity and world importance," Air Force Chief of Staff, Gen. Nathan F. Twining was named "Aviation's Man of the Year" for 1955 by the Air Force Association.

• WRIGHT BROTHERS MEMORIAL TROPHY

Dr. Hugh L. Dryden, Director of the National Advisory Committee for Aeronautics, was awarded the Wright trophy "for significant public service of enduring value to aviation in the United States."

• COLLIER TROPHY

For his discovery and experimental verification of the "Area Rule," Richard Travis Whitcomb, a research scientist for the National Advisory Committee for Aeronautics, received the Collier Trophy Award.

• BREWER TROPHY

Willis C. Brown, staff specialist for aviation education with the U. S. Office of Education, received the 1955 Frank G. Brewer Trophy, the nation's highest award in the field of youth aviation education and training.

• THOMPSON TROPHY

For piloting the record-breaking F-100C at 822.135 miles per hour (see Records), Col. Horace A. Hanes was awarded the Thompson Trophy at the National Aircraft Show in Philadelphia.

• RECORDS

In 1955 U. S. airplanes continued to make and break records:

The *North American F-100C* set the first supersonic world's speed record of 822.135 miles per hour. Flown by Col. Horace A. Hanes on August 20, 1955, the plane traveled over the Mojave Desert in California almost 70 miles faster than the previous record set in 1953.

Republic's F-84F Thunderstreak set two records during the year: On March 9, Lt. Col. Robert R. Scott set a new official transcontinental speed record, flying his Thunderstreak 2,445 miles non-stop from Los Angeles to New York in 3 hours 44 minutes at an average speed of 652 miles per hour. On August 17, the Thunderstreak set a new world's non-stop jet fighter distance record of 5,118 miles from London, England, to Texas.

Pictured here the *Douglas A4D Skyhawk* is rounding a pylon and smoke column marking the 500-kilometer course at California's Edwards Air Force Base, where Lt. Gordon Gray, Jr., set a new world's speed record of 695.163 miles per hour on October 15.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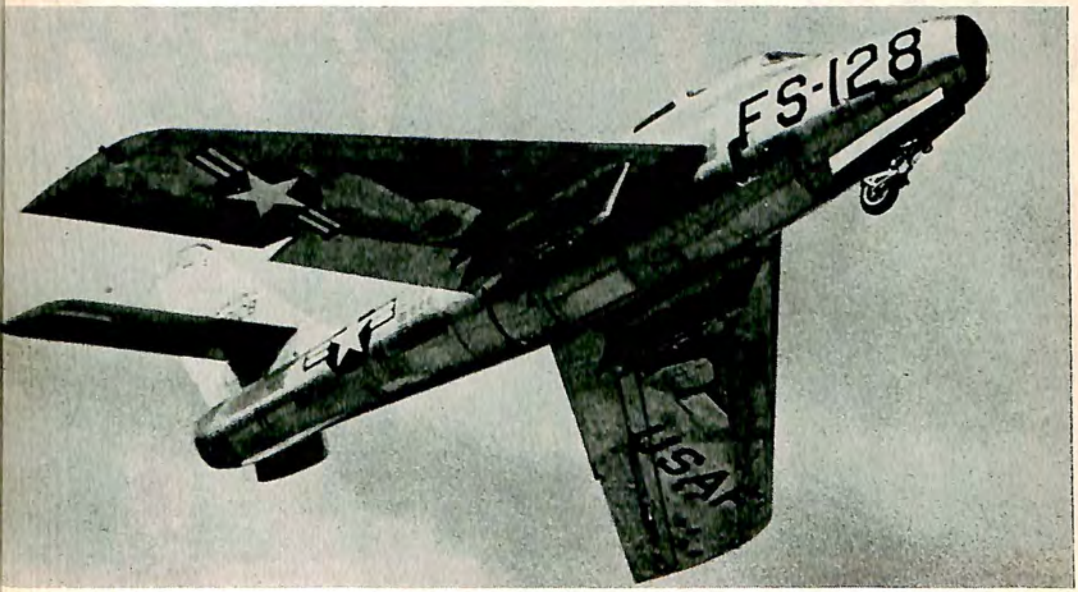
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• ELDER STATESMEN OF AVIATION

In December, 1955, the National Aeronautic Association honored fifteen Elder Statesmen who have made contributions of significant and enduring value to aeronautics. Pictured above, left to right, are: Jerome C. Hunsaker, Brig. Gen. Frank P. Lahm, Lester D. Gardner, William P. MacCracken, Jr., Paul W. Litchfield, Grover Loening, Vice Adm. Emory S. Land and Congressman Carl Vinson. Also elected Elder Statesmen were: William F. Durant, Godfrey L. Cabot, Hiram Bingham, Frederick B. Rentschler, Igor Sikorsky and Edward V. Rickenbacker.

CHAPTER ONE

The Industry

DRAMATIZED BY THE PRESIDENT'S mid-year announcement that U. S. scientists were at work on a satellite, and fed by solid research and development achievements in all fields, the nation's aviation industry in 1955 progressed farther than in any other year since the crisis in Korea. Scientific developments pointed the way toward a highly accelerated production of guided missiles, and there were scores of indications that tremendous advances were being made behind the security curtain toward solving problems concerned with atomic air power, interstellar flight and jet transports.

The nation's airlines responded to this last by placing more than $1-billion in orders for jet transports, meanwhile chalking up the biggest operational year in their history. This and other factors made possible sales volume for the industry of an estimated $8.4-billion, $100-million ahead of the preceding year despite the decline in unit production of military aircraft.

With an average of 750,000 employees per month, aircraft manufacturing industries ranked second only to the automobile industry as the nation's largest employer.

For the second year, sales of U. S. utility aircraft to businessmen and farmers set new records. More than 4,500 civil aircraft were sold during the year, a gain of approximately one thousand units over 1954, and dollar volume rocketed to $75-million from the 1954 high of $43.4-million.

Individual company achievements during the year appear on the following pages in alphabetical order.

AIRCRAFT MANUFACTURERS

Aero Design and Engineering Co.

During the year 1955, the Aero Design & Engineering Co. was in production on the Aero Commander business executive air transport model 560. The production of the 560 was phased out early in 1955 and production was commenced on the 560A model. The 560A model production was continued throughout the year. Fifteen of the 560A models were sold to the Air Force and given the designation of L-26B and assigned to Washington, D. C., area for VPI transports.

The 680 Super model, announced in September, 1955, was the first supercharged airplane in its category manufactured in the U. S. and also was the fastest airplane produced for business use in the U. S.

The company was employing around 425 people the first of 1955 and expanded its employee number throughout the year to a total of 600. The main operation has been continued in the Tulakes facilities. However, 34 acres of land were purchased in the immediate vicinity of the Tulakes Airport for future expansion. Hangar space of approximateliy 10,000 sq. ft. was leased on Cimarron Field, near Oklahoma City.

The company had a gross sales during 1955 of $7.5-million and at the end of the year had a back-log of orders of approximately $7-million. This back-log of orders was for the 560A and the 680 Super models. The estimated inventory was approximately $2-million.

A research and Development branch of the company was operated at Max Westheimer Filed at Norman, Oklahoma, some 40 miles southeast of the Tulakes plant. This department expanded during the year and its major work was centered on product improvement on the basic Aero Commander configuration.

Beech Aircraft Corp.

During 1955 Beech Aircraft Corporation strengthened its position as one of the dollar-volume leaders in the executive aircraft field with total fiscal year sales of commercial aircraft climbing to a new record of approximately $27.4-million. This 1955 record-breaking total compares with a total of $19.6-million for the previous year, indicating that Beechcraft commercial sales were increased almost 40 percent during 1955. Total sales for the company were in excess of $77-million for the 1955 fiscal year.

During the 1955 Beechcraft fiscal year, unit sales for each of the company's three commercial executive aircraft models showed an increase over the previous year: unit sales of the Beechcraft Super 18 eight-place twin-engine executive transport showed a gain of 84 percent; unit sales of the Beechcraft six-place twin-engine Twin-Bonanza executive airplane showed a gain of 21.6 percent; unit sales of the four-place single-engine Beechcraft Bonanza showed a gain of 20.5 per cent.

To meet the demand for these 1955 models, the company increased production rates during the year; and at year-end was experiencing distributor-dealer advance demands for 1956 models, indicating the continuance of a greater sales trend for the year ahead.

In mid-1955 the company delivered the 100th new Super 18 Beechcraft, which represented the 8,157th plane built from the basic Beechcraft Model 18 configuration.

During the year, the company announced its new "floor plan." As the first bank financing program of its kind ever presented in the aircraft industry, the Beechcraft plan opened new lines of credit for distributors. Through the new plan company distributors were able to finance their demonstrator airplanes at low bank interest rates and to intensify their sales efforts by stocking and maintaining a complete line of Beechcraft models "on the floor" at all times.

Also announced in 1955 was the Beechcraft "Aircraft Leasing Plan." Under this special distributor plan, U. S. business firms were able to lease a new Beechcraft executive transport with all insurance and financing charges included in a low monthly rental charge. During 1955 more than $1.5-million of new Beechcraft sales were provided for as a result of this new leasing program.

And for the seventh consecutive year the company offered to the owners of Beechcraft planes the services of special teams of factory-trained personnel during the manufacturer's coast-to-coast annual series of "Beechcraft Safety and Efficiency Clinics" conducted at distributor locations.

In June of 1955, Beech Aircraft announced its entry into the jet field by bringing to North America for a demonstration-tour the Morane-Saulnier 760, the world's first jet airplane designed for executive air travel. This 410-mph, twin-jet, low-wing monoplane seats four, has a fully pressurized cabin, and offers the same cross-country speed as the most advanced airline transports. Beech Aircraft holds an option for exclusive manufacturing rights in North America.

Following press premier showings in New York City and Washington, D. C., a nation-wide schedule of demonstrations was established to present the airplane to U. S. Military authorities and business executives and pilots throughout the United States and Canada.

First flight of the new Beechcraft Model 73 "Jet Mentor" was made on December 18, 1955. This privately financed, two-place tandem jet trainer will be offered to the military services as an "off-the-shelf" airplane.

Military sales during Beechcraft's 1955 fiscal year totaled $50-million. Backbone of the company's military plane production was the Beechcraft T-34 Mentor, a two-place, all metal trainer. This Beechcraft is now the official trainer of the U. S. Air Force, the U. S. Navy, and the military services of Canada, Chile, Colombia, El Salvador, and Japan.

In addition, the company produced in quantity two Beechcraft-designed jet-engine starters, the C-26 and the MD-3 generators, both still being extensively manufactured by Beech as ground power units for the Air Force.

For prime military contractors, Beech continued production of major parts, components, and sub-assemblies for: Lockheed's USAF T-33 and USN T2V; McDonnell's F-101; Republic's RF-84F.

While most of the 1955 projects in Beechcraft's accelerated research and development program remained under wraps as classified information, one new design was announced during August of 1955. Beech was declared the winner among nine aircraft companies invited to submit design proposals for a U. S. Navy pilotless target-plane, a remote-controlled target drone to be used in training ship-to-air and air-to-air Navy weapons systems crews. Announcement of the SKDB-1 contract was the first information made public of the work of Bechcraft's new missiles division established in September of 1954.

Employment at year-end was approximately 6,000, including the company's three major plant facilities at Wichita, Kans., the company's two leased production facilities at Herington and Liberal, Kans., and Beechcraft's new Boulder, Colo., engineering facility opened in July of 1955.

Bell Aircraft Corp.

Bell's twentieth year of operation in 1955 was a period of further growth in overall activity. A series of new products came into being and continued emphasis was placed on research and development to insure future progress. In line with this policy the Bell Exploration and Development Corporation was formed to further explore and expand the utility of Bell helicopters in the geophysical and geodetic field. This brings to five the company's wholly-owned subsidiaries.

In the Niagara Frontier Division, where programming is largely directed toward government work, efforts were concentrated in the fields of guided missiles, electronics, servomechanisms, rocket engines, special research aircraft, remote control systems for missiles and aircraft, flight simulation equipment and the production of various types of airframe and electronics components for bomber aircraft.

The year was an auspicious one for Bell in the field of special research aircraft and in the development of two revolutionary vertical-rising airplanes, VTOL and XV-3 Convertiplane.

VTOL enables the plane to rise and descend vertically without altering its horizontal attitude. It can turn in almost the width of its wing span and while it employs conventional control surfaces, the Bell-developed method of control provides ample pitch, yaw and roll control for take-offs, landings and normal flight. The jet engines are converted to vertical position for take-offs and landings and are rotated to horizontal position for forward flight.

The XV-3, produced in the Texas Division, represents a principle of flight which has an appeal to commercial aviation as a door-to-door vehicle. However, like the VTOL, the XV-3's immediate future will be military with promising applications for observation-reconnaissance, evacuation of front-line wounded, liaison and air rescue missions and a definite potential of larger cargo-assault transport.

Bell's vertical-rising aircraft

For take-off and landing the XV-3 resembles a helicopter in operation but for forward flight the rotors are tilted 90 degrees and become normal fixed-wing aircraft propellers.

Bell's stainless-steel, rocket-powered X-2, one of the now-famous "X" series, successfully completed guide tests during the year. The X-2, the first airplane specificially designed to investigate the effects of high temperatures on aircraft structures at very high speeds, is expected to outrun the X-1A which achieved a top speed of 1,650 miles an hour and reached an altitude of 90,000 feet, both unbroken records.

The company's guided missile effort continued on an integrated and unified weapons system basis. Much technical skill was devoted to such projects as the GAM-63 Rascal (guided aircraft missile) for the Air Force, and new contracts were secured from other missile prime contractors for the production of different missile components.

Design, development and testing of high precision electronics and servomechanisms also played a key part in the company's program.

Deliveries at an increased tempo were made of the Bell proportional control system for use in the launching and recovery program during flights of the Navy's Regulus missile.

The Navy also announced the successful testing of a Bell-developed automatic carrier landing system, capable of landing aircraft safely despite zero-zero visibility.

This system, a complex electronic combination of radio and radar, is operable both on airports and on aircraft carriers and has the advantage of being able to land aircraft whose pilots are either wounded or overly fatigued after flying long missions.

Other forms of flight safety, such as autopilots for helicopters and aircraft, were further advanced by the company's technical groups during the year.

Design, development and testing of high performance automatic control and maneuvering systems for guided missiles also was continued and an increasing effort was expended on several different types of guidance systems for missiles.

Bell engineers were also instrumental in the introduction to the commerical market of a line of two-stage electro-hydraulic servo valves which have applications in control systems where high performance and reliability are required.

In the production of major components for bombers, work on the Boeing B-47 remained constant and the company secured additional bsuiness of this nature by successfully competing for a contract to provide jet engine nacelles for the Boeing B-52 bomber.

In addition to this work, Bell also engaged in the production of other types of major assemblies, mostly electronic, for Boeing and Douglas.

In 1955 the company continued to supply entire rocket systems for the company's own missiles, such as the GAM-63, and received several new contracts to supply rocket engines for the missiles of other contractors. The U. S. Army revealed the identity of one of the latter missiles when it disclosed the company is in production of rocket power plants for the Nike anti-aircraft guided missile, a missile Bell Aircraft has been associated with since 1951.

The company's rocket engine program continued to expand in research and development, in personnel and facilities. Two test sites, one for research and the other for production engines, were augmented to accommodate increased efforts as well as to accommodate the new business secured. Over 600 engineers and technicians were engaged in rocket propulsion, exclusive of production workers.

Diversification also highlighted research, development and production activities at Bell's Texas Division.

Volume production continued on both single and tandem rotor helicopters, including three variations of the basic three-place Model 47 series Bell helicopters. The standard 200 hp Franklin-powered Model 47G machine was built and delivered during the year for commercial helicopter operators throughout the world. The same craft, with the addition of hydraulic boost control, was manufactured and delivered to the U. S. Navy as the HTL-6.

A more powerful version of the standard 47 was developed and produced for both commercial users and the Army. Designated the Model 47G-2 by Bell and the H-13H by the Army, the modified machine uses a 250 hp Lycoming engine to obtain improved hot weather and high altitude performance. The engine is derated to 200 hp for use in the helicopter, resulting in reduced maintenance and longer engine life.

The Texas Division of Bell, during the year, was manufacturing a streamlined, customized version of the Model 47, identified as the Model 47H-1. Private businesses use the three-place, 200 hp helicopter as an executive transport, reducing time spent by executive traveling from plant to plant, or plant to airport, to a minimum.

Volume production of the tandem-rotor Bell HSL continued throughout the year with deliveries being made to the Navy. The winner of the Navy's design competition, the HSL is an anti-submarine warfare helicopter and carries its own detection and destruction devices. A 1900 hp Pratt & Whitney R2800 engine powers the craft, which also features a Bell-designed autopilot.

The four-place Bell Model 47J, in limited production for the U. S. Navy as the HUL-1, was being developed for commercial sale the middle of 1956. Both the commercial and military production models are powered by a 250 hp Lycoming, derated to 220 hp for use in the Bell helicopter.

Bell Aircraft won the Army's utility helicopter design competition in 1955 and expedited the development of the turbine-powered, streamlined helicopter. Known as the XH-40, the Bell Model 204 is designed for frontline evacuation missions, general utility assignment and as an instrument trainer. It is scheduled to be powered by the Lycoming XT-53 turbine engine. The Bell XH-40 is classified as a closed cabin, single rotor, light weight helicopter in the 100-knot-plus cruising speed range. It can hover at 6,000 feet or more, climb at a rate of 1,500-feet-per-minute, and carry loads in excess of 800 pounds.

Work was started during the year on a long range helicopter instrumentation program, sponsored jointly by the Office of Naval Research and the Army Transportation Corps. Purpose of the study was to determine what basic information a pilot needs to fly a helicopter in any weather condition, and how to best present this information. The division also was developing a helicopter instrument trainer.

For the nine-month period ended October, 1955, Bell reported sales of $154,502,403 and net income of $4,547,756. Unfilled orders amounted to $241-million.

Consolidated net working capital increased $3,397,630 during the first nine months of 1955 and amounted to $22,898,416 at the end of the period.

Employment totalled 17,338 persons including 12,890 in the firm's Niagara Frontier Division and 2,971 in the Texas Division at Fort Worth. The remainder were employees in the company's subsidiaries.

Boeing Airplane Co.

B-52 Stratofortress production continued at an increasing tempo, and B-47 and KC-97 programs maintained their on-schedule deliveries to the U. S. Air Force, but it was the 707 jet tanker-transport which provided the major portion of the Boeing Airplane Company highlights for 1955.

With the airplane already ordered into production by the Air Force to fill its jet tanker-transport requirements, Boeing was advised by Secretary of the Air Force Talbott in July that there was no objection to building commercial jet aircraft concurrent with its production of military tankers. The Air Force was satisfied, Secretary Talbott said, that such commercial production would not interfere with, nor delay, scheduled delivery of military tanker-transports.

On October 13 the first contract for the commercial version of the new Boeing was signed, Pan American World Airways ordering a fleet of 20. American Airlines followed on November 9 with an order for 30. Delivery of the new jets to Pan American will start late in 1958, and to American in March of 1959. By year-end, jet transport sales totaled 72.

Meanwhile, the 707 prototype continued its intensive flight test program, turning in consistently outstanding performances as it reached and passed the 300-hour mark in flight time. Included were three long-range flights in which the airplane convincingly demonstrated what airline travel of the future would be like. The first, on October 7, saw the 707 average 550 miles per hour on a 3,038-mile non-stop test flight that took the airplane from Seattle to Denver to Los Angeles and return. The others, on October 16, broke transcontinental speed records in both directions, the 707 flying from Seattle to Washington, D. C., in three hours and 58 minutes for an average speed of 592 miles per hour, and returning the same day in four hours and eight minutes, an average of 567 mph. Top speed attained on the two trips was 662 miles per hour averaged for the 51-minute run from Rapid City, S. D., to Kansas City.

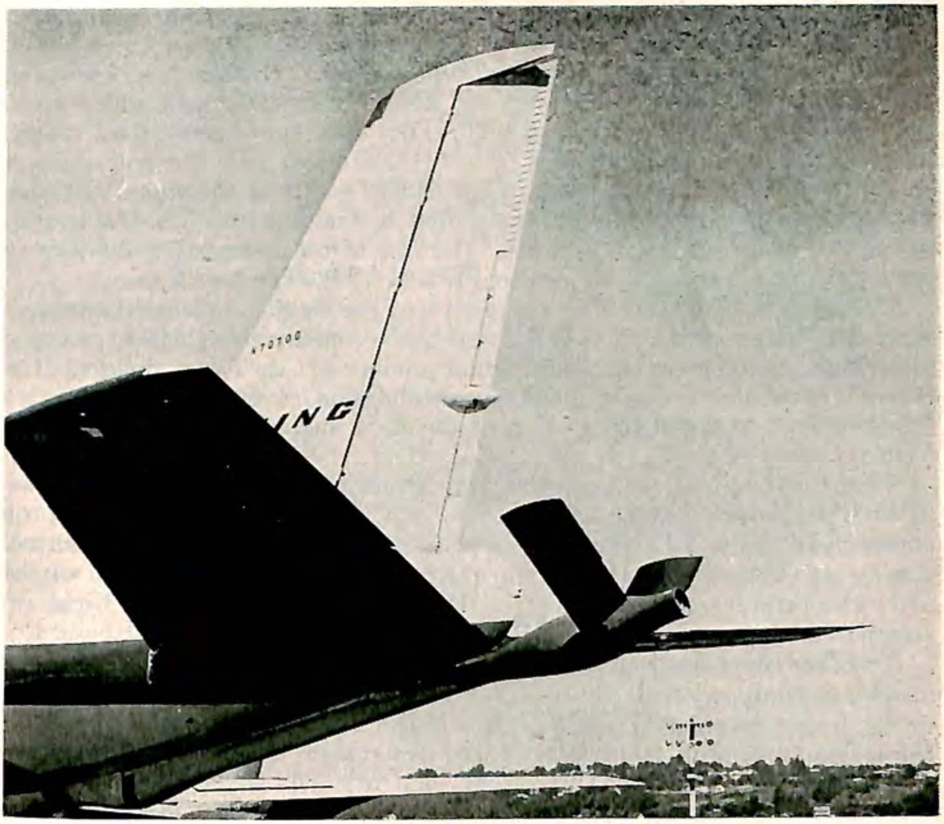
Mid-year also saw the 707 equipped with a new high-speed Flying Boom for aerial refueling tests. Considerably streamlined as compared with the boom used by Boeing KC-97 piston-engine tankers to refuel B-47 Stratojets, the device was thoroughly tested at high speeds and altitudes, with numerous contacts made with B-52's. The new boom will be installed on the KC-135, now in production at the Boeing plant in Renton, Wash., near Seattle.

With B-52 Stratoforts steadily rolling from the Boeing Seattle plant, the new Boeing flight test facility at Larson Air Force Base, Moses Lake, Wash., received its first Stratofortress for pre-delivery flight testing late in February. The Strategic Air Command's 93rd Bomb Wing took delivery of its first B-52 on June 28, flying the 350,000-pound, 650-miles-per-hour ship to Castle Air Force Base, Calif., to enter service.

Use of cross-wind landing gear as a standard production item on the B-52 was also revealed in mid-year, marking three world's "firsts" for the big bomber. It was the first use of this type gear on a production jet airplane, the first use of the gear on any production military airplane, and the first use of the gear on any heavy bomber.

The new gear can be prepositioned from the control cabin to permit the airplane to take off or land in a "crabbing" attitude that cancels out the effect of the wind across the runway. In this way, the gear simplifies the operation of the B-52 during what would otherwise be difficult landing and takeoff conditions, and in addition makes it possible for the plane safely to utilize many more existing airfields throughout the world than would be possible with a standard, unidirectional landing gear.

Meanwhile, in the huge Boeing Flight Center hangar at Seattle one B-52 was being put through a complete and deliberate scientific torture



Flying Boom on the Boeing 707

test to prove its structural integrity. In one of the most important phases of a year-long series of tests, the bomber's wings were stressed past the breaking point as approximately one million pounds of load were applied over the wing-span of 185 feet. The tests proved that the eight-jet heavy bomber structurally can withstand far more than the maximum load it may be expected to encounter in the most rigorous combat career.

The tests supplied information to Boeing and Air Force experts which was obtainable in no other manner. Specifically, they acquired precise knowledge of how much strain each part of the airplane would be able to withstand under every anticipated condition of flight. They learned how much room there was for "growth" in the design and made certain that everything designed into the airplane was built into it. The Boeing structures men had designed into the plane sufficient strength for any job it may be called upon to perform, but they had to prove this safety factor both to their own satisfaction and to the satisfaction of the Air Force.

With B-47 Stratojets continuing to roll from the Kansas plant, the Wichita Division announced in October that it had delivered more than were equipped with the French Turbomeca J-69 the 11 production airplanes will be powered by the Continental American-built engines.

CAA certification and completion of successful landing, hovering, and descent from Pikes Peak, altitude 14,110 feet, on September 13, 1955, was an outstanding event for the company during 1955. This Cessna CH-1 helicopter has a fan-cooled super-charged 260 horse power engine.

While 1954 saw the phasing out of the L-19 Bird Dog, 1955 saw the reinstatement of contractual requirements for 100 of these planes. On completion of this 100 contract, Cessna will have built 2,580 of these multipurpose aircraft. The Model OE-2, which is an improved version of the L-19, has been accepted for the Air Force and contract completely delivered for use by the Marine Corps. The Continental super-charged 265 bhp engine pushes the OE-2 along at speeds far in excess of the L-19.

Cessna's Hydraulics Division again showed a substantial sales increase for 1955 over 1954. The 1954 sales volume was $2.25-million with the 1955 sales showing $2.75-million. The increase is credited primarily to new items being manufactured for old customers.

During 1955, Cessna established the National Aero Finance Company, Inc., with offices in Wichita, to assist the Cessna dealer organization in the United States and Canada in financing its aircraft operations. The financing program will cover demonstrators, stock airplanes and leased airplanes.

Chance Vought Aircraft, Inc.

Chance Vought Aircraft, Incorporated, completed its 38th consecutive year of designing and building aircraft in 1955 with two of its products in active use by the Navy and a third in production following a successful flight test program.

Highlight of the year was the successful testing of the F8U-1 Crusader, followed by the receipt of an initial Navy production order of approximately $100-million for the airplane. Existence of the Crusader, designed to operate from aircraft carriers at speeds faster than sound, was announced in June, 1955, when the Navy revealed that the airplane had completed a series of successful test flights. The experimental prototype XF8U-1 made its first flight on March 25, 1955, exceeding the speed of sound in level flight. The first F8U-1 production model flew on September 30, 1955, and the initial production order was received in December.

On active duty with the Navy were the F7U-3 Cutlass, which reached fleet squadrons during 1955, and the Regulus guided missile, designed for launching from ships, submarines and shore bases.

First fights of the F8U-1 came less than a year after Chance Vaught Aircraft, Incorporated, separated from United Aircraft Corporation. From 1929 until July 1, 1954, Chance Vought had been a division of United.

Specifications for the F8U-1 called for a high rate of climb, exceptional combat ceiling and penetration of the speed of sound in level flight. The engine is the Pratt & Whitney J-57-P-4, a proven powerplant which has demonstrated a fuel economy which promises to give the Crusader the long endurance required in carrier operations.

The Cutlass program, which established a number of "firsts" since its inception, continued throughout the year with aircraft going to squadrons on both coasts. The first Navy jet production airplane to achieve supersonic flight, the F7U-3 was scheduled to phase out early in 1956.

The Cutlass also was the first Navy jet production fighter to release bombs at a speed greater than that of sound and to catapult from a carrier with nearly two and one-half tons of external stores and weapons.

While maintaining production of the F7U-3, Chance Vought also continued its development work in the guided missile field while producing the Regulus guided missile. A new high performance missile program was disclosed in March, 1955, but details were kept under a tight security cloak.

A surface-to-surface jet-powered guided missile, Regulus is manufactured in two versions—a recoverable test and training missile with a retractable landing gear and a non-recoverable tactical missile. Previously, the life expectancy of most missiles had been one flight, but the recoverable feature of Regulus meant that crews could be trained and test data gathered without the loss of the missile and the consequent cost to the national defense. Regulus missiles have been flown and recovered as many as 15 times.

In addition to being a prime contractor for the Navy, Chance Vought manufactured components for the North American F-100 Air Force jet fighter, the Boering B-57 Air Force jet bomber and the Lockheed P2V long-range Navy patrol bomber.

Early in 1955, the company completed a $900,000 low speed wind tunnel as an improvement to the 2.4-million square-foot of floor space it occupies at the Naval Industrial Reserve Aircraft Plant in Dallas, Texas. In December, bids were requested for construction of a $3.5-million high speed wind tunnel to expand the company's aerodynamic testing facilities, with completion scheduled for 1958.

The plant population during 1955 averaged 12,500 with approximately 250 employees stationed in California in connection with Regulus and Crusader testing operations. Chance Vought's engineering department includes approximately 2,200 trained employees.

Sales of aircraft, guided missiles, parts and services for the nine-month period ending September 30 amounted to $93.7-million. The company had a backlog at that time of approximately $162-million.

Convair
A Division of General Dynamics Corp.

Highlighting the 1955 production and facilities progress and employee activities of the Convair Division of General Dynamics Corporation at its San Diego and Pomona, Calif., and Fort Worth and Daingerfield, Texas, plants were these events of record:

Acceptance of the Convair Terrier as a U. S. Navy operational guided missile, marked by the commissioning of the USS Boston (CAG-1) as the world's first guided missile cruiser;

Receipt of new multimillion-dollar Air Force production contracts for F-102A supersonic interceptors and TF-102A combat proficiency trainers;

Ground breaking at Palmdale, Calif., for a $10-million F-102A-TF-102A flight test and acceptance facility;

Start of production on Metropolitan 440 transports, successors to the Convair-Liner 240 and 340 series;

Start of production on the Air Force B-58 supersonic bomber and intensified development leading toward application of nuclear power for aircraft.

As the primary armament for the USS Boston, the surface-to-air supersonic Terrier guided missile was in quantity production during the year at Convair-Pomona for the U. S. Navy Bureau of Ordnance at the government-owned Naval Industrial Reserve Ordnance Plant.

Meanwhile, at San Diego, Convair was producing Air Force F-102A all-weather delta-wing interceptors and had initiated output of Air Force TF-102A combat proficiency trainers. In connection with these programs, ground was broken in October at Palmdale, Calif., for a $10-million Air Force F-102A-TF-102A flight test and acceptance faciilty to be operated by Convair and to include nine major structures comprising more than 500,000 square feet.

An active market developed during 1955 for Convair's Metropolitan 440, an advanced version of the Convair-Liner 340 that, temporarily during the year, had been designated Model 340B. More than 60 Model 440s were on order by the airlines and military and private customers at year's end, even as negotiations continued for additional business.

Meanwhile, Convair-Fort Worth developed designs for and began production of components for the world's first supersonic bomber, the Air Force B-58, at the same time intensifying its development program in continuing an Air Force study of the application of nuclear energy in the production of aircraft.

And at Daingerfield, Convair continued its operation for the U. S. Navy Bureau of Ordnance of an Ordnance Aerophysics Laboratory, where research and development progressed for the armed services in the testing of large-scale ramjet engines and other classified projects.

Marking a milestone in a comprehensive Convair-Navy program of research, development and production of Terrier guided missiles, the Terrier-equipped USS Boston was commissioned November 1, 1955, at the U. S. Naval Base, Philadelphia, as the world's first guided missile ship. Far deadlier even than the largest anti-aircraft guns, the Terrier also will be the primary armament on the Navy's second guided missile cruiser, the USS Canberra (CAG-2), scheduled for commissioning in the spring of 1956.

The Terrier may be launched readily from a ship or from the ground to search and and destory with deadly accuracy any type of attacking aircraft. Because of its adaptability to amphibious warfare, the U. S. Marine Corps has selected the Terrier as its first anti-aircraft missile.

First of the future anti-aircraft weapons at sea, the Terrier will be fired from two twin launchers located on the after main deck of the Boston, a converted heavy cruiser which has been completely modernized from the hull up. The Boston's after 143-ton 8-inch gun turret has been removed and replaced with a missile launching platform. Another twin launcher has been installed on a higher level of the warship's decks. On the Boston, the Terrier is stowed below decks in two magazines. Dubbed the Coke machine, because of its resemblance to the soft drink dispenser, it is a completely automatic loading device.

Equally effective at night, the Terrier is guided by several different electronic devices aboard the Boston. Radar and electronic equipment for detecting targets and for "homing in" the missiles represents a most drastic change.

The Convair-Navy research, development and production program at Pomona includes weapons, systems analysis, and the preliminary design of new and improved guided missile components.

Largest at Convair-Pomona, the Manufacturing Building covers 17 acres and includes more than half the 1,286,000 square feet of floor space available at the facility.

In connection with the Boston commissioning, the Navy permitted Convair to announce that more than 30,000 inspections, tests and check-outs are made on Terriers before they are released from the nation's first fully integrated guided missile plant.

The Engineering Building, which contains an analog computer, a complete experimental factory and chemical and structural test laboratories, covers 384,000 square feet. It is flanked by several small structures that include two drop towers (one 200 feet high), two 34-foot centrifuges and two smaller laboratories. Missiles and components can be subjected to acceleration forces up to 60 times the force of gravity in the drop towers and centrifuges.

Total employment at the Pomona plant totaled 4,175 on Dec. 31, 1955.

While Convair-San Diego was turning out F-102A interceptors and TF-102A combat proficiency trainers, TF-102A nose sections were being built at Convair-Fort Worth and shipped to San Diego for final assembly. First trainer developed specifically for any of the "century series" of combat aircraft, the side-by-side, two-seat TF-102A was in the air 32 minutes during its initial flight Oct. 31, 1955, from the Air Force Flight Test Center, Edwards AFB, Calif. Although the trainer, if need be, could be flown as a fully tactical interceptor aircraft by either one or two pilots (Convair Engineering Test Pilot R. L. Johnson was alone on the TF-102A first flight), the TF-102A was designed primarily to familiarize trained jet pilots with F-102A performance as an integrated weapon, not simply as another jet airplane. A widened nose section forward of the leading edge of the delta wing is the principal external feature distinguishing the TF-102A from the F-102A. Air inlet ducts for the Pratt & Whitney J-57 turbojet engine that powers both aircraft were redesigend in the TF-102A and its windshield and canopy also differ slightly from those of the F-102A.

A later, improved version of the F-102, designated YF-102A and completed in the record time of 117 working days, was given engine and taxi tests at San Diego's Lindbergh Field and trucked to Edwards AFB Dec. 16, 1954, for flight tests. Convair Pilot R. L. Johnson made a shakedown flight Dec. 20 and the next day flew the new plane supersonically in a climb—only six months after design work had been completed and manufacture begun.

One of the first two U. S. aircraft to incorporate the now-famous NACA area rule, the YF-102A and its successors, the F-102A and TF-102A series, differ from the early F-102s in their longer fuselages with "Coke bottle," "wasp-waist," or "Marlin Monroe" configuration, cambered leading edges, reflex wing tips and streamlined fairings at the aft end of the fuselage. The canopy and air inlet ducts also were redesigned. The Air Force accepted the first F-102A late in June 1955.

At Palmdale, first units in the new Air Force flight test and acceptance facility are due for completion by mid-summer of 1956. Convair employment at Palmdale is expected to reach 1,200 by mid-August 1956. Convair also operates F-102A flight test programs at Edwards AFB and at Holloman AFB, N. M.

Loaded with the latest electronic gear, the supersonic F-102A will intercept enemy bombers at stratospheric altitudes at any time of day or night, in any kind of weather. Both F-102As and TF-102As will be assigned to the Air Defense Command.

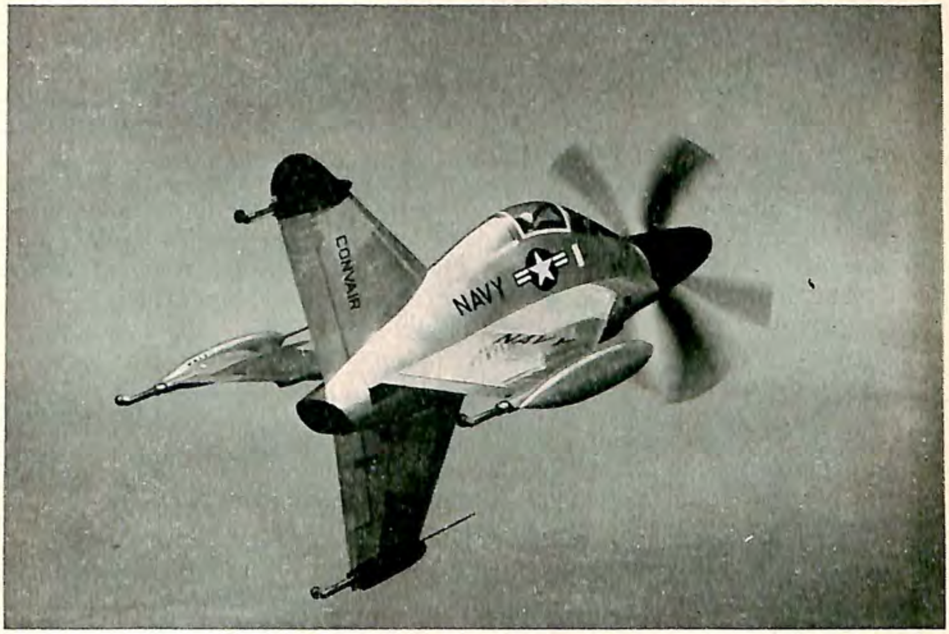
Meanwhile, two off-the-shelf San Diego-built Convair-Linear 340s, which in 1954 had been flown to Convair-Fort Worth for installation of Allison YT-56 turboprop engines and re-designation as YC-131Cs underwent an intensive evaluation flight test by the Military Air Transport Service during 1955. Flying coast-to-coast and border-to-border out of Kelly AFB, San Antonio, Texas, the two transports had logged 3,018 hours 35 minutes up to Dec. 17, when the program ended.

An active market developed during 1955 for Convair's Metropolitan 440, and advanced version of the Convair-Liner 340.

The "quiet cabin" Metropolitans incorporate power and aerodynamic improvements that were designed to increase payload and cruising speed of the aircraft. Most noticeable improvement in the Model 440, and one of the most important, was the exhaust silencer. This provides a single rectangular exhaust at the aft end of each nacelle instead of the two familiar circular openings on Model 240 and 340 augmenter tubes.

Model 440s may have a removable bulkhead in the forward cabin area, making it possible to convert to 52-passenger capacity by installing two extra rows of seats. By Dec. 31, 52 Model 440s had been ordered by three domestic and six foreign airlines, two others by private customers, six by the Royal Australian Air Force and six by the Air Force, with 60 additional Model 440s under option or in negotiation.

Also at San Diego, Convair was producing Air Force C-131D personnel transports and at work on an order for 36 Navy R4Y-1 cargo-personnel transports based on the Model 340 design . On Oct. 4 the last C-131B electronic test-bed aircraft was delivered to the Air Force; also completed



Convair's XFY-1 is test flown in California

during the year was a contract for Air Force T-29D trainers. Work began on the $8.5-million Air Force order for ten R4Y-type cargo-personnel transports designated TC-131E (3), RC-131F (6) and RC-131G (1). They will be put to a variety of military uses.

On Feb. 24, in a six-hour, non-stop, delivery flight which established a record for seaplanes, a Convair crew flew a Navy R3Y-1 Tradewind turboprop seaplane from San Diego to Patuxent Naval Air Test Center, Maryland, for subsequent Navy evaluation tests. The first bow-loading R3Y-2 assault transport also was flown non-stop from San Diego to Patuxent. Additional R3Y-1s and R3Y-2s were readied for delivery to the Navy.

In its F-102A and TF-102A production programs, Convair-San Diego introduced the process of chemically milling, or etching, the aluminum doors and doublers for these aricraft. Milled by the etching action of chemicals, these production parts proved to be lighter, stronger and less expensive than those previously made by conventional machining methods. Chemical milling was considered particularly useful in producing curved parts which would be difficult and expensive, if not impossible, to produce with a machine tool. A research program undertook to improve chemical milling techniques in order to expand the uses of this new method, which also was initiated at the Fort Worth plant during the year.

The first externally mounted gas-turbine units to supply electrical power for aircraft were installed on Air Force C-131B aircraft during the year. Mounted under the wing between the engines, two Solar Aircraft Co. T-41 units drive generators for a-c or d-c current. The portable units were designed for quick installation whenever operations require extra power for operating test equipment.

During 1955, Convair-San Diego completed the first phase of a $450,000 program to improve its Plant I steam heating system, with installation of two boilers and a water treatment plant and with three more boilers due for installation the next two years. This program won a national award in a plant modernization contest sponsored by Power Magazine.

Employment at San Diego rose slightly from Oct. 1, 1954, to Oct. 1, 1955, when the total reached 22,588, an increase of 458. Engineering personnel, included in this total, increased 1,177 during the period. In December San Diego employes set a new world plant safety record by working 68 consecutive days without a lost-time accident.

Supplementing its aircraft production programs at San Diego, guided-missile programs and electronics systems and equipment were under development or in production during the year.

For outstanding achievement in 1954 in becoming the first person to fly successfully a vertical takeoff aircraft—the Convair-built Navy XFY-1 Pogo turboprop VTO fighter—San Diego Engineering Test Pilot J. F. (Skeets) Coleman was awarded the 1955 Harmon International Trophy.

At Fort Worth, indications of stepped-up activity in the B-58 program came with establishment of a department to handle related B-58 subsystem responsibilities, such as bench checking, installing, performing operational check-outs, and trouble-shooting the plane's mechanical subsystems.

In addition, a B-58 flight test team was formed to insure success of the plane's flight test program. In May, a three-story radar sighting tower was completed for use with the plant's Aerophysics Laboratory for B-58 and other special project test programs.

Also at Fort Worth, employees began work in June on a new multi-million-dollar Air Force contract to convert a fleet of 36 C-54 four-engine transports into SC-54 air rescue craft, for use by the Air Rescue Section of Military Air Transport Service. The SC-54s will be equipped for day or night all-weather search and rescue operations over land or sea. The conversion program calls for installing larger fuel tanks for greater range, latest electronic devices for navigation and search, blister-type windows for improved visibility, and special rescue equipment. Prototype SC-54 was accepted by the Air Force Oct. 12, 1955.

Although Fort Worth B-36 production ended in Aug. 1954, the Strategic Air Command's B-36s are being rotated through the plan every two years for modernization, inspection, and maintenance under a SAM-SAC program (Specialized Aircraft Maintenance-Strategic Air Command). The plant also was producing an undisclosed number of tail fins and outboard wing assemblies for the Boeing B-52 bomber and converting RB-36s to carry RF-84 fighters.

Completed at Fort Worth was a huge jet engine test stand, built of reinforced concrete and lined with sound-absorbing material. The structure, 54 feet high, 158 feet long and 38 feet wide, was designed to enclose an existing open-bay test stand in preparation for tests of more powerful jet engines.

A new passenger-carrying record for land-based aircraft was established July 12 when the Air Force's Convair-built XC-99 transport landed at Convair-Fort Worth with 212 passengers, most of whom were AFROTC cadets attending summer camp at Kelly AFB, San Antonio, Texas, home base for the XC-99. The cadets were flown to Fort Worth to tour the plant.

Employment at Fort Worth, which totaled 17,232 on Dec. 31, 1954, stood at 21,026 on Dec. 31, 1955.

The Award of Honor—highest industrial safety award of the National Safety Council—was awarded the Fort Worth plant for the third successive year, on the basis of improvement shown in 1954 in accident frequency and severity rates. The plant also won the award in 1953, 1952 and 1949.

Douglas Aircraft Co., Inc.

Introduction of the new turbojet DC-8 commercial airliner and an unprecedented demand for propeller-driven transports of the DC-6 and DC-7 series were the outstanding developments in a year of further expansion by Douglas Aircraft company.

During its 35th year of continuous operation under the same management team, the company expanded its production and office facilities, the number of models under development or production and the size of its work force.

Despite the prominence of commercial transport orders in 1955, nonmilitary business represented less than 25 percent of the Douglas backlog. The remainder was for a variety of Air Force and Navy airplanes and missiles for the Army and Navy.

Douglas received an unprecedented volume of transport orders from the very start of the year. In the first two months, 17 world airlines purchased a total of 109 four-engined planes.

Before the close of the year, the company had received orders from 30 airlines for more than 230 propeller-driven transports—an all-time high for the industry. They included the DC-6A cargo plane, the DC-6B, DC-7, DC-7B and DC-7C luxury passenger airliners.

The "Seven Seas" long-range transport made its first flight in December and was scheduled to enter trans-Atlantic service during the first quarter of 1956. More than 100 in the backlog of propeller-driven transports were for the DC-7C, which is capable of non-stop flights in either direction between New York and principal European cities.

Also, during the year, Douglas made public a firm decision to produce a new turbojet transport. The DC-8 design, evolved by nearly four years of intensive engineering study, called for a large airplane with four jet engines slung in pods beneath 30-degree swept wings. Powered by four Pratt & Whitney turbojet engines, the DC-8 will cruise at more than 550 mph and have a top speed of 600 mph. Its overwater version, designed specifically for intercontinental travel, will be able to make transoceanic hops without refueling stops.

New York to London flight time will be slightly over six hours; New York-Paris, less than six and one-half hours; New York-Rio, less than nine hours.

Domestic versions of the DC-8, differing in fuel capacity and power plants, will be able to span the continent in less than five hours on regularly-scheduled flights. San Francisco to New York hops will require slightly over four and one-half hours.

Comfort as well as speed will be a prime characteristic of the DC-8. The interior will permit seating of 100 passengers in the ultra-luxury versions and up to 140 in tourist configurations.

Pressurization of the luxuriously appointed cabin will create sea-level atmosphere at a flight altitude of 23,000 feet, 5,000-foot equivalent at 34,000 feet and only 6,700 feet at a flight altitude of 40,000 feet.

Span of the DC-8 wings is 139 feet, 9 inches; overall length 148 feet, 10 inches; and height, 42 feet, 4 inches.

Gross weight of the intercontinental version will be 287,500 pounds and the domestic model will take-off at 265,000 pounds.

Among the interesting features of the DC-8 are reverse thrust and noise reduction devices on the engines; speed brakes located under the fuselage; underwing refueling; and landing gear which permits a short turning radius during taxiing operations.

In spite of its tremendous size, speed and performance capabilities, the Douglas jet transport has been designed aerodynamically to operate from existing major air terminals. The first DC-8 is expected to be flown in 1958 and to enter service late the following year.

Early orders for the DC-8 came from Pan American World Airways, United Air Lines and National Airlines.

While commercial transport sales occupied public attention, Douglas was in full production on four Air Force and four Navy aircraft. The company continued production of the C-118A Liftmaster, Air Force version of the DC-6A, at its Santa Monica Division and the Boeing-designed B-47 Stratojet bomber at Tulsa.

Both the Long Beach and Tulsa Divisions were producing twin-jet bombers of the B-66 series, including three separate reconnaissance versions. Newest of these, the RB-66C, made its initial flight at Tulsa on Nov. 5, 1955.

Long Beach was also preparing at year's end to roll out the first Air Force C-133 turboprop, which will succeed the C-124 Globemaster as the world's largest production transport. Last of more than 445 Globemasters built at Long Beach was delivered to the Air Force in May.

Still another Air Force plane, previously classified, was brought to light in November when it was announced that the C-132 turboprop transport project would be transferred from Santa Monica to Tulsa.

Under development for more than three years, the C-132 will have a greater range and payload capability than any other transport. Engineering, development and fabrication responsibility for the aerial behemoth will be assigned to Tulsa to permit Douglas to make better use of its production facilities.

For the Navy, Douglas was producing both the AD-5 "multiplex" and AD-6 single-place attack bombers; the swift, F4D Skyray jet interceptor; the large, twin-jet A3D Skywarrior; and the A4D Skyhawk bantam bomber.

This diminutive destroyer demonstrated its combat capability on Oct. 15 when it set a new world speed record for the 500 kilometer closed circut course.

Piloted by Lt. Gordon Gray, USN, the carrier-based attack jet whirled five times around a circular course at Edwards Air Force Base at an average speed of 695.163 mph. This speed, made at sea level, eclipsed by more than 45 mph the mark made by a fighter aircraft a year before. The flight was made under rules of the F.A.I. and application has been made to post the speed as an official mark.

A Navy announcement at the commissioning ceremonies for the U.S.S. Forrestal revealed that four Douglas planes—the A3D, F4D, A4D and AD-5—are scheduled for duty aboard the huge carrier.

Douglas also was engaged, alone or in collaboration with leading electronic firms, on eight major missiles projects under contracts from the Air Force, Army and Navy. Among them were three production models in the hands of operational units—Honest John, Nike and Sparrow I.

Douglas RB-66C makes first flight in November

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Douglas RB-66C makes first flight in November

Because of the growing importance of this phase of the company's activity, Douglas announced in October that it was separating missiles engineering from aircraft engineering functions. During the 14 years the company has been in the field, development and design of missiles has been undertaken within the framework of the Santa Monica Division engineering department.

The new organization is headed by E. P. Wheaton, chief missiles engineer, who had supervised Douglas missiles research and development since 1943.

Earlier in the year, the company activated a fifth manufacturing division at Charlotte, N. C., for expanded production of Nike. The modern, mechanized factory was being set up in a 1.25-million square foot plant under contracts with Army Ordnance and Western Electric company. It will be a second source to the Santa Monica Division for production of Nike.

Facility expansion, in addition to the new missile factory at Charlotte, included a nearly-completed multi-million dollar program at the Santa Monica Division. Largest unit is a $2-million manufacturing plant at Culver City, some three miles from the parent factory, for which ground was broken in July. A $500,000 office building was under construction opposite the main entrance, and another $1-million was spent for subsidiary buildings at the mile-long Santa Monica facility.

At the El Segundo Division, Douglas completed a $426,300 building for use as a research and development center for future Navy jet aircraft.

Near the end of the year, the company occupied greatly-expanded flight testing facilities constructed by the government at Edwards Air Force Base. A major portion of a $2.2-million structure was allotted to Douglas for centralization of its testing activities.

Increased production activity resulted in expansion of the company's employment from 71,900 at the end of 1954 to 77,600 at the end of 1955.

For the first nine months of the 1955 fiscal year, Douglas had net earnings of $23,368,000 resulting from sales of $676,157,000. The company's backlog on Sept. 30 was $1,824,000, of which approximately 25 percent represented commercial orders.

Fairchild Engine and Airplane Corp.

Receipt of a research and development contract calling for an undisclosed number of guided missiles, completion and subsequent opening of a new modification center at St. Augustine, Fla., initial delivery of the new C-123 assault transport to the U. S. Air Force and a proposal to build a light jet utility transport were among the major highlights occurring at the Fairchild Aircraft Division in 1955.

As Fairchild continued production on its new C-123 assault transport, a series of in-flight and loading tests were constantly carried out. These tests were conducted by the Air Proving Ground Command at Eglin Air Force Base, Fla., and at Fort Bragg, N. C., as part of the USAF's Operational Suitability program. Short field landings and takeoff characteristics were successfully demonstrated on unprepared fields.

In February preliminary flight tests with jet thrust augmentation were performed on the C-123 at Hagerstown and Edwards Air Force. During these flights two Fairchild J44 turbojet units were installed on the wing tips, providing an additional 2,000 pounds of thrust to meet critical or emergency takeoff conditions.

Also at this time a new Flying Boxcar was under development at the Hagerstown, Md., plant. The design of this new transport aircraft featured an upswept Pi-Tail and J-44 turbojet engines on each wing tip.

Development studies for a BLC system for transport aircraft generated considerable interest among the military services, and late in the year the company submitted a proposal to the Army for a VTOL research aircraft.

Throughout 1955 Fairchild continued its sub-contract production program on the tail fins and outer wing panels for Boeing's B-52 jet bomber and late in the year substantial additional subcontracts were received for sections of the top deck and fuselage side panels.

While actively participating in the delivery of supplies for the building of the DEW LINE (distant early warning line)—the northernmost of three radar networks between North America and Red Siberia—C-119 Flying Boxcars in May dropped 16,000-pound tractors by parachute which were used in building landing strips out of ice and snow.

Earlier, in January, 92 Flying Boxcars were used in connection with Exercise Snow Bird which featured the largest mass paradrop of men and material ever attempted in Alaska.

During November and December more than 160 Flying Boxcars and a number of C-123's participated in Exercise Sage Brush, the largest maneuver held since World War II. Approximately 150,000 service personnel took part in this joint Army-Air Force exercise, conducted over a seven million-acre area in Louisiana.

As production continued on both the C-119 and C-123, additional contacts were received for the latter and by June a total of 244 of these planes had been ordered by the Air Force.

Under terms of a joint contract announced in June by the Brazilian Aeronautical Commission, Fairchild was authorized to begin overhauling 12 C-82 Flying Boxcars, which were then in storage at Kelly Air Force Base, Texas. These were delivered of the Brizilian Air Force, making the company's re-entry into Latin American aviation after nearly 10 years' production of transports for American and NATO military air forces.

Special ceremonies held in July at Ardmore Air Force Base, Okla., marked the acceptance of the Tactical Air Command's first operational C-123 assault transport, and the formal activation of a new troop carrier unit, the 309th Troop Carrier Group (Assault Fixed Wing). By the end of the year 67 planes were delivered to this new 18th Air Force wing.

In September an accelerated service testing program was successfully conducted on the C-123 at Ardmore Air Force Base, Okla., where the assault transport completed a 500-hour shakedown flight in 54 days, equivalent to a year's normal flying time. Minimum maintenance was required.

During the summer months Fairchild announced it was holding three major Defense Department research contracts and was conducting design studies for the Office of Naval Research, the Navy's Bureau of Aeronautics and the Air Force's Research and Development Command. Under the terms of a Naval Research grant, the company's studies will determine the optimum configuration necessary to meet Navy requirements for an STOL (short takeoff and landing) transport aircraft with wide speed-ratio characteristics. The contract with the Bureau of Aeronautics calls for design studies which will meet Navy requirements for a high-performance observation aircraft. Under a contract with the Air Research and Development Command, Fairchild is undertaking exploratory design studies on a new Air Force utility command aircraft, which also features STOL characteristics. These three design studies were financed by the U. S. Army.

Early in 1955 work began on the construction of an aircraft repair and modification base adjacent to the St. Augustine Municipal Airport. Officially opened in November, the two-story structure is located on a 21-acre site and contains approximately 85,000 square feet of working area. It will serve as the center for future major modification work programs.

A new contract awarded Fairchild by the Air Force in August brought to more than 500 the number of Flying Boxcars scheduled to undergo a modification program.

It was at this time that plans were announced to build a light jet utility transport. Developed under the Fairchild's research and development program, this light jet would be capable of cruising 560-miles-per-hour, carrying a crew of two and seven passengers.

As the late summer hurricanes gave way to severe floods in many parts of the country, C-119's were pressed into service flying food and supplies to families who were virtually wiped out by one of the worst floods on record.

On Oct. 31 the final C-119 Flying Boxcar rolled down the assembly line at Fairchild, bringing to an end an era which first began back in 1949 when the first of these transports was built.

In early fall the plant facilities of the Jonco Aircraft Corp. at Shawnee, Okla., were leased to provide possible future expansion of the company's manufacturing and related aircraft activities. Some 90,000 square feet of manufacturing comprise the new Aircraft Division branch plant, located 35 miles from Oklahoma City, Okla.

Two basic types of instruments were developed and marketed by the American Helicopter Division of Fairchild during the year. The first type is miniature, light-weight, precision bridge balances. The second type is self-balancing, resistance-bridge indicators.

The bridge balance equipment is used in instrumentation systems that record the output from a number of strain gages, pressure pickups, thermocouples. Its purpose is to permit the establishment, for each channel of input, of a zero reference (or balance) a maximum scale factor and to permit all such channels to be calibrated on the record, once these two factors have been set, on the various resistors, for each channel. These instruments are being sold for use in airplane and guided missile flight-test instrumentation and for laboratory usage.

The resistance bridge indicator equipment is a type of self-balancing equipment that is used to read directly, in terms of units desired, the load, strain, pressure, temperature or displacement applied to an electrical transducer in an industrial or experimental system. Various internal calibration features are incorporated and models have been developed that will actuate a Clary-type tabulator, IBM typewriter or Commercial Controls Flexowriter for permanent recordings of readout data. This type of equipment incorporates a servo-amplifier and motor and can be applied to systems for the automatic control of certain types of industrial processes.

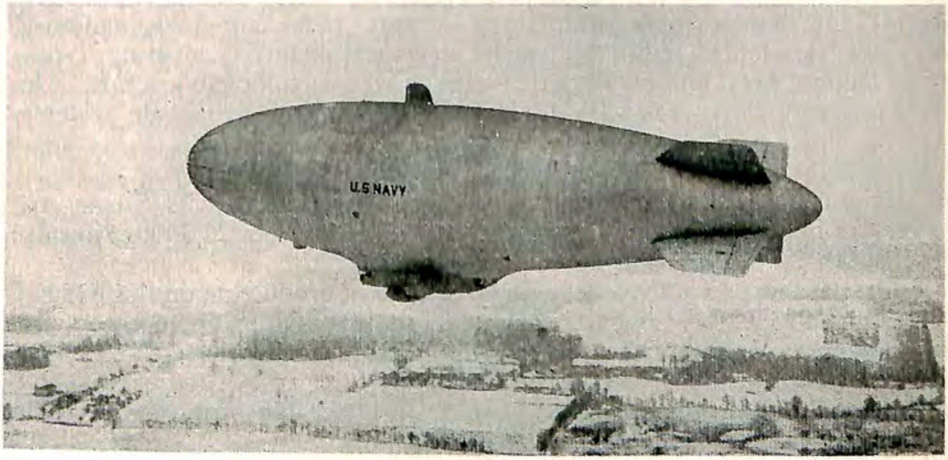
Also during the year, the American Helicopter Division of Fairchild, under the sponsorship of an Air Materiel Command Contract, developed processes and machinery for resistance welding steel-honeycomb-core material to steel-skin facings. The principal advantages of the welded panel are that (a) the sandwich components are welded together, as in any welding process, in an open area, (b) there is no practicable limitation on the size of the panels that can be welded, (c) there is no thermal distortion or discoloration of the sandwich resulting from the welding process and (d) full hard-skin facings can be welded without annealing, thus eliminating the post heat-treatment required by other processes.

The Division also developed fiberglas-reinforced plastic, microwave-guide components having transmission efficiencies equivalent to metal-type microwave-guide components. These components provide structurally superior and lighter weight wave-guide plumbing for use in airborne applications.

General Development Corp.

During the year, the General Development Corporation of Elkton, Md., a newcomer in the airship field, produced an airship envelope which utilizes

Goodyear ZPG-2W, Navy's newest blimp



a newly developed material. This envelope material has markedly superior characteristics of permeability and strength-to-weight ratio. This weight saving feature can be used to increase cruising range or other loads significantly.

Goodyear Aircraft Corp.

During the year, Goodyear Aircraft Corporation enlarged its research and development activities, its productive capacity and its employment roll. More than 10,000 employess worked on assignments in the six Akron plants and at the Wingfoot Lake Airship Base. Another 2,500 employees were active at the company's Arizona plant at Litchfield Park.

Construction of a new building was underway at the Arizona facility. This will house all engineering personnel and research and development programs. A similar program was underway at the Akron facility by addition of an engineering building with construction to commence in 1956.

First public appearance of the model ZPG-2W Airship was made in early 1955. This airship is a configuration of the ZPG-2 Airship that had previously established a world record for sustained flight without refueling. The ZPG-2W incorporates electronic features designed specifically for airborne early warning missions. An unusual feature of the ship is the radome bubble mounted on top of the envelope housing electronic equipment with a 75-foot vertical tunnel connecting this radome with the control car. The company also produced for the U. S. Navy an undisclosed number of model ZS2G and ZSG-4 airships. Production of the ZS2G, which is the current search craft incorporating the latest equipment for anti-submarine warfare, is continuing.

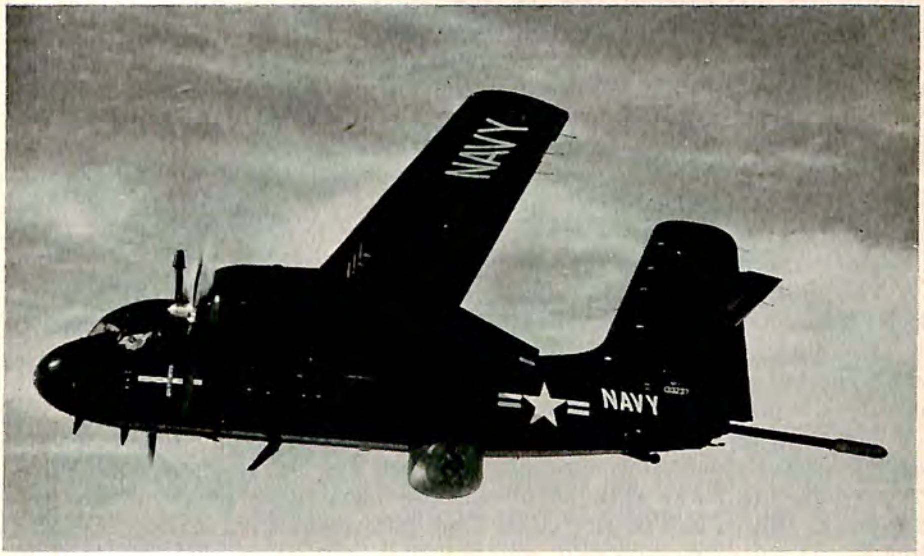
Aircraft designers are showing particular interest in the company's ejectable sea capsule, which is designed to protect against air blast and loss of survival gear.

During the year, production in the airplane wheel and brake, canopy and laminates, vinyl products and metalcraft divisions remained steady. Goodyear also manufactured aircraft parts (such as wings and other components) for newest types of military aircraft, radar antennas, radomes, canopies, Bondolite (lightweight metal structural material), ducting, crosswind landing gear, and artillery carriages as well as complete aircraft. The company increased work with guided missiles and guided missile systems.

Grumman Aircraft Engineering Corp.

Grumman Aircraft Engineering Corporation celebrated its Silver Anniversary in July 1955, and during the year turned out its 23,000th aircraft; its 2,500th jet fighter, and its 400th amphibian.

The year was an active one, with Grumman in production on the F11F-1 Tiger and the F9F-8 Cougar jet fighters; the F9F-8P, a photo reconnaissance version of the Cougar; the S2F-1 and S2F-2 sub-killers; the TF-1, a transport-cargo-trainer with carrier-capability; the air-sea-rescue SA-16A Albatross; and various classified projects in either the prototype or early design stages. All production was for the military.



Grumman S2F-1 Sub-killer

The F11F-1 Tiger was the nation's first aircraft to utilize the "area rule" or indented fuselage concept. In September 1955, the National Advisory Committee for Aeronautics released details of the new design principle, crediting the Tiger with being the first to adopt this "powerful, simple and useful device for designing new aircraft with dramatically improved performance."

The supersonic Tiger, capable of carrying the most modern external stores, including air-to-air and air-to-ground missiles, was designed to fit into the Navy's concept of a powerful striking force equipped with hard-hitting aircraft possessing the retaliatory ability to strike an enemy on his own territory. Construction of the Tiger was simplified in all possible respects, including the use of one-piece machined aluminum alloy skins for the upper and lower wing sections, and manual folding wing tips.

On April 20, 1955, the Navy accepted an F9F-8 Cougar, and this particular plane enjoyed the distinction of being the 2,500th jet fighter which Grumman had built for the Navy. The company was in full production on the sweptwing Cougar during 1955 and in the latter part of the year phased the F9F-8P photographic reconnaissance version into the assembly line.

The F9F-8P carries large cameras and the most modern automatic camera control equipment designed for photo fighter aircraft. The forward section has been completely redesigned and features three separate camera bays, capable of carrying seven cameras.

Grumman required only eight months and six days to develop the F9F-8P from the wooden mockup stage to actual first flight. Navy approval of the mockup was granted Dec. 15, 1954, and the Grumman engineering-production team designed and built a production F9F-8P and had it in the air on Aug. 21, 1955. The program was accelerated by modifying a basic F9F-8 Cougar jet fighter into an aerodynamic prototype of an F9F-8P. Valuable data obtained from testing this prototype hastened the final designing and manufacture of the first production article.

Grumman continued to build the twin-engine S2F-1 sub-killer, the world's first carrier-based aircraft specifically designed to detect, identify, track and destroy submarines. In addition, two variations of the basic S2F airframe were phased into the production line.

The first of these modifications, the S2F-2, was designed to carry a larger anti-submarine weapon than did the S2F-1. This was accomplished by designing an enlarged torpedo bay into the port side of the fuselage, while the tail surfaces were increased to compensate for the added weight and distribution.

The third version, the TF-1, was designed to fulfill its mission as a passenger-cargo-trainer-utility aircraft. Assigned to Fleet Logistic Air Wing, it provides the Navy with an all-purpose plane with excellent carrier-capability, The TF-1 carries either nine passengers or a cargo of 3,500 pounds.

The Albatross, famous air-sea-rescue amphibian, used jointly by the United States Air Force (SA-16A), Navy (UF-1) and the Coast Guard (UF-1G), also remained in production. This exceptionally seaworthy amphibian participated in rescues and missions of mercy in all parts of the world.

During the year two contracts were awarded Grumman by the Air Force under its IRAN project. The contracts provide for the company to "inspect and repair as necessary" over one hundred Albatrosses recalled from active service for overhaul.

Final assembly and flight testing of Tiger and Cougar jet fighters are performed at Grumman's new plant at Peconic River, Long Island, which began operation in 1954. Assembly and flight testing of propeller-driven aircraft are done at Bethpage.

Hiller Helicopters

Hiller Helicopters in April, 1955, unveiled its one-man ducted-fan Flying Platform, a cooperative project between the company and the Office of Naval Research.

The Flying Platform is the first ducted fan type of VTO wingless aircraft to fly in free flight carrying a man, and is one of the simplest, lightest, heavier-than-air craft ever devised. Still a research tool, the Flying Platform is undergoing modification and extended tests to further explore the principles involved.

Another major company project was the one-man "Rotor-cycle," designated XROE-1. Awarded a Navy contract following design competitions, Hiller Helicopters is to construct and demonstrate a flight article for a portable, collapsible, light weight, one-man helicopter to be used by the Marines for observation, liaison, and tactical maneuvers. The Rotor-cycle has a single two-blade rotor with a small tail rotor, powered by a Nelson air-cooled gasoline engine.

Both these projects point up the increasing emphasis being placed on research and development work at Hiller in order to obtain a balance between production and research activities. Toward the same goal, the company established a separate Advanced Research Division in mid-year, and built a new and separated facility 1,000 feet east of the main plant to house the division.

During 1955, the U. S. Army continued its role as largest buyer and user of rotary wing aircraft, and Army Aviation established the Army Aviation Division in the Office of Assistant Chief of Staff G-3, with a general officer assigned as chief. Hiller aircraft continued to play a vital role in the expansion of Army Aviation.

Embodying a number of improvements contributing to pilot efficiency and easier maintenance, the Army H-23C was put into production in the fall of the year, succeeding the H-23B now used throughout the Army for liaison, observation, and helicopter training programs. The Army National Guard also uses these helicopters. The commercial version of the H-23C is manufactured as the Hiller 12-C.

The first helicopter program in Holland was initiated with the acquisition of 35 H-23B's by the Dutch Army under MDAP.

Sales of the commercial version of the H-23B, known as the Hiller 12-B, continued on an international basis. Included in these were more aircraft for the Siamese Police Force, and the first commercial helicopters sold in Ecuador and Germany.

The ramjet Hiller Hornet (designated HOE-1 by the Navy and H-32 by the Army) was in production in limited quantities for evaluation by the services. The HOE's built for the Navy were accepted, and a program of evaluation at Patuxent, Md., was initiated.

Hughes Aircraft Co.

Late in 1955 Hughes Aircraft Co. announced development of an electronics system which will fly interceptor planes automatically from take-off to touch-down. It was also revealed that every interceptor plane now guarding this continent is already equipped with an earlier Hughes system of electronics.

By year-end, the company's electronics plant had produced more than 8,000 of these electronic brain systems.

Early in 1955, Hughes revealed production and capabilities of the company's new Falcon guided missile, stating that the missile "is deadly enough to destroy any airplane in the world, possesses an electronic brain capable of outwitting any enemy bomber, yet is so small it can be lifted by one man."

At year-end, the company had a backlog of orders in excess of $316-million.

As of October, a total of 19,317 persons were employed by the firm. Of these, 10,946 were employed at the main plant in Culver City, Calif., 4,000 at buildings at Lon Angeles International Airport and 4,371 at the Tucson, Ariz., plant.

Kellett Aircraft Corp.

Kellett's activities during 1955 fell generally into two categories: continued research and development in the field of rotary wing aircraft for the armed forces; and subcontract manufacturing the aircraft components for other concerns in the industry.

No aircraft were in the production stage during the year. Plans were completed for a move of the company's facilities to Willow Grove, Pa., in mid-1956, where construction of a new building was planned to provide modern accommodations for the firm's engineering, manufacturing, and flight testing activities.

Kellett had sales of $976,854 as the third quarter of 1955, as against sales of $690, 321 for the entire year of 1954. Earnings for the first nine months of 1955 amounted to $56,962.

During the year, work was started on two new Air Force projects, one dealing with the continued investigations of vibration effects on rotor blades of various service helicopters; the other being concerned with investigations of the application of various stabilizing systems to a service helicopter. Work on the construction, instrumentation and testing of a Model Rotor System, related to a theoretical study of helicopter rotors employing large hinge offsets, was furthered; the model is designed for wind tunnel testing.

Projects conducted for the Navy during 1955 included continued work on the application of wings and rotor system modifications to a tandem helicopter. This program's purpose is the improvement of flying qualities and service life of tandem helicopters. A second Navy project dealt with the construction and flight testing of a vehicle to investigate the in-flight characteristics of a partially loaded rotor system, the objective being to obtain design data useful in the development and evaluation of convertiplanes and compound helicopters.

Development of the small KH-15 rocket-powered helicopter was continued by the company through the incorporation of certain modified components and flight testing. The significant feature of this craft is its gyro stabilizing system.

In the area of subcontract manufacturing the company made a variety of sheet metal and welded structures, including, among others, elevators and pylons for one of the large jet airplane manufacturers.

Lockheed Aircraft Corp.

Large orders for military aircraft built by Lockheed Aircraft Corporation and the introduction of three new commercial models, including the propjet Electra, highlighted the aircraft firm's activities in 1955.

Each of the company's three divisions—California, Georgia and Missile Systems—benefited materially from military procurement plans.

New Air Force Hercules built by Lockheed

At the California Division, receipt of a large order for new F-104A air superiority jet fighters for the U. S. Air Force was reported in October. Terms were not disclosed, but Lockheed officials said the order would amount to more than $100-million, including spare parts.

Meanwhile, production continued heavy for other California Division military aircraft—new T2V-1 jet trainers for the U. S. Navy, T-33 and TV-2 jet trainers for the Air Force, P2V-7 Neptune anti-submarine planes for the Navy, C-121C Super Constellation transports for the Air Force and radar sentry versions of the Super Constellation for both services.

Lockheed's Georgia Division, at Marietta, Ga., announced in October that a contract expected to be worth more than $100-million for the C-130A Hercules turboprop transport had been received from the Air Force and would extend production into 1958.

The Georgia Division had received three earlier orders for the Hercules, one of these a $100-million contract. Marietta plane-builders also produce B-47 jet bombers for the Air Force.

Total employment at the Georgia plant increased from 14,500 at Jan. 1, 1955, to 19,750 by the end of last October.

Over-all Lockheed employment, including all divisions and subsidiaries, stood at 56,865 at October's conclusion, the highest peak since World War II days.

California Division employment rose from 25,971 to 29,182; subsidiaries went from 4,179 to 5.400 and the Missile Systems Division, newest of all Lockheed organizations, more than doubled in going from 1,248 to 2,533 in 1955's first 10 months.

At the California Division, biggest news in the commercial field was the announcement of Lockheed's new propjet Electra and subsequent orders for the 450-mph luxury airliner.

A wide-range, 66-85 passenger transport which can operate economically over routes from 150 to 3,000 miles, the Electra was ordered first by American Airlines in a $65-million contract for 35 aircraft.

Shortly after this announcement, Eastern Air Lines reported a $100-million order for 40 Electras and a number of spares—at the time the largest contract ever signed for a commercial plane. Braniff and National also have ordered quantities of these new airliners.

Two other new commercial aircraft were introduced in 1955 by the company.

One, the Super Constellation Model 1649A, is a 6,400-mile ranging luxury airliner which features a completely new wing of high aspect ratio for added speed and range. Airlines to date have announced orders for 36 of these ocean-spanning transports.

Second was the Super Constellation Model 1049H, a convertible cargo version of the famous 1049G, which was ordered by four airlines to give Lockheed a $40-million commercial cargo plane backlog.

In the fall of 1955, Lockheed reported these sales records broken: (1) Largest commercial backlog in its history: $340-million; (2) Signing of more new aircraft contracts (15) than for any previous period; (3) $40-million cargo plane record backlog; (4) Backlog of more airline transports than ever before—171 as compared to any previous year's record, 99; (5) Buildup of the Lockheed family of airlines to 31, a new high and up from 25 at the year's beginning; (6) Actual deliveries of $110.6-million worth of commercial airliners and spare parts, a record for nine months. These deliveries were of the Model 1049G Super Constellation.

Corporate earnings in the first nine months totaled $13.3-million, second only to the all-time record set in the same period last year. Backlog in the third quarter rose to $1.81-billion, up 15 percent from the same time a year ago.

Lockheed's Missile Systems Division, founded in 1954 to consolidate the company's 10-year-old effort in the guided missile field, increased its work backlog seven-fold this year. By October, the division had 2,533 employees using 475,000 square feet of floor space at its 77-acre plant in Van Nuys, Calif.

The division has work in progress on some half dozen major contracts and several smaller ones, all completely classified. In addition to these specific projects, it is carrying on an active program of study and research in virtually all phases of missile technology.

McDonnell Aircraft Corp.

Most important to McDonnell Aircraft Corp. in 1955 were additional orders by the Air Force for their supersonic twin-jet fighter, the F-101 Voodoo. Flown first in 1954, the F-101A was in production, and deliveries were being made in 1955.

The Voodoo, which achieved supersonic speed on its first flight, is

McDonnell Air Force F-101A Voodoo and Navy F3H-2N Demon

capable of carrying atomic weapons and can be refueled in flight. Powered by twin Pratt and Whitney J-57 turbojet engines, which develop a total of approximately 20,000 pounds of thrust, the F-101A is also equipped with afterburners. The Voodoo's operational radius of action can be extended by use of external fuel tanks.

Also under development was the F-101B Voodoo interceptor version, designed for duty with the Air Defense Command to operate under all weather conditions. It executes two primary missions — the identification of unknown aircraft and their destruction if they are hostile.

Deliveries of a third Voodoo version—the RF-101A photo-reconnaissance airplane—began in the fall of 1955. It is the Air Force's first supersonic photographic craft and is one of the world's fastest such planes. Its development will enable Air Force operational units to carry out routine supersonic photo-reconnaissance flights for the first time in military history.

In September, 1955, McDonnell announced receipt of an additional contract from the Air Force totaling over $330-million for all three versions of the Voodoo. This order boosted the company backlog to an all-time high of $601-million.

In April, 1955, delivery to the U. S. Navy was started on the F3H-2N advanced Demon, single-jet carrier-based fighter. A newer, more powerful turbo-jet engine in the 10,000-pound thrust class, the Allison J-71 powers the new Demon. An afterburner installation augments the engine thrust considerably.

The advanced Demon is designed as an all-weather, high performance fighter combining interceptor speed and fighter maneuverability with the payload of an attack bomber. Thin wings and tail surfaces are swept sharply back to place the big fighter in the 600 mile-an-hour speed class. A large internal fuel capacity provides the Demon with the range necessary for fighter-bomber missions. It has rapid firing, high velocity 20 mm cannon as well as a large number of rockets and combinations of external stores. Improved radar and latest developments in computing and fire control equipment enable the fighter to operate under all weather conditions.

The F3H-2N qualified for carrier duty in September, 1955, passing initial shipboard tests.

McDonnell also announced during the year that a missile carrying version of the Demon was on order. Delivery on this airplane—which has been designated the F3H-2M—will start in the near future. Contract production deliveries of the various versions of the Demon are scheduled through March, 1957.

Another Navy fighter, designated the F4H-1, was under development during the year.

McDonnell twin-jet Banshees of all types continued to operate with Navy carrier forces from Formosa to the Mediterranean during the year and were flown by 32 squadrons of the Navy and Marine Corps.

On April 29, 1955, the McDonnell XV-1 Convertiplane, an experimental liaison reconnaissance and research aircraft development for the Army, made the world's first helicopter-to-airplane conversion. Unofficially it exceeded the F.A.I. world's official speed record for helicopters on one of its first flights.

The four-place XV-1 combines the vertical flight characteristics of a helicopter with the speed and range of a conventional fixed wing aircraft. An overhead rotor similar to those on conventional helicopters is used for vertical flight, while a pusher type propeller and the craft's wings permit airplane flight.

XV-1 development is sponsored by the Army and directed by the Air Research and Development Command of the USAF. The development program provides both a prototype aircraft for Army liaison reconnaissance missions as well as research aircraft to explore this principle for possible use in larger troop and cargo carrying aircraft.

By mid-year the number of missile engineering and production contracts in work for both the Navy and Air Force was increased to 9, bringing the missile backlog for the company to more than $15-million. Employment in the Missile Engineering Division increased 65 percent.

The development of additional versions of the Talos missile was continued by McDonnell during the year, and the Missile Division enlarged its automatic fire control system and automatic drift computer work to support the company's airplane production program.

Total sales for the fiscal year ending June 30, 1955, were $154,588,816, having increased 25.6 percent from the previous year mainly as a result of the continuation of F3H Demon production and the commencement of F-101 Voodoo deliveries.

On Sept. 30, 1955, personnel totaled 14,405 compared with 13,786 in June, 1955, and 12,098 in Sept., 1954. The largest payroll in company history was 15,068 employees, reached in June, 1953. Current production schedules would add several thousand additional personnel by the end of 1956.

The four-year $19-million emergency facilities program started by McDonnell in July, 1950, was 99 percent completed during the year. In addition to this program, the company expended approximately $1-million in other facilities.

Total floor area now occupied or under construction amounts to 2,663,835 gross square feet.

Martin Company

Of first importance to the company during 1955 was the roll-out on January 5 and first flight on July 14 of the USN XP6M-1 Martin SeaMaster, a multi-jet attack seaplane.

Also important to Martin was the Defense Department's announcement on October 6 that the company had been chosen as prime contractor for building a multi-stage launching rocket which will put the earth satellite, announced by President Eisenhower on July 29, into its orbit around the earth.

In addition, on August 27 the creation of a separate, subsidiary company called RIAS, Inc., an advanced science laboratory dedicated to the discovery of new scientific knowledge beyond product application, was announced.

On November 28, the Company stated it will build a new plant on a 4,000 acre site 15 miles south of Denver, Colo. The new facility will contain 500,000 sq. ft. of floor space and over the next four years will employ a minimum of 5,000 people.

The swept-wing SeaMaster made its first out-of-doors appearance in January and its first flight six months later. By November the new seaplane had logged 50 flying hours in its flight test program. Simultaneously, in November the Navy and Martin announced completion of the second in the SeaMaster series.

The SeaMaster's designed tactical missions are minelaying and photo-reconnaissance. It has a water-tight rotary mine door on which a variety of weapons, including mines, or a camera pod can be suspended. It is able to carry a 30,000-pound payload and has a designed cruising altitude of 40,000 feet, and a maximum speed over 600 mph.

The mid-year statement by the President of the U. S. that work had been started on the task (Project Vanguard) of putting the first unmanned satellite into an orbit above the earth received international attention.

About two months later, the Department of Defense stated that Martin had been chosen to design and build the multi-stage rocket mechanism which will carry the satellite to an altitude of about 200 miles and launch it into its orbit at a speed of approximately 18,000 mph.

Among the factors bearing on the selection of Martin for this undertaking was the company's nine years of experience in the production and launching of 12 Navy Viking rockets, one of which currently holds the world's altitude record for single stage rockets of 158.4 miles.

It was expected that the first launching of the satellite-carrying rocket will occur during the International Geophysical Year (July, 1957-December, 1958).

The new subsidiary company, RIAS, Inc. will pursue fundamental research under industrial management without constraining its investigating scientists to product development. Work is already under way in general field theory aimed at expanding knowledge of gravity and other physical phenomena. Additional areas of physics will be explored in the coming years.

On August 3, the U. S. Air Force disclosed the award to Martin of a Phase I development contract for a new tactical bomber.

Among the year's noteworthy aeronautical achievements were (1) the world's first zero length launching of piloted fighter airplanes on January 13 at Edwards Air Force Base, Calif., using Martin techniques and launch equipment; (2) successful flight test of a PBM Mariner seaplane equipped with a Martin designed retractable hydroski.

During 1955 production of the USAF B-57B and C tactical bombers, the USAF TM-61 tactical missiles and the USN P5M-2 anti-submarine warfare seaplane continued on schedule and more advanced versions were studied in each case.

At the same time Martin continued to expand its guided missile study and production programs.

There was expansion, also, in physical facilities. A new building program begun in the fall will add 65,000 sq. ft. to the Engineering Building and 14,642 sq. ft. to the Personnel Building.

In 1955, positive steps were taken to reduce the community relations problem created by jet engine noise: (1) An educational sound and color film dealing with community noise problems was made available to interested groups on a free loan basis through a nation-wide agency; (2) Company representatives made frequent personal calls on and talks to gruops from which complaints might arise in the future; (3) A voluntary company policy was set prohibiting ground tests and flights after 9:00 p.m. except in emergencies; (4) Flight patterns were revised to keep air traffic away from heavily populated areas; (5) Six jet engine mufflers were installed and one noise suppression building was erected.

New manufacturing and test techniques were developed by the company during the year.

Test equipment was designed and built to successfully evaluate the thermal shock effects and material characteristics of the Viking rocket nose at critical re-entry temperatures.

An economical method was devised, using a vacuum technique, to remove dents in aluminum parts, restoring the original smooth contour to the metal.

Steel containers, incorporating special handling devices, were developed to replace all but one of the wood packages originally used for shipment of Matador tactical missile components. Results were a tare savings of 32 percent and a cubage savings of 34 percent.

On September 6, Martin climaxed more than a year of study of automation techniques in aircraft production by awarding a contract to Bendix for a numerically-controlled milling machine. The Bendix electronic control system will be applied to a recision DeVlieg horizontal milling machine. This will be the first full scale test of the theory of automatically controlled machines in actual airframe manufacturing.

On July 5 Martin announced successful development of a new tool which strips the insulation from a special wire composed of strands too fine for commercial wire strippers.

A small tool was created which erases scratches in aluminum sheet, saving 38 percent of the time needed by outmoded hand-burnishing methods.

Martin's sales for the first nine months of 1955 were $194,805,592 as against $187,178,497 for the same period of 1954. Employment at the end of October totaled 19,800.

North American Aviation, Inc.

In 1955 North American Aviation, Inc., had nine different models of airplanes in production at its Los Angeles and Columbus plants, and carried on an extensive program of modernization and modification at its Fresno, Calif., division. In addition it continued work in the fields of guided missiles, rocket propulsion systems, electro-mechanical products and atomic energy.

Of the nine aircraft models, four went into production during the year. These were the F-100C Super Sabre, FJ-4 Fury Jet, F-86F Sabre Jet and T-28C trainer. Production of other models, which included the F-100A Super Sabre, F-86D and F-86K Sabre Jets, the FJ-3 Fury Jet and T-28B trainer, carried over from the previous year. Four North American designed airplanes were flown for the first time in 1955, the F-100C in January, the F-86K and FJ-4 in March and the T-28C in September.

The Columbus, Ohio, Division became the second source of production for the Air Force's operational supersonic fighter, the F-100 Super Sabre and delivered its first F-100C's to the Air Force on Oct. 26, 1955. All production of the FJ-3 and FJ-4 and T-28 trainer was accomplished at the Columbus division.

Production at Los Angeles was devoted to the F-100A and C, the F-86D, F-86K and F-86F, the latter being ordered back into production by the USAF after original orders were completed in 1954.

Los Angeles delivered its first F-100C to the 450th Fighter Day Wing, Tactical Air Commande at Foster AFB, Texas, on July 15, 1955. The 450th thus became the second operational unit to take delivery of the new Super Sabres, the first being the 479th Fighter Day Wing at George AFB, Calif., which received F-100A airplanes.

A month after the first F-100C was delivered to the Air Force, it set a supersonic world speed record by flying an average of 822.135 mph over the Mojave Desert on Aug. 20, 1955.

The first North American designed F-86K Sabre Jet all-weather interceptor to be completed by FIAT in Italy was accepted by the USAF in May and turned over to the Italian Air Ministry as the first of the "Ks" which are to go to NATO countries. The F-86K was in production at North American's Los Angeles plant as well as in Italy.

F-86 Sabre Jets continued to make records during the year flying east-west in 5 hr. 27 min. and 30 sec. The flight was made on May 21, 1955, in an F-86A.

During the year, production on the F-86D Sabre Jet all-weather interceptor was completed.

Also during the year the Fresno, Calif., division completed modification of its 1,000th airplane, one of the earliest F-86D interceptors, on Nov. 3. Primarily a modernization and modification center, the Fresno division has grown from 350 to 2,080 persons in approximately four years.

North American announced an agreement with Mitsubishi Heavy Industries Reorganized, Ltd., of Japan for manufacture of F-86F Sabre Jets at its Nagoya plant and for overhaul of National Air Self Defense Force and Far Eastern Air Force Sabres.

A technical assistance agreement was also announced with Construccoines Aeronautics Sociedad Anonima ,CASA) of Madrid, Spain, under which North American will furnish technical advice and help for the repair and overhaul of F-86F Sabre Jets turned over to the Spanish government by the U. S. Air Force.

In 1955 the company established separate company divisions in Atomic Energy, Electro-Mechanics and Rocket Propulsion.

On October 18, 1955, it announced the formation of Atomics International, which will be headquartered at new facilities at Canoga Park, Calif. Atomics International announced during the year that it had designed and would build the first industrial atomic research reactor for the Armour Institute of Technology and the first private medical reactor in this country for the University of California at Los Angeles.

Work on the North American designed sodium graphite power reactor was nearing completion at the end of the year. This reactor, a part of the AEC's program for development of economical electrical power from nuclear energy, is located at the company's Santa Susana Mountain site about 30 miles from Los Angeles. It will produce about 20,000 kilowatts of heat and the Atomic Energy Commission has asked for proposals for use of this heat which would produce approximately 7,500 kilowatts of electricity.

Atomics International also began work on the development and design of a full scale sodium graphite nuclear reactor power plant for the Consumers Public Power District of Nebraska, following an agreement reached between Consumers and the AEC. The plant proposed by the Nebraska group will have a capacity of 75,000 net kilowatts and would be completed in 1959.

Announcement of the two other autonomous divisions was made in November. They are: Rocketdyne, an outgrowth of the company's Missile and Control Equipment Operations Propulsion Center, to continue research, development and manufacture of high-powered, rocket engines and related items; and Autonetics, an outgrowth of Mace's Electro-Mechanical Engineering Department, to continue development of automatic, electromechanical guidance, flight and fire control equipment and instrumentation for missiles and aircraft.

The year was also marked by official U. S. Air Force disclosure in March that the SM-64 Navaho long-range, surface-to-surface guided missile is being developed by Mace Operations, headquarters at Downey, Calif. For security reasons, details of the Navaho missile and its performance were not revealed.

Rocketdyne's Field Laboratary continued research and development of rocket engines and related items during the year. Construction was

Specially adapted camera catches North American F-100C in supersonic flight

underway on several additional test facilities and supporting structures in the recently enlarged 1,700 acre field laboratory. This expansion program was scheduled to be substantially completed in mid-1956.

In the late summer of 1955, North American Aviation and Rolls-Royce, Ltd., of Great Britain, jointly announced a ten-year, mutual technical assistance agreement wherein Rolls-Royce is licensed to manufacture rocket propulsion systems designed and developed by Rocketdyne and to exchange technical information relating to engineering, development and manufacturing in these fields.

Nearing completion at the Downey Plant at year-end was a two-story building to house the Autonetics division's engineering and manufacturing activities. Scheduled for completion early in 1956, the 40-feet high structure will cover some 200,000 square feet.

Several electro-mechanical and electronic devices developed by Autonetics were disclosed and publicly exhibited during the year. These included: (1) An airborne, digital computer in which transistors replaced vacuum tubes; (2) A versatile fire control system, designated the MG-4, which permits accurate firing of the North American F-86K Sabre Jet interceptor's 20-mm. guns; (3) A general purpose, programmed automatic computer, designated NATPAC. This computer has the ability to perform arithmetic operations, consult its own memory, or an external memory, modify its own orders and make decisions on the basis of numerical results; (4) A self-contained device for reliable aircraft flight instrumentation known as the Self-Balancing Potentiometer; and, (5) An emergency traffic control system (NATECS) which consists of a transmitter carried in emergency vehicles and a receiver wired into the controlling circuit of traffic lights.

Two new, modified phenolic adhesives, developed by materials research and process engineers with Mace's Aerophysics Department, were disclosed during the year. Both were developed to meet stringent requirements associated with supersonic aircraft and the high skin temperatures developed by such aircraft in flight. These were "NAA Hi-Temp," used for bonding metals and reinforced plastics, and "CHT," a modification of "Hi-Temp," used in the fabrication of heat-resistant, "sandwich" constructions.

Year-end employment was at a new peacetime high of 61,335 persons and employees were paid more in wages and salaries in 1955 than in any previous year in the company's history. During the year purchase orders were placed totaling $520-million to more than 12,500 companies. More than 90 percent of these companies were in the small business class having less than 500 employees.

For the fiscal year which ended Sept., 30, 1955, North American declared dividends totaling $4.50 per share on its 3,435,033 shares of capital stock outstanding, compared to $2.75 per share for the previous fiscal year.

Northrop's new buildings under construction

Northrop Aircraft, Inc.

In 1955 Northrop Aircraft, Inc. continued production of F-89D rocket-armed all-weather interceptors as its principal manufacturing assignment and began production of a new version of the Scorpion designated the F-89H.

Northrop stepped up development at Hawthorne of the SM-62 Snark Missile, an intercontinental pilotless bomber with atomic capabilities.

The company's Anaheim, Calif., division increased its production activities to include a greater diversification of products.

The Radioplane Company of Van Nuys, Calif., a wholly-owned subsidiary of Northrop, maintained full production of target drones for the armed services and broadened the scope of its activity in the development of guided missiles and advanced target drone systems.

Total employment for Northrop approximated 22,000 persons.

Scorpion F-89's were assigned to vital defense posts in the United States and the far north. Scorpion aircraft are now in service with the Air Defense Command, the Alaskan Air Command, the Northeast Air Command, the Icelandic Air Defense Force and the Air National Guard.

The rocket armed F-89D carries 104 2.75 inch rockets in permanently mounted wing tip pods. These may be fired in a single salvo or in a series of bursts. The F-89D flies at altitudes above 45,000 feet in the 600-mph range and carries a two-man crew. It is guided to its target by advanced radar equipment and is powered by two Allison J-35-A-35 engines.

Final assembly of F-89D's was accomplished at the Northrop Palmdale, Calif., faculty where more than 1,250 persons were employed. By year-end Northrop had delivered Scorpions on schedule in combat ready condition for more than 40 consecutive months.

A new contract at Palmdale was for modernization of a large number of F-89's currently in service. The program was scheduled to continue until 1958 and the modernized airplanes will be designated the Scorpion F-89J's.

In August, 1955, an Air Force contract covering the design phase of a new long range interceptor was received, qualifying Northrop to compete for a production contract.

During the year, in conjunction with the Air Force, several types of new high precision production machines were designed and developed by Northrop to meet extreme precision requirements of parts for the SM-62 Snark missile and the anticipated needs of the long-range interceptor now under consideration.

The Northrop-Anaheim in 1955 fulfilled contracts for the armed services which included fire control instruments for Army Ordnance; plotting boards, photographic windows and target towing reels for the Air Force; rocket and missile assignments for the Navy; design and production of correcting mounts for amphibious self-propelled artillery for the Navy and the extensive manufacture of optical, electronic and mechanical components.

Northrop during the year started a program of consolidation of its physical facilities. Acting within the framework of a master plan, the company will re-assign existing facilities and will construct new facilities required because of increased emphasis on engineering activities. Timetable for the entire program extends over several years. First phase of the new program will be construction of an advanced engineering research center, scheduled for completion within the next two years. Other new structures include wind tunnels, new engineering test facilities, engine test cells and a new cafeteria for personnel.

Northrop in 1955 continued in an advisory capacity to aid the pioneering aero-medical experiments of Lt. Col. John Paul Stapp, the "fastest man on earth" who traveled 632 mph on a Northrop-built rocket sled at Holloman, N. M., Air Research and Development Command in 1954.

Consolidate Sales for the year ending July 31, 1955, were $283,462,522 as compared with $171,666,343 for the 1953-54 fiscal year. Sales and earnings for 1955 were the highest for any one year since the inception of the company in 1939.

Piasecki Helicopter Corp.

Production by Piasecki of the H-21 "Work Horse" series increased steadily during the year and peak production was reached in October. The H-21's in production were the Army H-21C and the U. S. Air Force and RCAF H-21B. This model is a tandem rotor design with a large cabin, seating 20 troops, which has a wide center-of-gravity travel enabling complete cabin loading without loss of stability. It can transport heavy (4,500 lb.) external sling loads.

The Army H-21C is used by the Army Transportation Corps Helicopter Companies; the H-21B model helicopter is the Air Force's prime assault helicopter. Since this helicopter can be readily airlifted in a C-124 Globemaster, it is possible to send highly mobile striking forces to virtually any part of the world within hours instead of days.

Other H-21s are providing air transportation to mountain peaks in the construction of early warning radar stations and the supporting network of communication stations in the north.

Employment increased from 3,700 in 1954 to approximately 5,000 at the year's end.

Sales for 1955 were expected to exceed 1954's $48.5-million, and earnings to be comparable ($2.5-million before taxes). The annual payroll was over $20-million.

A new contract for additional H-21 Work Horse helicopters was awarded the company in November by the U. S. Army. This contract was for the largest production quantity ever received by the organization, raising the backlog of orders to approximately $140-million.

Piper Aircraft Corp.

During 1955, Piper Aircraft Corp. produced three basic commercial models: the two-place tandem Super Cub, the four-place single engine Tri-Pacer, and the twin engine all metal Apache, resulting in the best year in the company's history. For the fiscal year ending Sept. 30, 1955, there were produced 526 of the tandem, 882 of the Tri-Pacers, and 271 Apaches.

Employment increased from approximately 1,250 at the start of the year to approximately 1,500 at the close. Production and the output of airplanes were completely shut off for one month in August due to a four week strike of the employees, which cost the company approximately 60 Super Cubs, 100 Tri-Pacers, and 30 Apaches.

Lack of production floor space also hindered output and in the summer of 1955 production was begun on a new assembly building to be used primarily for the construction of Apaches. This building will cover approximately 60,000 sq. ft. and is sxpected to be completed in January, 1956.

Sales for the fiscal year were expected to approximate $16.7-million; income before tax approximately $3-million; and net income approximately $1.4-million.

Radioplane Co.

Principal production item for Radioplane Co. of Van Nuys, a subsidiary of Northrop Aircraft, Inc., was the OQ-19 airplane target, used by the armed services as the standard radio-controlled target for anti-aircraft gunnery and missile training.

The greater portion of 1955 Radioplane production was devoted to the OQ-19B target drone system, an out-of-sight target which may be equipped with radar corner reflectors to render the vehicle valuable for plotting board target missions.

Proved reliability of the OQ-19 has led to new applications of the drones for purposes other than purely as targets. One of the most recent of these has been the RP-71, a joint development of the U. S. Army and Radioplane in which the agile drones have been assigned the task of photographic reconnaissance.

No details concerning the company's increasing activity in the guided missile field have been released for reasons of military security.

Indicative of Radioplane's operations in the guided missile field was the announcement of plans for developing facilities at El Paso, Texas, close to military bases involved in guided missile and pilotless aircraft activities. Radioplane will build and operate a 25,000-square-foot pilot plant at El Paso. In addition, the company has announced plans to acquire a large industrial site near El Paso to provide for additional expansion.

A clue to Radioplane's activity in the supersonic field was contained in the announcement that a rocket-powered sled designed and built by the company had achieved a new land speed record in reaching a velocity of 1,100 mph on the 10,000-foot track at Edwards Air Force Base.

Besides its work in the pilotless aircraft field, Radioplane Co. is engaged in research on parachute deceleration and recovery systems. The company's Aero-Mechanical Projects Department is presently conducting parachute tests at various service installations in addition to designing, developing and fabricating missile recovery systems.

Republic Aviation Corp.

While mass production of F-84F Thunderstreak fighter-bombers and RF-84F Thunderflash photo reconnaissance fighters was Republic Aviation Corporation's major program in 1955, the company was also laying the foundations for a new family of super and hypersonic aircraft of the future.

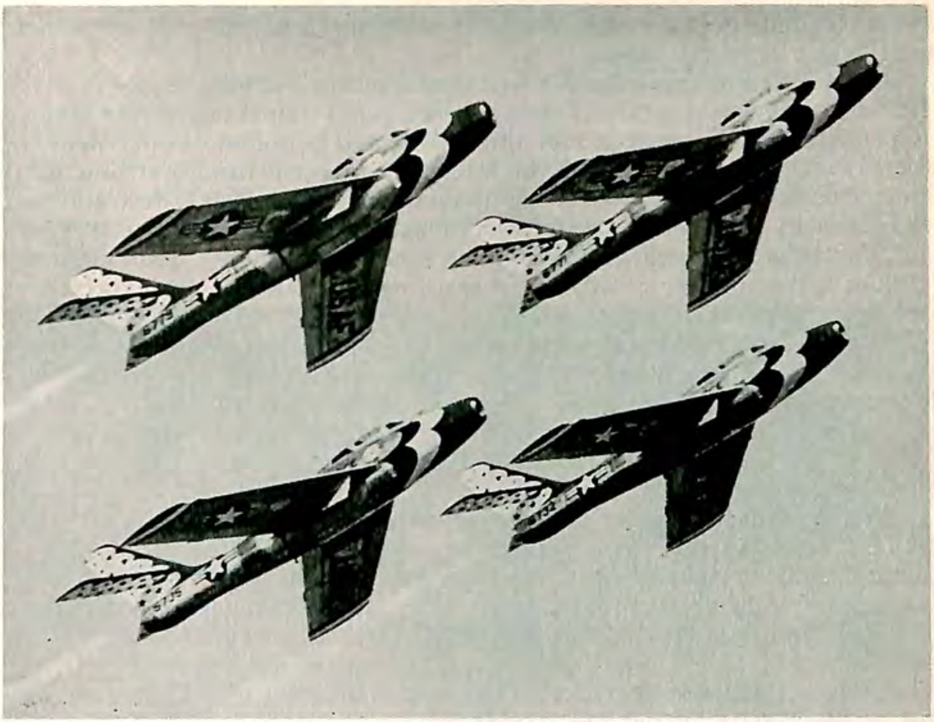
In mid-1955 Republic passed the 1,000 mark in Thunderstreak production and a few months later, in September 1955, announced it had launched a $12-million research and development facilities expansion aimed at accelerating design and production of future aircraft.

In their first full year of mass active duty both the Thunderstreak and Thunderflash were setting records. In March, 1955, a Thunderstreak flew 2,445 miles across country from Los Angeles to New York in 3 hr. 44 min. for an average speed of 652 mph and a new official transcontinental speed record. That same day two other Thunderstreak pilots bettered the previous transcontinental speed mark.

On Aug. 17, 1955, the 27th Strategic Fighter Wing set a new world's non-stop jet fighter distance record, flying Thunderstreaks 5,118 miles from London, England, to Texas, breaking the 4,840-miles trans-Pacific record set only three months before by Far East Air Forces' Thunderjets. Both Republic planes utilized mid-air refueling, which the company has pioneered, to set the records.

In "Operation Flashgun" in March, 1955, the 18th Tactical Reconnaissance Wing put its Thunderflashes through their first combat shakedown. During "Flashgun" the 18th flew double its quota of missions in only 23 of the 31 allotted days with a minimum of maintenance problems.

Republic completed, during the year, modification of an undisclosed number of Thunderflashes for use in the FICON F-84F-B-36 combination.



Republic's swept-wing F-84F Thunderstreaks

The Air Force announced formation of the first FICON Thunderflash unit, the 91st Strategic Reconnaissance Squadron at Larson AFB, Wash.

In service with six USAF commands, Thunderstreaks and Thunderflashes in 1955 joined the F-84 Thunderjet in the air forces of NATO (North Atlantic Treaty Organization) nations. The first NATO countries to receive the new airplanes were France, Belgium and The Netherlands.

The year was also one of increased activity on the F-103 interceptor and the F-105 fighter-bomber which is designed to follow the Thunderstreak on Republic's assembly lines. In 1955 the Air Force revealed the RF-105, a photo-reconnaissance version of the new fighter-bomber.

Republic's XF-84H experimental turboprop fighter made its maiden flight at the U. S. Air Force Test Center at Edwards AFB, Calif., in the summer of 1955. Built to split down the middle and take several forward sections with different types of supersonic propellers, the XF-84H incorporates many radical features. The plane is believed to be the first propeller-driven plane designed for afterburner jet augmentation of propeller thrust.

During 1955 Republic was also awarded a contract for development of a new, as yet undesignated, advanced fighter-bomber. The contract covers Phase I, complete design up to and including production of a mock-up, and if the Republic design is accepted, will result in mass production contracts for the new fighter-bomber.

Of the $12-million research and development facilities expansion for 1955-56, the most spectacular item is a new wind tunnel for testing models of proposed new aircraft at four times the speed of sound. Other items in the expansion program include high temperature structural and functional apparatus which can duplicate flight conditions above 50,000 feet and test airframes to the breaking point, additional analog and digital computers and multi-channel oscillographs and new machinery to work titanium, magnesium and a number of other heat-resisting alloys which are expected to help overcome the "thermal barrier."

Also in anticipation of future trends Republic began in 1955 a training program in the nuclear aspects of aviation design. Under this program two Republic engineers have already been enrolled in full-time courses at the School of Reactor Technology at Oak Ridge, Tenn., and the School of Nuclear Science and Engineering of the Argonne National Laboratory of the University of Chicago.

While plans for future research activities were getting underway, Republic scientists were investigating many of the problems of advanced high speed aircraft designs. Among the projects underway in 1955 were cockpit air conditioning in supersonic aircraft, lightweight honeycomb structure fuel cells and high temperature hydraulic systems and materials.

Properties of various high temperature structural materials such as titanium, special strainless steels and magnesium were investigated at temperatures up to 1,000 degrees. Preliminary research has also been done on high temperature honeycomb structures for use to 1,200 degrees. Other high temperatures materials projects underway in 1955 included paint and ceramic coatings for corrosion protection at 1,000 degrees and laminated plastics for possible utilization as structural insulation.

Antenna design and testing continued through 1955 with new equipment and facilities keeping pace with this important field. The scope of electronic instrumentation for measuring and recording data from all types of test work was expanded with new and improved equipment and advanced techniques.

In the fall of 1955 Republic began to move into the adjacent Fairchild buildings which were purchased last year. The new area consists of 425,000 square feet of floor area.

Other facilities expanded and enlarged in 1955 brought Republic's plant and airfield area to 586 acres and floor space to 2,813,000 square feet, nearly double that of five years ago.

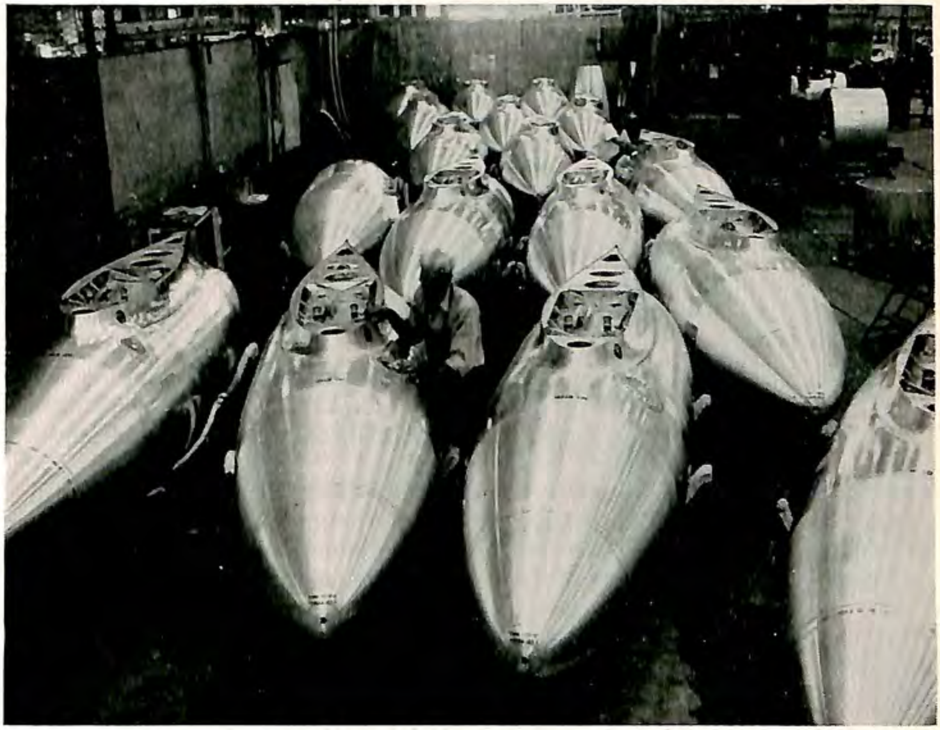
Net income for the first nine months of the year was $12,312,873. Sales for the period amounted to $422,607,390.

Ryan Aeronautical Co.

Ryan Aeronautical Company launched the most ambitious airframe tooling and production program of its history during 1955, while accelerating output of jet engine components, and continuing its large volume of piston engine exhaust systems, external fuel tanks, rocket engines, and pilotless target drones.

At the same time, the company completed and delivered to the testing grounds at Edwards Air Force Base the world's first all jet-powered vertical takeoff plane, and obtained a multi-million dollar contract from the Navy for a new system of automatic navigation.

The biggest jigs ever built at Ryan went into service as climax to a high-speed tooling program which saw more than 300 fixtures installed for the Boeing KC-135 jet tanker-transport project. One of the first subcon-



Ryan under-wing fuel tanks for Boeing KC-97

tracts let on this long-range program was to Ryan, for mid and aft-fuselage sections, and the large torque box structure inside the fuselage, serving as an integral unit in the flight controls system. Ryan is building almost half the entire length of the KC-135 fuselage.

To accommodate the giant structures, mammoth jigs were built. Biggest is the 57-foot long fixture which will mate the upper and lower lobes of the mid-fuselage section, which is 40 feet long. This jig is 17 feet high and 14 feet wide, and the first lobe assemblies were lowerered into it near the year's end.

At the same time KC-135 tooling was being stepped up, tools for another project began pouring into the plant from North American Aviation, Inc. Approximately 2,400 tools and templates, drophammer dies and stretch form dies were delivered to the company for immediate start of quantity production of aft fuselage sections of the F-86 Sabrejet fighter.

A steadily growing volume of jet engine and afterburner components was turned out during 1955 for the General Electric J-47, the Pratt & Whitney Aircraft J-57 and the Curtiss-Wright J-65. Exhaust systems for piston engines also held a prominent place in Ryan's production picture.

During the autumn of 1955, Ryan completed the 1,000th external fuel tank for the Boeing KC-97 aerial tanker.

Meanwhile, aft fuselage sections and other assemblies in Ryan's oldest quantity production project, for the KC-97, were built in gradually diminishing numbers, as Ryan entered its seventh year of work on orders of approximately $60-million.

Ryan added 100,000 square feet of floor space during the year, giving the company 850,000 square feet under roof. At the same time, its leasehold of San Diego Harbor Department lands on which the plant is located was increased from 40 to almost 44 acres. Additional facilities were built for warehousing, for expansion of the machine shop and the electronics department, and for establishment of huge process tank area in the KC-135 project.

More than half a million dollars worth of new tools and equipment were acquired during the year, and almost 1,000 additional employees were hired, bringing the payroll at year's end over the 4,700 mark, highest since the peak of World War II.

Sales during 1955 were approximately $40-million, only a slight drop under 1954's $45-million despite the great amount of time and effort spent this past year in tooling for future large production. Backlog remained at $35-million, and net worth of the company was about $10-million.

Sikorsky Aircraft Div.
United Aircraft Corp.

During 1955, Sikorsky Aircraft division of United Aircraft Corporation expanded manufacturing facilities, began quantity production of the S-58, completed initial production of the twin-engine S-56, continued production of the S-55, and carried on extensive development of the turbine-powered S-59.

Sikorsky Aircraft dedicated its new multi-million dollar plant on Oct. 26, increasing overall manufacturing facilities to well over a million and a half feet.

Principal product of the new plant is the Sikorsky S-56, a 26-plus passenger transport being manufactured for the U. S. Marine Corps as the HR2S and the U. S. Army as the H-37. In addition, all S-55 (H-19, Army and Air Force; HRS, Marines; HO4S, Navy and Coast Guard) production was transferred from the Bridgeport plant to the new facility in nearby Stratford.

In quantity production at the Bridgeport plant for the Army and Navy was the S-58, a single-engine aircraft offering a considerable payload increase over the S-55. Known as the HSS-1 by the Navy and the H-34 by the Army, the S-58 is powered by a single Lycoming-built Wright R-1820 delivering 1,425 horsepower. In addition to deliveries to the Army, which employs the aircraft as a transport, and the Navy, which uses the aircraft primarily as an anti-submarine hunter-killer, units have been delivered to the Royal Canadian Air Force and have been ordered by New York Airways. CAA certification of the S-58 is underway and New York Airways is scheduled to start taking initial deliveries during the spring of 1956.

In a commercial configuration, the S-58 carries 12 passengers plus provision for a crew of two. The aircraft cruises at better than 100 knots and carries a payload of over 4,000 pounds distances of approximately 100 miles.

First production delivery of the S-56 was accomplished in September. Powered by twin Pratt & Whitney R-2800s, the S-56 features a single five-bladed main rotor coupled with a four-bladed torque-compensating tail rotor. The aircraft also features a folding tail boom, for stowage below the decks of aircraft carriers, and clamshell doors at the nose of the fuselage which open to allow the unfolding of a ramp for loading and unloading of troops, weapons and vehicles.

In the meantime, the S-55, the only certificated transport helicopter in the world, continued to see broadening use by both military and commercial operators. Powered by a single Pratt & Whitney R-1340, the single main rotor, seven-passenger helicopter is now in operation throughout the world.

Outstanding in 1955 was the performance of helicopters during the Aug. 19 floods which swept through Connecticut, New York, Massachusetts and Pennsylvania. Although exact figures are not available, estimates indicate over 1,000 persons owe their lives to helicopter rescue. Sikorskys operated by all U. S. military services saw service throughout the stricken states and remained on duty carrying food, medical supplies and allied material as long as two weeks after the disaster struck.

Sikorsky Aircraft continued to hold the international helicopter speed record by virtue of the 1954 performance of the Army's XH-39. The international altitude record set by the XH-39, also in 1954, fell during 1955 to the French SE-3120. The speed record remains, however, at the XH-39's 156,005 mph, set over a three-kilometer course on Aug. 26, 1954.

The XH-39 (S-59) is powered by a single Turbomeca Artouste II gas turbine of 400 horsepower. In addition to its speed, the four-bladed single rotor aircraft offers extreme maneuverability. Payload of the record aircraft is approximately 800 pounds.

At the close of 1955, Sikorsky Aircraft employed approximately 7,000 office and production personnel at both the Bridgeport and Stratford facilities.

Stroukoff Aircraft Corp.

Highlight of the year's activity for Stroukoff Aircraft Corporation, of West Trenton, N. J., was the completion and flight test of its new Pantobase transport, the Air Force YC-123E. This all-purpose medium transport, although basically a land-based plane, demonstrated it unique capabilities at its first flight demonstration on July 28, 1955, by taking off from the water, landing and maneuvering with ease in the Delaware River at Mustin Field, Philadelphia, immediately after a conventional take-off from a hard surfaced runway. It is designed to operate from water, snow, ice, sand strips, rough or unprepared fields, as well as hard surface runways, with the choice of landing gear completely under pilot control from the cockpit. The prototype is undergoing an extensive flight test program conducted jointly by the company and the Air Force. Successful tests have been completed by the Air Force under conditions similar to Arctic operations.

The company is currently in production, for the Air Force, of a service test quantity of medium transports which will incorporate its previously developed Boundary Layer Wing, with the Pantobase airframe and landing gear system and two Wright 3350 compound engines. The general configuration is the low, truck bed height, integral loading ramp, high wing fuselage type, pioneered by Stroukoff. During the past year, the company has independently intensified its research activity in Boundary Layer Control systems. The very encouraging results attained promise important break-through in wing design directed to reduction of drag in high speed aircraft and cutting sharply take-offs and landing distances of all types aircraft.

Plant employment increased 40 percent for the year, reaching a high point in December, and an increase of 50 percent from present levels is planned for the first half of '56. Additional tools and equipment were acquired during the year, including a large hydro-press now being installed which will be in operation by March, 1956, placing the company in position to take on additional contracts for major aircraft assemblies or complete aircraft.

Taylorcraft, Inc.

During 1955 two new Fiberglas light airplanes were in production by Tavlorcraft, Inc. One, the Ranch Wagon, which will seat four people, is a medium-priced plane powered by a 225 hp Continental engine. The other, the Topper, is also powered by a 225 hp Continental engine and is used for crop dusting, seeding and spraying. It weighs 1,450 lbs. empty and will lift a three-quarter ton load after a short take-off run.

In constructing the airplanes, molds are made of the fuselage, wings and other sections. Fiberglas cloth and resin are placed in the mold and permitted to cure. The sections are then put into place on the tubular steel structure of the fuselage and the aluminum and spruce structure of the wing. By this method, the fuselage is made of only two sections, joined together. The wings are made of eight molded units. Present plans and facilities of the company are being geared for a one-a-day production.

At year-end, company plant facilities covered 50,000 square feet.

In addition to manufacturing Taylorcraft airplanes, the company produces parts and assemblies for other aircraft and helicopter manufacturers.

Temco Aircraft Corp.

By November, Temco had subcontracts for production of major components for 12 different aircraft types, including the production of parts and assemblies for the Boeing B-47 and B-52; Lockheed's P2V-7, C-130 and "Electra" turbo-prop transport; McDonnell's F-101, RF-101 and F3H; Republic's F-84F; North American's F-100; Convair's B-58, and Chance Vought's F7U-3. Eight of these subcontracts and three orders for additional work on contracts previously acquired were awarded the company during 1955. Temco's responsibility on these projects ranged from fabrication to basic component design.

As a result of engineering development work, Temco in 1955 acquired contracts from two U. S. Military services. In May the Navy ordered a number of Temco-designed "Alpha" airborne electronic systems which had been developed at company expense and flight-tested under a Navy contract.

In August the company announced it had a U. S. Army Signal Corps contract to modify six L-17s into photo-drone aircraft and to fabricate three ground control stations. The contract also gave the company responsibility for training Army pilots to use the drones, for providing instruction booklets and spare parts, and for providing engineering field service at Army research centers.

Temco Engineering also continued development work on classified aircraft, missiles and weapon systems of the company's own design. And engineers expanded the company's overhaul and modification potentialities to include the fields of electronic installation and modification. A step was taken in this direction when Temco signed open-end contracts with Air Force Air Materiel Areas in Oklahoma City and San Bernardino, Calif. These contracts make it possible for the company to perform special modification jobs as required in addition to the contract reconditioning being performed for the Air Force and Navy at the Greenville and Dallas plants.

The "Riley Twin," a twin-engine executive conversion of the single-engine Navion, was licensed by the CAA as a new aircraft type during the year, and Temco began deliveries of an improved version of the Twin, introduced late in 1954.

A new paint hangar and stripping building added 40,000 square feet to facilities available to Temco's Dallas plant during the year. The Garland facility was expanded by 76,000 square feet, and a 60 x 60 extension was added to the Greenville plant's largest production hangar. These additions raised the total square footage used by the three plants to more than 1,900,000.

Employees totaled about 7,000 throughout the year.

Temco registered net earnings after federal taxes of $2,350,707 for the first nine months of 1955. This figure was 2.6 percent higher than earnings for the first nine months of 1954.

Sales for the first three quarters of this year were $57,428,170, up 33.4 percent over sales for the same period last year.

United Aircraft Corp.

Because United Aircraft Corporation's three divisions operate autonomously, discussion of the company's 1955 operating activities are found under the names of the divisions: Pratt & Whitney Aircraft (engines), Hamilton Standard (propellers and aircraft equipment), and Sikorsky Aircraft (helicopters), all of which maintained high level production during the year.

Completion of the new 800,000 square-foot Sikorsky Aircraft division plant in Stratford, Conn., marked a milestone in a $175-million postwar expansion program conducted by United with its own funds.

The Research Department of United Aircraft Corporation made substantial contributions in support of the research and development programs of each of the three operating divisions. Intallation of two new wind tunnels was completed. One is a transonic tunnel operating in the range of speed up to one and one-half times that of sound. The second tunnel is supersonic and covers the range from one and one-half to five times the speed of sound. The department has also enlarged its electronic computer section.

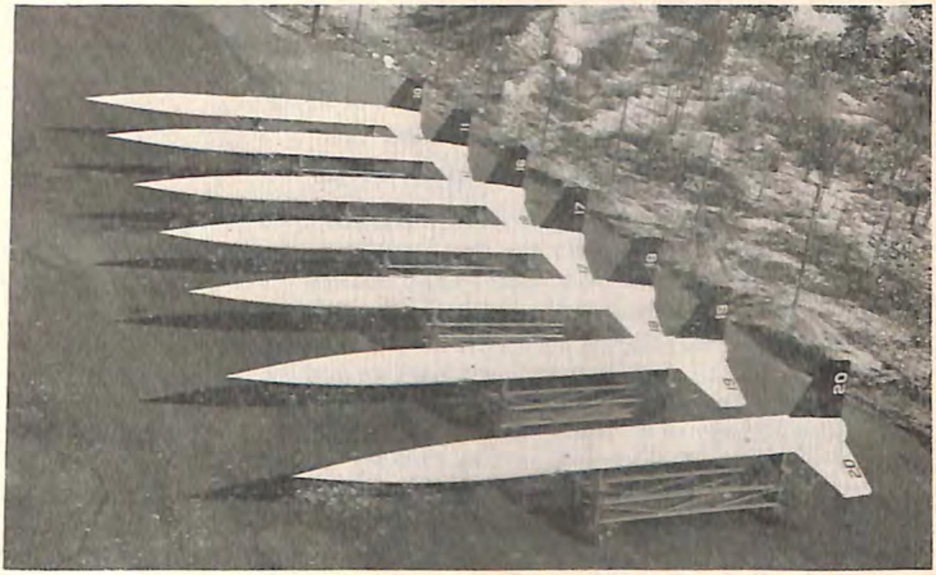
In 1954, the last complete year for which figures are available, United Aircraft reported a net income of $25,996,232 on sales totalling $654,239,-961. Total current assets at Dec. 31, 1954, amounted to $184,425,756,961. Total current assets at Dec. 31, 1954, amounted to $184,425,756 compared to total liabilities of $109,078,064 at that date. Contracts, orders and government letters of intent at Sept. 30, 1955, amounted to $1.275-billion.

ENGINE MANUFACTURERS

Aerojet-General Corp.

Continued expansion at Aerojet-General culminated in 1955 in the activation of a new Liquid Rocket Plant at the company's 15,000-acre Sacramento facility. Extensive facilities for testing rocket engines of extremely high thrust were completed.

Sodid-propellant rocket manufacturing continued at a high rate at Aerojet's adjacent Solid Rocket Plant. Jet-assisted takeoff units (JATOs) for aircraft and booster rockets for missiles streamed from the production lines, as well as rocket engines for deceleration sleds. Six of Aerojet's 5KS-4500 solid rockets, each delivering 4500 pounds thrust for 5 seconds, powered the sled used by Lt. Col. John P. Stapp in tests at Holloman Air Force Base. Using these engines, Lt. Col. Stapp was able to subject himself to deceleration rates as high as 35 g's. Twelve 5KS units are also used for assisted takeoff of the Navy's A3D Sky Warrior, a carrier-borne bomber.



Aerojet-General Aerobee sound rockets are used for upper-atmosphere research

An important event for the company was the CAA certification of Aerojet's 15KS-1000 JATO for use as standby power on business and executive aircraft. The 15KS produces 1000 pounds thrust for 15 seconds, the equivalent of about 400 horsepower. This rocket engine was originally developed for the Navy Bureau of Aeronautics.

At Aerojet's Azusa plant, production of metal parts for the Navy's 2.75-in. ordnance rocket continued at a high rate, as did production of the Aerobee research sounding rocket. Altitudes of 126 miles were achieved with the newest Aerobee models, and a height of 180 miles was anticipated in the future. The Aerobee, research rocket for the services for many years, was scheduled for extensive use in the International Geophysical Year. The Aerobee was also used in obtaining unusual photographs of the earth and in experiments involving the liberation of sodium vapor in the atmosphere to obtain spectral data.

The development and production of antiaircraft ordnance, underwater propulsion devices and electronic equipment continued, with exploratory work on many new propellant formulations for aircraft and missile applications, primary batteries, pilot ejection rockets, signal markers and turbojet starters. Various types of auxiliary power units and gas generators were in advanced development.

Aerojet, during the year, placed in preliminary production a simple, extremely effective thrust-reversing device for jet aircraft. Called the AeroBRAKE, the device permits up to 50 percent reverse thrust to be obtained, permitting any jet aircraft to land on very short runways. It was developed under license from Société National d'Étude et de Construction de Moteurs d'Aviation (SNECMA).

Allison Div.
General Motors Corp.

Commercial acceptance of the Allison 501 turbo-prop engine and Aeroproducts propeller package for the new Lockheed Electra highlighted 1955 for Allison Division of General Motors and marked the entrance for the first time of General Motors into the commercial aircraft power field.

Similarly, in the military transport field, an aircraft production program got underway with Allison turbo-prop engines and the Military Air Transport Service completed more than one month ahead of schedule a flight evaluation program on Allison turbo-prop engines and Aeroproducts propellers, piling up 3,000 hours on two Convair YC-131Cs within the year.

Following announcement in January of commercial availablity of the Allison 501 engine and Aeroproducts propeller, American Airlines signed the first order for the GM power package in its 35 Electras ordered for delivery beginning in 1958.

The 501 was certificated for commercial operation by the Civil Aeronautics Administration in May, the first certificate ever awarded by the CAA for commercial operation of a turbo-prop engine. Approval by the CAA was based on successful completion of the official U. S. Air Force qualification test by the military version of the 501, designated the T56 and now in production for the Lockheed C-130 Hercules. In meeting the requirements of the stringent 150-hour test, the T56 demonstrated 3750 equivalent shaft horsepower—2.3 horsepower for each pound of engine weight. The engine also demonstrated superior fuel economy.

Concurrent with the progress of the 501 engine was development of a four-bladed propeller by Aeroproducts Operations of the Allison Division. Receiving CAA certification in September, the propeller was ordered in substantial quantities by American in November.

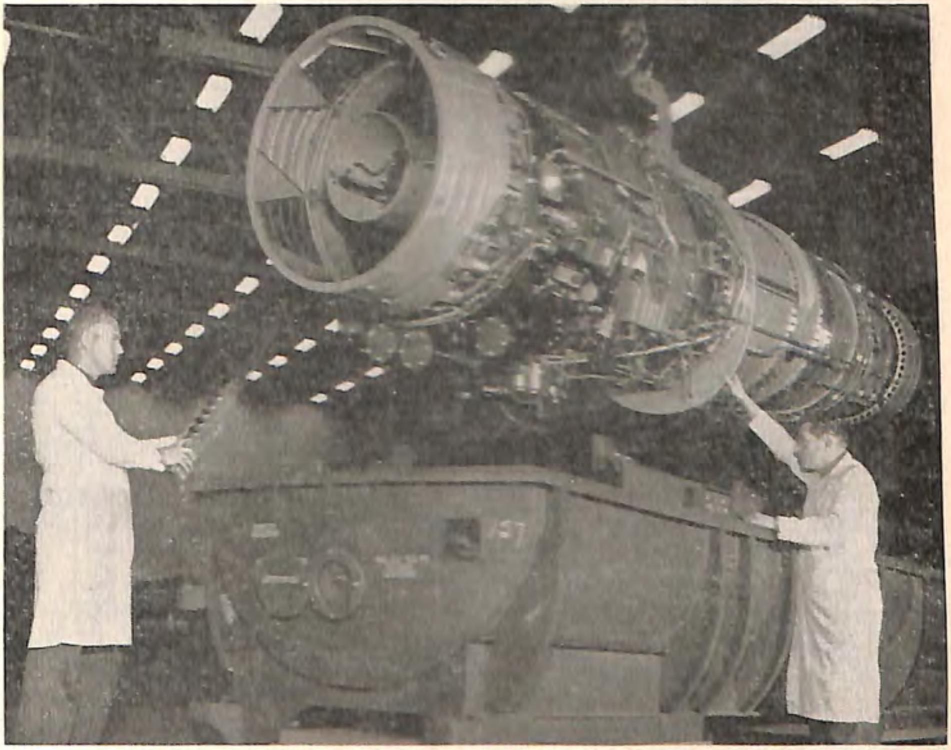
Prior to deliveries of the Electra in the latter part of 1958, the T56 will have accumulated more than 300,000 hours in military transport use. The bulk of this experience will be obtained from the four-engine Lockheed C-130. The USAF's first production turbo-prop transport, the Hercules was powered into the air for the first time in April by production model T56s. The initial flight, months ahead of schedule, was distinguished by the quick takeoff and landing characteristics afforded by the four 3750 HP T56 turboprops enclosed in slim-tapered nacelles. Considerable flight time with the T56 is currently being compiled as production aircraft are coming off the line regularly.

Additional experience was accumulated in 1955 by two twin-engine Convair YC-131C transports, equipped with prototype T56s and Aeroproducts propellers, in a USAF flight program designed to prove the adaptability of turbo-prop transports to scheduled operation. Operating since January over regularly scheduled Military Air Transport Service routes from Kelly Air Force Base, Texas, the aircraft attained the program goal of 3,000 hours 30 days ahead of the original target date. Making as many as four and five flights a day, maximum utilization reached 46 hours, 20 minutes in one 24-hour period for the two aircraft. In accelerating the program, USAF raised the maximum allowable operating time before overhaul on the prototype engines from 50 to 200 hours.

Continuing to augment this experience were two YC-130s, equipped with prototype T56s; Lockheed's Constellation "1961," with a YT56 enclosed in one nacelle; and the B-17 Allison flight test bed, with a YT56 installed in the nose. In addition, the Allison Turbo-Liner was being modified to carry a T56 production-type engine in one nacelle.

Developed under sponsorship of the U. S. Air Force, the T-56, or 501, consists of a single turbine power section connected by an extension shaft and a supporting structure to a reduction gear assembly having a single propeller shaft. The 12.5:1 ratio reduction gear assembly reduces the power section shaft speed of 13,820 rpm to the rated propeller shaft speed of 1,060 rpm. The engine has a 14-stage axial-flow compressor, six com-

Allison J71-A-11 axial flow turbojet engine



bustor liners and a four-stage turbine. It weighs 1610 pounds and is 145 inches in length, 27 inches in width. The Aeroproducts propeller is of hollow steel construction and measures 13.5 feet in diameter.

The Allison dual power section T40 turbo-prop engine, although out of production, compiled impressive performances in the Navy's water-based transports—the Convair R3Y-1 and R3Y-2. In February, with its four 5850 HP T40s driving contra-rotating Aeroproducts propellers, a R3Y-1 completed a record cross-country flight in 6 hours and bettered scheduled commercial time by 1 hour, 20 minutes. Theree different R3Ys negotiated four coast to coast flights during the year.

Further progress was demonstrated by Allison in turbo-jet development during 1955. Already flying in the twin-engine Douglas RB-66 reconnaissance bomber, the 10,000-pound thrust axial-flow Allison J71 powered the USAF's B-66B bomber version on its first flight in January. A B-66 flew from Edwards AFB, Calif., to Eglin AFB, Fla., in 3 hours, 15 minutes.

The Navy's carrier-based single engine fighter, the McDonnell F3H-2N Demon, completed its maiden flight in August equipped with an Allison J71 and high altitude afterburner. Carrier trials have been successfully completed and production aircraft at the McDonnell flight facilities, St. Louis, and Patuxent Naval Air Station, Md., have logged more than 1500 hours of J71 flight time.

Another Navy aircraft, the Martin XP6M Seamaster, took to the air for the initial time in July powered by four J71s with takeoff afterburners. Logging approximately 200 hours' engine flight time on its first 20 flights, the swept-wing 600 mph seaplane has attracted the close attention of both the USAF and the Army.

Although production of the axial-flow J35 engine was discontinued in 1955, quantities of the engine were overhauled in the Allison manufacturing plant during the year. Veteran of the Korean conflict and several record-breaking Atlantic crossings, the J35 was put into production in 1946 for the Republic F-84 Thunderjet. Current use of the J35 is in the twin-engine Northrop F-89 Scorpion fighter-interceptor, in service with the USAF in defense of the country's far northern bases.

Another workhorse and still in production is the Allison J33 centrifugal-flow turbo-jet. In production since 1945, the J33 is currently being produced in large quantities for the USAF's jet trainer—the Lockheed T-33A. Another J33 is flying in the Navy's new and improved trainer, the Lockheed T2V-1. In addition, two other J33 models incorporating reductions in cost and critical materials, power the USAF's Martin TM-61 Matador and the Navy's Chance Vought Regulus guided missiles.

An indication of future engine requirements was brought forth with the announcement in March that General Motors was investing $75-million of its own funds on facilities and forward development work at Allison to meet anticipated needs of the supersonic aircraft of tomorrow. The program includes a major expansion to present engineering facilities and the start on development of four new gas turbine engines.

Under the expansion program the total area devoted to engine research, currently amounting to 500,000 square feet, will be increased to approximately 1-million square feet. It is estimated that the number of personnel required for aircraft engine development will be increased by approximately 40 percent. Engineering and technical personnel will represent the largest part of the employment increase. Preliminary work on the model shop and the engineering building is now underway with completion of the entire program targeted for 1959.

At year's end, employment totalled in excess of 17,200 with more than 5-million square feet of floor space being utilized by the Allison Division.

Continental Aviation & Engineering Corp.

Continental Aviation & Engineering Corp., subsidiary of Continental Motors, accomplished a major expansion of its production facilities in 1955. It took over the Air Force facility on Lasky Road, Toledo, formerly occupied by the A. O. Smith Corp., and after extensive re-tooling, started production of gas turbine engines for various military applications.

Since the first production model left the Toledo assembly line in September, employment has risen gradually until it stood in the vicinity of 200 Dec. 1. Further increase is foreseen for early spring of 1956.

Among the turbine models now in production in Toledo are the TC104 air generator, heart of the MA-1 starting unit for large jet aircraft; the J69-T19 turbine which powers the Ryan Q2 Firebee target drone; J69-T9, used in the T37 twin jet trainer manufactured by Cessna Aircraft Co., and the new Beech Model 73.

Curtiss-Wright Corporation

Flag-raising ceremonies were held at Curtiss-Wright's new Research and Development Center at Quehanna, Pa., the entire facility having been constructed in just 121 days. An initial appropriation of $20-million was made at Quehanna. The 85-square-mile site, located in north central Pennsylvania in the Clearfield-Philipsburg area, is designed to stimulate the development and production of high power engine types and develop new products for the company's operating divisions. The Quehanna Center will feature outdoor engine test cells for turbojet engines of 100,000 pounds thrust and more. The advantage of the site's isolation permits running test engines without noise suppression problems. Research will be conducted in such diverse fields as nucleonics, ultrasonics, electronics, chemicals and plastics.

During the year the corporation embarked on the largest engineering program in its history. At the Wright Aeronautical Division in Wood-Ridge, a $7.7-million expansion of the supersonic, high-altitude laboratory was opened, making it the largest such privately operated laboratory in the United States. The new laboratory will bring together in a single unit equipment and test facilities costing more than $18-million. The supersonic laboratory is being used for the development and production testing of ramjets. Performance figures on the company's ramjet power plants are classified, but ramjets are generally known to operate best at speeds from Mach 2 to Mach 5.

First flight of the Bell X-2 under power was reported late in the year. A throttleable rocket engine, developed by Curtiss-Wright's Propeller Division, powers this Air Force experimental aircraft designed to probe the thermal barrier. Distinguished as the first throttle engine in the rocket field, the thrust rating of this Curtiss-Wright engine is classified as secret. It was designed for piloted aircraft flying from sea level to very high altitude. The engine is unique in that a lever controls the thrust, and the engine will idle with no thrust. It is known as the XLR25-CW-1.

The Civil Aeronautics Administration granted Curtiss-Wright the first approved type certificate for a U. S. designed and built turboprop propeller. The government certificate, which authorizes commercial airline use of the new turboprop propeller, marked a major step in the Curtiss-Wright turboprop development program, which includes engines as well as propellers. Curtiss-Wright Turbolectric propeller models have been selected for eight current development and prototype installations and have been specified for use on every U. S. turboprop engine currently under development or production.

Equipped with Curtiss-Wright Turboelectric propellers, the Boeing XB-47D made its maiden flight during the year. The big Stratojet bomber is powered by two Curtiss-Wright T-49 turboprop engines and two turbojet engines. No power rating was announced for the big T-49 turboprop engines, but the Turbolectric propellers were developed to harness as much as 20,000 horsepower.

The Department of Defense announced early in the year that Curtiss-Wright is participating under United States Air Force contract in design studies for the application of atomic power to the propulsion of aircraft.

The Curtiss-Wright Turbo Compound engine passed the 10 billion seat-mile mark in commercial service with a perfect safety record during the year. This 3,400 hp. 18-cylinder, radial engine has power recovery turbines to utilize normally wasted exhaust gases. This combination makes it one of the most efficient engines ever built. The Turbo Compound powers fleets of Lockheed Super Constellations and Douglas DC-7s of 35 of the world's leading airlines. At the year's end, this rugged engine was logging 90 million sea-miles per day.

An order for more than 850 Turbo Compounds in the new EA series was placed with Curtiss-Wright by Douglas for use in their DC-7C, and Lockheed for use in their Super Constellations.

The afterburner version of the Curtiss-Wright J65 turbojet engine was revealed to the public for the first time at the Paris International Aviation Exhibition and later at the San Francisco Aircraft Exhibition. The latest version of the J65 is rated at 7,800 pounds thrust without afterburner, but thrust of the afterburner version is classified. A Douglas A4D Skyhawk, the Navy's bantam atomic attack plane powered by the J65, set the world's 500 kilometer closed circuit speed record with an average speed of 695.163

miles per hour. The corporation delivered its 5,000th J65 turbojet engine to the U. S. Military in April for installation in a series of seven high-performance fighters and bombers. It is presently flying in the supersonic Grumman F11F-1 and in the FJ-3 and FJ-4 fighters, in addition to the A4D. J65s also power the Republic F84-F and the twin-jet Martin B-57 bomber. Advanced models of J65 have also been specified for additional projects of classified status.

The Curtiss-Wright Electronics Division delivered the first B-52 Flight Simulator to the Air Force in 1955 ahead of actual aircraft delivery. Flight Simulators like the one built for the giant eight-jet Boeing B-52 are used to train and upgrade flight crews without committing actual aircraft. The Simulators are exact replicas of the flight cockpit of the aircraft they represent, backed by intricate electronic computers which simulate all flight characteristics, from outside lightning to carburetor icing, and all maneuvers of flight.

A B-36 Flight Simulator built by Curtiss-Wright was put to extensive use at Carswell Air Force Base, training flight crews.

The Air Force, during the year, specified that Flight Simulators be built for every new type aircraft as it is put into production.

In civilian aviation, Flight Simulators were more and more in use in training safer, more dependable flight crews for passenger and cargo aircraft. United Airlines, already the world's biggest operator of Simulators, ordered three more during the year, two for the Douglas DC-6B and one for a Convair 340. Air France ordered two Flight Simulators for its Lockheed Super Constellations 1049 and 1649.

Curtiss-Wright built the first turboprop Simulator, to duplicate the first U. S. turboprop transport in production, the Lockheed C-130.

As Curtiss-Wright's policy of diversification continued, many new products were added to the list. The Electronics Division, located in Carlstadt, received orders for a variety of electronic equipment in addition to Flight Simulators. Some of them include a scaler and ratemeter to detect nuclear radiation, a Radiameter and Radiatector for detection and measurement of radioactivity, Distortion Eliminating Voltage Regulator which cuts out noise and harmonics in electrical current and an economical, dependable Iconoscope for television receivers.

The Industrial and Scientific Products Division was active in the field of ultrasonics with a line of new products which include an ultrasonic chocolate conche, an ultrasonic hops extractor, a complete line of ultrasonic flaw detection equipment, an ultrasonic tire inspector, ultrasonic washing units, ultrasonic medical therapy units, an ultrasonic drill, an ultrasonic anesthetizer and an electrostatic molecular heater. The division also introduced an infra-red night viewer valuable in police and security work.

The world's largest horizontal extrusion press was put in operation at the company's Metals Processing Division in Buffalo during 1955. The division increased its output of jet turbine blades and other aircraft engine components.

Curtiss-Wright Europa, N. V., with offices in Amsterdam, the Netherlands, continued during 1955 to service and supply the corporation's products to NATO nations.

The sale of spare parts and servicing of Curtiss-Wright engines and other equipment for the military, the airlines, and private plane operators is a function of Caldwell-Wright Division.

Marquette Metal Products, a corporation subsidiary at Cleveland, Ohio, continued producing electric and hydraulic windshield wipers for all types of aircraft, including high-speed jet fighters.

Fairchild Engine Div.
Fairchild Engine & Airplane Corp.

Powerplant development and testing capability of the Fairchild Engine Division was expanded during the latter part of 1955 with the completion of an advanced turbine research laboratory. This modern research facility, plus the acquisition of a new 400,000 sq. ft. production, engineering and administrative main plant at Deer Park, Long Island, N. Y., were basic additions to the division's long range plan for the development and production of small, high-performance jet engines.

Both structures, situated on a 210-acre site at Deer Park, were completed during the year. Production and personnel operations started in October with first test operations in the new laboratory scheduled for February and March of 1956.

The most significant activity of the division in the small jet engine field was the completion of 150-hour endurance tests of the 1000-lb. thrust J44 midget jet engine as a prior requirement to military and commercial certification of the lightweight powerplant for installation in inhabited aircraft. The engine has been in production for guided missiles, target drones and pilotless aircraft use since 1950. All basic engine tests were completed by the end of the year.

J44's starred in the first successful jet thrust assist evaluation flights on a military transport last year. One engine, installed in pods on each wing tip of the C-123B, twin-engine assault transport, increased the plane's single main engine take-off and climb performance by a marked degree and provided important safety, as well as many operational advantages.

As a result of these and other equally successful evaluations, thrust augmentation is expected to be applied to commercial and military, multi-engined transports which are engaged in a variety of specialized operations.

A J44 also powered a U. S. Navy, Ryan-built KDA-1 target drone to 45,000 feet at approximately .9 Mach.

Design and test work continued at Fairchild on the development of an entirely new type, high-performance, lightweight turbine in the 2,000-lb. thrust category, for the U. S. Air Force.

Subcontract production of large turbojet engine components was expanded during the year to include orders from four major producers of large, high-powered turbojet engines. Parts production included turbine wheels, forward frames, rear frames and nozzle diaphragms for the General Electric J47 engine. Orders for newer engines also included tooling allowances for components scheduled for long run production.

The Engine Division of Fairchild completed its experimental midget submarine and turned the craft over to the U. S. Navy for operational testing and evaluation in October. This underwater weapon, the first to be designed and constructed by an aircraft company, included many aircraft design features: airplane-like control system; a packaged powerplant; and provisions for dock or shipboard disassembly of components to permit rapid maintenance and replacement of parts.

The craft, officially designated the USS X-1 submersible, is approximately 50 feet long, 7 feet wide and weighs approximately 25 tons. Operated by a crew of four, its prime mission is the testing of United States harbor defenses.

Production of specialized, precision-built compressors for the Atomic Energy Commission was completed in August. Since this $40-million order was a one-time project, the company leased the 200,000 sq. ft. facility devoted to this work at Mineola to the Reeves Instrument Division of the Dynamics Corporation, and consolidated remaining spare parts production at the new Deer Park plant.

Al-Fin, a method for the joining of dissimilar metals in a lifetime bond, originally developed for aircraft engine use during World War II, expanded applications to many fields including automotive, trucks, missiles, consumer goods products and, the latest, for use on new design locomotives. Sizable contracts were received during the year from American Locomotive Company, for the production of ring band carriers for diesel locomotive pistons.

General Electric Co.

Research, development, and production of aviation products continued to be one of the General Electric Company's major efforts during 1955. Over 20 product departments engaged in the making of aviation systems and components during the year.

In the aircraft engine field production of the company's combat-tested J47 series jet engine continued, and the famed engine continued to set records for flying hours without overhaul. Six J47-23's in a Boeing B-47B Stratojet set one new mark in July by being the first complete group of powerplants on a multi-engined plane to pass 1,000 hours without major repair.

Also continuing in production was the company's J73 engine, which powers the latest of the North American Sabre Jet series, the F-86H. Sabre Jets powered by J73's have flown approximately 2.5-million miles without a single engine damaged by foreign objects.

The J47 also became the first U. S. jet engine to be licensed to a European manufacturer when an agreement was signed in June with the Fiat

Works of Turin, Italy, to build the J47-27 and the J47-33. The engines produced by Fiat will be used in the air forces of the NATO countries.

A new 14,500-acre outdoor testing center at Peebles, Ohio, was added to the Aircraft Gas Turbine Development Department's facilities during the year, enabling the department to test various types of engines on outdoor test stands and to carry out investigations on noise problems created by jet powered aircraft.

Other AGT facilities added during 1955 include a "hot" fuel and oil testing area capable of testing complete jet engine pumping systems under extreme temperature conditions, and a Computations Building to house two new IBM 704 electronic "Brains."

During 1955, the company's rocket engine development program was transferred to the Aircraft Gas Turbine Division, consolidating the company effort in aircraft and missile powerplants and making one group responsible for complete development of rocket, ramjet, and turbojet engines.

In line with the company transfer of rocket engine responsibility, the Aircraft Gas Turbine Development Department was assigned responsibility for producing the rocket engine for the first-stage of the Earth satellite vehicle, Project Vanguard, which will be launched into outer space sometime in 1957-58. Development work on this engine is being carried out both at Evendale and Schenectady, N. Y., facilities.

At the Small Aircraft Engine Department development of the XT58 gas turbine engine reached advanced stages during the year. This small turboshaft engine is being developed for the Navy Bureau of Aeronautics for use in helicopters. In addition, the department continued work on development of a small turbojet engine, the MX2273, for use by the Air Force in powering drones and pilotless aircraft.

The Aircraft Accessory Turbine Department revealed during the year that it was producing air turbine drives for the Boeing B-52 Strato-Fortress, the world's first aircraft to use pneumatic equipment for its complete accessory system. The department has supplied turbo-alternator drives for the X-52 and YB-52 and a number of initial production aircraft, and is currentliy supplying hydraulic turbopumps in support of the B-52 production program.

Also in production during the year were turbo-starters for the Martin B-57 Canberra bombers, afterburner fuel pumps for the North American F-86D, and turbo-superchargers for a number of military and commercial aircraft.

G-E's Electronics Division announced in 1955 that it was producing extremely high powered search radars for the Navy's radar picket blimps. A special advantage of the blimp radar is its ability to detect low flying planes at much greater distances than ground or ship radars, thus making it a major link in the country's radar defense network. Search radar for use on Air Force and Navy radar picket aircraft was also in production during 1955.

The opening of the division's completely mechanized printed wiring board production line at its Auburn, N. Y., plant was also announced during the year. This production facility will be able to produce between five and six million individual wiring boards, largest production capacity of any manufacturer in the country.

The company's Specialty Control Department continued development of new and advanced regulating and protective equipment for aircraft electric systems. Included in the new equipment announced during 1955 were a new totally enclosed generator protective panel for the McDonnell F-101, a static regulator for alternators rated up to 90kva and temperatures to 120 degrees C, and a carbon pile regulator for operation between 90 and 120 degrees C.

Several new developments in aircraft instrumentation were announced by the Instrument Department during 1955. Outstanding among these were a small remote compass transmitter designed for mounting in new thin wing, high speed aircraft; a miniature 400 cycle servo motor featuring

General Electric's new "hybrid" turbo for Stratocruisers

an especially high torque to inertia ratio; and a high-range mass fuel flow transmitter for in-flight refueling operations which measures fuel flow rates up to 600,000 pounds per hour.

During the year three USAF operational bombers flew with fire control systems built by the company's Aircraft Products Department. These included the Strategic Air Command's Douglas B-66, the first Air Force tactical bomber to be equipped with a radar-directed, remotecontrolled armament system.

The Aircraft Products Department completed development of a dynamic accuracy tester which completely evaluates airborne armament systems during ground firing under simulated flight conditions and continued advanced development of electric and hydro-mechanical jet engine control along with production of the company's integrated engine control for the North America F-86D fighter-interceptor.

Formation of the Special Defense Projects Department within the company's Defense Products Group was announced during the year. This new department was organized to conduct engineering and production of large, highly complex defense systems, primarily guided missiles, and to act as a focal point for the company organizations involved in development of defense systems.

The Schenectady Aeronautic & Ordnance operation continued its production of flight control systems, and announced the development and production of a new hydraulic constant speed alternator drive. Composed of ball piston hydraulic units, the new drive is being used on the Douglas A4D Skyhawk.

Announcement also was made of the development of a new lightweight computing gunsight for supersonic fighters. Considerably lighter than previous sights, the K-19 can be used with all weapons normally carried by a day fighter for both air-to-air and air-to-ground firing.

Lycoming Div.
Avco Manufacturing Corp.

Greater impetus in the development of its two gas turbine engines, along with an expansion of its reciprocating engine program, were keynotes of Avco's 1955 activity. Both of the turbines were being developed under classified contract for the Air Force at Avco's Lycoming Division in Stratford, Conn.

The smaller of the two engines, designated the T-53, successfully passed its initial 50-hour flight rating test in 1955. Described as a work horse engine, the T-53 will power the utility helicopter being developed by Bell Aircraft Corporation for the Army. The engine is designed for fixed-wing aircraft as well as helicopters. The helicopter version of the T-53 will have an 825 horsepower rating. Development work is continuing on the second, and larger, gas turbine engine. Marketing studies indicate that there are excellent prospects for using the engine in other applications besides rotary and fixed-wing aircraft.

In October, Avco announced the introduction of the first geared and supercharged aircraft engine to be manufactured in this country in its horsepower class. Designated the GSO-480, the engine is being produced by Lycoming's plant in Williamsport, Pa. It weighs 495 pounds, utilizes an integral gear-driven, centrifugal supercharger, develops 340 horsepower for take-offs and has a 320 horsepower normal rating. First aircraft manufacturer to use the new engine was Aero Design and Engineering Company which installed it in the 680 Super Aero Commander. Other firms have shown interest in the engine which is expected to open new horizons in smaller executive type planes.

Early in the year the company announced the formation of its new Advanced Development Division in Stratford. Since its inception, the division has engaged leading scientists in the fields of heat transfer, gas dynamics and related areas. At Everett, Mass., the division began experimentations at its research laboratories.

Other key Avco projects during the year involved the introduction of a new self-propelled auxiliary air supply and electrical ground power unit for aircraft. The unit has been named Pow-Air. Lycoming's Spencer Boiler department continued its development work on a new gas-fired boiler line and on oil burner package units.

Two contracts were received from the Atomic Energy Commission for items produced by the method of machining known as Hydrospin. In Stratford, Lycoming has one of the three Hydrospin machines in use in the country.

The division also received an extension of contract for additional state-of-the-art development for a 5,000 pounds per-square-inch compressor used with pneumatic control systems.

The Crosley division of Avco (Cincinnati, Ohio, and Nashville, Tenn.) was active throughout the year in the field of electronic control for aircraft and in the production of airframe component parts.

Marquardt Aircraft Co.

Marquardt Aircraft Company expanded both its facilities and areas of research in the field of supersonic ramjet propulsion during 1955. New fuels, new approaches to high temperature metallurgical problems and new applications for supersonic ramjet engines were in the sphere of Marquardt's research program.

The company's Research Division, established in 1954, moved to expanded quarters in anticipation of an increase in size and scope of activities. The variety of studies and evaluations underway included a number of advanced projects, all relating to very high speeds and altitudes.

In the field of metallurgy, Marquardt expanded its ceramics and cermet research and development program in search of materials that can withstand the high temperatures of sustained supersonic flight. A new metallurgical laboratory supported this effort.

Marquardt also joined with Reaction Motors, Inc., and Olin Mathieson Chemical Corporation in an applied research and development effort to advance the present limits of rocket and ramjet powerplants. Fuels and heat resistant construction materials were among the problems being researched by the OMAR program.

Ramjet engine development continued to represent the major portion of Marquardt's operations. Although military security prevents disclosure of how these supersonic ramjet engines are being used in the guided missiles field, it can be said that the powerplants have performed so well that they are now ready for volume production.

The record established by the supersonic ramjet as a missile powerplant resulted in orders from other sources for additional applications.

Engine research and development also went forward on supersonic ramjets of larger size and higher performance, ramjets of increased operating range and rotor-mounted (helicopter) ramjet powerplants.

Allied with Marquardt's ramjet program were the development of afterburners and nozzles for turbojet engines, accessory power packages (ram and bleed air driven) and ramjet and turbojet engine controls. Reverse thrust devices for turbojet engines and a system for vertical take-off propulsion also were among Marquardt's projects during the year.

The Marquardt Jet Laboratory was expanded to include the installation of a new high speed data recording system. In all, the Marquardt Jet Laboratory embraces a total of seven test cells. It can simulate speeds up to approximately Mach 3 and altitudes to 100,000 feet.

Marquardt employs 1,200 persons, half of whom are engaged in engineering and research. The company's plant facilities now occupy 160,000 square feet of floor space, situated on 30 acres of land.

Financially, Marquardt enjoyed its best year in 1955. Sales exceeded $10-million, up 10 percent from 1954, and net earnings recorded an equally favorable ratio. Early in the year, the company's stock was split, and 220,000 shares were outstanding at the end of the year.

Pratt & Whitney Aircraft Div.
United Aircraft Corp.

Pratt & Whitney Aircraft's operations during 1955 were highlighted by the performance and acceptance of its 10,000-pound thrust class J-57 jet-turbine engine by the Air Force, the Navy, and commercial airline operators. Progress was also made in the development and testing of the more powerful J-75 jet-turbine and T-57 propeller-turbine engines, and research on an atomic-powered aircraft engine was accelerated.

As 1955 drew to a close more than 2,500 of the twin-spool, axial-flow J-57's had been delivered to airframe builders for installation in many of the nation's first-line fighters, interceptors, and bombers.

In the commercial field Pan American World Airways in October opened the vista for commercial jet air travel when it placed the first firm orders for 20 Boeing 707's and 25 Douglas DC-8's. These transport jet aircraft, both to be powered by P&WA jet engines, are designed for nonstop transoceanic flights at speeds of better than 550 miles an hour and will carry up to 108 first class and 130 tourist passengers. The first 707's will be delivered by December, 1958, and the DC-8's by December, 1959.

Two weeks after the Pan American announcement United Air Lines ordered 30 J-57-powered Douglas DC-8's and shortly thereafter National Airlines and American Airlines ordered 6 DC-8's and 30 707's respectively.

Among the J-57-powered military aircraft are: the North American F-100, the first supersonic plane to be placed in operational use; the Air Force's the McDonnell F-101, the Convair F-102, and the Republic F-105; and the Navy's Douglas F4D and Chance Vought XF8U-1. All of these fighters and/or interceptors are supersonic and are equipped with P&WA-designed afterburners which greatly augment the thrust of the engine. Nonafterburner engines power the Air Force's Boeing B-52 eight-engined intercontinental bomber and JC-135 four-engined tanker, and the Navy's Douglas A3D twin-engine attack bomber.

The J-57, with afterburner, also powered a North American F-100 Super Sabre to a new official speed record on Aug. 20, 1955. On that date Air Force Colonel Horace A. Hanes piloted an F-100 over an 18-kilometer course at an average speed of 822.135 miles an hour. For his feat Colonel Hanes was awarded the Thompson Trophy.

The J-57 also helped set still another speed record when the Boeing 707 prototype commercial transport flew nonstop from Seattle, Wash., to Washington, D. C., in 3 hours and 58 minutes. The plane made the non-stop return trip in 4 hours and 8 minutes.

Full scale testing of the more advanced P&WA axial-flow jet turbine, the J-75, continued during the year. Flight testing of this engine was being carried out in a modified four-engined B-45 bomber in which the J-75 is mounted in the bomb bay.

The T-57, a propeller-turbine adaptation of the J-57 jet configuration, underwent extensive testing during the year and will start its flight test cycle early in 1956 mounted in the nose of a transport plane which will serve as a flying test bed.

Work on an atomic-powered engine, begun in 1951, proceeded on schedule in the company's leased facilities in South Windsor, Conn. In 1957, P&WA will begin operating a government-owned nuclear laboratory now being constructed by the Air Force and the Atomic Energy Commission, in Middletown, Conn.

The T-34 axial-flow propeller-turbine engine, delivering 6,000 equivalent shaft horsepower, powered both Air Force and Navy prototype transports in service evaluation test flights during the year. These aircraft were the Air Force's Douglas YC-124B, Lockheed YC-121F and Boeing YC-97J, and the Navy's Lockheed R7V-2.

Production on the 7,250-pound thrust J-48 centrifugal-flow jet turbine was resumed in 1955. Manufacture of this engine was suspended in 1954 but substantial additional orders from the Navy for Grumman F9F-8 Cougar, a carrier-based fighter, made it necessary to reopen the J-48 production lines. The J-48 also powers the Navy's F9F-5 Panther and F9F-6 Cougar, and an afterburner model powers the Air Force Lockheed F94C all-weather interceptor.

Production of the R-2800 Double Wasp piston engine continued at a steady pace, but that of the R-4360 Wasp Major phased out in August. More than 18,500 of the R-4360 engine have been produced.

A major addition to Pratt & Whitney Aircraft's North Haven branch plant was started in November and will be completed in 1956. The expansion program will add 500,000 square feet of manufacturing space and 100,000 square feet of office area to almost double the size of the original facility which was opened in 1952. The new company-owned space will be used entirely for jet-engine parts production.

Conceived by Pratt & Whitney Aircraft, and with the cooperation and collaboration of its parent corporation, United Aircraft Corporation, the Hartford Graduate Center of Renssalear Polytechnic Institute was established in South Windsor, Conn. Operating in a building purchased and given outright to RPI by UAC, the center opened in September. At present there are about 215 full-time engineers and scientists of UAC studying for advanced degrees under the direction of a faculty composed of RPI professors and instructors selected from the corporation's engineering staff.

A major expansion of the company's Andrew Willgoos Gas Turbine Laboratory was completed during the year. Five new test cells were added to the laboratory's original six. Three of the new units are capable of simulating both temperatures and other atmospheric conditions at extreme altitudes, and incorporate many improvements over the original cells including the ability to test gas-turbine engines of even greater power than those currently under development. Further expansion of the laboratory was authorized and started in late fall.

Pratt & Whitney Aircraft's licensing program to expand the production of its engines beyond the capacity of its own organization continued during the year. The Ford Motor Company's engine division at Chicago continued the production of P&WA's J-57 for a number of military installations.

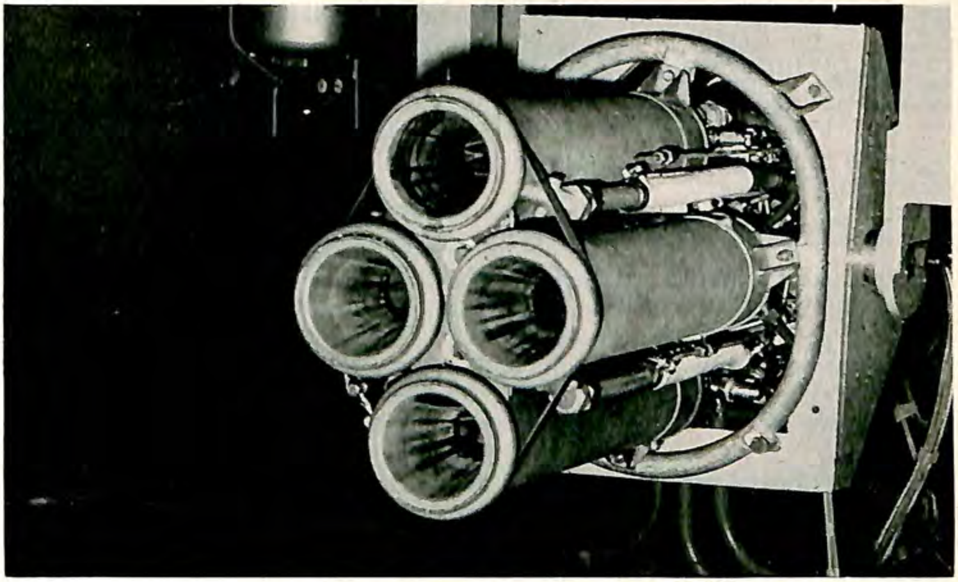
Reaction Motors, Inc.

The completion of a new $4-million rocket, engine development and production facility highlighted Reaction Motors' continued growth in the rocket industry during 1955. Built for RMI, this joint Navy-RMI facility includes over 200,000 square feet of working area, consolidates RMI's administrative offices, research, engineering and manufacturing operations previously divided between Rockaway and Lake Denmark, N. J., and expands the company's facilities in its extensive test areas.

The new RMI headquarters and Naval Industrial Reserve Aircraft Plant are located on a 50-acre site in the lake region of northern New Jersey. Built with future requirements in mind, the new plant is equipped with a well-rounded inventory of modern equipment and laboratories for all phases of research, design, development, fabrication and testing of rocket engines and their component parts.

In the middle of the year, a joint program of applied research to advance supersonic aircraft and missile propulsion was established by Reaction Motors, Inc., Marquardt Aircraft Company, and Olin Mathieson Chemical Corporation.

The new coordinated technical effort of complementary skills, known internally as the OMAR program, combines research, engineering, and production resources of the three organizations and, for the first time as part of an integrated plan, links mechanical experience in supersonic engine development with chemical experience in the manufacturing of special fuels.



Reaction Motors' rocket engine

A Marine Corps helicopter squadron was equipped with ROR (rocket-on-rotor) rocket power. The ROR system is the use of tiny-rotor-tip rocket engines that operate on hydrogen peroxide fuel and are working successfully in Marine Corps helicopters.

One of the newest RMI developments in rocket power was the preparation for the installation of a full scale aircraft launching catapult for field evaluations.

Now only in its second decade, Reaction Motors continues its mission of developing rocket power for aircraft, guided missiles, aircraft catapults and launching devices, and other military and industrial power requirements.

Westinghouse Electric Corp.

Continued expansion of research and development facilities geared to aircraft and airborne operations keynoted the 39th year of Westinghouse activity in the aviation industry.

Under construction were new jet engine research and development facilities at the Kansas City, Mo. Aviation Gas Turbine Division of Westinghouse Electric Corporation. Costing more than $12.5-million, the 230,000-sq. ft. laboratory will contain both high- and low-power laboratories and an engineering shop.

Also in full operation at the company's aircraft equipment department at Lima, Ohio, was a new high-altitude chamber designed for testing aircraft electrical accessories at altitudes up to 130,000 ft. Also in full operation was a permanent mock-up to permit simulating actual operating conditions for from two to four 60-kva alternators in parallel.

During 1955, Westinghouse completed its new multi-million-dollar metals plant at Blairsville, Pa. The main purpose of the new metals plant was to bridge the gap between research and the commercial application of metals in the fields of jet propulsion, atomic power, and electric power generation.

This plant provides equipment for the basic metal working processes of melting, forging, hot-rolling, cold-rolling, conditioning, pickling and heat-treating. Also installed are facilities for the newer foundry techniques of investment casting and shell-mold casting and equipment for limited manufacture of powdered metal parts.

Dynamic accuracy testing of bomber turret systems at a temperature of minus 50 degrees C, long sought by the armed forces, has been achieved and incorporated as standard test procedure by the corporation's air arm division.

Key to the accomplishment is a connecting chamber between a large conventional environmental test chamber and a microwave "free space" room specially constructed to complement the unit.

An electronic computer-simulator to help engineers design and develop better airborne armament systems has also been installed by the division.

The new computer, an IBM 650 magnetic-drum data processing machine, can "remember" 20,000 digits. It will be used on a number of important engineering projects such as the radar-controlled tail turret fire control systems being built for the Navy. Through the use of a highly developed radar and computer, this system automatically positions the tail guns of a bomber to the correct lead angle required to hit attacking aircraft. It is in production for the Douglas A3D Skywarrior, Navy's largest carrier-based bomber.

In addition, the computer-simulator will be used on other high priority projects including aircraft flight control studies, flight control data reduction, antenna design, and missile development.

Metallurgists at the Westinghouse Research Laboratories during the year conducted tensile tests on metals at temperatures as low as minus 452 degrees F. The metal specimens were stressed within a specially designed chamber which had been cooled wth liquid helium. Results of these tests will provide engineers with needed information regarding types of metals that are best suited for use under extreme temperature ranges.

The new testing temperature of minus 450 degrees is just short of *absolute* zero or minus 459.6 degrees F, the point at which, theoretically, all molecular motion ceases. The aims of these ultra sub-zero investigations are concerned with obtaining a better understanding of the strength of metals and the factors that cause embrittlement failures.

A new jet engine (PD-33) that is expected to have unusually low specific weight and fuel consumption was designed and built by Westinghouse in 1955. The new engine successfully completed a 50-hour flight substantiation test.

A new silicone lubricant with outstanding thermal and load bearing properties was developed by Westinghouse engineers during the year. The fluid satisfactorily passed thermal stability and viscometric tests ranging from minus 65 degrees F o plus 500 degrees F. Steel-to-steel bearing load tests showed the fluid to have execllent lubricating qualities up to 107,000 pounds per square inch bearing area.

The new lubricant was tested in a Westinghouse turbojet engine. At the completion of this test, the engine was completely torn down and examined. No evidence of wear was found by the gas turbine engineers and the system was entirely free of any sludge derived from the oil.

Westinghouse continued its work in the field of wind tunnel drive and control. One achievement in this field was the design and construction of large axial-flow compressors and drive motors (two 83,000 hp synchronous motors each started by a 25,000 hp wound rotor motor) for the Air Force's giant Propulsion Wind Tunnel at the Arnold Engineering Development Center, Tullahoma, Tenn.

The transonic tunnel was expected to be in operation by February, 1956, and the companion supersonic tunnel will be completed later. Each tunnel will be served by its own enormous axial-flow compressors and both will be driven by four motors totaling 216,000 hp, the largest concentration of motor horsepower on a single shaft in the world.

Westinghouse also designed and built precision wind tunnel components such as a sting support and a side-wall balance for the transonic loop of the PWT, and expanded its line of industrial air heaters.

Today's aircraft alternators require thorough testing under simulated flight conditions before being installed in actual planes. Westinghouse designed and built several electrical test stands to duplicate actual operating conditions as experienced by a jet-engine-driven alternator.

A new lightweight airborne a-c to d-c converter, lighter and smaller than its predecessors, was introduced by Westinghouse during the year. The new 200-amp. power pack converts engine-generated 200-v., 400-cycle power into 28-v. d-c, regulated to within one volt, and is capable of operating in ambient temperatures up to 120 degrees C. The new Westinghouse power pack, ATR-200A, owes its 55-lb. weight, high- temperature and close-regulation capabilities to the use of new high-power silicon rectifiers in combination with two-stage magnetic amplifier voltage regulator.

A new brushless, oil-cooled, a-c generator was developed by Westinghouse during the year. The fact that it is brushless and can be cooled by 300 degrees F oil means that it can operate at high altitudes and speeds without difficulty.

Companion to the new brushless alternator is a new Magamp voltage regulator and protective panel combined in one unit. This unit not only regulates the output of the a-c generator, but also protects it against grounds, and feeder and bus faults. In addition, it protects equipment utilizing the a-c power from overvoltage and undervoltage faults.

The new regulator and protective panel makes use of printed circuits and silicon power rectifiers, which are largely responsible for the decrease in weight over previous panels.

Westinghouse aircraft equipment engineers also developed a new a-c aircraft generator that is the lightest in its high-temperature class.

The new generator is a 20-kva, 3 phase, 120/208 v. unit that operates at 8,000 rpm, 400 cycles. It weighs only 44 pounds and is primarily intended for high-speed, high-performance aircraft. The unit consists of a class-H insulated alternator portion that receives its excitation from a similarly insulated integral d-c exciter generator.

A new series of gearhead and direct drive motors for aircraft were also introduced by Westinghouse Electric Corporation. The new motors were designed to drive such equipment as pumps, compressors, flaps, landing gear and armament accessories. The motors are supplied in frame sizes of 2½, 3⅛, and 4 inches, O. D. They are fan cooled, explosion proof, and totally enclosed.

The company also developed a new direct-drive explosion-proof fractional horsepower a-c motor for aircraft applications. It is equipped with a self-energized d-c electromagnetic brake. When current to the motor is interrupted, this brake can decelerate the rotating motor from 11,300 rpm to rest in less than one-fifth second.

Fan-cooled and totally enclosed, the new motor is available in ratings from 1/30 to ¼ hp and for seeds of 5,600, 7,500, or 11,300 rpm. Ratings apply from sea level to 75,000 feet.

During 1955, Westinghouse engineers developed a transistorized amplifier for controlling an electrohydraulic control valve in a high-performance servomechanism. It is the first step in the development of an all-transistor automatic pilot for aircraft.

A hermetically sealed, permanent-magnet rate gyro was designed by the company for use in arament control systems where extremely accurate angular rate measurements are necessary. The gyroscope wheel is mounted in a magnesium gimbal suspended on ball bearings. A current coil is rigidly attached to the gimbal, and free to rotate between two powerful permament magnets. When the assembly is turned (as if the aircraft were making a turn) the gyroscope resists turning with a force proportional to the rate of turn. The interaction of the permanent magnet and coil when a current flows in the coil creates a force in opposition to the gyroscopic force. Therefore, the current necessary to balance the gyroscopic force is an accurate measure of angular rate.

Radio transmitters, of the type used for long-range point-to-point communication service, can get a shot in the arm from a new linear amplifier developed by Westinghouse. When connected to the transmitter output, the amplifier will boost power to the antenna as much as 15 to 1. Maximum peak power output is 40 kw. The unit covers a range of 4½ to 30 megacycles.

Torturous treatment is taken in stride by a new aircraft lamp jointly developed by the company and by Kaman Aircraft Corporation. The new lamp withstands centrifugal forces of up to 1000 g. It fits in the tip of a helicopter blade, and is designed to give a distinctive identification feature to this type of aircraft. The lamp produces about 35 candlepower, but reflectors in the blade tips increase the effective light output about nine times.

Helicopters with blade tip lights are easily identifiable as far away as five miles, even against a background of city lights.

A small spot heater was also developed by Westinghouse. The resistance element heater has a rating of 100 watts and operates on 28 volts d-c. Electrical connectors consist of double nut terminals with the negative terminal grounded to the case. Over-all dimensions of the heater and two closely spaced mounting holes permit concentrated heating of flat surfaces as small as 1 x 1⅜ inches.

PROPELLER MANUFACTURERS

Aeroproducts Operation
Allison Div.

At Aeroproducts Operations, Allison Division of General Motors Corporation, Dayton, Ohio, a ten-year turbo-propeller research and development program was culminated in 1955 with the selection of Aeroproducts propellers for application on commercial turboprop aircraft. First installation of these propellers will be on the Lockheed Electra, now on order by leading U. S. airlines. With the Allison turboprop engine, this propeller-engine combination provides the commercial airlines with a power package having thousands of hours of successful flight operation.

During 1955 the MATS 1700th Test Squadron at Kelly AFB, with two Convair YC-131C aircraft powered by the Allison Turboprop engines and Aeroproducts Turbo-propellers flew over 6,500 propeller flight hours. Flight hours have also accumulated on other turboprop aircraft including the Navy-Convair R3Y Tradewind, the Air Force Lockheed C-130, and the Allison Turboliner. Successful flights of the Republic F84H were made at Edwards AFB which demonstrated the reliability of Aero-products supersonic turbo-propellers.

Aeroproducts has continued to supply propellers for reciprocating engine powered aircraft including the Air Force Fairchild C-119 Flying Boxcar, the North American T-28 Trainer, the Beech C-45, and the Navy's Douglas AD series carrier-based aircraft.

Aeroproducts self-locking hydraulic actuators incorporating an emergency electric overdrive were supplied during the year to control the horizontal stabilizer on the Air Force Republic F-84F jet fighter. In event of failure of the aircraft hydraulic system, the electric emergency overdrive enables the pilot to trim the "flyable tail" and safely land the aircraft.

Synchronized Linear Hydraulic Actuators were being used to control inlet guide vanes and for afterburner control. These actuators operate in synchronized travel regardless of the load differential at each actuator, and may incorporate a positive brake which holds the actuator in position in event of hydraulic power loss. This has made it possible to add the feature of an emergency pneumatic servo control to position the tail pipe doors should there be a failure of hydraulic pressure.

Aeroproducts Operations also supplied an undisclosed number of emergency ram air driven hydraulic pumps for installation on the North American F-100 Super Sabre.

The pump is driven by a two-bladed variable pitch propeller. A simple fly-weight type governor maintains a constant rpm of the pump drive shaft by mechanically changing the pitch of the propeller blades. The pump provides constant displacement of hydraulic fluid regardless of variations in power requirements.

In an emergency the air stream is diverted over the propeller blades, and in less than two seconds the pump will deliver sufficient hydraulic power to operate the flight control surfaces necessary to fly and land the aircraft.

Aeroproducts also delivered emergency ram air driven generators to Douglas Aircraft for installation on the Navy's Douglas A4D Skyhawk. As with the hydraulic pump, the generator is driven by a two-bladed variable pitch propeller incorporating a simple governor which maintains a constant rpm of the generator rotor. The power output of the generator is sufficient to operate flight control surfaces necessary to fly and land the aircraft, and to electrically operate instruments and other electrical equipment necessary for flight. Its practicability has been demonstrated many times in flight testing. Although it was designed to meet the aircraft industry's need for a dependable light weight emergency power source, this generator design is particularly adapted to other applications such as high speed tow targets and drones.

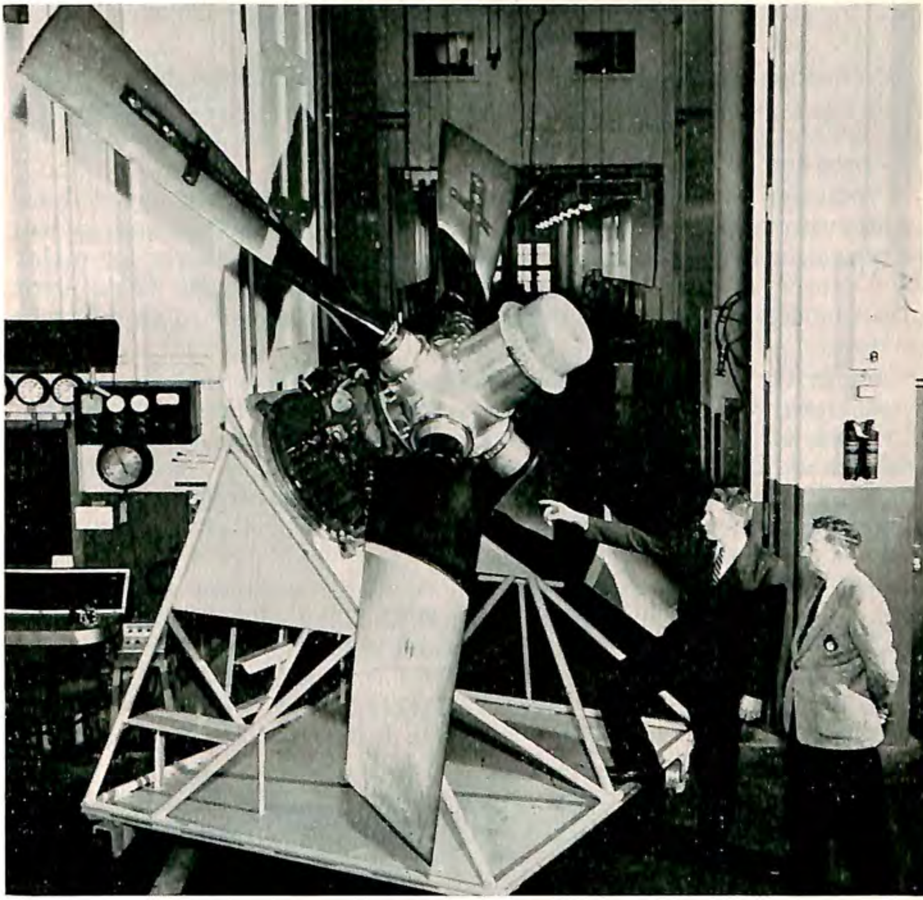
The experience which Aeroproducts has had in research and development in the field of aerodynamics and propeller governing systems has been directly applicable to the design of ram air driven power units.

A ram air driven emergency power unit with four automatically controlled variable pitch propeller blades has also been developed by Aeroproducts. This power unit has been specifically designed for application on a new high performance jet aircraft, and is capable of developing 44 hp at a constant driveshaft rpm. With propeller blades 22 inches in diameter, the unit is adaptable to driving either electric generators or hydraulic pumps.

Hamilton Standard Div.
United Aircraft Corp.

Hamilton Standard during 1955 continued producing aircraft equipment and Hydromatic propellers for commercial and military aircraft.

About one-third of the company's factory space was devoted to production of equipment during the year.



Hamilton Standard's turbo-hydromatic propeller

In the commercial propeller field, deliveries of the 43E60 reversing Hydromatic propellers continued for Douglas DC-6A's and DC-6B's, Convair 340's and Lockheed 1049 Super Constellations. Deliveries continued also on the 34E60 reversing Hydromatics for Douglas DC-7's and DC-7C's and 22D30 feathering Hydromatics for Beech D-18's.

In the military field, propellers were in production for the Lockheed C-121C, R7V and other versions of the Constellation; the R6D and C-118 versions of the DC-6; the Boeing KC-97F; the Fairchild C-123 and the C-119F version of the Packet; the North American AJ-2 and T-28B; Lockheed P2V; Grumman S2F-1, UF-1 and SA-16A; Convair C-131A and T-29B, C and D; and the Martin P5M. Conversion of Navy Beech SNB airplanes from Controllable Counterweight 2D30 propellers to 22D30 Hydromatics brought substantial production of the latter throughout the year. Similar conversion of Beech C-45 airplanes was completed during the year.

Production of the old 12D40 Controllable Counterweight propeller, which was resumed in 1954, continued during 1955. The 12D40 was first designed and produced in 1933 and the reorder was for replacements for Air Force and Navy Trainers.

Production of aircraft equipment items during the year included air conditioning systems, refrigeration units, starters, electronic and hydro-mechanical fuel controls, hydraulic pumps and pneumatic valves for major manufacturers of turbine engines and aircraft. Approximately 40 different aircraft models were using one or more of Hamilton Standard's equipment products.

Late in the year, the division announced that it was rounding out its coverage of the variable displacement pump field by placing in production a line of low-speed, light-weight pumps. Designed to satisfy installations which cannot use the high speed pumps now in production, the new line of pumps will use the latest hydraulic fluids. Already in production is a line of high speed pumps for operation at speeds up to 11,500 rpm and at temperatures of 275 degrees or more.

Turbine aircraft for which Hamilton Standard equipment was either in production or on order included: Boeing B-52, 707, C-97J; Canadair Sabre VI; Chance Vought F7U-3, F8U; Convair F-102, XC-131, R3Y; Douglas F4D, B-66, A4D, A3D-1; Grumman F9F-9; Lockheed F-94C, C-130; Martin XP6M, B-57; North American F-86D and H, FJ-2, 3 and 4, and F-100; McDonnell F-101, F3H; Northrop F-89D and H; Republic XF-84H.

Among the engine manufacturers using Hamilton Standard equipment were Pratt & Whitney Aircraft, Wright Aeronautical, General Electric and A. V. Roe.

Major changes in the production department were made during the year, chiefly as a result of the division's increased activity in aircraft equipment. About 17,000 square feet of production floor space were activated at a branch plant in Broad Brook, Conn. This space was filled with more than 120 pieces of machinery moved from the main plant at Windsor Locks.

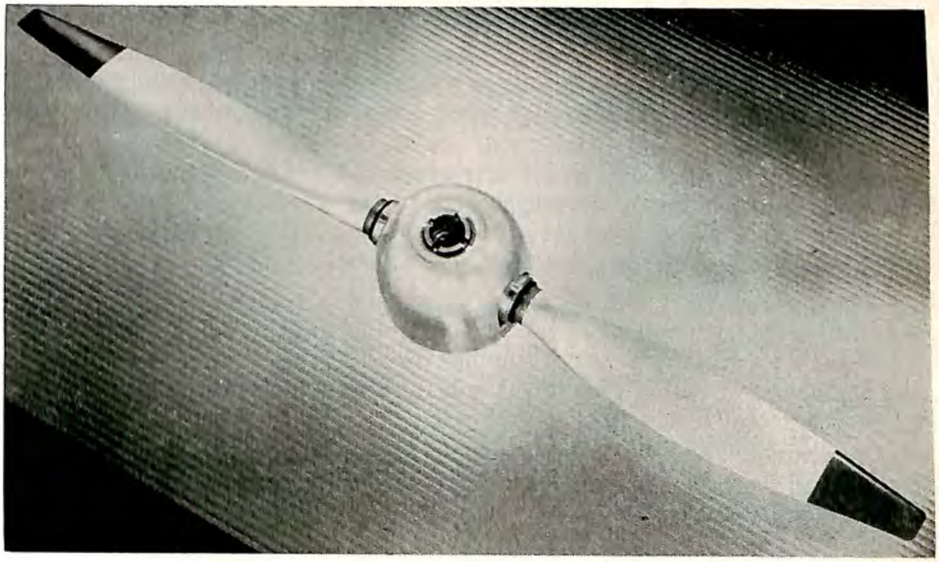
An analogue computer, which supplies in a matter of minutes answers to highly complex design questions, was installed during the year and was the latest electronic engineering tool to be placed in operation at Hamilton Standard. The new computer permits engineers to predict the performance characteristics of a new design under all possible conditions, even before the product is built. With the computer, engineers can simulate extreme conditions of altitude, speed, temperature, pressure and other factors difficult or impossible to set up otherwise.

Development of a large, four-bladed Turbo-Hydromatic propeller designed to operate through the subsonic and supersonic flight ranges was disclosed during the year. Completely new in concept, and in development for the past five years, the propeller attaches directly to the engine, thereby relieving the engine shaft of the propeller's weight and torque. The new principle of mounting was developed by Hamilton Standard and has become standard for all aircraft in the high-power, high-speed range. The installation saves several hundred pounds of weight per engine nacelle over a powerplant combination using the conventional propeller mounting system. The propeller derives its efficiency in the different flight ranges through use of different blade designs. It is intended for installation on large military transports using gas turbine engines of high power.

At the other end of the division's turboprop power range is its development of a Hydromatic type propeller suitable for medium-powered turbines in the 3,000-4,000 horsepower class.

Synchrophasing, a Hamilton Standard propeller innovation first developed more than ten years ago, was revived last year. Synchrophasing is a scientific system for keeping the propellers of multi-engined aircraft in step with split-second accuracy. It is an electronic method of controlling the propellers to turn at a specified relationship to each other and at the desired relative angle to the fuselage. Indications are that Synchrophasing will make air travel quieter for the passenger, as well as smoothing out the remaining sound to make it more acceptable to the ear. Thus far the development has been flight tested on a Lockheed Super Constellation, a Convair 340, and a Douglas DC-7, and is scheduled for test on a Pan American World Airways Boeing 377 and a United Air Lines Douglas DC-6. It was also scheduled for installation on Howard Hughes' executive 1049G Super Constellation. Its first airline application will be for a fleet of Lockheed 1649A Super Constellations ordered by Trans-World Airlines.

U. S. Propellers' constant speed propeller



McCauley Industrial Corp.

During 1955, McCauley Industrial Corp., the world's largest manufacturer of metal aircraft propellers for personal and business aircraft, manufactured five basic models. In October, the company announced production of its 50,000th aluminum propeller since 1948.

The fixed pitch McCauley models are for most engines with horsepower ranges from 65 hp to 240 hp, and the two-position aluminum propeller is for a 145 hp engine with a drilled shaft. The McCauley constant speed propeller is available on the Cessna 180.

U. S. Propellers, Inc.

Throughout 1955, principal aircraft propeller production at U. S. Propellers was in the field of target propellers. Large quantities of fixed pitch propellers for the radio-controlled target drones continued to flow from the U. S. Propeller specialized production lines. These propellers are made to government propeller specifications from company designs. Many other propellers were produced as well, such as blades for the Convair 20 ft. diameter wind tunnel, counter-rotating types for Hiller's flying platform, wind tunnel model propellers and special propellers such as for Custer's Channel Wing aircraft, Paul Mantz's World War I aircraft stable and others.

Two other major activities at U. S. Propellers resulted in substantial shipments during the year:

Honeycomb and sandwich construction division produced substantial quantities of contoured honeycomb parts, including adhesively bonded missile fins, aircraft control parts such as ailerons, rudders, tabs, and compound contoured aluminum and fiberglas honeycomb core sections for similar parts.

The maintenance and overhaul division was engaged in production type overhaul and repair of helicopter rotor blades under contract to the U. S. Air Force.

During the year U. S. Propellers expanded into a new building adding some 6,000 square feet of floor space.

Total sales for the fiscal year were somewhat over one-half million dollars, back log at the year-end being approximately $350,000.

During the year, the company developed a technique for compound contouring honeycomb materials by designing and manufacturing suitable machinery for this purpose. A method for rigidizing the honeycomb utilizing frozen water and fabrication in sub-freezing temperatures was perfected to permit actual production of such parts.

A completely self-contained constant speed propeller was produced and tested, and propeller designs for aircraft of higher performance in this field by year-end were in the detail stage for hydraulically controlled constant speed propellers promising the required low cost and high performance.

Completion and satisfactory operation of U. S. Propellers new giant G-4 machine, designed specifically for production contouring of aluminum and other types of honeycomb core material was a major event for the company in 1955. This machine makes available to the industry contoured honeycomb core in any size up to 4 ft. x 10 ft. High precision and high speed production characterize the design.

ACCESSORY MANUFACTURERS

In January of 1955 **Aerodex, Inc.** sold out its Aircraft Overhaul Facility and started a program of expansion on aircraft engine overhaul, modification, and sales; at which time a contract for the overhaul of R-2600 engines for the Air Force was in process at the rate of seven engines a day. In March a complete Accessory and Carburetor Overhaul Shop was installed. The Accessory Shop has received contracts from the Air Force, U. S. Navy and Coast Guard for the overhaul of various types of accessories.

During the first part of the year, additional conveyor systems and material controls were developed, resulting in Air Force contracts to Aerodex for the exclusive overhaul of their R-2600 and R-2800 CA and CB engines with a schedule that made this facility the largest Commercial Engine Overhaul Facility in the country.

At the same time, the overhauled engines for the Air Force were being produced, the commercial outlet for overhaul and sales increased over a hundred percent, and the company served both domestic and foreign airlines.

Marking its 27th year in the aircraft industry, in 1955 **Aeronca Manufacturing Corporation** of Middletown, Ohio, added two new divisions: the Industrial Research Laboratories (IRL), Baltimore, Md., and the Aircraft Maintenance Division, Ft. Rucker, Ala.

The IRL Division, engaged in basic and applied electro-mechanical research, had government contracts for research and development of flight simulators, electronic error indicators, telemetering and other electronic defense mechanisms. Among these were types which supply electronic "thinking" to govern the performance of guided missiles, determine errors, and reproduce flying conditions for elaborate training devices. In addition to its defense contracts, the new division was engaged in commercial contracts and held a number of patents on electronic devices.

Following the award of a contract for maintenance of U. S. Army aircraft at Ft. Rucker, Ala., Aeronca set up its new Aircraft Maintenance Division at the airbase, headquarters of the Army Aviation Center, in July 1955. The division was charged with maintenance of the approximately 300 fixed-wing aircraft and similar number of helicopters stationed there for training at the Fort's Army Aviation School.

Emphasis was placed on research and development at Aeronca's main plant in 1955, and facilities were expanded with the addition of a Research and Development Department where extensive research progressed on stainless steel honeycomb brazing. The company also added metal bonding to its production.

The bulk of the company's work, subcontracts for production of major airframe components, was done in the three Middletown, Ohio, plants where an approximate 2,000 people were employed. The two new divisions, with Aircraft Maintenance at Ft. Rucker adding 1,000 employees, swelled Aeronca's employment to over 3,000 in 1955. Construction was underway on a new manufacturing building of 50,000 square feet adjacent to the main Middletown plant.

Aeronca's backlog in 1955 was over $30-million with sales for the year of an estimated $20-million.

Air Associates, Inc., Teterboro, N. J., with three divisions engaged in the development and manufacture of electronic equipment and aircraft control mechanisms, and the distribution of aviation supplies, in 1955 established a fourth division, Facsimile Equipment Division, to manufacture the company's new facsimile communications machine. Known as the Electronic Messenger, the machine transmits-receives exact copies of typed, printed or written matter over telephone, closed, or micro-wave circuits to companion machines in other plants, offices, cities or states.

In its Aircraft Products Division, during the year a standardization program on fractional horsepower motors resulted in a new line of a-c and d-c motors for aircraft and related applications. Also, an electromagnetic a-c clutch-brake, a unique item that operates without rectifier or slip rings, was developed for use with 400 cycle a-c induction motors.

The Air Associates' aircraft seat belt, used by most major world airlines, was redesigned to incorporate a new personalized buckle and nylon rayon webbing. Other new products included a 2-inch diameter a-c generator, a twin-screw actuator and several new linear and rotary actuators.

The company also acquired rights as exclusive manufacturer of a new single-axis automatic pilot, the Dart I, a light-weight, low-cost, simple, compact unit for light and medium-weight aircraft. Dart I is dependent neither upon electronics or hydraulics for operation.

The Electronic Equipment Division in 1955 produced the following new products: a high-performance 1-kw, vhf-uhf amplifier, boosting 100 watts to 1,000 watts and used for ground to aircraft communication; a liquid-sensing control, an extremely sensitive device consisting of a probe (containing a tiny thermistor) and an electronic relay which detects the presence of liquid in less than one second and the absence of liquid in less than five seconds. Application is for aircraft and industrial fluid systems. Also developed by the company was the "Talking Beacon," a vhf navigational device.

In 1955, **Aluminum Company of America** announced: new forging facilities for producing one-piece aircraft structural members; widest hot sheet rolling mill in the aluminum industry; world's; largest aluminum plate stretcher and heat-treating equipment; a new high temperature alloy; and a new aircraft-airframes department to expand the development of aluminum and magnesium forgings and castings. During the year Alcoa's production of primary aluminum increased approximately 5.5 percent.

Probably the most important development of 1955 was the dedication at Alcoa's Cleveland works of the 35,000-ton and 50,000-ton presses, representing the first completed forging facility in the Air Force's heavy press program. Massive airframe parts, shaped to close dimensions for high performance aircraft, are forged in one piece on the giant presses. This advance in the production of large structural members greatly reduces the machining and assembly costs formerly encountered in building members from individually forged and machined components.

Installation of the widest hot sheet rolling mill ever designed and built for the aluminum industry was started at the Davenport, Iowa, works in May, 1955. The capacity to roll sheet 160 inches wide will permit the introduction of larger ingots, and will meet the demand for increased widths in aluminum sheet and plate required for modern aircraft.

Also at Davenport, Alcoa planned to install the world's largest aluminum plate stretcher. Capable of exerting a pull of 16-million pounds, the new stretcher will make possible the production of heavy, heat-treated aluminum plate in record-breaking sizes for aircraft. In conjunction with the stretcher, the largest heat-treating equipment in existence will be built to handle plates 60 feet long, 144 inches wide, and 6 inches thick.

In the field of new alloys, Alcoa developed X2219—a high temperature alloy offering improved properties in forgings and extrusions up to 550° F. Higher heat resistance makes this alloy valuable for applications in and near aircraft engines.

During 1955, Alcoa announced expansion programs for its works in Wenatchee, Washington, and in Rockdale and Point Comfort, Texas. This program was expected to increase the company's primary aluminum production by 5 percent during 1956.

A new aircraft-airframes department was created in the Cleveland, Ohio, sales development division to concentrate on the further development of aluminum and magnesium forgings and castings for the aircraft-airframes industry.

During 1955 **Avien, Inc.,** Woodside, N. Y., continued to manufacture capacitance fuel gages and fuel management systems, and accelerated its expansion into other fields of instrumentation for aircraft and industrial application.

In fuel gaging the year was marked by full scale production and volume deliveries of the company's two-unit lightweight gaging system. These advanced systems have been specified for a number of Air Force and Navy aircraft, including the F89H, A4D and the Army's H-34. In a number of these systems, Avien used its Thervel Liquid Level Switch to provide fuel level control, tank switching, CG control and overflow warning.

Early in the year, the company introduced its transistor fuel gage. Combining transistor circuitry with a new drag cup servo motor, the system offers further improvements in system weight and simplicity, featuring an indicator-amplifier measuring less than 5 inches in length, and providing a response time of only 5 seconds. In addition to application as a fuel gage, the transistor system has been specified for gaging oil quantity.

The company also moved into production of its integrating flowmeter. Measuring mass flow from tanks to engines, the flowmeter utilizes a velocity servo to integrate this measurement with time, indicating fuel remaining by means of a digital counter presentation. A second type of flowmeter, providing rate-of-flow indication and combined with a totalizing system for multi-engine aircraft was also introduced during the year.

Aircraft Radio Corporation, Boonton, N. J., manufacturer and designer of navigation and communication equipment, flight instrumentation, and related test equipment, for aircraft and ground use, extended its production activities in 1955 to meet the ever-increasing demands for lightweight, diversified electronic equipment.

During the year, the company introduced and put into production its Type CD-1 Course Director, a new instrumentation system which provides the pilot with steering information for precise instrument approaches, as well as highly accurate en-route-tracking on omni and vhf visual-aural ranges.

Also made available was the space-saving Type IN-10 Course Indicator. This is a single flight instrument which combines in an equal-size case the functions of ARC's No. 13310 Cross-Pointer Meter and its No. 15453 Course-Selector/To-From Meter. The compactness of the IN-10 makes it particularly suitable for use in dual-omni installations.

Aircraft Radio Corporation added to its Type 12 Equipment a uhf transmitter-receiver converter, designated as the TV-10 UHF Transverter; a K-13 Oscillator-Relay Unit, which permits precise tuning of a vhf receiver to a vhf transmitter crystal output frequency; and inverted-L vhf and uhf antennas for low-ground-clearance aircraft, with the added factor of use under heavy icing conditions.

An outstanding engineering development was the design of a lightweight, space-saving ADF system, to be known as the Type 21 Automatic Direction Finder; production is scheduled to start early in 1956.

A Beechcraft Twin Bonanza was added to its present company-owned, single-engine Navion and Bonanza airplanes. A complete complement of ARC navigation and communication equipment has been installed in the new airplane. With this addition, improvements in its on-the-premises flying field and hangar facilities have also been made.

In the process of construction, with completion expected in March, 1956, is a new engineering building of approximately 18,000 square feet. Upon completion, the present development and research area will be used to extend production facilities.

In addition to its activity in fuel gaging, the company also went into volume production of its Temperature Indication System for exhaust gas and turbine-inlet temperatures.

The company also entered the electronics components field with its "k-Volt Standard," a d-c reference voltage source for measurement and control circuits. Developed originally as the reference source for Avien's Temperature Indication System, the unit offers extreme stability of output with temperature and time.

In addition to four plants in the Woodside area, Avien operates a wholly owned subsidiary, Control Laboratories, Inc., in Great Neck, N. Y., where basic research and development work on instrument systems is carried out. A sales and service branch, Avien Service Corporation of California, is maintained in Culver City. At the year's end the company was completing an extension to its Woodside engineering and administration facility, adding 11,000 square feet to its plant area. The new wing will house enlarged test engineering and service school facilities.

The **B. G. Corporation,** Ridgefield, N. J., during the year received CAA approval for a new long life platinum electrode spark plug with an all weather top. This spark plug, Model RB39R, is approved for use in all Pratt & Whitney R-4360, R-2800, R-2000, and R-1830 engines. Development also continued on non-platinum long and short reach spark plugs.

During the year, the corporation continued to manufacture ceramic terminal sleeves, and spark plug and ignition harness test sets for use in conjunction with piston engine operations.

In the gas turbine engine field, the B. G. Corporation supplied all of the principal large and small gas turbine engine manufacturers with igniters, thermocouples, and thermocouple harnesses. Progress was made in the development of semi-conductor igniters for use in high energy low tension ignition systems.

In 1955 the firm expanded its line of special alumina ceramics for the electrical and electronics industries.

During 1955, Eclipse-Pioneer Division, **Bendix Aviation Corporation,** Teterboro, N. J., concentrated fully on the design, development and manufacture of products in the three major areas of aircraft systems, aircraft instrumentation, and components for aeronautical applications.

Highlight of the division's systems effort during the year was the completely transistorized Automatic Flight Control System. Although prototype systems had been flown successfully during 1954 in the division's B-25 Flying Laboratory, and a preproduction model had been delivered to the military for evaluation purposes, 1955 saw this new concept for control of high-performance aircraft go into production, backed by orders from the military as well as commercial airline operators. Whereas previous autopilots had been of more or less "stock" design and installed in an aircraft as accessory equipment, development of the PB-20 was coincidental with and very carefully engineered into the basic performance requirements of high-performance aircraft.

Progress was also made at Eclipse-Pioneer in the area of central reference systems for aircraft. One of the outstanding developments was the successful production design of a 3-Gyro Stable Platform weighing only 27 lbs. and consuming only a half cubic foot of space. Designed for use as a master gyro reference, the 3-Gyro Stable Platform was capable of replacing all vertical and directional gyros used for such functions as indication, autopilot control, fire control, radar stabilization, navigation. While designed for an application that required it to be slaved to vertical, it could also be used as a free platform.

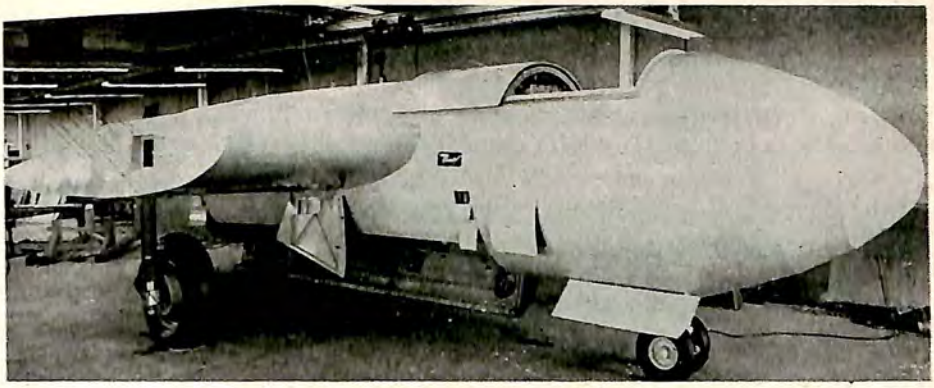
Work on Air Data Computers also was inspired by the increasing trend toward central intelligence centers. With the advent of supersonic speeds and more flight functions depending upon accurate measurement and use of air data, new obstacles to the old methods of obtaining this information were presented. And whereas such functions as Mach number, true airspeed and altitude were once adequate, many new functions such as relative air density and true angle of attack were additionally being demanded, as well as increased accuracy of all functions. Eclipse-Pioneer's development of an Air Data Computer System to satisfy all of these requirements was based on a modular design consisting of a basic unit with interchangeable multiple drive assemblies.

Another product announced during 1955 was the Bendix Flight Director System. Featuring two 4-inch diameter flight indicators, the system reflected latest requirements of the aviation industry for simplified and consolidated display of flight performance. One instrument known as the Flight Path Indicator combined omni-bearing selection, VOR or localizer and glide slope reference as well as compass heading, to replace three previously required indicators. The other, known as a Flight Director Indicator, provided attitude reference and coordinated turn indication, as well as computed pitch and bank command. The command function of this instrument could be used by a human pilot in flying his airplane to a radio reference such as an ILS approach system or an Omni-Range network, or could be used as a reference to monitor performance of an Automatic Flight Control System.

Many different types of navigational Computers were developed by Eclipse-Pioneer during 1955. One of these was a small, lightweight, compact Course Line Computer designed for console mounting. Another was a miniaturized dead reckoning type of Rho-Theta Computer. With distance and bearing of desination, plus wind force and direction set into the control panel at the start of a flight, an indicator showed ground track and miles remaining to destination throughout a flight. If destination was changed during flight, the human pilot merely set new data into the control panel and immediately obtained new bearing and range information on his indicator.

Also in 1955 the division produced a number of new corrosion-resistant, high-temperature, miniaturized devices. Most interesting of these were the "penny" size servo motors and motor generators. Further activity was also continued by the division in the components field.

An extremely unique product that was part of the division's output during 1955 was a B-57 Aircraft Loading Trainer. Built to conform precisely with B-57 electric and hydraulic systems as well as contour, it was destined to provide training for B-57 crews in preflight operation checks



Bendix Eclipse's loading trainer for B-57 aircraft

and bomb load installation procedures. A control panel, located at the outside rear of the fuselage, was used by an instructor not only to check operational technique of the trainee but to insert malfunctions into the loading operation for training the crew in the recognition and reporting of troubles.

Indicative of trends in aircraft systems and instruments other than those such as the central information centers already mentioned, was an increasing demand for integral lighting of individual instruments and a more widespread application of transistors in place of vacuum tubes. By the end of the year Integral Lighting was considered a must in the design of all new instruments and the Bendix design which provided white numerals and graduations against a black background by day, and Identification Red (the color science has proved best suited for sharp readability with a minimum effect on "dark-adapted" eyes) by night, was rapidly gaining recognition for its effectiveness in solving instrument readability under varying conditions of dusk to dawn flying.

The Hamilton Division of Bendix continued in 1955, to manufacture fuel controls for jet engines along with flow dividers, fuel pumps, and other aircraft accessories requiring precision manufacturing techniques and extensive testing. In addition, a program for the overhaul of jet engine fuel controls was expanded.

The Engineering Department continued to develop jet engine fuel controls for engines in the low thrust class and on fuel and hydraulic pumps for both aircraft and missile application.

Several new products were developed as a result of the cooperation between Bendix Engineering and the various aircraft engine and missile manufacturers.

The engineering facilities afforded by the division's new engineering building included complete and modern laboratory equipment for the development of engine and related components. The laboratory is equipped with a jet engine test cell for engines developing up to 5,000 pounds thrust and dynamometer equipment for pump development having power up to 150 horsepower.

Capacitance type liquid oxygen gages were put into production around the first of the year for the first time by the Pioneer-Central Division of Bendix.

Two new oxygen regulators were also placed in production in 1955. Both were the automatic diluter demand pressure breathing kind. Oxygen regulator 2894 is the MD-1 and MD-2 military types. Oxygen regulator 2881 is Type D-2A, the new Air Force standard oxygen regulator.

About 35,000 square feet of additional working space were acquired by Pioneer-Central during the year. In September, a large group of engineers moved into 12,000 square feet of office and laboratory space in a new wing constructed during the summer. Early in 1956, Pioneer-Central activities will expand into a recently purchased plant (the other 23,000 square feet) which lies adjacent to the main building.

Sales and service activities were also expanded in 1955. Previously handling sales and service on just oxygen equipment and ultrasonic cleaners, Pioneer-Central added complete responsibility for sales and service of all flight instruments and flowmeters it manufactures.

Bendix Products Division, South Bend, Ind., continued during the year to design and manufacture Fuel Metering Systems and components for all types of airborne engines, and landing gear shock struts, wheels and brakes for airframes.

Included in new facilities under construction in 1955 were two new fuel test modules valued at $2.5-million. The buildings, under design for a year and a half, will house equipment which will be capable of testing jet engine fuel metering controls and systems to be designed during the next five or ten years. The test cells of each module are designed to simulate conditions of engines of 20,000 pounds thrust and up and record them with laboratory precision.

Another new building nearing completion at year-end housed an extreme temperature test facility with equipment designed to test jet engine fuel systems and fuel system components in present day and future aircraft operation.

Bendix continued the complete fuel systems approach in their research and development activities in 1955. This included hydraulic-mechanical improvement, electronic, and magnetic applications and combinations.

During the year telemetering principles widely used to transmit temperatures and other data from a simple weather balloon or from a guided missile flying miles above the earth were used by Bendix fuel metering engineers as an aid in direct plotting of engine data while the airplane is in actual flight near the mobile ground station.

By means of suitable ground instrumentation housed in a special semi-trailer truck, which can be moved anywhere, and a transmitter in the airplane, dynamic measurement of the various engine parameters such as fuel flow, engine speed, engine temperature, compressor temperature and many others can be plotted instantly and accurately.

Voice radio communication is maintained between the transmitting location and the receiving location so that the test operation can be directed from the ground station. This permits coordination of the test on the basis of data already taken. This equipment designed by Bendix to measure aircraft engine parameters can be readily adopted for use in many other industries where the presentation of data on an instantaneous basis is desired.

In 1955 Bendix Radio Division became the only electronic manufacturer in the world to offer both X-band (3.2 cm) and C-band (5.5 cm) airborne weather radar systems in its product line. Addition of the C-band system this year gave Bendix Radio customers a choice of frequency dependent upon the operational requirements of the user and the nose configuration of the aircraft.

In November it was disclosed that more than 110 RDR-1 systems had been sold to business aircraft owners and airlines, including Panagra, National, Northwest, and Eastern.

Simultaneously, as a result of more than 14 months of evaluating performance of airborne radar in regularly scheduled flights and under all possible weather conditions, the Radio Division announced up-to-the-minute improvements in the equipment during the annual meeting of the National Business Aircraft Association, in Detroit. Included were a new ½-ATR synchronizer-power supply unit, 27 pounds lighter and using 13 tubes less than its larger predecessor, and a 30-inch X-band antenna which can be switched from pencil beam (for cloud probing) to cosecant squared beam patterns.

Bendix Radio also announced the marketing of a new ¼-ATR marker receiver and that Pan American World Airways had bought 15 units for installation in DC-7 aircraft. A crystal-controlled superheterodyne receiver which operates on a fixed frequency of 75 megacycles, the MKA-7 marker receiver features improved circuitry that greatly reduces the chance of television or FM interference and serves to stabilize gain under wide ranges of environmental conditions and line voltage fluctuations.

Another addition to the aircraft radio line was the TA-20 vhf airborne transmitter. Designed as a companion piece for the RA-18C communications receiver, the ½-ATR transmitter is designed to provide crystal-controlled operation on 360 channels spaced 50 kilocycles apart.

The first use of transistors in communications gear for airline and executive aircraft use was accomplished with the development of the CNA-2 audio control panels. Initially available in two models which differ only in configuration, the CNA-2A and CNA-2C units emphasize functional design through the use of three different types of switches: illuminated pushbuttons for transmitting, a rotary switch for filter selection, and toggle switches for receiving.

Within the year, a large number of airlines began the adoption of the RA-18 vhf airborne receiver for fleet installation. At one time, for example, four major U. S. air carriers—TWA, Northwest, Pan American, Northeast—ordered a total of 411 receivers, and had planned to order another 200 units within a six-month period. Capital Airlines also selected Bendix Radio equipment for fleet installations in their new Viscounts.

Also started was a new $2-million engineering building being built adjacent to the main plant, near Towson, Md. The two-story structure will provide Bendix engineers with an additional 100,000 sq. ft. of floor space for work on radar, communication and navigation devices, and other projects with heavy emphasis on commercial development as well as advanced military research and development.

During 1955 Scintilla Division of Bendix Aviation Corporation started construction of additions to both its engineering and manufacturing facilities totaling 27,000 square feet.

Several new developments in ignition analyzers, electrical connectors, and ignition equipment were introduced in 1955.

Ignition Analyzers Nos. 11-3398-1 and 11-4810-1 were placed on the market. The 11-3398-1 was developed primarily for use on Navy P2V-7 and P5M aircraft. The 11-4810-1 ignition analyzer was developed especially for use with small aircraft and helicopters.

The type "QW" electrical connector is a heavy duty, waterproof power and control connector. It was designed principally for missile and radar ground control applications. A potted connector was also developed. With the resilient insert common to Scinflex connectors this series provides excellent moisture and vibration resistance characteristics.

Miniature coaxial connectors were produced for critical signal circuits on miniature equipment. This line features soldered connections to the braid and conductor offering serviceability in this field for the first time.

The Scinseal protected wiring assembly was developed for a wide variety of applications. Scinseal, a thermo-plastic material, is especially effective in providing sealed junctions in leads and harnesses and to seal braided conduit.

A number of harnesses for jet engine controls and several new ignition systems for jet, turbo-jet, turbo-prop, and small gas turbine engines were also developed by the Scintilla Division.

During the summer of 1955 the Utica Division of Bendix, with the cooperation of Air Force personnel, arranged with the famed Thunderbirds to demonstrate their precision flying skills at Griffiss Air Force Base, Rome, N. Y. A total of 30,000 people attended the event. The Thunderbirds fly the Republic F-84F Thunderstreak which is equipped with one of the Utica Division's fuel air combustion starters as well as 29 other Bendix products.

During the year, the Utica Division had in production a new type combustion starter for the J-57 engine. A new fighter aircraft for the Air Force now in production will be equipped with this new member of the fuel air combustion starter family.

Also in production in 1955 was a new type constant speed air turbine driven alternator for a fightercraft, and a new type air turbine driven fuel pump for high speed missiles as well as high temperature 3,000 psi variable displacement hydraulic pumps. An air conditioning and pressurization system which will be incorporated into high speed aircraft was also under development.

In order to keep pace with both development and production engineering advancements, Utica expanded its facilities in 1955. The building covers an area of 11,205 square feet and increases its testing potential approximately 850 percent.

Pesco Products Division, **Borg-Warner Corporation,** Bedford, Ohio, in 1955 expanded its facilities by 25,000 square feet to provide additional space for the Service Department, and to house a new model shop for building prototype models of the various aircraft fuel and hydraulic pumps, axial flow blowers, and special application electric motors designed and manufactured by the company. The plant addition also provided a new location for the growing Research and Development group, with increased space and facilities.

A new line of axial flow blowers was introduced during the year. Designed by Plannair, Ltd., these blowers have been accepted and widely used by the British aircraft industry and are now manufactured by Pesco under an exclusive license. Presently engineered are models from 16 to 750 cfm, with larger sizes in development. The patented aerodynamic design results in higher flow and/or pressure than other blowers of comparable size and weight.

The development of plug-in and line-mounted booster pumps continued, and a line of 400 cycle a-c booster pumps powered by Pesco electric motors was developed for delivery of 1,000 to 40,000 pounds of fuel per hour.

Also developed during the year were a pump for propyl nitrate, one for red-fuming nitric acid, and a nuclear coolant pump.

Champion Spark Plug Company, Toledo, Ohio, for the eleventh consecutive year, sponsored its Aircraft Spark Plug and Ignition Conference in Toledo in 1955. Nearly 200 representatives of world airlines, the armed forces, aircraft engine manufacturers and suppliers to the aircraft industry attended the three-day session. Among discussion subjects were spark plug service experience, spark plug fouling, the effects of fuel and lubricants on spark plugs, reconditioning, tests and inspection of spark plugs, research and development in the ignition and spark plug fields, ignition analyzers and jet ignition.

The year 1955 also saw the development and the acceptance after tests of Champion's AA14S spark igniter for jet engines. Incorporating the latest developments in high temperature ceramics and heat resistant alloys, the AA14S has a unique construction designed to provide long operational life at lowest cost.

The 2,500 employees of the **Cleveland Pneumatic Tool Company** located in three plants, continued during the past year to design and manufacture aircraft landing gears and ball-bearing screw mechanisms for military and commercial use by major airframe companies.

A separate actuator division was established in a separate plant, exclusively engaged in the production of these products. During the past year, several new types of testing equipment were added to the present battery of testing devices in this division.

Cleveland Pneumatic was commissioned during the year to design and manufacture ground-handling equipment for the handling and loading of bombs and guided missiles. Two of these projects were completed and others are in production.

The company continued to supply many unique services for the aircraft industry in the field of flash butt welding, high heat treating, and precision machining. Progress was also made in the field of high heat treating. Parts can now be strengthened to 280,000 psi in alloys that only a few years ago were limited to 180,000 psi. Weights are being reduced without reducing strength, or strengths can be increased without "beefing up" the size and weight of parts.

The precision machining operations of the company which include every type and variety of machine needed for precision manufacturing of aircraft parts were supplemented by the addition of eight Kellering machines.

The company continued to search for new materials and following its initial research in the field of titanium which began in 1953, the company completed the country's first titanium landing gear. This work continued during 1955 and included the fabrication of other titanium air components.

During 1955, **Connecticut Hard Rubber Co.,** New Haven, Conn., produced de-icing units, aircraft seals and components at a rate slightly above 1954. The number of employees increased 11 percent. Backlog, dollar volume of sales increased and required considerable new equipment.

The company developed a new series of heat stable silicone rubbers with tear and tensile strengths nearly double commercial silicone rubbers for sale in 1956. Also developed was a line of fabric reinforced silicone rubber seals for pylon, body and external aircraft seals that have proved useful where abrasion is too great for plain silicone rubber extrusions.

Another major development was an inflatable silicone rubber canopy seal for a new day fighter that is in production and has proved to be the answer for low temperature service as well as its complete resistance to ozone cracking.

In production in 1955 were silicone rubber seals with a film of Teflon bonded over the surface which proved useful for sliding surfaces and gave protection to the rubber from fuels and hydraulic oils.

The **Dow Chemical Company** of Midland, Mich., in addition to being a supplier of primary magnesium metal and alloy ingot to various aircraft foundries and other magnesium fabricators, produces magnesium sheet, plate, extrusions and tooling plate. A new 13,200-ton extrusion press was being assembled by the company at year end.

In 1955 Dow introduced a new magnesium base thorium-zirconium alloy for use in the 300-700° F temperature range. It is available in the form of sheet, extrusions and castings. Prototype missiles, ramjet engines, highspeed aircraft and aircraft components have been built with this material, and the first quantities for initial production have been shipped.

Military use of Dow 17 and HAE anodize treatments during the year expanded the aircraft and radar applications of magnesium by providing superior corrosion protection. The development of chemical etchants for magnesium indicated it will be one of the easiest metals to chem-mill.

The growing importance of in-flight refueling in 1955 saw much of the development and production activity of refueling equipment centered at the new plant of **Flight Refueling Inc.** at Friendship International Airport, Baltimore, Md.

Entering the year with a backlog in excess of $7.8-million, production, engineering, and test activity was increased as rapidly as possible in the new facility of the company which had moved from Danbury, Conn., to Baltimore in 1954. By the end of 1955 employment had reached approximately 300 people including an engineering staff of 75.

Main production during the year was concentrated on the A-12 hose reel unit used by the Navy in the North American AJ tanker and to be used with B-50 tankers of the Tactical Air Force. Production was also stepped up on a variety of other equipment for refueling including the A-1 nozzles and A-3 couplings for Navy use and the MA-2 nozzles and coupling for the Air Force.

During the year the U. S. Navy announced that all of its new carrier-based fighters were being fitted to receive fuel in flight by means of the Probe and Drogue system developed by Flight Refueling Inc. The ability of the system to be used remotely on wing tips to permit multiple refueling of three fighters at one time also figured in TAC's decision to adopt Flight Refueling equipment for its tanker program.

Early in the year the company unveiled to the public its test facility where complete refueling systems can be tested under all types of simulated flight conditions.

Sales for 1955 totalled approximately $4.5-million.

The **Garrett Corporation** of Los Angeles continued, in 1955, to be a major manufactures of aircraft accessories and components, through its AiResearch Manufacturing Divisions in Los Angeles and Phoenix; but the corporation widened its activities extensively in the aviation field and elsewhere, by continuing a large scale expansion program.

The corporation as of Oct. 1, 1955, had increased in size from seven divisions and two subsidiaries last year, to nine divisions and three subsidiaries this year.

In 1955 at AiResearch Manufacturing in Los Angeles, the year saw a heavy 600 percent volume increase in the manufacture of transducers, which are used in air computing systems and other electronic systems necessary for the operation of present day turbojet aircraft. Among other items turned out in volume were electric actuators, cabin air compressors, cooling turbines, air data systems, oil temperature regulators and miscellaneous valves. At AiResearch Manufacturing in Phoenix, the dollar value of products shipped from Arizona, excluding those subcontracted for Los Angeles, amounted to a 76 percent increase over last year. Products included six types of gas turbines, seven types of air turbine starters, three types of air turbine motors as well as pneumatic valves and controls, electronic and electrical equipment.

Expansion, both in additional space and new facilities for the Garrett Corporation, was considerable in 1955. Outstanding was the vast new Production Test Facility at Sky Harbor Airport, Phoenix, Ariz. Here the major aircraft accessories and components manufactured by AiResearch are thoroughly mass-tested as they roll off production lines and go into service, after having been operated at simulated altitudes up to 70,000 feet and at temperatures varying from 80° below zero to 1,000° F.

A new Garrett Corporation headquarters was built—a $1.3-million project—in Los Angeles, adjacent to the AiResearch-Los Angeles plant and offices. The new headquarters occupies 82,000 square feet of floor space and gives an additional 258 feet of frontage to the AiResearch building as it has been constructed to appear as one building with AiResearch. These other facilities, includig the new giant test facility at Phoenix, plus additional office construction, are all part of a $5-million program of major additions planned by the Garrett Corporation, to be finally completed on or about June 30, 1956.

Consolidated sales for the corporation were $103,393,450, the highest in the corporation's history, and an increase of 2.2 percent over 1954's record high. The current backlog amounts to approximtely $98-million, having held fairly close to this figure for the past year. About 11 percent of this is for commercial products, and the remaining 89 percent is for military end use products.

Employment in the entire corporation stands at approximately 7,600 people.

General Laboratory Associates, Inc., Norwich, N. Y., through 1955 were consistent in their expansion of research, engineering and production of high energy ignition systems for turbo-jet and turbo-prop engines. 1955 was highlighted by design and production of a lightweight compact ignition system for use in the small turbine field. This ignition system has extended the high energy level to all turbojet and turboprop engines in practical size for each particular application.

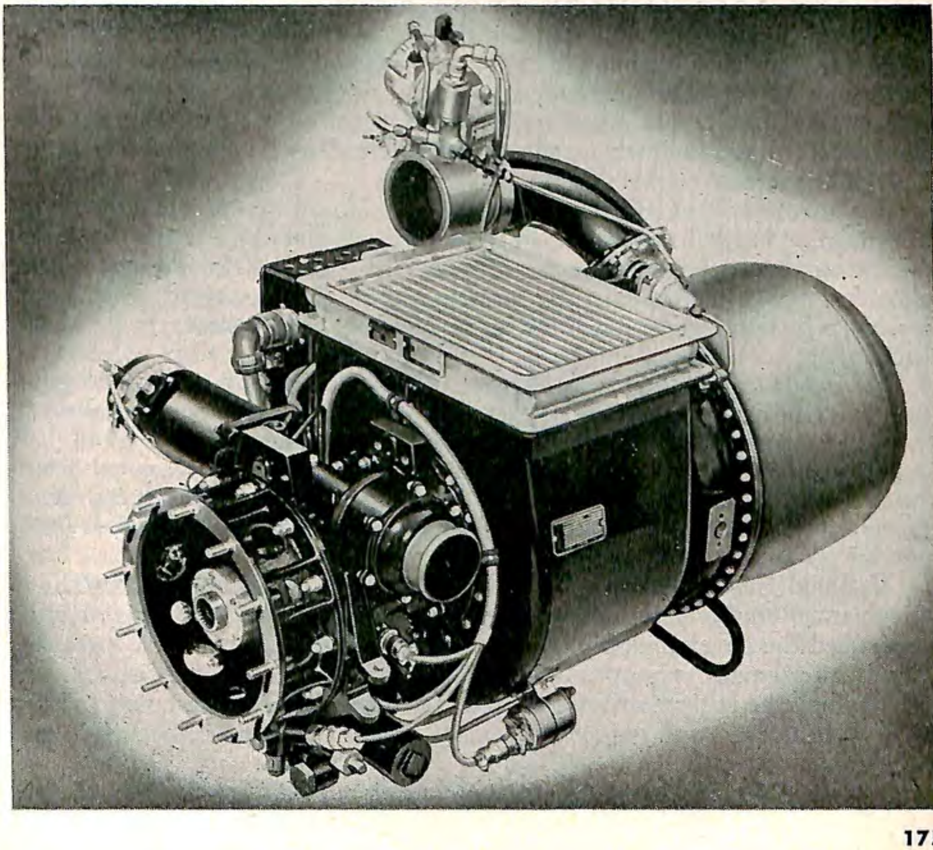
The improvement of ignition devices for operation at extremely high temperature was a major activity of the company during the year. Special ignition devices for varied requirements were also engineered and produced to meet the needs of an ever expanding sphere of activity in the development of turbojet and missile engines.

Outstanding events and developments that occurred during 1955 for **Harvey Aluminum,** Torrance, Calif., included: entrance into the primary aluminum industry, installation of USAF Heavy Press facilities, over-all expansion of production facilities, new techniques for the production of extrusions in high-strength titanium and steel alloys.

Also during 1955 the company resumed construction of a \$65-million aluminum reduction plant at The Dalles, Ore., annual primary capacity will be 54,000 tons.

In 1955, Harvey completed the buildings housing the Air Force Heavy Press equipment. Installation of the new 12,000 ton and 8,000 ton hydraulic extrusion presses will be completed in 1956. The 12,000 ton unit is the largest extrusion press ever built in the U. S. It will enable Harvey to produce aluminum alloy extrusions of unprecedented size, weight, and length dimensions for aircraft and missiles. The huge press will extrude aluminum alloys into shapes up to 80 feet long and 25½ inches wide; and by utilizing special fabricating methods, Harvey will be able to produce panel-type shapes in single sections as wide as 60 inches. While the extrusion presses are being installed, Harvey engineers have been working with the aircraft industry on design studies concerning the utilization of heavy press extrusions. Auxiliary equipment being readied for installation in-

Garret Corp.'s gas turbine compressor power unit



cludes two hydraulic stretch-straighteners of 3-million and 1.5-million pound capacity.

Another highlight during 1955 was the perfection of no-draft, precision forging techniques, enabling Harvey to become one of the major airframe suppliers of aluminum press forgings. The expansion of the impact extrusion division and the development of new methods for the production of complex, close-tolerance impacts were other accomplishments.

Other developments by the company were the production of titanium alloy press forgings; and the fabrication of titanium and steel alloy extrusions on a production basis. The availability of production titanium extrusions allows airframe manufacturers to incorporate the performance characteristics of extruded titanium sections in production aircraft. With the installation of vacuum double-melting furnace equipment for the production of titanium alloy ingot, Harvey Aluminum emerges as the only integrated facility devoted to the extrusion and forging of titanium alloys for aircraft.

During 1955 **Hoffman Laboratories, Inc.,** wholly owned subsidiary of Hoffman Electronics Corporation, continued its research, development and production activities in the areas of airborne navigation, communications, radar, guided missile systems and electronic countermeasures.

Initial shipments were made during the year against government contracts for TACAN equipment. Products delivered included the ARN-21 airborne navigational equipment and related test units developed by Hoffman. The company has also been engaged in active research and development work aimed at further refining and increasing the capabilities of the TACAN system.

An intensive research program in the field of multi-color radar presentation resulted in the development of the Hoffman color system and the introduction of an experimental color cathode ray tube of the 2-gun, 2-color phosphor type for use in radar presentations. Development of a 3-gun, 3-color tube for radar scope and other presentation systems is presently under way.

During 1955, research was also carried on in the fields of missile guidance and control, ground surveillance radar and electronic countermeasures.

An expansion of Hoffman Electronics Corporation was effected in July by the acquisition of the National Fabricated Products and National Semiconductor divisions of the company. National Fabricated Products, headquartered in Chicago, produces electronic components and is the first commercial producer of silicon solar batteries.

National Semiconductor Products, located in Evanston, Ill., produces silicon junction diodes and other semiconductors. Late in 1955, this division announced the development of a silicon power rectifier capable of operating at ambient temperatures up to 200° C. This new power rectifier is expected to overcome the limitations of selenium, germanium and the vacuum tube in supersonic aircraft and guided missiles at a major savings in both size and weight.

During 1955, **Hydro-Aire, Inc.,** Burbank, Calif., supplied its Hytrol

Braking System equipment to three of the nation's largest aircraft builders for their latest jet aircraft. Republic Aviation Corporation is installing the system on its RF-84F Thunderflash; Douglas will equip all A3D Skywarriors and B-66's with Hytrol; and North American will use the system on its F-100. Already Hytrol equipped are the B-47 and the B-52. Hytrol is designed to assure smoother, shorter landings, provide savings in tire wear and prevent dangerous skids and blowouts on ice and rain-covered runways.

Hydro-Aire's line of HY-V/L (for high vapor-liquid ratio) fuel booster and transfer pumps were produced in volume during 1955. The basic pump design differs from the conventional fuel booster in that it handles the fuel vapors by integration rather than separation. HY-V/L pumps have been specified for the B-52, the F-100, the F8U-1, the Regulus Guided Missile and other applications.

The company also developed this year a "complete package" turbine-driven fuel booster pump for high performance jet aircraft. This unit combines a new accessory-drive turbine with the above-mentioned pump design. The turbine-driven fuel booster pump is now out of the development stage and units are in full production for a new Douglas airplane and another unit is being built for evaluation by North American, Columbus.

Electro-Aire, Incorporated, manufacturer of fractional horsepower motors for aircraft applications, became an operating division of Hydro-Aire, Inc., on Dec. 1, 1955. The concern had been a Hydro-Aire subsidiary since 1951. Earlier in the year the transistor production and development facilities of Hydro-Aire were purchased by the Marvelco Electronics Company. Hydro-Aire's Electronics Division continues to do research and development work in the field of transistor applications for aircraft; however, the company will not manufacture or sell transistors as an end product.

Other product developments were a new two-in-one pressure regulator and hot air shutoff valve operating at 1000° F and several other hot air valves for extremely high temperature jet engine applications. A group of new fuel gate valves were also developed during the year and ready for production.

Volume of business during 1955 remained substantially unchanged from 1954. The trend of Hydro-Aire's sales was toward fewer items in larger quantities. Major products as the company moved into 1956 were: Hytrol anti-skid braking system, fuel booster and transfer pumps, hot air valves, fuel valves.

During 1955, **Jack & Heintz** continued to concentrate the major portions of its research, design and development organizations on new alternating-current generators, regulators, control panels, circuit breakers and all ancillary system components. The company received two prime a-c system contracts: the Convar F102A Supersonic Interceptor and the Douglas DC-8 Jet Transport.

The J&H air-cooled system for the F-102A is the first blast-cooled generator proved completely capable of meeting normal and overload requirements at ambient temperatures to 120° C sea level. It has a "Hi-Phase" voltage regulator protecting against phase overvoltage caused by asymmetrical fault conditions including open sensing leads, and a control panel using a new gas-discharge overvoltage detection tube insensitive to acceleration.

Jack & Heintz has also developed special oil-cooled generators to be installed on later F-102 models.

The J&H a-c system for the Douglas DC-8 consists of four constant-speed generators arranged to operate in parallel through a suitable bus arrangement or to operate isolated. Each generator is to be driven from a separate main airplane engine through a constant-speed variable-ratio drive. The system will supply power at 115/200 volts 3-phase grounded-wye 400-cycles for various plane loads. In addition to the generators, Jack & Heintz is also supplying regulators, control panels, generator buses and power relays.

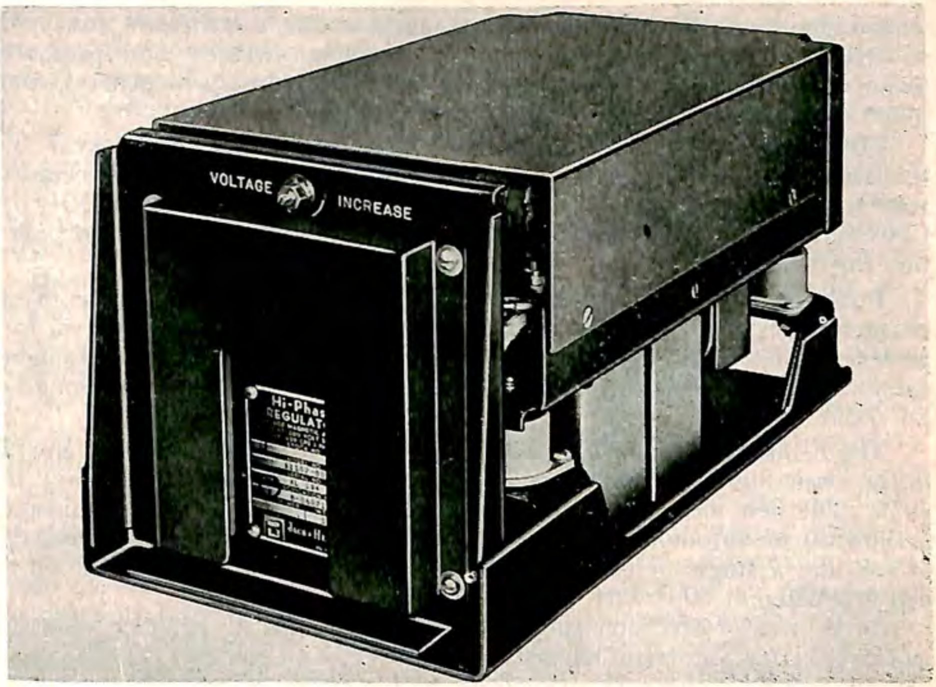
Concurrent with these 1955 developments were: an expansion of the J&H line of air-cooled, oil-cooled and vapor-cooled systems to include ratings from 3 through 160 kva; the development of new high-performance auxiliary components such as transformers, reverse power relays, phase sequence relays and others; and the development of 3,000-va inverters for the airlines. The latter machines—with 20 percent greater output than the largest inverter now available for commercial use—are expected to help airlines speed the expansion of a-c systems to include radar and other new a-c devices.

Total sales for the year were between $30-35-million and the backlog of unfilled orders was approximately $18.5-million. Employment totaled 2,800 and total productive floor space exceeded 600,000 square feet.

Kaiser Aluminum & Chemical Corporation, fully-integrated producer of aluminum and aluminum mill products, marked 1955 by embarking upon an additional expansion program. Following the completion in 1954 of a three-year $230-million expansion of basic production facilities, the 1955 program, requiring an investment of $90-million was directed toward the rounding out of the company's mill fabricating facilities, which supply the aircraft industry.

The company installed at its Trentwood mill (Spokane, Wash.) fully automatic immersion type ultrasonic testing equipment for detection of below-surface flaws in aluminum alloy plate. The unit provides for nondestructive testing of the large dimension aluminum plate increasingly in demand for machined aircraft applications. Ultrasonic inspection, plus the high quality ingot resulting from degassing and metal handling techniques developed by the company's department of Metallurgical Research, made available to the aircraft industry aluminum plate ideally suited to its critical requirements.

As part of the Company's $1.25-million expansion of plate facilities at Trentwood, the present aluminum plate stretcher of 5-million pound capacity, was being rebuilt to exert a 10-million pound pull. An additional



Jack & Heintz hi phase regulator

5-million pound stretcher will be installed. These additions were undertaken in 1955 to enable the company to provide the aircraft industry with a greater supply of critically needed stress-relieved aluminum alloy plate.

During the corporation's latest fiscal year, ending May 31, 1955, net sales were $268,133,000. Net earnings were $28,565,000. The corporation's production of primary aluminum amounted to 813-million pounds. During the first six months of 1955, Kaiser produced 27.4 percent of all primary aluminum produced in the United States.

During 1955 production of precision aircraft and optical instruments and systems and special purpose motors at **Kollsman Instrument Corporation,** wholly-owned subsidiary of Standard Coil Products Co. Inc., maintained a steady pace. The total Kollsman plant employment increased approximately 12 percent, representing production, engineering and office personnel. In November of the year, ground was broken for a new plant in Syosset, Long Island, N. Y., which will cover an area of 157,000 square feet.

In demand through the year, were the Periscopic Sextant, various types of electromechanical flight data computers, the company's line of sensitive altimeters, tachometer indicators and generators, standard and sensitive manifold pressure gages, and many types of special flight research units such as angle of attack indicators and machmeters. Synchrotels and synchrotel transmitters, pressure monitors, pressure switches and pressure pickups, and monitor servos gained wider use in industry in general, and more specifically in guided missile applications.

Following successful results of tests performed early in the year by the Air Force at Wright Air Force Base, Kollsman pressure ratio indicators were adopted by McDonnell Aircraft Corporation for use in the F-101, by Convair for the F-102A and TF-102, and by Republic Aviation Corporation for the F-105.

Put into production was an electric system with proportional control characteristics that introduced a new concept in cabin pressure control for airliners. This small, lightweight system which provides greater passenger comfort with low maintenance will be standard equipment on Douglas DC-7C's.

The Kollsman counter altimeter, marking the first radical improvement in this basic flight instrument, went into production for the U. S. Navy in 1955. The new altimeter registers altitude on a counter the way mileage is shown in an automobile. A two-digit counter shows altitude in thousands of feet and a single pointer makes one revolution per thousand feet on a dial graduated at 50 ft. intervals.

In the area of precision optics, Kollsman continued to produce systems and devices for automatic navigation, many types of sextants, bombsights, anti-aircraft sky sweepers, telescopes, and the sky compass, as well as optical components such as lenses, prisms, reticles, mirrors, hyper- and hypo-hemispherical sighting domes, retro-reflectors and many others.

The company expanded its line of precision motors and developed many new units for special applications. Production of motor-driven induction generators, servo motors and teletorques was especially high.

Research and engineering activities at Kollsman in 1955 were intensified and prototypes of advanced electromechanical-optical systems for the control and guidance of high altitude, high speed aircraft and missiles were supplied to the military and to commercial customers. Effort was directed in the field of automatic navigation equipment and air data computers with particular emphasis on simplicity of design.

Lear, Incorporated, Santa Monica, Calif., estimated shipments for 1955 of approximately $60-million. The backlog increased $8-million during the first six months of the year to $46-million; at the same time the proportion of commercial sales, as compared with military, increased. Acquisition of 25 percent additional floor space brought total square footage to more than 700,000; and employment increased approximately 25 percent by mid-year to nearly 5,000.

Development of the European market for the company's high-precision aircraft instruments, accessories, and electronic products was given intensified significance when a distributor agreement was signed with Dassault of France.

The Grand Rapids, Mich., Division during the year continued development of advanced flight control and stabilization systems. Among important new products announced was the L-10 autopilot for supersonic aircraft, ordered for the first US jet tanker-transport, the Boeing KC-135. The L-10 combines such features as automatic Mach hold, automatic G-control, all-attitude maneuverability, automatic heading selection, command maneuvering optional by control stick or conventional controller, continuous side-slip control, and continuous automatic trim control for all control surfaces. Other products of advanced design developed during the year were a miniature rate gyro, an all-steel displacement gyro, a miniature power unit for remote actuation, and a complete range of thin-package actuators for all types of missile and jet aircraft requirements.

Initial deliveries were made of gyro-stabilized angular reference platforms for the Boeing Bomarc and for other missiles. High volume production continued on vertical gyro indicator systems and various automatic flight control systems. The new Electro-link remote positioning system was introduced for industrial control applications.

The LearCal Division at Santa Monica, Calif., continued quantity production of aircraft radio, automatic stabilization, and navigation devices, including the Arcon automatic rudder control system. Production was started on the Nafli "natural flight instrument" system. Other new products announced during the year were an airline automatic direction finder, electric pitch trim system, sub-miniature loud speaker amplifier for aircraft, and a line of light-weight portable electric power generators.

Developed and produced during the year at the Lear-Romec Division, Elyria, Ohio, were a cooling unit for airborne electronic equipment, piston-type oil-free air pump, and a submerged fuel booster pump for inverted flight. Quantity production continued on military type submerged fuel booster pumps, water injection pumps, engine- and electric motor-driven fuel, oil, hydraulic, alcohol, and ethylene glycol pumps, ground test sets, universal bombsight desiccators, and pressurizing equipment for microwave units operated at high altitudes.

Continuing to make news at the Aircraft Engineering Division, Santa Monica, Calif., was the high-speed, high-performance executive plane, the Learstar. The Learstar was CAA-certificated in the airline transport category at a gross weight of 22,500 lbs. and an increase in gross weight to 24,000 lbs. was later authorized.

This marked the 35th year the **Liquidometer Corporation** of Long Island City, N. Y., has devoted to the development and production of a wide range of tank contents gages and position indicating systems for aircraft, diesel locomotives, industrial and airport storage tanks and surface and undersea marine craft.

In the field of aircraft fuel measurement Liquidometer further expanded the range of control functions which their gaging systems can perform. These include the control of complex fuel sequencing programs and various methods of detecting trapped fuel and eliminating its quantity from the total indication.

New applications were made of the company's Capacitor Type True Weight Gaging System which employs an electric hydrometer known as the Liquidensitometer to directly measure fuel density. Whereas the so-called gravimetric uncompensated and compensated capacitor type fuel gages depend upon the loose relationship between fuel density and its dielectric constant, the True Weight System measures fuel density and volume as two independent variables and multiples them electrically to produce an indication of the true weight of the fuel. As a result, a gage response error of less than ± 1 percent is achieved.

A new remote reading dial type indicator for measuring the contents of airport fuel storage tanks was also announced. Known as the Model 216 Indicator, it contains 20 inches of scales length while occupying a panel area of only 3 x 10 inches. The system is Underwriters approved for gaging hazardous liquids.

In addition to plants in Long Island City, Liquidometer maintains other manufacturing facilities in Bellows Falls, Vt., and St. Johns, Quebec, and overhaul and engineering facilities in Los Angeles and Montreal, Canada.

During 1955 **MacWhyte Co.,** Kenosha, Wis., continued production of Hi-Fatigue cable assemblies, Safe-Lock terminals and Hi-Fatigue aircraft control cable. Lightweight and flexible wire rope slings were also manufactured by the company for use in handling and shipping of aircraft.

MacWhyte also manufactures tie rods for external and internal bracing of aircraft.

Minneapolis-Honeywell began production in 1955 of its newest system, the MB-3 Autopilot, which features control stick steering, for installation in the North American F-100D. With the introduction of the MB-3, Honeywell now is producing autopilots and dynamic stabilizers for all front-line USAF supersonic aircraft—the F100, F-101 and F-102.

In addition to autopilots, Honeywell introduced its precision inertial guidance system for aircraft and missiles. The company expanded its line to include precision inertial gyros and accelerometers and a smaller HIG series for stabilization.

Following its introduction of the transistor fuel gage in 1954, Honeywell followed in 1955 with its fully transistorized Exhaust Gas Temperature Indicator. It also put into production Pressure Ratio System.

During 1955, the company established an Aeronautical Division of Canada, located in Toronto. Ground was broken for an addition to aeronautical engineering facilities in Minneapolis. An engineering facility serving West Coast airframe companies was established in Los Angeles in June.

Honeywell's active research program resulted in advances in the following fields: nuclear propulsion controls problems; improved gyro and accelerometer components for inertial guidance and navigation equipment; utilization of digital computer techniques in control problems of weapons systems; human engineering of helicopter controls; basic instrumentation; hydraulic controls; and non-linear and sampled-data systems.

The **New York Air Brake Company's** Watertown Division, Watertown, N. Y., continued in 1955 as a supplier of both fixed displacement and variable delivery hydraulic pumps to builders of military aircraft, rockets and guided missiles as well as those producing transport and civilian planes.

The Stratopower 65F series fixed displacement pumps and the 65W series variable delivery pumps, both new developments, went into production. These pumps are engineered to meet the aircraft industry's demands for smaller, lighter hydraulic pumps capable of dependable service at higher speeds, higher temperatures and higher altitudes.

Laboratory and test faciilties were expanded to include equipment enabling full evaluation of the new Stratopower 65F series and 65W sreies pumps under high speed, high temperature conditions.

Further progress was made in the engineering of electric motor-driven pump units. Several new models were developed to provide hydraulic power for primary, secondary and emergency circuits.

Norden-Ketay Corporation, New York City, continued during the year its growth in the instrument and electronics field. 1955 products of Norden-Ketay included a complete line of precision servomechanism components, aircraft instruments, computers and complete automatic control systems.

Products of the Corporation's subsidiaries also cover a wide range. The Frohman Manufacturing Co., Inc., of Miami, Fla., manufactures precision and high speed shafts, precision gears, and gear trains. Scientific Specialties Corporation, of Boston, Mass., is engaged in the research, design, development, and manufacture of technical and scientific equipment of all kinds. Vari-ohm Corporation of Amityville, Long Island, manufactures a revolutionary line of high precision light weight potentiometers and precision resistors.

Other subsidiaries are Ketay Ltd. of England, which is manufacturing high precision synchros, servo motors, and resolvers for Western Europe; and Nuclear Science and Engineering Corporation of Pittsburgh, a service research and development firm for private industry in the nucleonics field.

Parker Appliance Company's Rubber Products Division in Berea, Ky., continued in 1955 as a leading supplier to the aircraft industry of synthetic rubber o-ring seals to meet the various military specifications for fuel, oil and hydraulic service. Successful formulation of new Parker compound number 47-671 made available o-rings for the operating temperature of minus 65° to plus 250° F in hydraulic service.

Parker's Tube & Hose Fitting Division continued producing tube-working equipment such as hand benders, cutters and flaring tools as well as bench-mounted benders and power flaring machines. A new toggle clamp, for easier and speedier operations, was introduced as an improvement for the Parker Model 824 tube bender. The new Tork-grip hand tool for non-slip tube bending and Exactol crank-operated bender were also introduced.

During 1955, the **Radio Corporation of America** intensified its activities in the field of aviation electronics. The year was marked by important design and development progress on such equipments as tracking radars, guided missile systems, and infrared detection devices, and by accelerated production of a wide range of airborne communications and intercommunications equipment.

For the U. S. Air Force, production was carried forward on the RCA-developed AN/ARC-21, a pressurized transceiver which can be operated on 44,000 different frequencies and on full power at altitudes up to 50,000 feet; Loran; Shoran; Navigational Radar; and Fire Control Radar.

RCA, working with the U. S. Signal Corps, continued to advance techniques for Airborne Reconnaissance Television. RCA cameras were installed in L-20 reconnaissance planes for use in intelligence gathering, artillery spotting and the relay of vital information to command posts.

Commercial aviation activities increased at RCA during 1955 with full scale production of the AVQ-10 airborne weather radar—the first such system designed for commercial use. The system is a C-Band (5.6 cm) radar built entirely to ARINC specifications. The equipment weighs less than 115 pounds and employs conservatively-rated tubes and components for maximum reliability and long life.

During 1955, RCA's reliability program for military electronic equipment, with particular emphasis on airborne electronics, was expanded and intensified. Extensive testing and theoretical analysis were carried forward, with the resultant development of both theoretical techniques and factory test methods which simulate actual field experience and which represent important contributions to the advancing reliability art.

To acquaint designers, manufacturers, and users of military electronics with advanced ideas and techniques for designing greater operating reliability into increasingly complex equipment, RCA and the U. S. Air Force jointly prepared and sponsored Reliability Conferences which were presented in Philadelphia and Dayton. Information disseminated by RCA participants focused largely on procedures and techniques employed to advance reliability in the design of recent airborne electronic systems for military use.

Reynolds Metals Company expanded its mill product availability, added new higher strength alloys and introduced advanced quality control measures during 1955.

A tapered sheet mill at its McCook plant was scheduled for operation by the first quarter of 1956. The mill is a Navy owned facility that will be operated by Reynolds for producing tapered sheet and plate in sizes up to 40 feet long, 120 inches wide and .032 to 3 inches thick.

Expansion and modernization at both of the company's extrusion plants at Grand Rapids, Mich., and Phoenix, Ariz., occurred during the year. A 6,000-ton extrusion press was ordered and is under construction.

Reynolds designed and built a 78-inch wide foil mill during 1955 which has operated successfully from the time it began production. A second mill is in the process of completion and will be followed by others. The mill rolls wide foil in thicknesses down to .00035 inches. This wide foil is of particular interest to the aircraft industry because of its advantages in the fabrication of aluminum foil honeycomb structures for use in "sandwich" panels.

Research and development work on titanium extrusions was conducted during 1955. In connection with this work a survey was made of the aircraft industry to determine their current and future requirements for titanium extrusions. This work is being continued.

Rohr Aircraft Corporation, Chula Vista, Calif., added more than 500,000 square feet to its manufacturing, warehouse and office space, bringing the total to 1,858,225 square feet. Completion of a metal-bonding building at Riverside, opening of an assembly plant at Winder, Ga., and election of several structures at Chula Vista resulted from expansion of the company's activities.

Rohr Aircraft during the year was awarded a contract for manufacture of the power packages (complete engine assemblies) for the Lockheed Electra, new turbo prop airliner, and for the new Convair 440 Metropolitan.

Also in 1955 the company manufactured power packages for 12 different airplanes. The commercial plane power packages were for the Convair 340 Liner, the Douglas DC-7 and the Seven Seas, and the Lockheed Super-Constellation. The military planes are the Boeing B-52 Stratofortress, and the KC-97 Stratotanker, the Convair T-29 Navigation Trainer and C-131 Samaritan, the Fairchild C-123, and the Lockheed P-2V Neptune Bomber, C-121 Picket, the R7V, and the turbo prop C-130 Hercules. The company was also tooling and preparing to go into production on power packages for the Boeing KC-135 jet tanker.

Other major components manufactured by Rohr were aft fuselage sections and flap tracks for the B-52, stabilizers, elevators, jet tailpipes and variable nozzles, reciprocating engine exhaust turbine nozzle boxes, and pneumatic system components for other airplanes. In all the company produces more than 30,000 separate parts for aircraft assemblies. The company was also engaged during the year in a research and development contract with the Wright Air Development Center in exhaust system inerting. This contract involves the design, tooling and manufacture of prototype articles to determine the practical aspects of a crash fire prevention system for both reciprocating and turbine powered aircraft.

Company sales for the year ending July 31 amounted to $82,407,804 and employment averaged 7.383.

During 1955, the **Russell Manufacturing Company,** Middletown, Conn., continued to produce for the aircraft industry seat belt webbing and hardware, seat belts, elastic shock absorber cord, shock absorber rings and web straps.

Net worth of the company was $4.2-million, and employees totaled 780 at year-end.

Simmonds Aerocessories, Inc., worked in 1955 toward improving reliability, reducing weight, simplifying installation and reducing costs of capacitance type fuel measurement and fuel management systems. In this connection, the M-1 lightweight fuel gage tank unit was produced. This unit is made of resin impregnated Fiberglas and is highly rugged and fuel resistant.

The M-1 tank unit can be used with several combinations of intermediate device and indicator. A two-unit system consists of the M-1 unit and (1) an indicator which also houses a transistorized amplifier-bridge, or (2) a combined indicator and vacuum tube amplifier-bridge unit. In order to give maximum accessibility to the vacuum tube amplifier-bridge, and to provide for mounting separate from the indicator, this amplifier-bridge section of the combined unit is available separately in a three-unit system consisting of the M-1 tank unit, an indicator and an amplifier-bridge. The amplifier-bridge is procurable in either of two separate cases, one featuring a cylindrical case for clamp or panel mounting, the other allowing for rack mounting.

Also in production by Simmonds were thermistor level swtiching devices for low level and high level switching, as well as for fuel pump sequencing operations.

The new lightweight Pacitron Fuel Gage System has been installed on several aircraft for the U. S. Air Force and the Bureau of Aeronautics, as well as on the Vickers Viscount turboprop transport.

At year-end, Simmonds was working on development and perfection of Explosion Suppression, a new protective technique against explosions resulting from the ignition of fuel-air mixtures.

Work continued during the year in the development and manufacture of precision push-pull controls, heavy duty aircraft latches and fasteners, and a related line of aircraft and engine accessories.

Solar Aircraft Company, San Diego, Calif., in 1955 completed an expansion program to provide work area for the production of its two small gas turbines, an increasing backlog of airframe components and guided missile fuselages, and other aircraft and commercial fabrications. Floor space now totals 1,178,895 sq. ft.

Sales for the year ending April 30, 1955, were $63,915,568. Total employment averaged 4,653

Solar's two gas turbines, the Mars® engine, rated at 50-60 hp, and the Jupiter engine, of about 500 hp, were turned out in production quantities. Aircraft auxiliary power units driven by Mars turbines are now used on the Douglas C-124C Globemaster, the Lockheed C-121C, military transport version of the Super Constellation, and the Convair C-131B.

Solar continued in 1955 to produce large bellows type expansion joints for such applications as wind tunnels and atomic energy plants and small size bellows for aircraft ducting systems. This department of the firm had the largest backlog of orders in its history.

A research and development program on high temperature resistant, light weight, all-metal sandwich structures assembled by means of high temperature brazing, was continued in 1955.

QF-80 pilotless jet is equipped with Sperry's command guidance system

In October, 1955, security wraps were removed from Solar's Microjet controls, a pneumatic principle which has been exploited for simple, light weight and fast response control of turbojet and ramjet engines. Already more than 1,000 control systems and devices using this principle have been built by Solar for the prime engine contractors in various applications.

Research and development continued on coatings for the protection of both high and low alloy steels against oxidation and corrosion. Advanced knowledge and techniques improved the new Solaramic aluminizing process which uses ceramic methods for the aluminum coating of high temperature parts.

The design, development and manufacture of advanced aviation equipment received greater emphasis at the **Sperry Gyroscope Company** in 1955 than at any time in the company's history. Systems, components and products for electronic control, navigation and guidance of transports, bombers, fighters, helicopters, missiles and drones far exceeded equipment being designed and produced for ground forces, naval and merchant shipping.

Manufacturing volume continued high in the fields of (1) pulse and continuous wave radar for fire control-tracking, airborne beacon, navigation-search and air-to-air rendezvous equipment—as well as radars for other airborne and ground-based navigation and guidance missions, (2) K-bombing systems, providing for automatic navigation, target identification and bombing, (3) electronic counter measures and (4) automatic fire control systems leading to the development of still more advanced systems to meet strategic and tactical requirements of bombers, fighter-bombers and interceptor aircraft, still in the design stage.

The Aeronautical Equipment Division was created for development and production of flight and engine control systems and instrumentation.

Progress was highlighted during the year with solid achievements in flight control equipment for manned aircraft, pilotless aircraft or remote control operations, and guidance gear and flight control systems for missiles.

The company's earlier efforts in helping to develop two advanced guided missiles were rewarded during the year when both were included in the nation's defense arsenal. The supersonic Sperry Sparrow I, first air-to-air guided missile to reach operational status, was put into volume production for the U. S. Navy at the Sperry Farragut Division's specially-designed, new missile-manufacturing plant in Bristol, Tenn. At the same time, fully automatic flight controls and obedience systems for the Navy's Regulus were advanced by Sperry to the volume production stage at its Great Neck, N. Y., plant. Late in the year Sperry organized a Special Missiles Systems Division.

In 1955 Sperry and the USAF Air Research and Development Command announced a new, simplified electronic drone control system for QF-80 fighter aircraft. Utilizing uhf radio transmitters and receivers, the Sperry system enables pilotless fighters to make take-off, landing, climbing, diving, level flight and orbiting maneuvers under precise and instantaneous command of accompanying "director" aircraft and ground station controllers. QF-80 aircraft were used for obtaining data during nuclear tests.

During the year, Sperry developed a miniature flight control system, specially designed for rotary wing aircraft. The compact, fail-safe system provides helicopter pilots with an option for either greatly-simplified manual control or fully automatic operation of rotorcraft. Yet basic units of the system—including automatic trim devices, altitude and speed controls—weigh only 60 pounds.

Extensive surveys by Sperry of flight operations personnel in all parts of the nation led to additional visual refinement of the company's latest Integrated Instrument System, production versions of which now are being adopted by leading airlines.

The system—combining a horizon flight director, pictorial deviation indicator and gyrosyn compass—portrays even more graphically than before the heading and displacement of an aircraft in flight, and in relation to VOR-OMNI and ILS beams. Sperry's IIS enhances margins of air safety by reducing the number of instruments pilots must check and by making it virtually impossible for them to misinterpret the information portrayed—even in busiest flight situations.

Completion early in the year of a $3-million factory for the Sperry Electronic Tube Division at Gainesville, Fla., was followed almost immediately by additional expansion of the facility there. Production of high-power klystron and traveling wave tubes was broadened considerably in response to military demands for new types of microwave tubes used in radar, missile guidance and air navigation systems.

The company also increased production of microwave test and measuring equipment, including that used for maintaining weapons systems in the field.

Sundstrand Aviation, Division of **Sundstrand Machine Tool Company,** Rockford, Ill., continued during 1955 to manufacture mechanical-hydraulic constant speed drive systems and related products for aircraft. Aircraft now flying with the Sundstrand Drive include the B-36, P5M, F3H, B-47E, RB-66, KC-135 prototype, F-101, F-102, XP6M, and two missiles. As of 1955, over 7,000 Sundstrand Drives were in use all over the world.

Among new products for the industry introduced in 1955 were constant speed drives built for operation in conjunction with oil-cooled alternators, field test stands and overhaul test stands for both the military and industry, special gearboxes, a new magnetic trim control for drive governing, and a new line of aircraft hydraulic motors.

To keep pace with demand for constant speed drives, a new plant was constructed in Denver, Colo. Completed Nov. 1, 1955, the new plant has a total space of 161,000 sq. ft., of which 131,000 sq. ft. is devoted to manufacturing. The new plant, located on a 32-acre tract northwest of the center of Denver, initially was planned as an additional production facility exclusively, with several models of drives scheduled to be built there. The new facility became known as Sundstrand Aviation-Denver.

The Rockford plant was expanded by 28,000 sq. ft. to accommodate new heat treating facilities, 33 percent more test facilities including a new environmental chamber, and other expansions made necessary by production demands.

Thompson Products, Inc., Cleveland, Ohio, continued in 1955 to produce jet engine compressor blades, turbine buckets and fuel system equipment. Also, with expanded facilities and continued emphasis on research and development, Thompson Products was selected to manufacture its unique electronically controlled air-turbine drive for 400-cycle alternators used in one of our most modern jet engine type bombers.

The main feature of this alternator drive is the integral four-unit electronic load-sensing and control system having extremely acurate and automatic regulation characteristics. Another important feature is the use of transistors and magnetic amplifiers in place of corresponding circuits embodying electronic vacuum tubes. Production facilities are in the company's

Pneumatics Division where the alternator unit and drive are assembled and shipped to the aircraft manufacturer.

The Gas Turbine Laboratory, located east of Cleveland on the shore of Lake Erie and operated by Thompson Products for the U. S. Navy, was completed early in November of 1955 and engine tests were conducted later in the same month. Each test cell at this facility is designed to accommodate engines developing up to 30,000 pounds thrust.

The company's staff research and development programs included a project in turbine fuel voltatility characteristics at temperatures up to 450° F. Previous data on fuel volatility characteristics represented temperatures up to 250° F.

Other activities at Thompson Products included auxiliary power units, fuel flow distributors and variable area fuel nozzles for gas turbine engines, vapor utilizing fuel systems for high-altitude aircraft engines, afterburner pumps, high-energy fuels and research in high-temperature alloys.

Vickers Incorporated, Detroit, Mich., manufacturer of oil-hydraulic systems, again expanded the company's El Segundo Division during 1955 to provide complete facilities for the design and manufacture of special oil-hydraulic valves for airborne application.

Development of complete systems and sub-systems through cooperation between Vickers application engineers and airframe manufacturers was expanded during 1955. Reduction in system weight in the early design stages (with ultimate proportional reduction in airframe weight) and minimized plumbing through the manifolding or "packaging" of hydraulic components are two of the inherent advantages gained where the "system concept" has been applied. An additional user benefit is that of undivided responsibility for system as well as component performance.

The year 1955 also saw an expansion of activity in the Vickers organization in the field of jet engine controls. One significant move by the company was the establishment of a special group within the Aircraft Products Department for design and development of jet engine hydraulic control systems. Another was the Vickers' announcement of the first Jet Engine Conference scheduled to be held in Detroit in February, 1956.

Also underway at Vickers were: (1) a program for the development of high temperature hydraulic system components and (2) a long range study of higher pressure systems (above 3,000 psi). Test and development work was also going on in the field of in-flight refueling systems, including controls for both the handling of fuel as well as drogue and probe systems.

Four system component developments announced by the company during 1955 were the Constant-Speed Motor, the Thermal-Vented Relief Valve, the 55 hp Servo Controlled Pump, and the Packaged Constant Gain Nose Wheel Steering Valve.

The Constant Speed Motor has an integral speed control which maintains motor speed within plus or minus 3 percent of a pre-determined setting (from no load to full load). The Thermal-Vented Relief Valve is basically a 3,000 psi relief valve which includes an integral temperature control element. The temperature control prevents fluid in the working circuit from exceeding a maximum safe operating temperature.

The Servo Controlled Pump introduced during 1955 is rated at 55 hp and delivers 35 gpm at 3,500 rpm. It is available as one of a variety of hydraulic transmission assemblies, built up as packaged units to meet the specific job requirements in oil-hydraulic servo systems having intermittent operating pressures up to 4,500 psi. The Constant Gain Nose Wheel Steering Valve is representative of advantages possible where the "system concept" approach is applied. This rotary input valve contains, within a single housing, the functions of all the necessary control elements for automatic nose wheel steering and caster control. This compares with a conventional steering system where four or five separate valves are required. The "packaged" design results in weight saving (up to 500 percent) and simplified maintenance.

Wyman-Gordon Company, which operates the largest single unit in the United States Air Force heavy press program, placed a 35,000-ton and a 50,000-ton capacity closed die forging presses into operation in 1955. The plant is in North Grafton, Mass.

The 35,000-ton press was the first of the program to be placed into operation anywhere. First forging off the press, on March 11, 1955, was a wing spar for the new Convair F102. Of aluminum, it was 10 feet, 6 inches long and 3/16 inch thin in some sections. Convair said each spar represented 68 "bits and pieces" and 800 rivets and 25 pounds of metal made unnecessary compared to the old method of making planes.

The 50,000-tonner went into production in the fall. It was last of the closed die giants to go into service.

First forgings off the 50,000-tonner were aluminum landing gear support ribs for Lockheed's new Super-Constellation, capable of 6,500 miles of non-stop flight. The ribs were 105 inches long, 28 inches wide, more than 4 inches thick in places and ¼ inch in others.

Assembly of the 35,000-ton capacity press was completed Feb. 17, 1955. It weighs 7,180 tons, stands 45 feet above the operating floor and 62 feet below it. Assembly of the 50,000-tonner was completed Aug. 24, 1955. It rises 48 feet above the floor and goes 60 feet below it.

Zenith Aircraft, Division of Zenith Plastics Co., continued during 1955 to produce approximately 50 percent of all the reinforced plastic components used by the aircraft industry. These included electronic components such as radomes, external stores such as developmental fuel tanks, aircraft and guided missile structural components such as wing and missile components.

The work force was increased 30 percent over its 1954 figure, and at year-end the total employment was over 1,000. Keeping pace with the increased personnel was a corresponding increase in plant facilities and area, primarily in tooling and press molding, of over 40,000 sq. ft. Zenith Aircraft now possesses such equipment as a Pratt & Whitney BG 22 automatic contour milling machine, a specially designed 60-in. Axelson contouring lathe and complete supporting equipment such as milling machines, shapers, and special welding equipment.

In the press molding field, the company installed a Zenith and HPM designed 600 ton capacity molding press having a platen size of 75 in. by 104 in., with daylite of 27 ft. no inches between platens. This press enables the molding of reinforced plastic components in matched metal dies up to 10 ft. in length.

In the final stages of completion at year-end was a research and development laboratory covering over 4,000 sq. ft. and including a complete complement of testing equipment such as tensile tester, impact testers, laboratory presses, mettalograph equipment, salt-spray and humidity cabinets, muffle furnaces and other high temperature ovens, hardness testers. Zenith engineers and technicians are developing high temperature resins and reinforcement materials for aircraft and guided missile components of the future.

Active research continues toward the use of reinforcing agents other than fibrous glass. Indeterminate results are being achieved with such materials as asbestos, silicones, and ceramics. In the electronic field, new techniques are being developed for the marriage of reinforced plastics with ceramics so as to achieve supersonic materials resistant to ram air temperature and rain erosion effects.

CHAPTER TWO

Research and Development

Industry

THE AVIATION INDUSTRY is plowing back some 65 percent of its earnings, a substantial amount of which are used for research. This makes aviation research spending, including electronics, larger than that of any industry in the world.

The wellspring of aeronautical research is in the industry itself and while private enterprise turns to the universities and government for help and advice, it is today the major source of progress in aviation advances.

During 1955 three parameters were set for basic research and development procedures.

First, the Air Force is tempting to cut development time by contracting for new planes on a prototype-production basis rather than on a prototype-evaluation basis.

Second, development time and costs are cut by leaving the responsibility for a certain project with the prime contractor alone.

Third, all military services try to draw small businesses into the research and development picture, granting them substantial contracts for first-phase type work.

Most of the research work conducted by private companies is carried out in strict secrecy; but although little or nothing can be said about specific projects, it is possible to summarize the various fields of research and development trends.

For example, great emphasis is put on improvement of propulsion systems such as the turbojets and turbo-props. Short-take-off-and-landing aircraft, using deflected slipstream, boundary layer control or direct jet lift are also studied intensively by many companies. Convertiplanes, different vertical-take-off aircraft and faster rotary-wing planes are on most companies' research and development lists.

At least two companies (Martin and Convair) are working on anti-gravity devices based on electromagnetic field physics.

Several companies are engaged in high-altitude rocket and satellite research studies.

Extensive industry-government research programs are also conducted in the fields of nuclear propulsion. Organizations and firms engaged in development of atomic powerplants and aircraft currently include the Atomic Energy Commission, in particular the Oak Ridge National Laboratory, Oak Ridge, Tenn., where radiation shielding and investigations on reactor materials and heat exchange media are being conducted. National Advisory Committee for Aeronautics, at its Lewis Flight Propulsion Laboratory, Cleveland, Ohio, is also engaged in powerplant studies. The Air Force and AEC are jointly behind ground test installation for atomic aircraft powerplants in conjunction with the National Reactor Testing Station at Idaho Falls, Idaho (cost $33-million), which is operational this year.

The Martin Company of Baltimore is conducting preparatory studies on atomic reactors and the Union Carbide and Carbon Corporation is engaged in an atomic engine program.

North American Aviation Inc., which started out on its own and abandoned its plans, now carries out radiation research and preliminary studies on reactors. Plans call for a $10-million reactor at Santa Susana, Calif. Phillips Petroleum Company has a contract for operation of a material testing reactor for the AEC at Idaho Falls, Idaho.

General Electric Company began work in 1951 on aircraft reactors. The AEC is to provide a total of $5.6-million for General Electric's development work during the 1955-56 fiscal year.

Pratt & Whitney Aircraft Division has been working since 1953 on an alternate engine program to General Electric's. The AEC is to subsidize Pratt & Whitney's work with $8.6-million in the 1955-56 fiscal year.

With Boeing Airplane Company, development work has been going on since March, 1952, on an atomic airframe, presumably for Pratt & Whitney power-plants.

Convair (Division of General Dynamics Corp.) has been engaged in the field with development work since 1951 on an airframe, under an Air Force contract, supposedly to be fitted with General Electric atomic engines. Convair also has a test reactor in operation at Fort Worth, Texas.

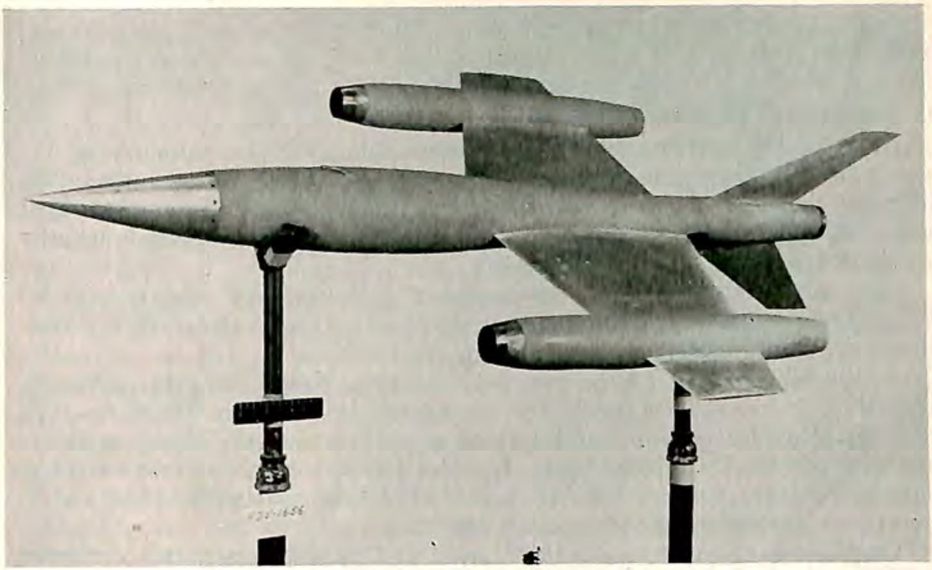
Lockheed Aircraft Corporation is said to have several years of experience in development work on an atomic airframe although participation was not announced until 1953.

In 1955, Curtiss-Wright announced breaking ground for a new atomic aircraft engine plant in Pennsylvania, although it has not been disclosed whether the company has been awarded any fixed contracts.

The trend in research and development is now toward greater spending on industry-conducted programs, in other words, the individual companies will spend more of their own money and conduct programs independent of government projects. All of the aircraft manufacturers now have their own research programs under way.

Ryan, for example, devotes considerable attention to research and development in the rapidly expanding field of electronics. Since the creation of its *Firebird* missile and later the *Firebee,* Ryan research showed tangible results in 1955 with award of a $5-million contract from the Navy for an automatic navigator device.

Research in the jet engine field is expedited by its jet engine test cell which went into full-scale use in 1955, including testing of jet engines in



Rocket-propelled research test model fired at supersonic speed over Atlantic Ocean to obtain information on flight characteristics

the vertical position. The test cell, valued at $375,000 with instrumentation, is the first of its kind in the United States designed and instrumented for testing jet engines in the vertical position.

This feature is of particular interest to Ryan, where characteristics of jet engines in vertical position comprise information vital to its VTO project and to other airframe projects still in the development stage.

Research of importance to the armed forces as well as to the commercial aircraft industry was conducted during the past year in the use of titanium for various aircraft structures, in pneumatic ducting for supplying heat and power for planes in flight and in welded honeycomb or sandwich structures to provide rigid structures at light weight.

A unique concept of scientific climatization has been largely responsible for the development of advanced models of interceptor electronic control systems and *Falcon* guided missiles at Hughes Aircraft Company.

Scientific climatization, as applied to the research and development laboratories, consists of providing the scientist and engineer with the freedom to develop his own theories, extensive facilities for experimentation, skilled labor, precision tools and the necessary materials to construct experimental prototypes.

The service organization which backs up Hughes' research program includes such innovations as specialized machine shops which tailor-make intricate components to the specifications of researchers, often without benefit of blueprints; labs equipped with complex analog computers and other electronic equipment which will prove or disprove the value of a theoretical component before it is even fabricated; and self-service "supermarkets" through which a scientist or engineer may browse to find a specific part to fit into equipment being developed.

Most of the systems laboratories' work falls into the category of research and development leading to volume production. It is divided into different departments, each assigned the responsibility for some type of technical work. Development of any one electronic control system is usually performed within several departments.

Extensive research and development activity was undertaken by TEMCO in 1955 with preliminary design and proposal efforts being conducted in many, varied military aircraft fields.

In the Materials and Processes Section of the Engineering Department, extensive developmental work was conducted in titanium, large no-draft forgings, chemical milling and welded steel fabrication. New manufacturing processes introduced were dry film lubricaton, phosphate coatings, cadmium plating, furnace brazing, use of reinforced plastics and the manufacture and use of bonded sandwich structures.

Operations research, including market and product research, continued at TEMCO with extensive research being conducted on the operational problems of military weapons systems and feasibility studies of military and civilian aircraft.

In the field of research, the stringent scientific requirements of several immediate and long-range programs under way at the Convair Division of General Dynamics Corporation in 1955 led to the appointment in March of 14 scientists from the nation's leading laboratories and universities. These consultants were engaged to study problems of basic nuclear research and industrial applications of nuclear power, and to consider special problems in the development of military aircraft and strategic missile systems for which Convair is responsible to the armed services.

Research and development programs were initiated and continued at Convair's four plants throughout the year: at San Diego and Pomona, Calif., and at Fort Worth and Daingerfield, Texas.

At Pomona, Convair and the Navy are joined in a comprehensive program of research, development and quantity production of superonic surface-to-air operational Terrier guided missiles. Work at Pomona includes weapons, systems analysis, and the preliminary design of new and improved missiles and components. These projects were being undertaken in the Naval Industrial Reserve Ordnance Plant facilities, operated by Convair under contract to the U. S. Navy Bureau of Ordnance.

Convair's Daingerfield plant, otherwise known as the Ordnance Aerophysics Laboratory, continued functioning for the Navy Bureau of Ordnance under the technical direction of The Johns Hopkins University Applied Physics Laboratory. OAL is principally engaged in developing and testing supersonic ramjet-powered guided missiles for the Navy's Bumblebee program. OAL also conducts considerable developmental test work for the Navy Bureau of Aeronautics and the U. S. Air Force. The Laboratary comprises essentially a supersonic wind tunnel, two sea-level ramjet engine test cells, a high-altitude ramjet engine test cell, and necessary supporting groups. Daingerfield employment totaled 285 on Oct. 24, 1954, and 298 on Oct. 23, 1955.

In August, a separate department was established at Fort Worth to direct the plant's research and development work on atomic-powered aircraft, a program that had been initiated in 1951 by the Air Force. Also under way at Fort Worth was a research program to determine the ultrasonic effects of jet engine noise and aerodynamic friction on various aircraft materials. Engineers and chemists were studying the effects of ultrasonics (20 kc and up) on fuels, lubricants, hydraulic fluids, plastics, and adhesives, as well as possible changes in the explosive limits of fuel. The research will aid Convair in designing future arcraft to withstand any possible effects of intense ultrasound.

During the year, Fort Worth developed a new-type ejection seat for crew members operating in high-speed aircraft. Called "SacSeat," the seat sets new standards for safety and comfort, and is adaptable to airplanes using any method of takeoff: conventional, catapult, or vertical. Various research and development projects of a classified nature were begun or continued at Fort Worth in 1955.

At San Diego, the largest wide-rang temperature research cell on the West Coast for testing effects of extreme high and low temperatures on aircraft structurs was placed in operation. Capable of testing full-size test sections of aircraft, the cell is 20 feet long, 10 feet high and 10 feet wide. Temperatures in the 2,000-cubic-foot chamber can be controlled from $-100°$ F to $+300°$ F within four hours.

Another vital research project undertaken during the year was a study of metals and aircraft construction designed to withstand high temperatures encountered at supersonic speeds. Metals under study included titanium and precipiation-hardened stainless steel. Wing and tail assemblies incorporating honeycomb sandwich panels were being tested.

In the electronics research field, San Diego continued development of new types of high-resolution radar mapping antennas and compact radar mapping systems for both guided missiles and piloted aircraft.

New techniques were studied in connection with precision ground-based tracking systems. A study of cooling methods for electronic components in high-speed aircraft and missiles was undertaken, as was the development of flush-mounted antennas for navigation and communication on supersonic aircraft. During the year, San Diego developed a unique method of utilizing an analog computer to determine hydrodynamic stability characteristics of water-based aircraft under various conditions of hull design, wave action, ski design and other factors, all of these and other studies thus being conducted in a minimum of time by use of the computer.

Air Force

Dramatized on the eve of the new year, 1956, by Defense Secretary Wilson's announcement that research and development on guided and ballistic missiles would go forward at an accelerated pace, that branch of defense activities anticipated early expansion all along the line.

Even training of engineers came in for additional emphasis and development. The Air Force expanded its program to improve the technical competence of its officer personnel during 1955.

Air University and the Air Force Institute of Technology produced an increasing number of qualified engineers and scientists for use in research and development.

The USAF Institute of Technology offered undergraduate and graduate work both in residence courses and courses in the nation's highest quality academic institutions in all fields of engineering and science required by the Air Force.

Between fiscal years 1950 and 1955, the Air Force Institute of Technology has placed in training 1,673 officers in engineering; 404 officers in sciences; and 141 officers in engineering administration and research and developmet.

ARDC receives approximately 90 percent of the USAFIT graduates in engineering, 85 percent of the science graduates and all of the research and development management graduates. In addition, the Air Force is conducting well-designed and timely technical training and education programs for civilian personnel. These are all calculated to continue to improve the technical competence of research and development personnel within the Air Force.

The Air Force has taken many progressive management actions, paramount of which was the establishment of a single command responsible for all research and development. USAF has subsequently been engaged in numerous actions to improve the operation of this organizational concept. It will continue to make advances in management improvement and will continue to study and implement recommendations for further advancement.

The subcommittee of the Committee on Appropriations has recommended that the Secretary of the Air Force modify existing Air Force procurement regulations to take into account the coexisting Air Force policy with respect to material support and research.

Since the organization of the Air Research and Development Command, there has also been a progressive improvement change in the Air Force procurement policy.

The Air Force is, further, giving serious consideration to organizing top-level civilian scientists and technicians employed by USAF both at staff levels and at operational research and development field activities into an advisory committee which would participate with the Air Force's highest planning councils.

In support of the Air Force attitude toward the use of civilian scientists, there are several prominent groups which are being used for the prosecution of high priority research and development programs. Included in these are the Science Advisory Committee to project *Atlas,* the Ballistic Missile Defense Committee and the Air Research and Development Command Research Committee. In addition, the ARDC now has frequent technical meetings of the key civilian scientists and engineers from each center to discuss technical problems. These meetings have proven to be most profitable to the overall technical management and have increased both the recognition and use of civilian scientists and engineers.

In addition, the Scientific Advisory Board, organized in December, 1944, provides a means for civilian science to make its views known and provide assistance to the Air Force research and development structure. The board consists of 66 civilian scientists who are considered among the most prominent men of science in the United States.

It has been recommended that the Assistant Secretary of Defense for Research and Development take steps to direct that formulation of a uniform policy, applicable to all military departments, designed to prescribe the conditions necessary for the most effective administration of military research and development programs in order to assure maximum attraction and use of our national scientific and technical personnel resources and maximum use of our national scientific facilities.

The Air Force agrees that the formulation of such a policy would be desirable. The Air Force members of the Research and Development Policy Council, under the Assistant Secretary of Defense for Research and Development, are assisting that office in the preparation of such a policy statement.

The USAF research and development organization is necessarily a highly heterogeneous mixture of scientific, technical, and military activity. Each Research and Development Center is different in the basic nature of its mission, in the composition of its working force and in its facilities. Management at each center must be arranged as the circumstances dictate and there must exist the freedom to fill management needs as the demand occurs.

Air Force research and development organizations recognize the need to separate base support from research and development. This has been done in every instance where advantage has been evident. The support needs of each research and development center must be considered in terms of the individual character of each activity. The uniform mandatory type organization for support cannot be expected to properly provide for the many different circumstances which now exist or which may exist in the future.

A systematic program of basic research has therefore been recommended to the Secretary of Defense, with funds authorized for expenditure by the Assistant Secretary of Defense for Research and Development.

A total of 87 percent of the Air Force research and development project funds last year went to contractors in industry and universities.

Air Force Research and Development is under two major commands, the Air Research and Development Command, which carries through the stage of development testing and the Air Proving Ground Command, which has the responsibility for operational suitability testing. The reason for the separate commands, reporting separately to the Chief of Staff, is to have a two-way check on the development itself in behalf of the operational commands to make sure that the decision that the article is combat-worthy and ready to go in the inventory is not the decision of the developer alone.

The AF Cambridge Research Center, devoted mainly to research, this year specializes in electronics and geophysics. The latter has as its main current product weather techniques and systems. This includes meteorological studies and the upper atmosphere. Cambridge also supports Project Lincoln, the main Air Defense Laboratory for the ground electronic environment system. Lincoln is managed by the Massachusetts Institute of Technology.

At the Rome, N. Y., Air Development Center, missions were mainly in the area of ground electronics components. Developmental work, supervised and administered from there, resulted in actual hardware.

The Headquarters of the Research and Development Command is located on a temporary basis in Baltimore, Md.

The Wright Air Development Center, most familiar of USAF's research locations, is now devoted mainly to weapons systems and airborne equipment. The largest by far of the centers, it employs one-fourth of the total personnel of the Air Research and Development Command.

The Arnold Engineering Development Center, located near Tullahoma, Tenn., a complex of wind tunnels designed for very high mach numbers and high altitude flight, got its first tunnels in operation during 1955, and others are coming along on schedule.

The Missile Test Center at Patrick Air Force Base in Florida, base point of the long-range missiles testing ground across the Carribean and out into the south Atlantic, continued experimental testing on missiles with a range up to 5,500 nautical miles.

At Eglin Field, Fla., is located both the Air Proving Ground Command and the Air Force Armament Center.

The Proving Ground Command was active in testing the operational suitability of equipment. The Armament Center tested developmental equipment from the Armament Laboratory at Wright Field and other locations.

At San Antonio's Randolph Air Force Base, the School of Aviation Medicine concentrated its research on aero-medical problems for the most part in the high-altitude and mach-speed areas.

The division of the effort between the Research Division of the School of Aviation Medicine and the Aero-Medical Laboratory at Wright Field is that the former is primarily research on humans. At Wright Field this research is on hardware, such as the flying suits and bail-out equipment.

At Holloman Air Development Center, work continued on short-range missile testing.

The Air Force participated in research at the White Sands Proving Ground, part of the integrated Department of Defense organization under the administration of the Army. Holloman does the flying support for the work at White Sands and has its own missiles program and firing programs integrated into the total firing programs at White Sands.

At Kirtland Air Force Base, in Albuquerque, N. M., the Air Force

Special Weapons Center worked closely with the nearby Atomic Energy Commission developments at Sandia Base and Los Alamos.

Located at the base is also the Tri-Service Armed Forces special weapons project, Field Command, under Army administration.

The Special Weapons Center is the Air Force Research and Development home and permanent base for flight activities in support of the Atomic Energy Commission's test program, not only at Indian Springs, located close to Las Vegas, Nev., but also at Eniwetok.

Expanding activities went forward at the Air Force Flight Test Center at Edwards AFB, where early test work on new aircraft is done. Some missiles testing was also done there particularly suitable to Edwards' facilities, such as the early models of missiles which eventually will not have wheels, but in their early versions do, so one can land them and bring them back and use them over again.

Navy

Today, all funds for the Navy's research and development programs are combined in a single appropriation. The Chief of Naval Research is the man who combines the budget requests of the bureaus, the Marine Corps and the ONR into this single appropriation. ONR is responsible for administering the appropriation and for keeping the necessary control records.

The problem for ONR is to make sure that the Navy is using the latest and best of science and technology, in a way that really meets the Navy's needs. To do this, says Rear Admiral F. R. Furth, USN, Chief of Naval Research, "we must foster new knowledge through active support or research, especially in areas that don't get support as a result of normal commercial and industrial pressures."

With a 1955 fiscal budget of $60-million, ONR is sponsoring about 360 projects which it farms out to about 217 universities and industrial laboratories, in addition to keeping a 4,500 staff in its own laboratories and offices.

Support is given to proposals having the greatest scientific merit and that have important bearing on Navy problems.

Recognizing that basic research should not be slowed by security restrictions, ONR encourages workers in unclassified projects to share their ideas with their colleagues, and to publish their results in recognized journals.

In addition to its basic research program, ONR supports a major applied research program. The office is constantly looking for new ideas and principles that will lead to the development of new weapons or warfare techniques. It is general practice to carry a project based on such ideas to a point where the technical feasibility of the principles have been established. At this point, the projects are normally turned over to a Navy bureau for further development and production.

Navy research and development is carried out along the same organizational lines as those used by a private industrial organization. An example is the electronic counter-measures program. Vacuum tubes are being developed for frequencies that are important for naval operations. When

ONR gets the basic principles worked out and the tubes developed, the Bureau of Ships will use them in developing shipboard electronic equipment and the Bureau of Aeronautics to develop airborne equipment. The Bureau of Ordnance may use them in guided missiles or fire control mechanisms.

The bureaus are analogous to operating divisions or companies. They maintain laboratories and support contract research and development of equipment in their particular fields. ONR provides corporate across-the-board supporting research, exploratory development and coordinates the total research and development programs. The nature of the entire program stems from operational requirements that are prepared by the Chief of Naval Operations, and that reflect the functional needs of the fleet.

Meeting the needs of the operating forces poses many problems for any military research and development program. New developments must be closely tied to operating plans, to requirements, to logistics and to tactical developments. Also, military planning must take into account new weapons that might soon be available, or could be developed should a military need arise. With the new techniques of operations research the Navy is able to analyze some aspects of these problems on a quantitative and objective basis. In this way much of the guesswork is taken from military planning. Broad areas for research have been outlined by the Chief of Naval Research. These areas are being explored through ONR.

Basic research is being conducted in aerodynamics, in power, in metallurgy and in other basic fields that affect aircraft development by the aviation industry.

Aircraft are being developed to meet the threat of enemy air attack on troop transports or convoys. The two vertical rising and descending fighters, Convair's XFY-1 and Lockheed's XFV-1, are distinctly new and different types: they do not need catapults or long runways, and can be operated from carriers or even from merchant ships.

The Navy's rocket-powered aircraft *Skyrocket* is a flying laboratory for research in rocket propulsion. Further, the continuous push to higher altitudes has taken the ONR to a point where major progress must be accompanied by new knowledge of the upper atmosphere, which is virtually airless and is bombarded by cosmic rays. ONR is constantly gathering data about this region through high altitude balloon and rocket flights which are carefully instrumented.

Basic research is supported in areas such as solid state physics, electronics, electromagnetic radiation and communication theory. The material bureaus are emphasizing miniaturization and reliability in all electronic equipment. Such developments as the transistor and the printed circuit have proven most valuable in this effort.

Support given to mathematical research has yielded new knowledge of differential and integral equations. These equations have great value in solving problems concerned with guided missiles and aircraft. In addition, the equations have permitted studies that have revealed the cause of some rocket motor explosions, and suggested some possible remedies.

CHAPTER THREE

Department of Defense

THE YEAR 1955 SAW no wavering in U. S. determination to maintain its ability to meet and repel any aggression with crushing force, despite the hope of a breakthrough improving East-West relations and easing world tensions. The era of good feeling generated at the Geneva summit conference soon evaporated, leaving in its wake disappointments which only served to re-emphasize the need for a military defense system which, in quality and quantity, would be a convincing deterent to war.

In the realm of military aviation, charged with the responsibility of providing the retaliatory take-out punch against any opponent, the tenth year of the cold war was marked by many noteworthy achievements in the continuous search for more effective airpower. And the stepped-up pace of aeronautical research and development offered the promise that 1956 and the years immediately beyond it would bring still greater improvements in the nation's defensive-offensive capabilities.

President Eisenhower's State of the Union message on January 6, declaring the forthcoming military budget for fiscal 1955-1956 would emphasize new weapons of rapid and destructive striking power, was followed by aircraft and missile performances which underscored that objective.

New altitude and speed records were established and important new developments were made in design and production of turboprop transports, in the new generation of long-range jet bombers, in jet-powered helicopters and other vertical rising craft, in more powerful engines, and in the missiles art. All contributed to steady progress in the forward march of aeronautical technology.

The new generation of century fighters and interceptors began to reach production, bringing still closer the day when combat operational speeds in the Mach 1.5 to 2 range will be commonplace. Construction was begun on wind tunnels to test aircraft up to Mach 5.

The year 1955 also saw greater concentration on development of a nuclear powered aircraft, and investigation in this area was given tremendous impetus with announcement by the Atomic Energy Commission of a major breakthrough in reactor research.

Another project, one with a Buck Rogers flavor, was organized during the year to accelerate research on an earth satellite capable of orbiting at an altitude of 300 miles. And the space platform project was followed by a Defense Department decision to begin studies in the field of anti-gravitation.

As in the past, May Day fly-by demonstrations over Red Square in Moscow disclosed new aircraft types and spawned new questions concerning the comparative U. S.-Soviet air strengths. Defense Department, Air Force and industry spokesmen joined President Eisenhower in refuting charges that this country had lost leadership in the air.

Year's end found Administration leaders deep in studies to determine ways of trimming the 1956-1957 defense budget estimates without impairing airpower and supporting military strength. Simultaneously, came assurance from Air Secretary Quarles and Air Force Chief of Staff Twining that the goal of 137 wings would be maintained.

Air Force

The Air Force moved closer to its 137-wing objective during the year and, simultaneously, made significant progress in its long-range program of integrating unmanned missiles and conventional aircraft for maximum striking power.

Manned combat aircraft will continue to predominate in the Air Force defensive-offensive machine for years to come, but developments in the missiles art in 1955 defined more clearly than ever before the increasingly important role unmanned vehicles will play in defending the U. S. and the North American continent against air attack.

Trevor Gardner, Assistant Secretary of the Air Force for Research and Development, sketched in some of the details of the Air Force missiles and their roles in March and revealed that full use of high yield atomic warheads would be made to permit earlier availability of operational missiles. Atomic warheads, he said, reduce accuracy requirements, permitting an easing of guidance systems specifications. He grouped missiles into the following categories: air defense, tactical, strategic intercontinental, and strategic air-to-ground.

Earlier in the year, the Air Force announced accelerated development of three missiles with intercontinental range — North American Navaho, Northrop Snark and Convair Atlas—and by spring the Atomic Energy Commission had detonated the prototype of an air-to-air nuclear warhead missile more than 30,000 feet above the Nevada desert. Another milestone in missiles development was the start of construction on a new rocket test stand to withstand 1-million pounds of thrust.

Convair TF-102A combat proficiency trainer and the new F-102A all-weather jet interceptor

By the end of the year, the Air Force had been given responsibility for development of medium-range as well as long-range missiles, and Air Secretary Donald Quarles could report that the U. S. was ahead of the Soviet Union in the field of intercontinental missiles.

Research on a nuclear powered aircraft, a project severely criticized in the past for its slow rate of progress, was accelerated during the year and an important advance in reactor studies provided further impetus. The Navy also began work in this field, concentrating on the application of atomic power to large flying boats.

One of the more startling announcements by the Defense Department was the disclosure that an earth satellite would be sponsored jointly by the Air Force, the Navy and the Army, and that 1957 had been designated as target time for its launching. The Martin Company was awarded the prime contract for the satellite, which would orbit at an altitude of 300 miles, and General Electric was charged with responsibility of providing the rocket engine. Subsequently, the Martin Company announced that design techniques and components "are at hand" to create a multi-stage rocket required to launch the planned satellite.

The Air Force ordered a speed-up in production of the Boeing B-52 bomber, the first of which was delivered during the year, and Air Materiel Command reported that Phase I development contracts already had been prepared for the successor to this eight-jet aircraft. A similar speed-up also began on most of the F-100 series of jet fighters and interceptors.

Convair was awarded a multi-million dollar contract for production of the F-102A, which had reached a supersonic speed in level flight in shakedown tests at Edwards Air Force Base late in 1954, and for an undisclosed number of TF-102A's. That was followed by an AF order for the Convair F-102B interceptor powered by the Pratt & Whitney J57.

Other designers of "century" series aircraft sharing in production orders included McDonnell, F-101 and RF-101; North American, F-100C which established a new official world speed record of 800 mph-plus at Palmdale during the year; Lockheed, F-104, reported to have exceeded Mach 2 speed; Republic, F-105 and RF-105; and North America, F-107.

Convair, which received its first order for the B-58 delta-wing supersonic bomber in 1954, received the green light for stepped-up production and enlisted the aid of the following seven companies for the construction of major sub-systems: Sperry Gyroscope, Bendix's Eclipse-Pioneer Division, Bell Aircraft, Melpar, Emerson Electric, Sylvania, and Fairchild Camera and Instrument Corporation. Other subcontractors on this program include Magnavox, Bendix Radio, Hamilton-Standard, Ultrasonic Corp., Minneapolis-Honeywell, Motorola of Phoenix, Westinghouse Electric of Lima, Aerojet-General, and Federal Telephone & Radio.

Turboprop transports played an ever larger role in the Air Force in 1955, the largest being the Douglas XC-123, an 80-ton capacity plane with three times the load ability of the C-124B Globemaster. Other aircraft in this category which moved closer to operational duty during the year included the Lockheed C-130A and YC-131F. Boeing began extensive service tests of the P&W T-34 turboprop engine.

The year also was marked by several spectacular jet aircraft performance records. In January, a Republic F-84F made the longest non-stop flight for jet fighter-bombers, traveling 2,390 miles from George AFB in California to Langley Field in Virginia at an average speed of 605 mph. A month or so later, the Air Force activated its first squadron of parasite fighters, using Republic RF-84F's equipped to be carried, launched and recovered from an RB-36 in flight.

Early in April, NAA recognized a Republic Thunderstreak's speed of 3 hours 44 minutes 53 seconds between Los Angeles and New York as a new official mark. Pilot was Lieutenant Colonel Robert R. Scott. In May, a North American F-86 became the first aircraft to make a round-trip ranscontinental dash in daylight. And a few months later a North American F-100C hung up a new official world speed record over a measured course at Palmdale, passing the 800 mph mark.

General O. P. Weyland announced in May that all forthcoming combat planes of the Tactical Air Command — fighter-bombers, day superiority fighters and light bombers—must have refueling capabilities. A few months later the wisdom of that decision was demonstrated when 12 Republic F-84's used in-flight refueling to fly 5,116 miles, from England to Texas, in 10 hours 48 minutes.

Progress continued in the convertiplane field and in the design and production of helicopters. McDonnell's XV-1 convertiplane made its first successful in-flight conversion from helicopter to conventional plane, and Bell's XV-3 convertiplane made its first flight at Fort Worth. Sikorsky Aircraft received additional orders for its H-19D helicopter, Bell began tests of a flying wing helicopter with side-by-side rotors, Sikorsky dedicated a new Stratford, Conn., plant, and Ryan received a contract for development of the Air Force's first jet-powered vertical takeoff craft. It carries Air Force designation XF-109.

Jet power ratings continued to climb during the year and many engine production facilities were greatly expanded. Another notable development in this field was a Defense Department directive establishing policy governing development and application of gas turbine engines, followed by creation within the Air Force of an Aircraft Logistics Planning Board to make better forecasts of spare engine requirements.

General Electric's J79, earmarked for the Lockheed F-104 and the Convar B-58, was officially rated at 15,000 pounds of thrust, and Allison's J71 qualified for a 10,000 pound thrust rating. General Electric completed full-scale tests of a thrust spoiler for in-flight braking of the B-47 Stratojet, and Allison produced ahead of schedule its T56 turboprop engine for the Lockheed C-130A. General Electric, Pratt & Whitney and Curtiss-Wright expanded facilities for production and research in gas turbine and nuclear energy power fields.

Research, the cornerstone of aeronautical progress continued to keep pace with other advancements in aviation. NACA added new tools and exploratory aircraft in its never-ending search for methods of increasing aircraft performance, and the manufacturing industry added many new facilities to aid in the same common goal—qualitative air superiority.

General Electric announced a five-year, $40-million program of expansion for its aircraft gas turbine plant at Evendale, Ohio, where $60-million already has been invested. Boeing launched construction of a wind tunnel to test aircraft and missiles in the Mach 1.2 to 4 speed ranges. Convair earmarked $3.5-million for a "trisonic" tunnel for the testing of aircraft and missiles models up to Mach 4.5. Pratt & Whitney established a new nuclear propulsion facility at Middletown, Conn. Northrop chose El Paso as the site for a new guided missiles plant. Air Research and Development Command blueprinted a $1-million electronic testing and flight simulation laboratory for Wright-Patterson Air Development Center. Glenn L. Martin set up a new research lab to explore the frontiers of knowledge, including space travel and ways of overcoming gravity. NACA picked Sandusky, Ohio, as the site for a $5-million research reactor.

Other important Air Force developments during the year included: a Hughes-designed fire control system to enable the Northrop F-89D to use guided missiles . . . unveiling by Link of a simulator to train AF navigators for high speed, high altitude flight . . . award of a jet tanker contract to Boeing for the KC-135 and a Phase I contract to Lockheed for design of an advanced tanker . . . stepped-up orders for the Douglas F4D-2 . . . development by Sperry of an improved remote control for jet fighter aircraft . . . activation of the first AF unit equipped with Fairchild C-123B aircraft . . . delivery of the final Douglas C-124 Globemaster . . . delivery by Republic of its 1,000th F-84 . . . retirement of the B-36 intercontinental bomber . . . development of an improved downward ejection seat for the Douglas X-3 research aircraft.

Naval Aviation

Perhaps the most important development in Naval Aviation during the year was the decision to launch a vigorous program of exploration in the realm of nuclear powered aircraft.

A policy instruction issued by Navy Secretary Charles S. Thomas in May ordered a broad attack in the field of atomic power for application to all types of surface ships and sub-surface craft, as well as to aircraft. In June, Rear Admiral Frederick R. Furth, Chief of Naval Research, disclosed that the Office of Naval Research and the Bureau of Aeronautics had made "initial fesibility studies of nuclear powered seaplanes."

In October, James H. Smith, Jr., Assistant Secretary of the Navy for Air, announced that the Martin Company and Convair Division of General Dynamics Corporation—principal companies in the flying boat business—had been awarded high priority contracts "directed specifically toward the early development of nuclear powered seaplanes." At the same time, unidentified companies were given contracts for the Navy's A-engines.

Although the Air Force saw the proposed Navy atomic powered seaplane as suitable for strategic bombing, Navy Secretary Thomas declared firmly that the potential of the A-powered seaplane could be fully exploited by the Navy only. He pointed out that the modern seaplane must be supported and assisted by other ships and integrated with the other offensive team members of the new Navy.

On another front in the task of adapting new weapons to the Navy's roles and missions, the sea-going service made considerable progress in the field of guided missiles.

In November, Admiral Arleigh A. Burke, Chief of Naval Operations, declared that "the long dry spell in missiles development is over" and revealed that the Fairchild Petrel, air-to-underwater missile, had reached the operational stage. He also disclosed that the Sperry Sparrow, supersonic air-to-air missile, and the Chance Vought Regulus, for surface-to-surface duty, are being exploited in fleet units—subs, cruisers and aircraft carriers.

The U.S.S. Boston, commissioned in Philadelphia, became the Navy's first missile ship and by the end of the year a second vessel of that type, the U.S.S. Canberra, had been added to the fleet. The Boston is fitted with batteries of the Convair Terrier, surface-to-air missile which went into production in 1953.

Chance Vought was given a $16-million Navy contract for the Regulus missile in January, and by August the company began to deliver the KDU-1 target drone version of the Regulus. Production continued on other missiles designed for the Navy.

The Martin Company received a $5-million contract to continue research and development on the XP6M-1 seaplane, capable of 600 mph-plus. Now fitted with four Allison J71 engines, this 15-ton payload aircraft also is being studied in connection with the nuclear power program. The Navy also joined the Air Force and the Army in the earth satellite project involving Martin and other companies.

The U.S.S. Forrestal, first of the new super carriers, made its first trial run at Newport News, Va., August 29, and in November the Navy awarded a contract for the fifth Forrestal-class carrier to New York Shipbuilding Corporation.

Among new aircraft designed for shipboard operations unveiled during the year was the Chance Vought XF8U-1, a supersonic fighter powered by a Pratt & Whitney J57-P-4 equipped with afterburner. It has a thin sweptback wing mounted high on the fuselage and set well back from the cockpit. Substantial weight reductions were made possible through the use of titanium in aft and mid sections.

An $8-million contract for the Douglas F4D-2 fighter was placed in February, and in March the first production FJ-Fury made its initial flight at the North American Columbus, Ohio, plant. The Navy also revealed that its first aircraft to incorporate the area rule design developed by NACA was the Grumman F11F-1.

North American FJ-4 Fury on active service with the Navy

An FJ-3 Fury established a new altitude climb record late in January, climbing to 10,000 feet in 83 seconds piloted by Lieutenant Commander R. H. Moor at Miramar Naval Air Station. A month later, Pilot Robert O. Hahn piloted a Douglas F4D-1 to the same altitude in 56 seconds. In October, an A4D, light-weight bomber, set a new 500-kilometer closed course speed record of 695 mph at Edwards Air Force Base.

Hiller Helicopter Company designed and delivered the first small wingless flying platform, which combines the principle of weight shifting with the ducted fan, and began work on a new VTO-type aircraft and one-man helicopter (XROE-1) for Navy and Marine Corps. The Navy also revealed that it had placed an order for the Ryan vertical takeoff jet aircraft also ordered by the Air Force. The Navy continued to take delivery on several types of helicopters during the year from Bell, Sikorsky, Hiller and Piasecki.

The first of the Navy's new T2V-1 jet trainers designed for carrier operations rolled off the Lockheed assembly lines under a $14-million contract. First deliveries of the Beech T-34B trainer were made in January.

One of the largest Navy contracts during the year was the Bureau of Aeronautics $38.6-milion contract for an undisclosed number of Lockheed WV-2 radar picket planes. Lockheed also received a substantial order for P2V-7 patrol planes powered by two Wright R-3350's and two Westinghouse jets.

Bell Aircraft and the Navy tested an electronic landing system for aircraft carrier use which has since brought in several hundred aircraft in fully automatic, hands-off landings. John A. Attinello, head of the Bureau of Aeronautics division of supersonics, reported that low speed landings, coupled with thrust reversers, may soon eliminate the need for special airports with long runways.

The Navy's Bureau of Aeronautics spelled out during the year a new aircraft procurement policy under which aircraft delivered to operational squadrons would be as nearly combat-ready as possible and would require no major "fixes" in the field. Basically, the new procedures call for a low rate of production on a new plane during the first three years, with all production planes going immediately into the test program. The Navy's objective under the program was thorough evaluation of a new product before a commitment to large production funds.

At year's end, the Navy was building toward its objective of 17 carrier air groups and 15 anti-submarine warfare squadrons.

Army Aviation

Greater air mobility for the ground forces continued to occupy much of the time of Army research and planning staffs in 1955, and near the end of the year two top Army generals spelled out the air transportability requirements.

General Maxwell D. Taylor, who succeeded General Matthew Ridgway as Chief of Staff, said that present requirements to plug gaps around the frontiers of the free world impose on the Army new requirements for mobility, requirements which can be met only by air transport. He pointed out that the need for airlift had caused the Army to restudy the weight and design of all of its equipment "in an effort to fit our combat units as rapidly as possible into the aircraft available for strategic movement of large bodies of troops."

Another former arborne commander, Lieutenant General James M. Gavin, chief of Army Research and Development, declared at Fort Ben-

Sikorsky S-59 Helicopter

ning, Ga., that to fight successfully in the future "our Army must be mobile not only on the ground but in the air." He said that most supplies for battle areas should be delivered by aircraft of the assault cargo and convertiplane types, while tactical transport of units into and within battle areas must be accomplished by basic reliance on planes and fast naval vessels. He advocated airlifting into battle zones all but the heaviest armored units.

Earlier in the year, Army spokesmen intimated the Defense Department might be requested to authorize formation of an Army Air Wing to provide Army-controlled transport and tactical air support. In October, the Army War College asked the Martin Company to explain the advantages of water-based aircraft, such as the XP6M-1, in transporting troops and cargo. In the same month, Defense Secretary Wilson vetoed an Army plan to procure jet aircraft on its own, and decided that the Air Force could lend a few jet trainers to the Army for evaluation as liaison and reconnaissance duty.

However, a responsibility previously handled by the Air Force was taken over by the Army when the latter ordered its first fixed-wing tactical transport company to be activated at Fort Riley, Kans. This laid the groundwork for the Army to begin airlifting and dropping its airborne units.

The transport company, known as the 14th Army Aviation Company, was assigned to the Fifth Army. It will use 21 de Havilland U-1 Otters, 90 of which have been ordered. Each can carry 3,000 pounds of cargo or 14 passengers, pilot and co-pilot. Their range is 1,100 miles at a cruising speed of 140 mph.

Another important Army development was a decision to train 900 helicopter pilots during fiscal 1956. Civilian flight training schools would be used for primary training for cargo helicopter pilots.

Major General Paul A. Adams, Deputy Chief of Staff, told a House Appropriations subcommittee in April that the Army was planning for a low-level, "tank killer" aircraft. At the same time, Major General K. F. Hertford disclosed the Army was investigating feasibility of extremely small helicopters for Army front line reconnaissance missions.

William H. Martin, new director of Army Research and Development, announced plans to increase spending for guided missiles. He said Army's research next year would emphasize missiles to kill airplanes and missiles and rockets to deliver atomic and conventional warheads on nearby and distant targets.

Helicopters continued to play important roles in Army activities and the service continued to explore the convertiplane field. By the end of the year, the Army had spent nearly $16-million on two experimental convertiplanes—the McDonnell XV-1 and the Bell XV-3. Bell won an Army competition for development of a light, closed cabin utility helicopter for frontline evacuation, utility missions and instrument training.

The Army set up a second source of supply for its Nike missile, letting a contract to the Douglas Marietta, Ga., division. A new missile for close support for the ground forces was developed during the year by Cornell Aeronautical Laboratory.

A novel Army development was a small camera-carrying drone to make still and motion pictures from altitudes ranging from several hundred feet to four miles. The drone is catapulted and parachutes to the ground.

Marine Corps Aviation

The Marine Corps continued its work on combat helicopter organization during the year, advancing toward the day when it will have the capability of landing an entire assault force of men and their weapons by rotary wing craft.

General Lemuel C. Shepherd, Corps Commandant, cited two distinct advantages in the use of helicopters for such assault operations: (1) They would make it possible to disperse transports and minimize the possibility of an atomic bomb destroying more than one ship. (2) They would make it possible to make landings anywhere on an enemy shore.

In pursuit of this objective, landing an entire assault force by air, the Marine Corps continued its experiments and practice maneuvers with such large helicopters as the Piasecki and the Sikorsky HR2S.

In addition to large helicopters, the Marine Corps also is planning to incorporate one-man helicopters into its operations and to continue experimentations with new high performance observation planes. And it was expected that by 1956 all jet fighters assigned to the Corps by the Navy would have in-flight refueling capability.

The Navy and the Corps anticipate delivery of 2,616 aircraft during fiscal 1956 and it was expected that orders would be placed for an additional 1,613 in the same period.

CHAPTER FOUR

Manpower

THE MOUNTING SHORTAGE OF ENGINEERS continued to plague the industry during 1955.

So grave was the problem that President Eisenhower established a cabinet committee to study the question of training scientists and engineers. The committee included the Secretaries of Commerce, of Labor and of Health, Education and Welfare, the Assistant Secretary of Defense for Manpower, and the Directors of the Atomic Energy Commission, of the National Science Foundation and of the Office of Defense Mobilization.

The critical shortage continued to grow. The number of engineers entering industry in 1954 was less than one-half the number required. Despite this fact, the rate of induction by Selective Service of engineering personnel showed a marked increase during the same year. Figures published by the agency disclosed that in 1954 the number of occupationally deferred registrants, excluding agricultural, had been reduced 35 percent.

The Selective Service took no definitive action in 1955 despite the ringing of new alarms. Particularly loud were the speculations appearing in the national press as to whether the Communists were overtaking the United States in the race for new and improved airborne weapons. Editorials emphasized that if we just hold our lead, we may be slipping towards defeat, for if we lose the cold war, we have no choice but to depend first and most heavily upon aerial superiority.

Congressman Carl Hinshaw of California recently pointed out that because of the fundamental issues involved in the critical shortage of scientific manpower facing the nation today—and for years to come—Congress is conducting a searching examination, which it is hoped will lead to overhaul of the Selective Service law through enactment of pertinent new legislation.

This proposed legislation would amend the present draft law to provide for the discharge and continuing deferment of certain persons of exceptional scientific, technical and engineering ability. It would provide that each individual inducted or enlisted in the armed forces "shall within 30 days from the date of his induction or enlistment be afforded an opportunity to apply to a Scientific Specialist Board . . . for suspension of his obligation for training and service in the armed forces."

This legislation would simultaneously create a Scientific Specialists Board, composed of five members appointed by the President, who would have the sole power of determining whether an individual's obligation to serve in the armed forces would be suspended.

The Board would be charged with the prompt examination of the inductee or enlistee applicant for technical ability or aptitude "to warrent suspension of his obligation to serve in the armed forces . . . because he is actually or potentially more valuable to the interests of the national security and defense as a scientist, technician, or engineer, than as a member of the armed forces."

The proposed legislation further provides that "Prior to the expiration of the eighty-fifth day from the date the applicant was enlisted or inducted, the Board shall notify him of its decision with respect to his application."

If the Board decides that an individual who has applied for a suspension is "actually or potentially" more valuable to the interests of the national security and defense as a scientist, technician, or engineer, then the Secretary of Defense will suspend the obligation of the individual to serve in the armed forces not later than the eighty-ninth day after the date on which he was inducted or enlisted.

The Board would be autonomous, with full power of decision. It would not act in an advisory capacity. It would decide whether an individual's obligation would continue to be suspended, and it would be up to the Board to decide whether an individual should be reinducted should he fail to fulfill the purpose that justified the suspension of his military obligation. The legislation further provides that an individual who receives such a suspension would remain liable for induction up to age 35.

Continuing industry reports show that engineers are vitally needed for design and development work in preliminary analysis, aerodynamics, aerothermodynamics, thermodynamics, structures, stress analysis, missile components, systems, and static and flight tests. Important in current electromechanical engineering programs is reducing through subminiaturizing the size and weight of electronic components. In advanced electro-mechanical programs, engineers are needed for design of guidance systems, fire and flight control for aircraft, component development, instrumentation, radar systems, computer systems and development of related systems.

Engineers most vital are those with majors in mechanical, aeronautical, electrical or electronic engineering. Much in demand are mechanical engineers with options in thermodynamics or aeronautics, civil engineers for stress work and design. Chemical engineers are finding a special niche in thermodynamic functions. Those with engineering physics degrees are readily being used in aerophysics or electro-mechanical systems projects. For materials research in connection with airframe and the broad propulsion program, the need is for chemists, physicists, metallurgists, chemical engineers and welding and ceramics engineers.

Late in 1955, an extensive study of Soviet professional manpower was issued by the National Science Foundation. The report states that in 1953, the Soviet had about 500,000 trained professional engineers, while in the United States there were about 530,000 trained engineers. Analysis of the Soviet professional labor force by occupational field, as well as certain comparisons made with professional personnel in the United States, suggests that Soviet higher education is still oriented primarily towards the training of specialists in scientific-technical and applied fields, and has succeeded over the past two and a half decades in reaching a level of close equivalence, and occasionally of numerical supremacy, to that in the United States.

Soviet secondary semi-professional education has provided a large supply of trained supporting personnel, which in the United States is obtained mainly through the automatic process of on-the-job training or through under-utilization of trained college graduates.

The Soviets over the last 25 years have made these substantial gains despite the disrupting effects caused by forced collectivization, purges, and war, as well as the radical experimentation that took place in education in the late 1920's. The growth of professional manpower has been considerably eased by the extensive employment of women, who comprise nearly half of all professionals.

Far from decreasing, the present shortage of engineers and scientists in the United States will become increasingly worse before it bcomes better. Fewer technically-trained men are being prepared by the colleges and universities. According to a report by the Teacher's College of Columbia University, between 1950 and 1954 the total number of students graduated by colleges and universities decreased about 34 percent, owing in part to the fewer number of students studying under G. I. Bills. The number of natural science graduates decreased about 51 percent, and the number of engineering graduates decreasd about 58 percent.

Figures show that the number of natural science graduates in 1950 was 59,000; in 1954, 29,000. The number of engineering graduates in 1950 was 52,000; in 1954, 22,000. In contrast, the best information indicates that the USSR doubled the number of its engineering graduates during the same period, from 28,000 in 1950 to 54,000 in 1954.

The United States trains three-fourths of its Ph.D's in the humanities; the USSR trains three-fourths of its doctoral condidates in science and related fields. At the present time there is reason to believe that the USSR is training 300,000 scientists in schools of university rank and 1,600,000 students in intermediate technical schools.

The Teachers College report concludes that the supply of scientists in the United States is drying up at the secondary school source because of (a) lack of an adequate corps of well-trained high school science teachers, and (b) lack of an adequate and challenging science and mathematics program in many schools.

Aviation industry consensus at the end of the year was that only a concerted effort on the part of everyone concerned to establish a long-term program could possibly meet the Russian challenge.

CHAPTER FIVE

Guided Missiles

UNITED STATES MISSILE SCIENCE in 1955 was highlighted, first of all, by the fact that decisive steps were taken toward development of space flight. On July 29 the White House announced that the first unmanned Earth satellites would be launched during the International Geophysical Year (July 1st, 1957-December 31st, 1958). The Defense Department, in cooperation with the National Science Foundation, went to work on the coordination of Project *Vanguard,* the official code name for the satellite project. An estimated 10 instrumented, spherical 30 to 40-pound satellites will be launched. The prime contracts were given to the Martin Company of Baltimore for the first stage of the three-step rocket vehicle. The General Electric Company received the contract for the engine of this stage. The contracts for the second stage was given to Aerojet General Corporation, which manufactured the Aerobee-Hi.

Actually, 1955 marked the end of the first decade of United States guided missile science; most of the missiles whose names are common knowledbe today have been developed and produced by the aircraft industry since in January 1945. Their speeds now extend from subsonic to supersonic and they have varying range capabilities and guidance systems. In function, they are described as surface, air-to-air, surface-to-underwater and ship-to-air weapons. And coming along behind these is a new family of missiles capable of adding new dimensions to warfare and national defense.

The Joint Chiefs of Staff made it clear in 1955 that the United States must do more than to maintain its strategic deterrent; it must also establish a tactical deterrent. It must be able to punish local aggressions with such speed and force that the enemy will call a halt before he has an opportunity to even consider large scale aggression. This is the concept of the so-called double deterrent to wars of tomorrow. It is based on an extensive use of guided missiles and, in particular, guided missiles with atomic warheads.

The aircraft industry has made great progress in missiles during the last few years, but our scientists are still fighting the basic engineering problems—the biggest of them all being how to more nearly approach perfect guidance systems. Progress has been made, and htere are several accepted systems currently in use.

Nevertheless, the fact that various guidance systems have been developed to the extent where one can talk about production missiles became apparent in 1955 and basic concepts of the systems in use and/or under development were discussed officially for the first time and ever since our missile industry was established.

The systems are divided into two general categories, those used against moving targets and those used against fixed targets. Guidance systems are further broken down into a number of basic types. Guidance systems most useful against moving targets are the *beam rider,* sometimes called *beam timer, homing* and *command systems.*

In the beam riding system a missile is directed along the line of sight which extends from the launching site to the target. A radar or other beam is laid along this line of sight, the beam being of such a character that the missile can sense its deviations from the beam and attempt to return to its center. Since the line of sight and consequnently the beam follow the motions of the target, the missile will, with a certain error owing to time lag in the system, eventually pass through or near the target. In beam riding systems, the information on where the target is goes from the target to the guidance station, which may be on the ground or in the launching aircraft, and then back up to the missile.

In the homing system the target position information goes directly from the target to the missile, the missile homer sensing changes in the direction of arrival of signals from the target. There are three types of homing systems, *passive, semi-active,* and *active.* The first of these relies on some type of disturbance emitted from the target. The most obvious of these is the radiation in the infrared region due to the generally higher temperature of the target compared to its background. If not relying on the target completely for location information, the missile can be guided by a target illuminated by a reflected source of energy. This is called semi-active homing. In active homing, the illuminator is in the missile itself.

The third type of guidance system useful against moving targets is the command system. With this system, target location is sensed at the guidance station by radar or other means. Computations are then made and flight directions sent to the missile.

For the command system, two radar sets are involved. As the target moves along, one radar set tells the location of the target. A missile is launched and is tracked by a second radar set. If the position of the target and the position of the missile at the same time are known, the necessary missile course can be computed.

Fixed targets present a different but not necessarily easier problem. Information about the location of the target is generally not measurable at the location of the guidance station, but must be obtained by some indirect means such as mapping techniques.

Other techniques, most of which are just automatic adaptations of navigation systems, include the *baseline* systems and the so-called *self-contained* systems. The baseline systems may be somewhat familiar in the form of Loran or Shoran. In these systems an artificial grid of lines in space is laid down above the ground in the target area.

One system consists of a grid of lines that measure specific distances from two ground stations. If a missile is to reach a target in a particular location, the missile flies out along a particular line and as it crosses the grids, it will come to one it recognizes and which represents the target.

The term self-contained guidance implies that a missile carries within it all the information that is necessary to reach the target, that is, the location of the target and an internal means for sensing deviations from an arbitrary path to the target. This definition is really fulfilled only by the type called *inertial*.

The simplest form of inertial system is the use of a purely ballistic path, where the forces acting on the missile are limited to inertial and gravitational forces. However, the system normally employs a technique denoted as *inertial space*. This technique is achieved by the use of two instruments. The first is the gyroscope which tells the direction in which the missile is headed and the second is the accelerometer which provides the information from which (by integration) the velocity of the missile and, therefore, the distance traveled, may be determined.

Information on target location with respect to the location from which the missile starts can be stored in the missile ahead of time, and since the missile knows at all times where it is, at least to some degree of approximation, from its history of heading and distance traveled, it can compute the course it still has to take to get to the target.

The Army's new artillery system, the Douglas *Nike* system, sometimes called the*Nike-1* has the ability to attack most aircraft type targets. There are indications that new and supposedly improved *Nike-type* missiles are being developed as replacements for the type currently in operation. To support its tactical mission in the field, the Army has the Douglas *Corpal*, which is in effect a moderate range, tactical, ballistic missile capable of carrying atomic warheads. It has a guidance system that is precise enough to make it effective in the sense that it has the necessary precision to deliver fire effective against tactical targets.

In addition to the *Corporal* guided missile, the Army has now put into the field here and abroad its unguided ballistic rocket, the Douglas *Honest John,* which is a considerably shorter range weapon, somewhat comparable with the longer range artillery, but capable of carrying a much larger warhead than any artillery, including atomic warheads.

The Army reached the testing stage of a longer range, ballistic type rocket, the Chrysler *Redstone* rocket, in 1955, the characteristics of which have not been released. The *Redstone* sometimes has been referred to as the modern V-2 but it is considerably more advanced than the V-2. Some of the German scientists who developed the V-2 have also been responsible for the *Redstone,* developed in cooperation with the Army's Missile Center, Huntsville, Ala.

The Navy has three missiles already deployed in support of its mission. The first of these is a ship-launched, anti-aircraft missile, the Convair *Terrier,* which has now been tested in fleet operational tests off the battleship *Mississippi.* Two of the Navy's cruisers were equipped operationally last year to defend the fleet with the *Terrier* missile system.

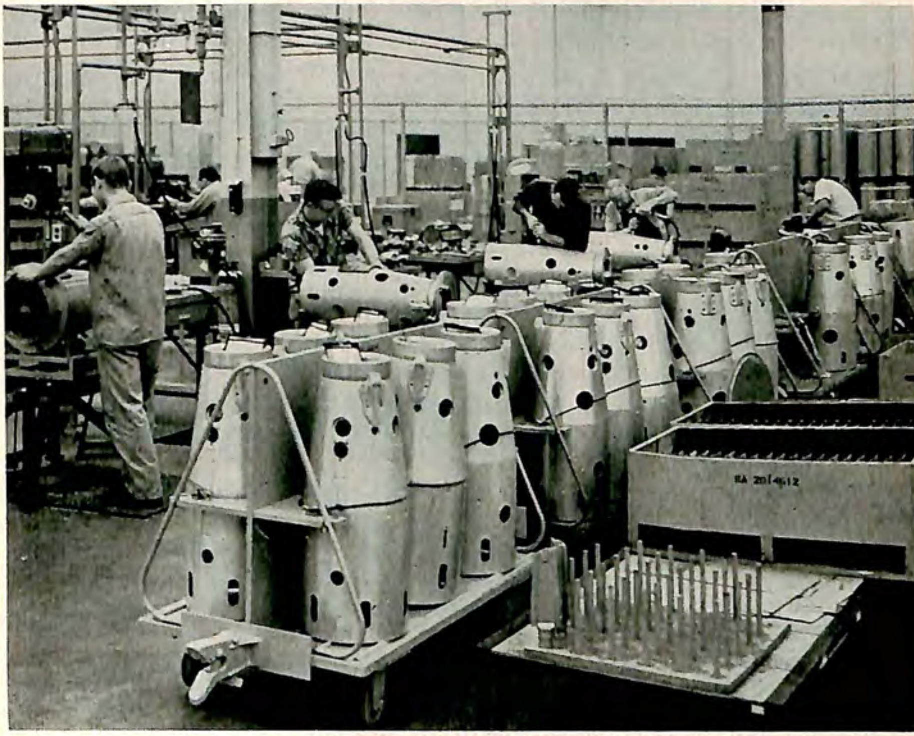
More than 30,000 inspections, tests and check-outs are made on a *Terrier,* primary armament of the *USS Boston* (CAG-1) before the completed surface-to-air guided missile is released from the factory. The *Terrier* is being produced in quantity for the Bureau of Ordnance at the government-owned Naval Industrial Reserve Ordnance Plant, operated at Pomona, Calif. for the Navy by Convair. Ground was broken at the 141-acre plant site in August, 1951, and limited operations were begun in the Engineering Building a year later. The finished plant, capable of complete missile design, manufacturing and testing, short of actual firing, was activated in January, 1953.

Second Navy missile—but first to attain combat-ready reliability in quantity production—is its air-to-air system, the supersonic Sperry *Sparrow* I. Years of tests and current fleet training have proved it effective against speedy jet aircraft of any size, and its range is far in excess of previous conventional aircraft weapons.

Both fleet and Marine air arms are evaluating two or more different *Sparrow* I guidance systems, also developed and produced by Sperry Gyroscope under that company's complete system program since 1947, originally termed "project Hot Shot." Current-model "birds" are quantity produced at a Navy facility, the Sperry Farragut plant in Bristol, Tenn.

The Navy's *Regulus* missile is in the surface-to-surface class and is designed for launching from Naval vessels. The versatile *Regulus,* developed by Chance Vought Aircraft, Incorporated, under the sponsorship of the Bureau of Aeronautics, has increased tremendously the striking power of the Navy's surface and submarine forces.

Designed for launching from submarines, surface ships and shore bases, *Regulus* is one of the most modern weapons in the nation's arsenal of defense. It is in full scale production at the company's Dallas, Texas, plant, where maximum effort is being devoted to increasing the performance and versatility of advanced missile types.



Convair Terrier guided missiles under construction at Pomona plant

Regulus can deliver a powerful warhead at transonic speeds over a range of hundreds of miles, guided along its course by a built-in electronic system.

The first Navy surface-to-surface guided missile to become fleet-operational, *Regulus* was conceived by Chance Vought in 1947. However, its existence was not disclosed publicly until March, 1953, when the Navy announced that the program had reached the stage where information concerning some of its earlier phases could be released to give the public information concerning engineering and technical progress made by the Navy Department and its contractors.

Regulus was designed in two versions: a recoverable test and training missile with a retractable landing gear and a non-recoverable tactical missile.

In addition to contracting for a tactical missile, the Navy had introduced an exceptional requirement: the basic missile configuration must contain provision for recovery. This meant that the missile, in its test and training versions, must be capable of landing intact after a mission so that it could be flown again.

The concept of recoverability paid off. Some *Regulus* missiles have been flown as many as 10 times and one missile has flown at least 15 times.

In addition to savings in money, the recoverability concept was responsible for much of the exceptional versatility of *Regulus*. It led to new developments in certain elements of the missile system that extended the usefulness of *Regulus* far beyond its original mission and extended development in simplified training.

The submarine *USS Tunny* was the first underwater craft specifically modified to launch *Regulus,* with other craft slated for similar conversion. Recommissioned on the West Coast in March, 1953, the *Tunny* was a converted World War II submarine, modernized by the addition of the snorkel and streamlining of hull and conning tower. A special tank for storing of the *Regulus* and a launching ramp also were installed.

Navy crews have successfully launched *Regulus* from cruisers, aircraft carriers, small surface ships, and from portable launchers ashore, as well as from submarines.

In the missile field, *Regulus* has transferred the research and development plans of many years into operational reality. Working closely with the Bureau of Aeronautics, the Bureau of Ships, and the Bureau of Yards and Docks, Chance Vought, in its *Regulus* program, did far more than develop a missile—it pioneered in developing the Weapons System Concept in the missile field.

This concept involved all phases of planning, development, manufacture, and utilization, not only for the missile but also for all necessary supporting elements to fulfill the operational role of the weapon.

Throughout its existence, the *Regulus* program has continued to meet the requirements laid out in the basic development plan to incorporate the missile as an integral part of the Navy's defense program.

It was the first surface-to-surface missile to be equipped with a landing gear and to be recovered successfully and the first to use a parachute brake. *Regulus* also was the first guided missile with which two flights were made in one day with the same missile and the first guided missile to fly 15 times (one vehicle). It was the first guided missile to be flown successfully from all of the following: an aircraft carrier, a cruiser, a guided missile ship and a submarine.

The Air Force is developing a surface-to-air interceptor type guided missile, the Boeing *Bomarc,* which was announced somewhat prematurely because "it is not the habit of the Defensee Department to announce weapons at the stage of development where *Bomarc* now is."

The Air Force announced actual production in 1955 of the Hughes *Falcon* air-to-air guided missile. Existence of the*Falcon* guided missile was originally announced by the Air Force on March 15, 1955, when it was revealed that tests indicated the *Falcon* packs the blast of a heavy artillery shell and every hit is a kill.

The *Falcon* is slightly over six feet long, is six inches in diameter and weighs less than the average man. It is small and light enough to be carried in quantity by a small interceptor, and can be fired in salvos. The Air Force said that this missile, launched at a range of miles, not yards, gives interceptor pilots better odds in combat than they have ever had before:

First, the *Falcon* can be launched from well beyond the reach of an enemy bomber's defense. Second, it can be launched on a climbing course from an interceptor that is far below the enemy bomber, thus saving time that the interceptor would need to gain the bomber's altitude. Third, the *Falcon* has an extremely high probability of kill, even against maneuvering targets.

Once the target has been pointed out to the *Falcon,* its electronics intelligence steers it to anticipate and strike the target no matter how the target maneuvers. The Falcon's computing devices give it a built-in habit pattern.

The Air Force has also developed and has put into operational use its surface-to-surface *Matador* missile. It takes off from a mobile launcher with a booster which puts it on its course and then a sustaining motor to carry it along very much the way an airplane would be carried on its course.

Engineers of the Martin Company recognized that a successful missile is not simply a warhead delivery wagon. *Matador* was designed as a comprehensive tactical weapons system in the rounded military sense. TM-61 embraces: (1) a transonic, high performance airframe, featuring interchangeable parts; (2) means of automatic guidance; (3) alternative warheads; (4) a zero-length launcher and booster rocket; (5) a full complement of ground-handling and transporting vehicles; (6) fully equipped squadron assembly, ordnance and launch areas; (7) complete systems check-out and testing apparatus; (8) depot, housing and maintenance facilities both at the factory and in the field (9) shipping containers for the seven major components; and (10) packaged spare parts ready for shipment and long-term storage.

Means for launching the *Matador* received early study. It was decided to employ a booster rocket that would hurl the *Matador* into the air from a stationary condition. The simple, mobile, zero-length launcher provided a basic part of the answer. The booster rocket is of the underslung type and burns a solid-propellant fuel. When expended, the booster is detached from the missile by a compressed air cylinder. Rocket alignment and launch angle are predetermined, so that speed and altitude at end of boost can be made consistent with flight requirements.

Prior to igniting the booster rocket, the launch crew revs up the missile's engine to full rpm. The missile has been raised to flight altitude. As the jet impulse takes effect, a hold-back bolt prevents the missile from nosing over. The bolt fails in shear as the rocket imparts added thrust.

The first *Matador* launcher was a goliath. It was fixed in position and took eight men 15 minutes to operate. It had no self-contained systems. Today it is a specially constructed semi-trailer of 35,000 pounds containing a d-c motor-generator, a blower for electronic cooling and a hydraulic pump. It raises the missile in a matter of seconds.

Considerable attention was paid to such problems as strength, clearance, blast protection, use of a tractor vehicle, missile hold-back during engine run-up and self-contained systems. Structurally, thought was given to the springiness of forward and rear support points, as these affect the launch of a missile. Of concern also, was the angular momentum imparted to the missile by the supports at the instant of separation from the launcher.

Successful tests at Aberdeen Proving Ground, in 1947-1948, verified the zero-length launching technique. Wooden dummies simulated the *Matador*. Last year, Martin launched a piloted F-84 from the zero-length platform.

Shipments of Allison J33 series centrifugal flow turbo-jet engines for use in surface-to-surface guided missiles increased in 1955 as a result of a step-up in military operational training programs.

In continuous production throughout 1955 were the J33-A-37, power plant for the TM-61 *Matador,* and the J33-A-18A which provides the power for the Chance Vought *Regulus*.

The J33-A-37 in the USAF's *Matador* is currently being replaced by a J33 engine with higher power, a conversion of an engine originally used with a piloted aircraft. The conversion was engineered by a modification of the fuel system; removal of afterburner, air inlet screens and emergency fuel system and the installation of lower cost but more durable turbine buckets to withstand increased temperatures and rpm.

First official disclosure that the 600-plus mph Ryan *Firebee* jet target drone also has potential tactical applications and could be used as a guided missile or for reconnaissance was made last year by Ryan Aeronautical Company, with Department of Defense approval. At the same time detailed performance characteristics of the swept-wing pilotless plane were released.

Designed originally as a high-speed target to provide the military services with a jet-fast flying bull's-eye which can realistically simulate attacking enemy aircraft, the *Firebee* has a maximum speed of 610 miles an hour at sea level, or 605 miles an hour at 40,000 feet. It is designed to fly under remote control from the ground, after air launching from a mother plane, for 1 hour and 20 minutes at 575 miles an hour and an altitude of 40,000 feet. Its service ceiling is approximately eight miles up—42,500 feet. Its rate of climb at sea level is a spectacular 8,500 feet per minute.

The *Firebee's* primary function, for which it is now being evaluated by the Air Force, the Navy and Army Ordnance, is as an evasive target for ground and air-to-air gunnery practice and as a high-speed bull's-eye to aid in evaluating the effectiveness of new weapons systems. Its production cost is approximately one-tenth that of piloted aircraft converted to pilotless drones. The *Firebee* has a parachute recovery system which permits repeated use of the drones for target practice.

For guided missile use, a warhead or other special equipment could be carried in the fuselage or in pods slung beneath the wing. Smaller pods could be mounted on the wing tips. As a versatile guided missile for a variety of applications, the *Firebee* could be ground launched from rail or zero-length launchers, or air-launched from a carrier plane in flight.

For tactical reconnaissance, a *Firebee* could be equipped with aerial cameras, radar, Reconofax and television installations to transmit intelligence information to operational headquarters. As a tactical reconnaissance vehicle, it could be catapulted from the ground, vectored over the proposed target area, and brought back for parachute recovery of the plane and its intelligence data without risking the loss of an expensive plane or an irreplaceable flight crew. For long-range reconnaissance, its scope could be extended by air launching from a mother plane.

Northrop Aircraft, Inc., and its subsidiary, the Radioplane Co., are active in several types of guided missile work which continue to grow in importance in the national defense program.

Although most of the work in this field is necessarily secret for reasons of military security, it can be said Northrop's program is one of the most advanced in the field. Official announcement has been made that the company is engaged in development of the *Snark* SM-62, a long-range pilotless bomber with atomic capabilities. Other details concerning the *Snark* and other missile projects assigned to Northrop and the Radioplane Co. have not been released.

Radioplane's pioneering experience in the target drone field has enabled the company to extend its activities to substantial guided missile projects. As the builder of more than 40,000 radio-controlled target drones, Radioplane Co. possesses one of the nation's most talented teams in the design, development and production of unmanned aircraft.

As Northrop's guided missile program has advanced, the company has devised new types of production machinery, accurate within millionths of an inch and capable of performing production jobs not possible with standard machines.

In one case a series of five machines, known to Northrop missile men as the "precision quintet," were designed and built to machine *Snark* missile castings.

One of these machines holds to angular tolerances of one second of arc—3,600 times more precise than customary airframe tolerances of plus or minus 30 minutes of arc.

On another, several different surfaces may be milled in sequence and two or more compound angular surfaces may be milled at the same time. On still another of the five machines parallelism of two surfaces can be held to .0002 of an inch within a 10 inch span, or 20 millionths of an inch per inch.

To illustrate the effect of precision of this type, Northrop engineers cite the fact that a rocket or missile aimed at a spot on the Earth's surface 5,000 miles distant and traveling at no greater deviation from true course than one second of arc would hit within 120 feet of its target.

Although it is too early to tell at this point the exact expenditure for guided missiles in 1955, the planned allocations called for $254.1-million. The 1956 estimate is $242.4-million. The biggest problems right now seem to be consolidation of proven developments and how to meet the increasing demand for more engineers.

Concerted efforts to improve the over-all reliability of missile weapons systems through improved component reliability are being made by the major designers and producers of guided missiles, reliability being the greatest single problem facing the missile industry.

Component reliability is a limiting factor in today's missiles. The AIA Guided Missiles Committee, working with the military services and the suppliers of equipment, particularly electronic components, will seek to establish new standards for missile equipment. These standards will necessarily be considerably higher than the most stringent requirements of other industries.

In a missile no human is along to monitor and make adjustments. Therefore, the failure or malfunctioning of any single part among the thousands needed to make a missile can mean total failure of the missile. Component reliability is the key to greater reliability in the missiles themselves.

The pyramiding effect of "failure probability" can quickly lead to the point where the probability of a successful flight can reach the zero point unless missile components are refined until their reliability rate nears the absolute. If, for a simple example, the average failure expectancy in electronic tubes, resistors was one per thousand and a missile contained 1,000 electronic components, successful flight probability would be zero.

Good advances have really been made in the missile field in the past ten years. The greatest immediate progress could probably be made through improvements in reliability. Such improvements would be beneficial not only to present missiles but also to missiles not yet off the drawing boards.

CHAPTER SIX

Government and Aviation

Agricultural Research Service

AIRCRAFT AND EQUIPMENT SPECIALISTS in USDA's Agricultural Research Service gave technical assistance in the supervision of approximately 100 aircraft in 31 States during 1955 in treating about 1,600,000 acres for control of grasshopppers, 97,600 acres for Mormon crickets, 1,370,000 acres for gypsy moths, and 1,549,000 acres for spruce budworms. In cooperation with nine states, these specialists made experimental field applications from the air of granulated insecticides for control of soil-inhabiting pests (Japanese beetles, European chafers, white fringed beetles) and reported excellent results.

Agriculture advisors cooperating overseas with U. N.'s Food and Agriculture Organization met with the Desert Locust Control Committee in Syria to plan this year's aerial attacks in the Near East against grasshoppers, which have plagued this area throughout history.

In another overseas project, Operation Gyroscope, a U. S. Army regimental combat team being rotated by air from Japan to the mainland went through pre-departure quarantine clearance by a combined Customs and Agriculture team. Compared with the usual method—inspection upon arrival in the United States—this pre-clearance at point of departure provided better protection against spread of plant and animal pests and diseases at less cost in manpower, and also expedited the military movement.

During typical U. S. quarantine activities in 1955, Agricultural Research personnel examined nearly 90,000 transport aircraft for materials that might contain plant pests; nearly a third of these airplanes carried prohibited or restricted plant materials.

Livestock inspections also were carried out, since nearly 73 percent of all poultry, 53 percent of all horses, and 16 percent of all other animals, such as cattle, swine, sheep, and goats, coming from other countries (exclusive of Canada and Mexico) arrived in this country by air. USDA scientists are developing special procedures to be used in detection of destructive pests around airports to reduce their spread or establishment elsewhere.

Another USDA study group met informally late in 1955 to outline research needs in agricultural aviation. Among the needs: engineering innovations (as in the shape, size, and position of nozzles and spray booms); fertilizers formulated for aerial application; better guidance system for directing pilots; an agricultural aviation handbook for industries, applicators, farmers, and others.

ARS engineers who designed a fluidizer that expands dust to an easy-flowing, liquid-like mass (through air pressure) now are experimenting with different numbers of dust-spray tubes in various positions on the plane, to determine which combination is best under specified conditions. The work also includes design and development of equipment for application of sprays and granular materials.

In experiments successfully closed in 1955 on the island of Curacao, USDA scientists saturated the wild population of screwworm flies (maggots from the fly eggs grow in open wounds, may kill livestock) with many thousands of laboratory-reared male flies made sterile by exposure to gamma rays from radioactive cobalt. These flies were spread by airplane. Since female screwworm flies mate only once, the population soon dwindled to nothing. The entomologists now believe they might rid Florida of this pest through the same method. But, whereas the island of Curacao measures 170 square miles, the peninsula of Florida contains some 58,000 square miles. Designing the equipment for covering the vast southern areas of Florida with male sterile screwworm flies dropped from the air—if this is ever tried—will offer an interesting challenge to the agricultural aviation engineer.

In eight western states, some six million acres have been infested by halogeton, an annual noxious weed that has killed thousands of sheep and cattle. During 1955, plant pest control personnel of USDA cooperated with the Department of the Interior in trials in Nevada and Idaho of various formulations of herbicides and use of aircraft to control the weed.

Air Coordinating Committee

The Air Coordinating Committee, established in 1946, Executive Order 9781 of the President to coordinate Federal policy in the field of aviation, is composed of the following members of the eleven Government Agencies having an important interest in aviation: Louis S. Rothschild, Under Secretary of Commerce for Transportation, Chairman; Chan Gurney, Member, Civil Aeronautics Board, Vice Chairman; Herbert V. Prochnow, Deputy Under Secretary of State for Economic Affairs; George H. Roderick, Assistant Secretary of the Army; James H. Smith, Jr., Assistant Secretary of the Navy for Air; Bradley D. Nash, Acting Deputy for Civil Aviation, Office of the Assistant Secretary of the Air Force; David W. Kendall, Assistant Secretary of Treasury; E. George Siedle, Assistant Postmaster General; Robert E. Lee, Commissioner, Federal Communications Commission; Percy Rappaport, Assistant Director, Bureau of the Budget (non-voting); and Colonel Alvin B. Barber, Consultant for Transportation, Office of Defense Mobilization (non-voting). The Executive Secretary is William E. Neumeyer.

The Committee, during 1955, developed, coordinated and recommended to the Department of State the United States position for the Agenda of the Ninth Session of the ICAO Assembly dealing primarily with financial and administrative matters. Recommendation was made for approval of the application for membership in ICAO of the Federal Republic of Germany.

In the technical field, the Committee approved the United States position for six international technical conferences concerned with the work of the International Civil Aviation Organization.

Also during 1955, amendments numbered 15 through 21 were made to Annex 10 (Aeronautical Communications), were approved by the Contracting States and became effective. In addition, recommendations were made with regard to amendments to the ICAO approved phonetic alphabet.

The Committee approved revision of the Terms of Reference for the Air Traffic Control and Navigation Panel which provided that the Navy Panel would guide the combined efforts of the voting membership of U. S. Government agencies with primary aviation interests and the non-voting aviation industry membership toward the development and implementation of programs to meet the air traffic demands on the common system. The Committee also approved "Civil Aeronautics Administration's Proposed Federal Airway Plan, Fiscal Years 1957-1961"; approved a program for immediate first-stage integration of air defense and air traffic control functions by expanded use of long-range military radar; approved a program on electronic short-distance navigation systems to minimize disruption of use of all aviation interests—this program will provide a common civil-military system of navigation to the extent possible for basic tactical operations as well as civil-military non-tactical operations. Effective August 1, 1955, a trial high-density zone in the immediate area of Washington National Airport was delineated and appropriate rules promulgated in order to determine methods for reducing the mid-air collision hazard in metropolitan areas of high-density air traffic and in an effort to accommodate the needs of military air operations; approved criteria for the use of frequencies and operational facilities in the limited radio spectrum between 200 and 415 kilocycles to be applied to any proposed aeronautical facility operating in this band; requested the CAA to make a policy study of the extent to which the ground radio navigation and other non-visual aids are being used or needed; accepted the Radio Technical Commission for Aeronautics' Special Committee 57 report on Instrument Landing System (ILS), Visual Omni Range (VOR), and Distance Measuring Equiupment (DME) frequency channel utilization as a guide in implementing frequency plans for those types of navigation facilities; determined that altitude input information was important to further development of airborne pictorial computers, transmitting this information to the Air Navigation Development Board for its guidance in developing the equipment.

The Committee continued the development of a proposed National Search and Rescue Plan to insure the effective utilization of all available facilities for all types of search and rescue missions.

The Committee continued its examination and review of U. S. regulations and administrative practices in order to simplify and expedite international border crossing procedures relating to the entrance and clearance of air passengers, crew, cargo and aircraft. Such review resulted in elimination and clarification of U. S. derivations from ICAO standards contained in Annex 9 to the Chicago Convention. In addition, numerous actions for the facilitation of international air travel were taken during the year. The Committee also approved and recommended policy instructions to the Department of State for the use of the U. S. Delegation to the Fourth Session of the Facilitation Division of ICAO, held in Manila, Philippines, October 10-24, 1955.

In the Economic field, the Committee completed a study of international airport charges and approved the U. S. position that the international conference planned for the fall of 1956 on this subject should not attempt to reach conclusions regarding standardization of levels, but should discuss and exchange views on the more technical and specialized aspects of the problem; approved U. S. positions for the use of the U. S. Representative to ICAO in discussions by ICAO of the study of the financing of air route navigation facilities and services, suggesting that it be directed toward the development of broad principles on which to base charges rather than the presentation of detailed techniques for institution of charges. The Committee reviewed the North Atlantic Ocean Station Program and agreed that the existing program was a minimum which would furnish the meteorological information communication services, navigational aid and search and rescue capability required by the United States; this action had the effect of approving the extension of the program automatically till June 30, 1957. Also approved was the position for a meeting with Canada to discuss the Pacific Ocean Stations Program in response to a Canadian proposal that the program be expanded in both terms of stations and participating countries. The Committee submitted to ICAO eight reports covering deficiencies of air navigation facilities and services in various regions. Further coordination was effected during the year for domestic and foreign civil aviation requirements for priorities for the production of civil transport aircraft; four such programs were approved during the year covering the construction and delivery of 592 multi-engine civil transport aircraft during the years 1955, 1956, 1957 and the first and second quarters of 1958. In the non-transport category, manufacturers' planned production for 1955 through the second quarter of 1958 indicated construction of 17,516 aircraft which are not included under the Defense Materials Systems.

In another Economic phase, the Committee approved a proposal by the Navy to lease for commercial operation a limited number of aircraft already owned. The Committee also undertook a study of the need for financial assistance by the Federal Government in the design, development and service testing of transport aircraft suitable to the needs of the local service air carriers.

In the legal field, the Committee coordinated preparation of the U. S. position for the International Conference at The Hague to finalize the protocol to the Warsaw Convention. The Committee advocated an increase in the limit of liability of international air carriers for personal injury or death of passengers from $8,300 to $25,000. The U. S. delegation succeeded in achieving agreement on an increase in the limit to $16,500.

Airport matters considered by the Committee during the year consisted largely of problems resulting from expanded Reserve training and Air National Guard programs authorized by the Congress.

Civil Aeronautics Administration

Early in 1955, F. B. Lee, Administrator of Civil Aeronautics, forecast that 50 million passengers would be carried on U. S. airlines in 1960, and added that "the biggest job ahead is the further improvement of existing facilities for handling these passengers with the utmost safety."

By the end of the year, the CAA had issued a forecast of air transportation growth which indicated 55 million passengers by 1960, and 70 million by 1965, and several projects for airways and safety improvement were occupying CAA's planning and operations.

Domestic air carriers went right on with the trend in producing more and more converts to air travel and the use of air cargo and air mail each year, exceeding last year's 32.3-million passengers by an estimated 19.2 percent for a total of 38.5-million. International air travel increased also to an estimated 3.4-million passengers, and traffic over the North Atlantic produced the surprising statistic in July of one airplane taking off every 17 minutes, or a total of 2,559 crossings in that seasonal month.

Safety figures took a turn for the worse, with an estimated .62 fatalities per 100-million passenger miles recorded as compared to the all-time best figure of .1 per 100-million passenger miles for domestic and international service in 1954. Despite the 1955 record, however, the trend over the years toward safer and still safer air transportation continues.

The 1955 figures do not include the fatalities which resulted from the explosion of a bomb in an air carrier in November, nor the death of a stewardess by shooting on board an air carrier. Both incidents were deemed outside the range of air accidents.

Major events in airways, airports and air safety took place during the year within the CAA.

Congress passed an amendment to the Federal Aid to Airports Act which made available some $63-million a year of matching federal funds for 1955 through 1958. The original appropriation of airport funds for fiscal

1955 was $20-million, to which $42.5-million of the new funds was added. At the same time, the criteria for federal participation in airport improvement and construction was changed by the amendment, and federal funds were made available to aid in construction of most buildings at airports except hangars, for automobile parking lots and the acquisition of land to provide clear approach areas. Most important result of this amendment, according to city and CAA authorities, was the opportunity it allows for long-range planning in airport improvement, an important feature in the enlarging aviation picture.

In view of the new criteria, communities were requested by the CAA to submit entireliy new applications by Dec. 1, 1955, and a program for using the $42.5-million was promised for Jan. 1, 1956.

Improvements and changes along the airways were constant throughout the year to keep these facilities ahead of the steady growth of air commerce. In August the CAA initiated a study of airways requirements for a period of five years ahead, and, after coordinating this plan with the government agencies concerned and with the industry, had it ready for approval by the Air Coordinating Committee late in the year.

Important elements of this plan are radar beacons for better control of faster air traffic and a doubling of the navigation aid installations so that "tomorrow's growth will not be throttled by limitations of the airways system." To prevent a log jam developing on the ground, the plan involved also an expanded airport program.

The possibiilty of the growth of air traffic outgrowing its navigation aids on the ground excited the industry late in the year, and industry collaborated closely with the CAA in planning solutions to all anticipated problems.

To expand and increase the airways service to air commerce, the CAA began a 90-day evaluation program of operating certain Interstate Airways Communications Stations from nearby stations. At busy terminals the CAA installed "repeater" radar scopes in 38 airport towers, making a total of 81 such scopes, to speed aircraft safely in and out of busy terminals. The CAA was replacing radar equipment inherited from the military after the war with new and better surveillance radar at 18 terminals.

An experiment was conducted at Washington National Airport by designating it as a high density area, and placing all traffic under more complete control. If successful, the plan probably will be adapted to other busy terminals where the density of air traffic justifies added control.

In Aviation Safety, the CAA continued its intensive studies of the problems which will be posed by the adoption of jet planes by the airlines. Forty-five more CAA workers, this time air traffic controllers, aircraft communicators and certain specialists, took the jet indoctrination course which 40 CAA officials previously had taken at Moody Air Force Base at Valdosta, Ga.

The first formal step toward airworthiness certification of a U. S. jet transport was taken in the fall with the convening of a preliminary type board meeting. This was a culmination of long study and observation by the CAA of jet plane characteristics begun several years ago when CAA officials went to England to see the first jet-powered transports. This advance planning and study made easier the work of the CAA in connection with Capital Airlines, which had four of its Viscount turbine-powered planes in service by the end of the year. In that operation, the CAA and all airline operators learned helpful lessons in maintenance of this new plane during the year.

In its concern for air safety, the CAA moved on a broad front during 1955. Its goal of turning over to industry certain responsibilties for certifying the safety of its products was pursued, and the practice of designating responsible individuals in the industry to carry on certain inspection and certifying activities continued. One manufacturer certified that a new model plane met CAA requirements for safe design and construction, and two other builders certified the same about several models of their planes after the prototype had been certificated by the CAA.

Problems of certification of U. S. built jet transports occupied much of the time of the CAA's aircraft engineers and flight engineers. Although the problems are so new as to give little guidance, the CAA Safety Agents and the Civil Aeronautics Board, which issues the civil air regulations, continued their close study and observation alongside the industry firms that were building new jet transports. A rash of advance buying of these new planes featured the history of airlines during the year, with a total of $1-billion orders recorded. This activity paralleled CAA advance planning.

Sixteen foreign planes were submitted during the year for CAA certification, one foreign engine was approved and application was made for four others.

Sharing the concern of pilots about mid-air collisions, the CAA staged a major symposium on the problems late in the year, attended by a wide representation of the industry. A week-long study of procedures for getting passengers out of a land plane ditched in the water was staged. A new handbook on weather for all pilots was issued. In cooperation with the Texas Aerial Applicators Association and Texas A & M College, the CAA staged a school for agricultural pilots, hoping to lessen the hazards of this kind of flying. It is hoped that other land grant colleges will repeat the course if it proves helpful in promoting safety.

In the neighborhood of busy air terminals, CAA communicators reminded pilots at the close of every communication about the congested traffic area toward which they were flying, using such catch phrases as "Look out, traffic is heavy." "Heads up, watch for the other fellow," as reminders.

The Administrator held up before the airline industry the prospect of 130-million new passengers when rotorcraft of proper kind can be put into service. That many passengers, he said, take intercity trips of 150 to 700 miles, and today are using other forms of transportation. Convenient heliports and efficient aircraft will make possible their conversion to air travel, he said.

The parade of foreign aviation officials and trainees to the United States continued during 1955, and the CAA, taking stock of the results of this observation and practical training, pointed out that we are nearer than ever before to standardized airways over the world. U. S. methods and U. S. equipment were sold widely in European, Asian and South and Central American countries. The CAA supervised training and visits by aviation leaders, most of which were financed by International Cooperation Administration funds.

As part of its promotion of civil aviation, the CAA launched its Aviation Incentive Movement in 1955, designed specifically to capture and hold the interest of youngsters between 7 and 15 years of age in aviation pursuits. Schools, service clubs and other organizations have begun to follow the suggestions for AIM, and local sponsors of groups of youngsters have appeared in many parts of the country.

Steady progress was made during the year in the installation of new markers, and evidence piled up proving the effectiveness of these simple ground aids to the pilot.

Civil Aeronautics Board

Many new policy-making decisions were issued by the Civil Aeronautics Board in 1955 that will significantly assist the growth and development of American civil aviation.

In three major route cases Board decisions reflected a new and liberal policy that resulted in granting the largest expansion of domestic air service in any year since the Board began. In the New York-Chicago case, in the Denver Service case, and in the Northeast-Southwest case, the Board authorized new competition in all three areas of operation, which will result in making new and improved services available to the public.

In the New York-Chicago case, the Board made possible new nonstop and turn-around service between cities already receiving service in this area, making possible more convenient and expeditious service on the routes of Capital, Northwest, TWA, United and Eastern Air Lines.

In the Denver Service case, the Board certificated competitive transcontinental air service for Denver, Colo., Kansas City, Mo., and Pittsburgh, Pa., for the first time, and also authorized a third nonstop trunkline service between the San Francisco Bay area and Chicago and improved the existing services between the Bay area and points east of Chicago such as Detroit, Washington, New York, Hartford, Springfield, and Boston. In the same case, the Board also improved the regional air services to Chicago, Los Angeles, and San Francisco, and authorized improved service between Kansas City, Mo., and the West Coast and the Pacific Northwest.

In the Northeast-Southwest case, the Board certificated new, additional and competitive air service between the principal cities in the southwestern and northeastern areas of the nation and to certain midway cities lying between these two areas. This rearrangement of the route structure made possible new or additional air service between major cities in the Northeast (Pittsburgh and Philadelphia, Newark, New York, Baltimore and Washington) and in the Southwest (Tulsa and Oklahoma City, Dallas, Fort Worth, and San Antonio, Houston and New Orleans) and midway cities between these areas (Atlanta, Chattanooga, Knoxville, Memphis and Nashville). In this case the Board recognized the need to strengthen the smaller trunk airlines so they will be able to operate without subsidy and at the same time compete effectively with the larger trunk carriers. Braniff Airways and Delta Airlines were both authorized for the first time to extend their operations into New York City and Newark, N. J., via Washington, D. C., and other points.

The Board also announced a new policy defining the role of large irregular air carriers and their position in the nation's air transport system. The Board's decision followed a 4-year investigation of approximately 50 large irregular carriers, commonly referred to as non-skeds. The Board adopted a policy in this decision that would strengthen these carriers and foster their continued growth. In achieving this, the Board redesignated these carriers to be Supplemental Air Carriers and decreed they would no longer be confined to irregular and infrequent flights by authorizing a specific maximum of 10 flights per month between any single pair of points, which makes it possible for the Supplemental Carriers to offer regular scheduled service so long as the 10-flight limitation is not exceeded. The Board's new policy also decreed unlimited charter operations on a plane-load basis in domestic, overseas and territorial operations, excepting Alaska, and also would permit the carriage of cargo in international operations, and carriage of passengers in international charter operations on an individual exemption basis.

In 1955, the Board also completed the issuance of permanent certficates to the 14 local service air carriers which are now authorized to serve 398 citiest in 42 states over more than 35,000 certificated route miles. These local air carriers are presently operating 175 twin-engined transport aircraft and carried approximately three million passengers in the current year, an increase of nearly 26 percent over 1954. Although all local carriers are presently receiving subsidy, several appear to be close to achieving self-sufficiency before subsidy aid.

In September, 1955, the Board issued the fifth in an annual series of reports identifying the service mail pay and subsidy mail pay received by U. S. certificated air carriers. This report revealed that in fiscal years 1956 and 1957, subsidy will have been reduced to $48.5-million for the certificated air carrier industry as a whole. This is a decrease of $23.5-million —or 33 percent—from the subsidy for fiscal 1954, and is a decrease of $7.2-million—or 13 percent—from the subsidy for fiscal 1955.

The Board's estimates for fiscal 1956 revealed that all 14 certificated local service airlines are subsidized and that all three certificated helicopter operators are subsidized. On the other hand, only two of the 13 domestic certificated trunk airlines required subsidy. At the same time, the Board's subsidy estimates for fiscal 1956 showed that all carriers engaged in states-Alaskan and intra-Alaskan operations required subsidy, as well as the two carriers operating in the Hawaiian Islands. The report estimated that only one of the two American carriers in trans-Atlantic operations required subsidy while all three U. S. certificated carriers operating in the trans-Pacific area were subsidy-free. In Latin American operations, all four U. S. carriers still require subsidy.

Federal Communications Commission

On June 30, 1955, the Aviation Services of the Federal Communications Commission had a total of 43,855 stations which provide radio facilities for communication essential to aircraft operation and safety of life and property in the air.

More than 29,900 aircraft radio stations are authorized for installation on both air carrier and private aircraft.

Enroute and fixed aeronautical radio stations provide the necessary communication for the safe, expeditious, and economical operation of aircraft. Aeronautical land stations are used for communicating with aircraft whereas aeronautical fixed stations engage in point-to-point communications.

The more than 11,000 Civil Air Patrol radio stations are used during missing aircraft search missions, training missions, air shows and as communication systems at encampments, base, and official meetings.

Airdrome control stations transmit control instructions to arriving and departing aircraft to prevent collision and to provide efficient flow of air traffic into and out of airports. Control station operators direct the movements of crash, maintenance, and fire vehicles through mobile utility stations installed aboard the vehicles.

Special radio signals which enable an aircraft to determine its position with reference to the navigational facility involved are transmitted via nearly 300 navigational aid radio stations.

In order to deal with the many new problems which arise as a result of increasing telecommunications developments, the Federal Communications Commission, during 1955, continued active participation in various interagency radio coordinating and policy groups. Among these groups were the Air Coordinating Committee, the International Civil Aviation Organization, and the Radio Technical Commission for Aeronautics.

Fish and Wildlife Service

The Fish and Wildlife Service uses aircraft both in Alaska and the United States on wildlife and fishery enforcement patrols; waterfowl nesting and population surveys; big game and fur animal inventory surveys; predator control operations; waterfowl depredation control activities; as well as agricultural operations on national wildlife refuges which include spraying for the control of noxious vegetation, and the seeding of waterfowl foods.

During fiscal year 1955 the Service owned and operated 50 aircraft. The fleet was composed of: 27 Pipers (Supercubs, Pacers, and J 3 C's); nine Grumman Geese; eight Grumman Widgeons; two Boeing YL 15 observation planes; one Stinson V 77; two Cessna 180's; and one Twin Beechcraft.

Sixty-eight personnel held letters of flight authority during the fiscal year. These pilots flew more than 12,000 hours and the territory covered included Alaska, Canada, Mexico, Cuba, Puerto Rico, Haiti, and the Dominican Republic, as well as the United States.

The maintenance and repair of Service aircraft operating in the United States are handled through commercial shops. In the Territory of Alaska, however, where 34 Service aircraft were used during the fiscal year, the Service maintains overhaul and repair shops of its own.

Forest Service

The Forest Service uses aircraft in connection with the protection and management of 149 national forests, located in 39 states, Alaska, and Puerto Rico. Chief uses include the transportation of men and supplies during forest fire emergencies, fire detection and aerial reconnaissance of going fires, supplying remote and inaccessible stations, aerial survey, reseeding or revegetation of burned-over and denuded areas, surveying and spraying for insect control, and search and rescue.

The Forest Service fought 9,976 fires in the national forests during the fiscal year ended June 30, 1955. A total of 203,973 acres were burned, which was below the annual average of 285,230 acres for the preceding five-year period. California, however, later in the summer of 1955, experienced its worst fire season in many years. Forest Service forces during a period of a few weeks had to fight 16 major fires in California national forests. While so engaged they also controlled more than 900 smaller fires in California, Oregon, Montana, and Idaho.

The Forest Service in 1955 owned and operated 21 fixed-wing aircraft. These includedf 14 single-engine airplanes and four twin-engine planes previously owned, and three twin-engine planes acquired through transfer from another agency. These planes have been equipped for transporting personnel, cargo parachuting, and smokejumper work. Some single-engine planes and one DC-3 are equipped for seeding and spraying.

Latest yearly figures (1954) show use of fixed wing aircraft by the Forest Service totaled 9,698 hours. This included 2,558 flights, totaling 3,476 hours, by Forest Service airplanes; 2,876 flights, 6,202 hours, by commercial planes under charter contract; and 12 flights for 20 hours flown by the armed services for the Forest Service. Use of helicopters (commercially operated under contract) amounted to 765 hours (Not included in the above figures is certain contract flying for aerial photography and insect control work.)

A total of 10,441 fire-fighters and other passengers were transported by air during 1954. Cargo transported totaled 1,087,332 pounds, of which 717,254 was air freight (delivered at nearest airport), and 373,078 pounds was para-cargo dropped by parachute.

The Forest Service's "smokejumper" corps of parachute-jumping fire-fighters, maintained during the fire season for service in national forests of the western states, totaled 286 men. Smokejumper units were stationed during the fire-danger season at Missoula, Mont.; Grangeville, Idaho City, and McCall, Idaho; Silver City, N. M.; Illinois Valley, Ore.; and Winthrop, Wash. During the year, the smokejumpers made 728 jumps to 235 fires. They worked a total of 3,054 man-days on fires.

An accelerated program of aerial surveys to locate incipient outbreaks of forest insects and diseases was undertaken during the year. A total of 1,271 hours of flying time was devoted to aerial insect surveys and 279 hours to the scouting of oak wilt and other tree diseases. The surveys covered an estimated 100,000 square miles of forest lands in various parts of the country. Forest Service planes and rental aircraft were used in the aerial pest survey program.

Research on the improvement of aerial insect surveys and aerial spraying also was expanded to develop new methods and extend their use to new areas. The research work on surveys included an evaluation of aerial photography and strip sampling techniques for detection and appraisal of insect infestations, and required 266 hours of flight time.

In the summer of 1955, a total of 2,235,000 acres in Idaho, Montana, New Mexico, and Oregon was airplane-sprayed for the control of epidemics of the spruce budworm. Because these infestations increased so greatly in intensity during 1954, Congress made a special appropriation of $2,570,000 for the 1955 control work. Most of the acreage involved was federal lands. State agencies and private interests, however, contributed $124,000, plus time and facilities, to the work in Idaho, Oregon, and Montana.

"Operation Firestop," the most ambitious cooperative field project so far undertaken in forest fire research, was carried out in California in 1955. This project pooled the interests not only of forest fire fighting agencies but of municipal fire departments and of the Civil Defense Administration and Department of Defense. It was aimed at developing new aids that will be effective in combatting forest fires even under the most difficult conditions. Activities included tests of mass water drops from aircraft, water bombing, application of chemical retardants from the air, and the use of helicopters for laying hose. There is much promise of better forest fire control through development of these and other new techniques.

National Advisory Committee for Aeronautics

During 1955 the research programs of the National Advisory Committee for Aeronautics (NACA) were devoted for the most part to learning how to extend further into the supersonic range the performance of airplanes, and to accumulate the basic information for development of useful military and commercial aircraft with the vertical rising capabilities of the helicopter and the high speeds of conventional airplanes. Beyond this work, of course, were the vigorous research programs to provide solutions to the massive problems, such as aerodynamic heating, leading to achievement of the intercontinental ballistic missile.

NACA scientists study vertical flight problems with airplane models

In 1955 the NACA observed its 40th anniversary as the government agency charged with responsibility "to supervise and direct the scientific study of the problems of flight, with a view to their practical solution."

When the NACA was established, a compelling reason for its creation was the fact that in the United States, birthplace of the airplane, aeronautical progress had been so slow as to fall behind several other nations. Even then, when the potential value of the airplane both in war and in peace was seen but dimly by the public, the importance of aeronautics and what must be done to advance it was recognized by the Congress.

In the years following World War I, definite leadership in aeronautics was regained by the United States. This continuing achievement has been the result of a partnership joining the Congress, the military air services, the aircraft industries, and the NACA. For its part, the NACA undertook research to provide basic information which talented designers in industry used in developing superior airplanes, both civil and military.

The success of this team effort was emphasized by the disclosure in the fall of 1955 of the discovery and experimental verification of a new aerodynamic concept known as the area rule, and of its prompt use by the aircraft industry. A simple method of reducing the sharp increase in drag heretofore associated with transonic flight, the area rule has led to speed gains of more than 100 mph by supersonic airplanes. At the time of announcement of the new concept, it was disclosed that the Grumman F-11-F1 Tiger and the Convair F102-A, utilizing the area rule, were flown supersonically in 1954.

This accomplishment is credited to the NACA's Richard T. Whitcomb, who received the Collier Trophy for his work. It resulted from the first major research project (begun in 1951) made possible by the new transonic wind tunnels which were first developed at the NACA Langley Aeronautical Laboratory. By mid-1952, the validity of the new design concept was sufficiently vertified by intensive wind tunnel tests to warrant confidential disclosure to the military services and to the manufacturers of high-speed aircraft.

The military services already had committed hundreds of millions of dollars in contracts for supersonic airplanes. From the standpoint of national security, it was imperative that such heavy investments provide superior airplanes. The timely availability of the area rule concept and its prompt application by industry assured to the military services airplanes wth much superior supersonic capabilities.

In 1955, much remained to be done before the airplane could demonstrate its great potential as a supersonic vehicle of commerce and a supersonic weapon of war. Eight years have passed since the first flight at a speed faster than that of sound, but the supersonic airplane is still beset by many troubles.

The gap between initial achievement of supersonic performance by a prototype or experimental airplane and day-to-day accomplishment of such performance under the rigors of service operation and maneuver can be very great. In the area of supersonic flight, in addition to problems arising from the demands for faster flight over longer ranges, it has become obvious that more, much more, must be known about the laws of nature to enable more efficient, more satisfactory flight at faster than sound velocities.

In stability analysis, the mathematical formulas employed are the same but the values to be applied have changed so extensively that the designer needs a large amount of new and detailed information to guide his work. Drag caused by interference between wing, body and tail surfaces exists at subsonic speeds but in the supersonic range it appears in new forms, and with different emphasis.

Much research is being done on interference caused by vortexes. Every lifting surface produces a vortex, which is simply a swirling column of air extending rearward. Large amounts of energy may be packed into these rotating columns. If an airplane's tail moves into the path of a vortex, its ability to produce an aerodynamically stabilizing force may be reduced seriously or even reversed so that the tail aggravates any disturbance.

Modern airplane design employing short stubby wings and lengthened fuselages adds complications because a share of the total lift is carried by the fuselage, which in turn creates additional vortexes of real interest to the designer. Progress is being made in providing information on this type of interference over a wide range of airplane attitudes and speeds.

Precise knowledge of dynamic stability is likewise necessary to design satisfactory maneuvering performance into new aircraft types. Without acceptable dynamic characteristics, an airplane may be unsuitable as a gun or bombing platform, or may be unmanageable under some flight conditions. The problem must be solved afresh for nearly every new design because considerable changes in dynamic stability arise from every change in airplane geometry.

The lengthened fuselages and thin stubby wings favorable for supersonic speeds often serve to reduce damping, the tendency to wipe out an oscillation when it occurs. Subsonic designs usually have high damping qualities, but a new series of difficulties is encountered as designs to achieve supersonic speeds sacrifice damping for performance. Oscillations caused by low damping can take place so quickly and so violently that a human pilot cannot control them. Special corrective devices such as the yaw damper have been used to cope with the problem.

A new form of dynamic instability, traceable to the spreading of the modern airplane's weight along its lengthened fuselage, has appeared recently. When an airplane of this type rolls, centrifugal forces tend to swing the nose and tail outward and the airplane begins to yaw. If it completes a full roll revolution in less time than a single yaw oscillation, centrifugal forces outweigh the stabilizing influences. The likely result is a violent yawing and pitching motion uncontrollable by the pilot. This complicated and dangerous reaction known as roll-yaw coupling, may strain the airplane beyond safe structural limits.

Although ways have been found to alleviate this form of instability, intensive research in wind tunnels, in flight and by theoretical approaches often employing analog computers, is required for a full understanding of the problem.

At the other end of the speed scale, a comprehensive research program is underway to determine ways and means of slowing down landing and take-off. Other goals of this work include the ability to operate from unprepared surfaces, and ultimately, to attain vertical flight itself by aircraft capable of very high speed. Obviously, such goals will be of great value both of civil and military aviation. Some possibilities are evident in the helicopter, the vertical take-off airplane, the seaplane hydro-ski and the thrust vector.

Though control of boundary-layer air is one of the oldest problems of aeronautical research, it appears more promising today because of the growing use of turbojet power and extremely thin wings. The gas turbine is a convenient means either to blow or draw off the boundary-layer; further, the design of flaps as a speed reduction device has become more difficult with the thin wings now being used. This approach is especially attractive to naval aviation, where the reduction in stalling speed of only a few knots can mean proportionately much more to the capabilities of carrier-borne planes.

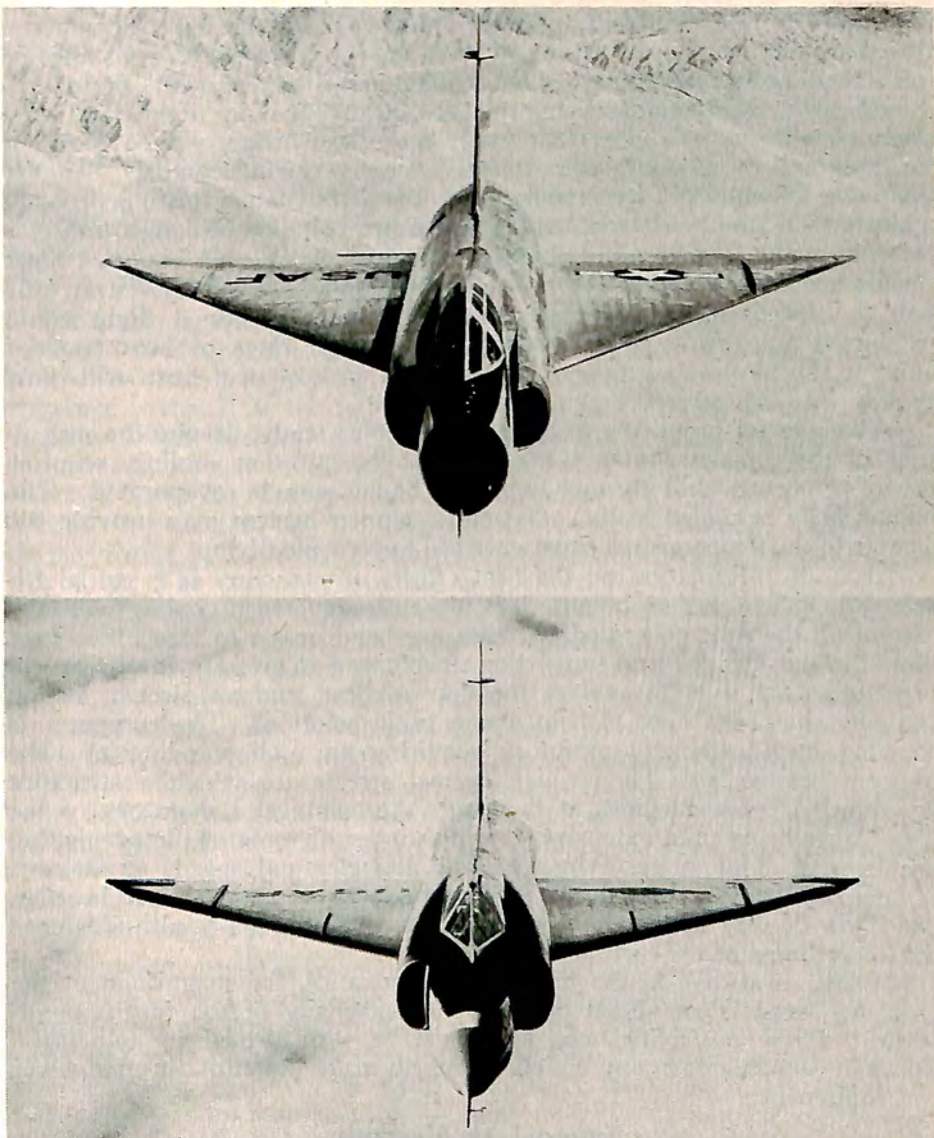
The idea of reducing launch-and-landing speeds is, in the extreme, vertical take-off, which the helicopter does well although it has a limited top speed. The type of vertical take-off or VTO aircraft capable of a wide speed range is one which rests on its tail. Provided with enough thrust to exceed its own weight, the VTO takes off vertically, then tips over to climb and cruise in the normal attitude. It backs down tail-first to land. Chief among VTO problems, once sufficient thrust has been provided, are stability and control in hovering, and transition to forward flight.

Another type of VTO utilizes the principle of deflecting the propeller slipstream downward through sets of large wings or turning vanes. The objective is a system able to produce vertical lift while the airplane remains in the horizontal attitude, or nearly so. Necessary, of course, is the ability to retract whatever turning device is used, so that a clean aerodynamic shape results when forward flight is undertaken. NACA scientists are studying various flap and slot combinations, using models of transport and utility airplanes. Thrust can be provided either by propellers or by turbojets. Still other tests are being conducted with models whose wings and propellers are turned upward 90° from the horizontal. This principle permits hovering and landing and take-off in small space, plus reasonably high performance in cruising flight.

The thrust vetor or "flying platform" principle, first disclosed in 1955, is still another VTO concept, and was first investigated at the NACA Langley Laboratory. Stemming from the idea that a man might be able to fly naturally and control his movements without elaborate training or the use of complex machinery, the principle was studied first with jets of air attached to a man's feet. During the year at least two prototypes, incorporating the thrust vector principle were flown.

Since the war hydrodynamic research has attacked the problems of cumbersome seaplane floats and hulls to find solutions without compromising performance either in flight or on water. From this work has come the hydro-ski, a flotation device which is retracted into the fuselage like a set of landing wheels in full flight. The hydro-ski has been proved capable of attractive performance, reduced landing loads, and offers the added ability to use snow and ice for landing or take-off. In addition, greatly improved hull shapes have resulted from the research programs. Narrow hulls enable reduction of aerodynamic drag simultaneously with lighter landing loads and better hydrodynamic performance.

Today, the nuclear bomb carried now by the airplane, and ultimately by its unmanned counterpart, the guided missile, has become the most powerful military weapon of all time. How to intercept the delivery systems which an enemy might employ if he elected to use nuclear weapons against the United States has become a massive problem demanding solution with compelling urgency. A matching problem no less urgent, is for the United States itself to learn how to deliver such weapons for defense.



NACA area rule application changes shape of Convair turbojet fighter pictured here

The true ballistic missile will be accelerated to hypersonic speeds (as much as 10,000-15,000 mph) in the first 15 or 20 miles of its flight and this initial push will carry it to altitudes well beyond the earth's thin mantle of atmosphere. It flight path under the influence of gravity will resemble the trajectory of an artillery shell. As it re-enters the atmosphere, resistance of the air will reduce its speed to about 5,000 mph at the end of the flight.

Already, much valuable information on hypersonic flight has been accumulated, but it is clear that vastly more knowledge will be required for designing successful missiles to attain these performance goals. Among the many difficulties of hypersonic flight, the aerodynamic heating problem appears to be the most troublesome at the present time although progress is being made. Temperatures high enough to melt or even vaporize most metals quickly develop in the skin of a hypersonic aircraft. Even at only half the speeds anticipated, or about 7,000 mph, sustained flight could produce temperatures of to 8,000°F. Very high rates of heat transfer exist at such elevated temperatures. This means that heat will flow rapidly into the aircraft's skin and structure.

A number of promising techniques are under study, despite the magnitude of these temperatures. One method, transpiration cooling, requires use of a porous skin through which a liquid may be evaporated. The human body is cooled in this way, and a similar system may provide the answer to the temperatures experienced in hypersonic flight.

Accurate information on the heat effects on structure is essential for safe and efficient design, because it is presently doubted if cooling will take care of all the heat generated. Studies are being made to learn how heat flows through the skin and supporting structure of an aircraft. Mathematical procedures are used to analyze the flow of heat, and an electric analog computer has been built to help obtain rapid solutions. The computer is showing itself especially useful in acquiring an understanding of non-uniform heating and the unequal thermal stresses to which a structure is subjected. New facilities at the Ames Aeronautical Laboratory of the NACA are being used extensively in the studies of some of the perplexing problems of flight at the extremely high altitudes and speeds envisioned. A new heat transfer tunnel aids in investigations of aerodynamic heating, and a low density tunnel enables simulation of conditions at altitudes near the upper limits of the earth's atmosphere.

Today, as always in the history of aeronautics, the magnitude of the problems faced is surpassed only by the immensity of the future possibilities. These possiblities can and must be transformed to actualities. This can come about in any nation willing to make the effort in manpower and equipment.

National Air Museum

The outstanding accomplishment during the year in caring for the national aeronautical collection was the shipment from the Museum's former storage facility at O'Hare International Airport, near Chicago, to the new facility at Suitland, Md., of the full-sized aircraft which, for lack of exhibition space, must be kept in storage. This move, involving more than 100 aircraft, was performed with the assistance of the United States Air Force. The Navy Department continues its cooperative policy of providing space on several bases for historic aircraft destined for the National Air Museum. In the Suitland facility, prefabricated buildings have been erected for storage, the largest one to be equipped as a shop in which each aircraft will be given interim preservation treatment and restoration so that when the proposed exhibition building is provided, material can be exhibited with minimum delay. Realization that only 30 of this famous collection of aircraft are exhibited while more than 100 are in storage, emphasizes the importance of the preservation and restoration program and the need for an exhibition building in which these aircraft, each one of historical and technical significance, can be made available to the public.

The National Air Museum Advisory Board, composed of leading armed forces and civilian aeronautical experts, has concluded that the proposed National Air Museum building is to be in the Washington, D. C., area. The preference is that it be located adjacent to existing exhibition buildings of the Smithsonian Institution. As evidence of the concern for preserving these aircraft, shown by the areonautical interests, the Aircraft Industries Association and Air Transport Association financed a study of the specific needs of the collection and the design of the proposed building. This study was performed by the architectural firm of McKim, Mead & White, New York City. The proposed building is intended for a site approximately 1,000 by 500 feet. The requirements for exhibition, study, and administrative needs would be met in an imposing structure in which some of the outstanding features would be a full-scale diorama enshrinement for the Wright Brothers' original "Kitty Hawk" flyer, a hall of famous flying firsts, and a grouping, in chronological arrangement, of the other aircraft which embody the tangible evidence of aeronautical progress. Individual unit displays would include sections devoted to the beginnings of human flight, lighter-than-air craft, the "Early Bird" era, World War I, the "Golden Age" of the 1920's and 1930's, commercial aircraft development, World War II, jet and rocket progress in the current age, a rotorcraft, and ex-enemy aircraft. A Hall of Fame honoring those persons who have given wings to man is included.

Meanwhile, progress is being made with the improvement of the existing exhibits housed in a 40-year old temporary hangar-building and the adjacent 76-year old Arts and Industries Building. Additions to the collection during this year include the famous racing plane "Buster" constructed in 1931 by Steve Wittman of Oshkosh, Wisc., and flown by him and other pilots in more than 50 races, winning many events until it was finally retired in 1954. With the cooperation of the Goodyear Corporation, exhibition of the car and canopy of the airship "Pilgrim," first airship designed to use helium gas, 1925, was renovated, while preservative work was completed on a number of the other exhibited aircraft. Several notable engines, numerous scale models, and biographical exhibits honoring General F. P. Lahm, Lieutenant Colonel H. H. Hartney, Captain Vernon Castle, Amelia Earhart, and Harriet Quimby, the first American woman licenesd to fly, were added. The total number of specimens received during the year was

117. Improvements were also effected in the documentary files, which constitute a valuable source of information in conducting the Museum's extensive service to correspondents and visitors.

Work is proceeding on several publications describing the national areonautical collection. "Masters of the Air," which was produced with the assistance of the Link Foundation, describes 12 of the outstanding aircraft in the collection. It is available from the Editorial and Publications Division of the Smithsonian Institution at 50¢ per copy. The text and illustrations for the ninth edition of the "Handbook of the National Aeronautical Collection" have been completed, and this narrative history of aeronautics as evidenced by the outstanding specimens in the custody of the Museum will soon be available. A catalog listing all the full-scale aircraft in the collection is in preparation.

Post Office Department

The fiscal year ending June 30, 1955, showed a continued increase in the use of the air services. Almost 1.446-million pieces of domestic letter mail were transported, an increase of approximately 19-million pieces, while there were nearly 21-million pieces of air parcel post carried, an increase of approximately 1.25-million pieces.

The total net weight of air mail including air parcel post was over 84-million pounds, an increase of about 3.6-million pounds over the previous year.

The above figures do not include free air mail letters from armed forces overseas.

During the fiscal year 1955, a total of over 11.7-million pounds of United States mail, including nearly 3-million pounds of air parcel post and other articles, was transported by air to foreign countries, showing an increase of over 2.2-million pounds. These figures do not include the mail exchanged with U. S. possessions and military installations overseas.

Foreign air parcel post service and air service for other articles; that is, prints, samples, newspapers, is now available to more than 100 countries.

Weather Bureau

The continuous broadcast of recorded aviation weather and NOTAMS on the Arcola, Virginia, L/MF radio range (reported in the 1954 YEAR BOOK) completed its first year of operation and received the endorsement of aviation groups and many pilots. A similar broadcast will soon be activated on the L/MF range at Los Angeles. This is a joint CAA and Weather Bureau project and plans call for 20 additional installations during 1956.

A series of aviation weather articles for pilot consumption was issued on a monthly basis throughout the year and will continue into the early months of 1956. Each article is illustrated and gives a brief discussion of a particular weather topic, such as Ice on Aircraft, The Jet Stream, Turbulence, Thunderstorms. Through the cooperation of the CAA a copy of each article printed in poster form is posted at about 2,500 public airports. The articles are also available in pamphlet form from the Superintendent of Documents, U. S. Government Printing Office.

The installation of remote reading equipment for measuring cloud height and visibility in the approach zone of a runway has continued. Twenty stations are now equipped with these instruments. A method of estimating the visibility of an approaching pilot from parameters measured on the ground, developed from a research program conducted by the Weather Bureau and the Sperry Gyroscope Co. is now being given a field evaluation at the Newark Airport.

The operation of six rawinsonde stations was taken over from the military services and 19 additional stations will be transferred to the Weather in 1956.

The first phase of a four-year program of modernizing instrumental equipment and facilities at field stations was initiated. This modernization program will include the installation of new upper-air electronic wind-finding equipment, new radar equipment, remote recording telepsychrometers utilizing the infrared hygrometer, wind speed and direction recorders, and end-of-runway cloud height and visibility measuring equipment.

Additional radar storm detection equipment was placed in operation,

Convair rocket sled is readied for high-speed test of pilot escape system in F-102A

increasing the total number of stations to 48. Notable success was obtained in tracking hurricanes Connie, Diane, and Ione with new radar equipment at Hatteras, N. C.

One new automatic weather reporting station was placed in operation and plans were made to add six more installations in 1956. Components of this equipment will now measure and transmit runway visibility, temperature, dew point, wind, altimeter setting and precipitation. The development of equipment to report cloud height is nearly completed.

An accelerated program of hurricane and severe storm research was outlined for the development of more accurate methods of forecasting these phenomena. Funds were appropriated by the Congress to begin a five-year program. In addition to augmenting the rawinsonde and radar networks, it is planned that other valuable data will be collected by aircraft and rocket reconnaissance. Elaborate tooling up is required for the data collection phase. This will extend through fiscal year 1956. Data processing and related studies will follow, leading into the final phase of research and development.

CHAPTER SEVEN

The Airlines

WITH THE NEW AIRPLANES DELIVERED last year and scheduled for delivery this year and next, the U. S. scheduled airline fleet will have grown by about 16 percent at the end of 1956. By that time, it is estimated that the fleet will consist of more than 1,500 airplanes. At the end of 1953, the fleet total was 1,289. Because they are more efficient than their predecessors, the new airplanes will enable the airlines to offer over 50 percent more service than they did in 1953 in terms of available seat-miles operated.

This addition to the fleet has an even more far-reaching implication. More than 90 percent of the new equipment already in the fleet or scheduled for delivery are four-engine airplanes. All are capable of non-stop over-ocean flight.

Most of them will become a part of the Civil Reserve Air Fleet, which military authorities point out is the country's second line of air defense. The airlines have 290 airplanes in the CRAF today. Twenty-five others are earmarked as a contingent reserve. These aircraft represent a $400-million contribution to the welfare of the U. S. public. It would cost this public about $300-million a year to keep them in operation on a stand-by basis.

In a national emergency, CRAF airplanes and their flight and ground crews would be subject to call into military service on 48 hours notice. They would stay in service for the duration.

The Civil Reserve Air Fleet today has a capacity ten times greater than the civil fleet that performed with such distinction in World War II.

Although the Civil Reserve Air Fleet and the bulk of the scheduled airlines' national defense potential is provided by the larger trunk and international carriers, the 14 scheduled local service lines are also an important part of the defense picture. Due to decentralization, more and more defense plants are located away from major population centers and must rely upon the local service airlines for fast transportation.

Another phase of the scheduled airlines' increased usefulness to the nation is concentrated in the activities of the Military Bureau of the Air Transport Association. Through the bureau, with offices in Washington, the airlines speed up the movement of about 13,000 military personnel a month to points all over the country. It has shown that the movements of large groups of men, long regarded only in terms of trainload or shipload, can be made by air with substantial saving in time and money.

Where mail revenues constituted the major source of income for the country's young airlines in the past, mail payments today amount to only 8.66 percent of total revenues. At the same time, the amount and quality of air mail service today is greater than ever before.

Passengers account for 88.76 percent of total operating revenues for the domestic trunk lines, 50.99 percent for the local service lines and 68.89 percent for the international lines. The percentage for the entire industry is 82.03 percent.

Freight makes up 3.37 percent of the trunk lines' revenues, while it is 0.92 percent for the local service lines and 8.08 per cent for the international lines. Total for the industry is 4.54 percent.

Express comes to 1.52 percent for the trunk lines and 0.92 percent for the local service lines for a total of 1.09 percent for the industry. Express and freight revenues are not segregated by international airlines.

It is still too early to determine the success of the 3-cent mail by air experiment now in its second year. During the first year, however, senders of first-class letters saved nearly ten billion hours of delivery time, with hundreds of millions of letters reaching their destinations an average of 11½ hours sooner than if they had moved by surface means.

Postage revenues during the first year of the experiment amounted to $29.5-million. Out of that, the Post Office kept $27.6-million or 94 percent of the total, while they paid the airlines only $1.8-million for the service.

The experiment is not limited only to the larger cities in the country served by the trunk lines. Intermediate cities are also taking part in the experiment through the operations of the local service airlines in 23 states.

It must be pointed out that this new service does not infringe upon six-cent air mail service, which gets priority treatment from the moment of mailing. Space is contracted for air mail. It is guaranteed air transportation and it takes precedence over other mail, as well as passengers and cargo.

There follows a comparative table showing traffic and revenue statistics for the U. S. scheduled airlines during 12-month period ending September, 1954, and 12-month period ending September, 1955.

U. S. AIRLINE STATISTICS
12 Months—September 1954-1955

	1955	1954	Percent Change
DOMESTIC TRUNK			
Revenue Passengers (000)	33,689	28,363	18.78
Revenue Passenger Miles (000)	18,648,353	15,621,291	19.37
Mail Ton-Miles (000)	84,826	78,728	7.75
Express Ton-Miles (000)	47,057	38,135	23.40
Freight Ton-Miles (000)	170,366	138,440	23.06
Total Operating Revenues (000)	\$1,106,037	\$944,125	17.15
LOCAL SERVICE			
Revenue Passengers (000)	2,728	2,099	29.97
Revenue Passenger Miles (000)	495,315	386,566	28.13
Mail Ton-Miles (000)	1,220	1,007	21.15
Express Ton-Miles (000)	1,257	954	31.76
Freight Ton-Miles (000)	1,262	991	27.35
Total Operating Revenues (000)	\$55,304	\$49,300	12.18
INTERNATIONAL			
Revenue Passengers (000)	3,246	2,779	16.80
Revenue Passenger Miles (000)	4,287,097	3,633,195	18.00
Mail Ton-Miles (000)	55,863	37,992	47.04
Cargo Ton-Miles Express & Freight (000)	87,528	80,241	9.08
Operating Revenues (000)	\$378,724	\$357,556	5.92

Source: CAB recurrent reports.

Allegheny Airlines

Allegheny Airlines' traffic during the first nine months of 1955 has established new records almost on a monthly basis.

For the period, January through September, Allegheny flew more than 42,248,000 passenger miles for an average incerase over last year of 33 percent.

Expres and mail loads were also up substantially over last year.

In June, 1955, Allegheny Airlines started services over selected routes on the Company's seven-state system in the Middle Atlantic Area with twin-engine Martin aircraft seating 40 passengers. By September, Allegheny had Martins operating on four of the Company's seven segments. Allegheny, calling itself the "Airline of Executives," named the new equipment "Martin Executives."

The Company now has four Martin Executive aircraft and 14 DC-3's.

New services were begun at Trenton, N. J., during the year, and for the first time, Allegheny Airlines operated non-stop flights between Pittsburgh and Atlantic City during the summer.

The Civil Aeronautics Board has inaugurated a proceeding during which Allegheny will be certificated permanently over its present route system, and hearings are presently in process concerning Allegheny's application to extend direct services to Detroit, Mich., by way of Erie, Pa., and eight other industrial centers in New York and Pennsylvania.

The company again won the Aviation Safety Award of the National Safety Council, and through September, 1955, has flown over 200-million passenger miles without an accident.

American Airlines

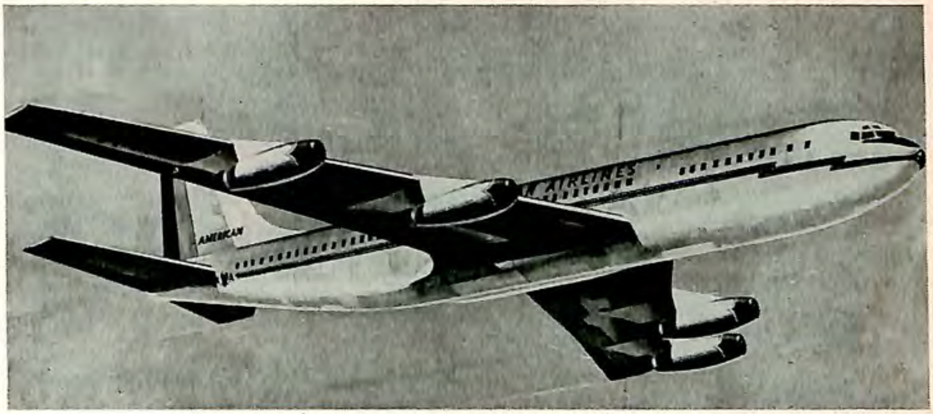
American Airlines in 1955 made new traffic and revenue records, and began phasing toward the turboprop and turbojet age.

Highpoint of the year came on Nov. 9, when C. R. Smith, President, announced that American will operate the first transcontinental service with turbojet aircraft, beginning June 15, 1959. The service will be operated with Boeing 707's, powered with Pratt & Whitney J-57's. Thirty planes are ordered, with delivery to begin in March, 1959. The order totals about $135-million with each aircraft costing about $4.5-million.

First schedules will be between New York and Chicago, Chicago and Los Angeles, and non-stop between New York and Los Angeles. The Los Angeles-New York run was expected to take 4 hours, 15 minutes; the return leg, 5 hours and 15 minutes. Chicago-New York would be cut to 1 hour, 25 minutes, with the return flying time running to an hour and 45 minutes.

On June 9, American also announced it had ordered 35 four-engine turboprop "Electra" transports from the Lockheed Aircraft Corporation, valued at approximately $65-million. The Electra will be powered by Allison 501 turboprops, will cruise at over 400 mph, and has a cruising range of approximately 3,000 miles. Deliveries will be in 1958-59. Also on order by American are 14 Douglas DC-7's (delivery in 1956-57), four Douglas DC-6A Airfreighters (delivery in 1956) and 12 Douglas DC-6B's (delivery in 1957).

Substantial increases in traffic and revenue marked the first nine months of 1955. Revenue totaled nearly $195-million, up 26 percent over the same period a year ago. Net earnings, after taxes, were over $14-million. American carried nearly 5.5-million passengers over 3-billion passenger miles during the period, a 30 percent increase over 1954, plus nearly 50-million ton miles of airfreight—a jump of 31.5 percent. A new all-time record for airfreight was set in September at 6,653,000 ton miles. The previous record airfreight month, also set by American, was August, 1955, at 6,375,000 ton miles. American thus became the only domestic airline ever to reach or exceed the 6-million ton mile-a-month mark, having done it five times: in October and December, 1954; and again in June, August and September of this year.



American Airlines purchases turbojet aircraft for delivery in 1959

American scored another history-making first on Wednesday, October 12, when it became the first airline in the world to fly 50-million passengers. The 50-millionth passenger, Edgar Elbert of Maywood, Ill., rode American's flight 204 from Chicago to New York.

A third all-time traffic record was established in June, when American flew more than 686,000 passengers approximately 416-million passenger miles. It marked the first time that any airline had flown more than 400-million passenger miles in a single month.

In October, installation began of radar inflight weather surveillance equipment on the 25 American DC-7's now in transcontinental service. Radar will also go on 14 additional DC-7's due for delivery in 1956. Cost of the entire initial program was estimated at $800,000.

Early in the year, American was given the National Safety Council's highest employee safety award, the Award of Honor, for the company's employee safety record in 1954. The new record—8.9 disabling injuries per million manhours worked—was described by the Safety Council as 39 percent better than the overall air transport industry average for the three years ending Dec. 31, 1954.

Braniff International Airways

An $87-million aircraft program which will include the purchase of turbo-jet, turbo-prop and piston-engine transports, as well as placement of the largest new aircraft order in its 27-year history, highlighted the activities of Braniff International Airways during 1955. Braniff's management also took steps toward expanded corporate financing, improved ground facilities, and stronger schedule patterns through equipment interchange agreements with other major U. S. air carriers.

And the year 1955 also saw Braniff's domestic system free of subsidy from the government. Subsidy on the airline's international routes to South

America has been greatly reduced thus, according to Braniff President Chas. E. Beard, creating a "healthy situation reflecting the increased earning capacity of our operations."

In March, Braniff contracted to buy seven DC-7C's, delivery to begin in the fall of 1956, for $20-million, including spare parts and special shop equipment.

In October, Braniff programmed to purchase up to eight new Convair 440's, up to ten turbo-prop aircraft and up to six jets, at a total cost of $67-million. Firm delivery dates in 1956 cover six Convair 440's, and in 1959 and 1960 for both Douglas and Boeing jets. Tentative arrangements have been made for deliveries of Lockheed Electras in the spring and summer of 1959.

Modification of Braniff's present Douglas DC-6 fleet at a cost of $1.2-million was begun in the company's shops November 1. More powerful engines, which will increase the plane's speed to 335 miles per hour, will be installed, and the passenger cabin interiors will be completely modernized.

During the first six months of 1955 Braniff called all of its outstanding convertible debentures and paid off in advance other long term debts, leaving the airline free of debt except for current operating items.

Major move to improve the airline's ground facilities came in June, 1955, when President Beard signed a 30-year agreement with Dallas, Texas, for the lease and construction of a new $4-million maintenance and overhaul base at Love field. The new base will be completed by the end of 1956.

The Civil Aeronautics Board decision in the New York-Balboa Through Service Case, April, gave Braniff its most important access to new markets. In August, Braniff and Eastern Air Lines began new through one-plane air-service between New York and Washington, and key cities in Panama and on both coasts of South America through an equipment interchange at Miami. Braniff and Eastern are now providing daily DC-6 service between New York and Washington and South America. Four flights weekly are through interchange flights, with three additional connecting schedules per week at Miami.

In January, 1955, Braniff and Trans World Airlines, under an interchange agreement, began through one-plane service between Houston and Dallas and Los Angeles, Oakland and San Francisco. Las Vegas was added as an intermediate stop on August 15.

Single-plane through air service between Houston and Dallas and Salt Lake City, Boise, Portland and Seattle-Tacoma also was resumed September 25 by Braniff and United Air Lines through a similar interchange agreement. Begun in September, 1953, the service was temporarily suspended in April, 1954.

Braniff continued to show increases in virtually every category of its operations during 1955. For the first nine months of the year, revenue passengers increased 13 percent, from 1,101,000 in 1954 to 1,248,600 in 1955. Overall revenue passenger miles increased 12 percent, from 456,818,-

000 in the first nine months of 1954 to 510,587,000 in the same period of 1955.

Air freight tonnage increased 11 percent during the first nine months of the year, with an 8 percent increase in freight ton miles. Express tons were up 5 percent, and express ton miles flown showed an 11 percent increase.

The four billionth passenger mile flown by Braniff International Airways was recorded Oct. 10, 1955, on a Houston to Chicago DC-6 flight, a little more than 27 years following the airline's first 116-mile flight between Oklahoma City and Tulsa.

Capital Airlines

Outstanding among the events of the year 1955 for Capital Airlines was the inauguration of turbo-prop Viscount service on July 26. The airline became the first U. S. carrier to operate turbine-powered aircraft in scheduled service.

The first of the fleet of 60 Viscounts ordered by Capital arrived in America from Vickers-Armstrongs, Ltd. in Great Britain on June 16. By the end of the year, six of the airplanes had been received and frequent service was provided between Washington and Chicago and between New York and Chicago. Pittsburgh, Cleveland, Detroit and Norfolk were also included in the Viscount schedules. During 1956, it is expected that the manufacturer's production will be increased to allow the delivery of three to four airplanes a month so that schedules will be progressively augmented and extended to cover eventually virtually all of Capital's system.

The Viscount was christened on June 23 at the National Airport in Washington. Vice President Richard Nixon extended greetings to the audience of some 2,500 guests and congratulated Capital on the significant step it had taken in advancing the jet age of flight in American air transportation by introducing the Viscount.

The airline during the year launched a comprehensive training program to acquaint all its personnel with the new airplane and to enable a transition program which would permit the change-over from reciprocating to turbine power efficiently and easily.

Capital took a major step forward in the developmenut of its route program when the Civil Aeronautics Board removed restrictions which had previously hampered operations between New York and Chicago.

The decision gave Capital a new route segment from New York to Rochester, Buffalo, Detroit and beyond to Chicago and to Milwaukee and Mineapolis/St. Paul.

In addition, the arline was sanctioned by the CAB to operate non-stop flights between New York and Chicago. Also, flights can be operated non-stop Detroit-New York and between Pittsburgh and New York on an unrestricted basis. Prior to the decision, the company was required to make at least one stop between New York and Detroit and two stops between New York and Chicago.

Philadelphia was made a stop on Capital's New York-Chicago route as well as on the airline's route between New York and Atlanta and New Orleans.

In the Northeast-Southwest case, the Civil Aeronautics Board authorized Capital to connect its northeast cities of New York, Philadelphia, Baltimore and Washington on a straight-line operation with its equally important southern cities.

At the same time, the Board amended Capital's certificate on its southern route structure to permit more effective competitive service between New Orleans and Atlanta via Birmingham and Mobile. Also authorized was service between Pittsburgh and Philadelphia.

For the second consecutive year, the Board of Directors of Capital Airlines announced a 5 percent common stock dividend on the outstanding common capital stock of the company payable December 28, 1955.

For the third consecutive year of successful operation, Capital brought forth its popular package-tour Weekend at the Waldorf. The airline also continued to set a pace in the charter field for major league baseball teams, college and professional football teams and other special group movements.

The company's advertising program was stepped-up to introduce the Viscount and to educate the public to turbine-power. The scope of the program included newspapers, national magazines, trade magazines, radio, television and its unique direct mail program which has earned seven consecutive national awards.

A 45-foot tractor-trailer housing a Viscount display with a cut-away model of a Rolls-Royce engine was toured throughout the country as part of the Viscount educational program.

For the first nine months of 1955, the airline reported an operating income of $945,842. Net income after taxes, principally on sales of aircraft, amounted to $4,081,277. In the like period of 1954, net income was $1,010,647.

Passengers carried during the first nine months totaled 1,946,229 as compared to 1,813,518 in 1954 for the same period. Passenger miles flown during the first three quarters reached 605,116,431. Revenues were up from $35,901,275 for the first nine months of 1954 to $38,043,463 for the same period in 1955.

Colonial Airlines

Colonial Airlines celebrated in May, 1955, a quarter of a century of flying without a single accident involving a fatality to passenger or crew—a new all-time high in air transport operations.

During the year, the airline expanded the frequency of its service between New York and Montreal, scheduling nine daily flights between the cities. Service totals 468 seats daily in each direction.

The Colonial Owl Flight to New York from Montreal, a late-at-night economy service, proved a popular service, and traffic increased during winter months between Canadian points and Bermuda. Winter service for skiers in the other directions also increased.

Beginning of work on the St. Lawrecne Seaway also brought rapidly increased traffic, doubling and in some cases tripling service in cities along the route.

Delta Air Lines

The Civil Aeronautics Board decision, in the fall of 1955, giving Delta Air Lines entry into New York and Washington, was Delta's biggest news event for the year.

Passengers carried during the first ten months of the year show a 6 percent increase over the 1,830,015 total carried during 1954. Revenue passenger miles increased 2 percent over last year, from 836,215,635 during 1954 to 850,216,154 during the first ten months of 1955. Through October, 1955, the airline transported 10,749,204 pounds of air express, an 11 percent increase over the 9,646,391 pounds carried during a corresponding period last year. For the first 10 months of 1955, airfreight totalled 22,640,184, a 16 percent increase over the 19,584,590 pounds carried during the first ten months of 1954.

Delta reported a net income after taxes of $636,000—equivalent to 86 cents a share on 738,038 shares of common stock outstanding for the quarter ending September 30. Net income for the quarter—first quarter of the current fiscal year—amounted to 4.28 percent of gross revenues.

For over two years since the merger, Delta had operated as Delta-C&S, but in September the airline announced that it was progressively discontinuing the use of the dual operating name. Aircraft markings, company billboards, electric signs, ticket forms, stationery, telephone directory listings and advertising materials will be changed over a period of months.

Asquisition and operation of Golden Crown DC-7's during 1955 contributed to the company's revenue gains. Of the present ten DC-7's now in use, seven were received last year and three during the early part of 1955. In April, Delta placed orders for five additional DC-7's, and in August placed orders for six, making a total of 11 of the giant 69-pasenger 365-mile-per-hour transports on order. One is scheduled for delivery before the end of 1955 and ten others in 1957.

For the ninth straight summer, Delta in 1955 offered all-expense packaged vacations to Miami Beach and to such holiday spots as Fort Lauderdale; Nassau; Mexico City; Havana, Cuba; Montego Bay, Jamaica; Port au Prince, Haiti; San Juan, Puerto Rico; and Ciudad Trujillo, Dominican Republic.

Eastern Air Lines

As 1955 closed, Eastern Air Lines was charting the final steps in another long-range flight equipment program which would take it well into the jet era, at a cost of more than $350-million. Eastern has already signed contracts for a total of 40 DC-7B's, 10 new Lockheed Super-G Constellations, 40 Lockheed Electra turbo-prop's, and an option for 30 additional planes. Cost of the 50 piston driven aircraft (12 of which were in operation in the fall of last year) amounts to $125-million and the jet-props will cost another $100-million.

An additional $125-million had been set aside for straight jet airliners, either Douglas DC-8 jets or Boeing 707's.

To finance this program Eastern negotiated a 20-year, $90-million loan with the Equitable Life Assurance Society.

The projected program will increase Eastern's present operating fleet from 120 aircraft to 218 by 1961. Capacity would increase from 5.7-billion seat miles to 15.5-billion the first year the entire new fleet is in operation.

At year's end, a new $5-million northern maintenance base at Idlewild Airport was nearing completion. The New York City reservations sales office was enlarged to nearly double its capacity and new improved telephone facilities and other fixtures were installed to take care of increased travel demands.

Evidence of the airline's success in overcoming traditional summer slump in travel to the south was apparant in Eastern's third-quarter report which showed the first nine-months traffic and net earnings at an all-time high.

Third quarter statistics showed earnings, after taxes and all charges, at $4,748,089 or $1.90 a share as compared with $1,789,824 or 72¢ a share for the same period of 1954.

Gross operating revenue for the first nine months of 1955 was $148,483,-380, a gain of 16 percent over the $127,915,987 reported during the previous year.

Operating expenses, including depreciation, were held to $129,685,000, representing an 11 percent increase over the $116,755,000 for the same months of 1954. A provision for federal income tax of $14,067,000 for the first nine months of 1955 compared with $9,049,000 during the corresponding period of 1954. Compared with the nine months operating ratio of 91.3 percent in 1954, the ratio of expenses to revenue, including depreciation, but before taxes, was 87.3 percent for the same period in 1955.

A major contributing cause to the improved earnings record was the continuing drive on cost control in all departments of the airline's activities.

Evidence of this was reflected in nine months' figures showing that, while a 17 percent increase was shown in revenue passengers carried (from 4,307,000 for the first nine months of last year to 5,037,000 for the current period), and an additional 400-million seat miles were operated, expenses were held to an across-the-board increase of only 11 percent. The gain in load factor during the period was from 58.49 percent in 1954 to 62.54 percent for the first three-quarters of 1955.

Mohawk Airlines

Appropriate to a tenth anniversary year, 1955 was a significant one for Mohawk Airlines. Many forward strides were made—route extensions, new equipment, permanent certification—bringing Mohawk to a prominent position in the local service field.

Mohawk, in 1954, carried 222,564 revenue passengers and flew 40,-006,000 revenue passenger miles. The traffic figures for the first ten months of 1955 already have exceeded the 1954 totals, with 231,137 revenue passengers and a total of 40,303,000 revenue miles, 22.4 percent more passengers than in the same period a year ago.

Five consecutive monthly passenger records were set during May, June, July, August, and September. Although October failed to produce a new monthly record it produced the best single day in Mohawk history—1,732 passengers on Oct. 28.

The ten month total of 40,303,000 revenue passenger miles was achieved without accident or fatality to passenger or crew members.

During the year, Mohawk flew nine charters for New York State Govnor Averell Harriman, carried sports teams from 27 different colleges and universities, transported the professional basketball world champion Syracuse Nationals for the fifth year, flew human eyes, for sight-saving transplantings, and made planes available for flood relief to stricken New England communities.

On Feb. 28, 1955, Mohawk began service to Westchester County Airport, serving White Plains, N. Y., an important step in competing with other carriers serving the densely-populated New York metropolitan area.

The purchase of four Convair 240's increased the Mohawk fleet to its present total of ten DC-3's and four Convairs, with another DC-3 being operated experimentally for General Electric.

During 1955, Mohawk conducted, under contract, flight test work for General Electric and for Hazeltine Electronics Corporation of Little Neck, N. Y. The airline operates and maintains a special DC-3 to test electronic equipment. The plane, operating out of Newark, N. J., is used commercially during weekends.

At the end of 1954, Mohawk showed a year's operating profit of \$184,577. For the first six months of 1955, with exclusive DC-3 service, operating profits were \$104,747.

Mohawk added Convairs on short haul, local service operations on July 1.

National Airlines

National Airlines was one of the leaders in 1955 in the trend to jet transport and its President, G. T. Baker, predicted that DC-8's would go into service between New York and Miami (2 hours, 21 minutes) in the summer of 1959. NAL placed a firm order with Douglas last August for six of the 550-mph jets at a total cost of \$36-million. National has an overall plane procurement program totalling \$95-million.

Total revenue passenger miles flown during the year ending June 30, 1955, was 860,067,000, a 26.05 percent gain over the previous year. Passenger load factor increased to 61.85 percent compared to 60.53 percent. Operating revenues reached an all-time high of \$58,616,468, an increase of 25.4 percent over the preceding year. Passenger revenue was \$44,164,227. It represented 90.8 percent of total revenue and was 28.1 percent ahead of the year before.

Only air mail revenue dropped by 10.5 percent, but this was made up by increases in first-class mail carried. Total revenue for both was $991,042, a gain of 8 percent over the previous year. Express, air freight and excess baggage revenues increased 15.7 percent.

Net operating revenues were $6,604,576, an increase of 121 percent over the year before. Net profit after taxes, depreciation, and all charges totalled $3,075,778, as compared with the net profit of $4,465,743 for fiscal 1954. Total operating expenses were $42,011,892, an increase of 17.4 percent.

In addition to its plane expansion program, National is investing $1-million in airborne radar for all its equipment. Four-engine planes were expected to have it installed by the beginning of 1956.

National is now offering for lease executive type aircraft operated under scheduled airline operations and maintenance standards. Planes may be leased by the trip, day, month or more extended periods. Three Lockheed Lodestars are already in this service.

Northeast Airlines

Northeast Airlines set an all-time high in traffic for the company in 1955 by carrying more than a half million passengers by November. Northeast serves 36 New England communiities, New York City and Montreal.

Ski traffic to northern New England states and Quebec's Laurentians was promoted again in 1955 by Northeast, and the company flew more than twice the number of ski passengers that they did in 1954. The company inaugurated a fall fishing promotion in New England with areas interested in extending the region's vacation season.

The company reduced its federal subsidy by $220,000 in the first ten months of 1955, and placed a $14-million order for ten new DC-6B airplanes. The first of these airplanes will be delivered in the first months of 1957.

Late in the year, Northeast applied for a route extension to Washington, D. C., and Florida.

The line operates six Convairs and 12 DC-3 aircraft in winter months and leases additional airplanes during the summer.

Northwest Orient Airlines

Northwest Orient Airlines' New York service through the Chicago gateway climaxed a year of developments for the company.

Since June 1, 1945, when Northwest became a transcontinental air carrier with flights into New York by way of Milwaukee and Detroit, it had sought a route also through Chicago instead of being compelled to terminate all eastbound flights there. The Civil Aeronautics Board finally authorized this, and service began October 30. Also authorized is a shuttle service between Detroit and New York.

Earlier in the year, the CAB renewed Northwest Orient Airlines' certifications for operations to the Orient, to Hawaii and along the inside route to Alaska.

Northwest entered into an arrangement with New York Airways by which passengers have been flown by helicopter between La Guardia and Idlewild airports, as well as to and from a group of cities in the metropolitan area.

Northwest introduced Constellation flights to the Orient. It also provided five weekly frequencies to the Orient, for both first-class and tourist passengers. It doubled its service to Hawaii with four flights a week to Honolulu.

Northwest continued its million-plus passenger business in 1955. The year's total, based on actual figures up to September and projections to the end of the year, was 1,272,000 compared with 1,111,034 actual total for 1954, an increase of 14.5 percent. Revenue passenger miles flown were 838,356,000 compared with 748,616,575 in 1954, an increase of 12 percent.

On the domestic system, freight ton miles were 6,071,000 compared with 4,467,891, up 58.3 percent; domestic mail, 4,309,000 ton miles, compared with 3,394,416, up 26.9 percent; express, 2,491,000 ton miles, compared with 1,898,395, up 31.2 percent.

On the international route, passenger boardings were 100,000 compared with 88,159 during 1954, an increase of 13.4 percent. Revenue passenger miles were 180,528,000, compared with 161,057,970 for 1954, up 12.1 percent.

Other categories for the respective years were: freight ton miles, 6,600,000 and 6,424,960, up 4.7 percent; mail ton miles, 9,825,000, and 3,596,046, up 173.2 percent; express ton miles, 188,000 and 178,863, up 5.1 percent.

Northwest has ordered 13 additional DC-6B's and 8 DC-7C's for delivery starting early in 1957.

Ozark Air Lines

During the year ending June 30, 1955, Ozark Air Lines carried 193,876 passengers, 36 percent more than in the previous year. Air mail volume was up 46 percent to 65,082 ton miles, air express up 82 percent to 113,497 ton miles, and revenue passenger miles flown increased by 33 percent to 7.7-million.

Ozark expanded its charter operations and increased revenue by 68.7 percent. It won one of the largest single industrial charters in the country to fly 593 farmers and implement dealers from various midwest cities to the International Harvester Company.

The Ozark fleet was increased to 16 with the addition of three DC-3's.

During the fiscal year ending June 30, 1955, Ozark Air Lines revenues were $3,706,000, an increase of 11 percent over the previous fiscal year. Expenses, after provision for depreciation of $227,000, were $3,643,000, an increaese of 7 percent over the previous year, resulting in a profit before income taxes of $34,712. For the previous fiscal year the operations of the airline resulted in a net loss of $103,775.

Ozark's non-mail revenues during the past fiscal year increased from

$1,388,862 to $1,964,399, an increase of $576,000 or by 42 percent. Subsidy and service mail revenue decreased during the past fiscal year from $1,946,511 to $1,741,239, a decrease of $205,000 or by 10.5 percent.

Pan American-Grace Airways

As the year came to a close, Panagra (Pan American-Grace Airways) reported an increase of approximately 12 percent over 1954, the airline's best previous year, as air travel between North and South America continued to rise.

New, faster flights, special summer excursion fares, improved hotel accommodations, and tourist attractions and a growing awareness on the part of U. S. businessmen and pleasure travelers of the economic and tourist potential in South America all contributed to making 1955 the best travel year in the continent's history.

On August 1, Panagra introduced radar-equipped Douglas DC-7B's on its El Inter Americano Fiesta Lounge service between Miami and Buenos Aires. The airline was operating daily first class service by September 14, and extended operations to Washington and New York through an interchange agreement with National Airlines and Pan American World Airways.

By eliminaitng changing planes at the Miami gateway, this new through-service cut flying times between New York and Buenos Aires to 21 hours.

The planes are equipped with the latest X-band weather radar developed for airline use, the Bendix RDR-1. This radar system enables Panagra pilots to spot and avoid storms and areas of considerable turbulence during day or night flights.

The interchange agreement also provided for the operation of Panagra's 72-passenger Douglas DC-6B's on daily El Pacifico tourist class flights from New York to Lima, Peru, and on a three times a week service to Buenos Aires.

Faster service and improved performance in its local flights in Peru, Bolivia and Ecuador were reported by Panagram after a month of regular operation with its modernized, high-performance DC-3 planes.

These recently converted and modified DC-3's, which were placed in operation early in January, 1955, have enabled Panagra to speed up flights and carry bigger loads over certain portions of its routes where local facilities do not permit the use of its four-engine DC-6 and DC-6B aircraft.

The new Panagra Hi-Per DC-3's have a cruising speed of 214 miles an hour and a maximum gross weight of 26,900 pounds, as compared to its former 180 mph and 25,200 pounds, respectively. Equipped with R-2000 Pratt & Whitney engines and new Hamilton Standard Hydromatic propellers, they have 20 percent more power on take-offs from sea level and high altitude airports.

At La Paz, Bolivia, where the airport is 13,400 feet above sea level, for example, the Panagra Hi-Per DC-3 has one-third more take-off power and can carry a bigger payload with a greater safety factor.

The modernization of these planes, which includes not only new engines and propellers but also improvements in landing gear, brakes and the hydraulic, electric, instrument and control systems on the aircraft, cost Panagra around $250,000.

Panagra planes last year began operating into the new airport at Antofagasta, Chile.

This new airport, commonly known as Group Seven Air Base, offers vast improvements over Cerro Moreno, the field formerly used by Panagra to serve this important commercial and mining area in the north of Chile.

Continuing the program it established with Pan American World Airways in 1937, Panagra last year granted 18 travel fellowships to study in U. S. universities to graduate students from the countries on its route.

The students, who received round-trip transportation from their respective countries to the United States, were selected by the Institute of International Education and recommended to the airline on the basis of merit and need.

Pan American World Airways

Highlighting the most successful passenger and cargo-carrying year in its history, Pan American World Airways in 1955 became the first airline to purchase American-built jet transports.

The company ordered 45 jets at a cost of $269-million to go into trans-Atlantic, South American, trans-Pacific and round-the-world service in the five-month period beginning in December, 1958. The 575-mile an hour planes will carry betwen 104 and 131 passengers. Twenty will be built by Boeing and 25 by Douglas. By the end of the year other American and foreign airlines had followed Pan American's lead in placing jet orders.

New high marks in the number of revenue passenger miles and cargo ton-miles flown by Pan American were established in 1955, according to figures for the first nine months of the year and estimated totals for the final quarter.

Reflecting increased travel in the company's Atlantic, Pacific, Alaskan, and Latin American sectors, revenue passenger miles added up to 2,667,-439,000 compared to 2,189,668,000 for 1954.

Cargo ton-miles also were up over the preceding year, 666,379,000 as opposed to 57,377,000 in 1954.

An all-time high in transporting freight by air between the United States and Europe was recorded by Pan American in 1955, with the total reaching 6.8-million pounds. The total represented an increase of 46 per-cent over 1954's amount of 4.6-million pounds.

The only direct one-plane service from New York to Munich and Vienna was begun by Pan American in October on a basis of three round-trips a week.

In the Middle East, new routes from New York were launched to Damascus in February, to Tehran in April, and to Ankara in December.

An interchange agreement was signed with National Airlines and Panagra (Pan American-Grace Airways), Pan American affiliate, to provide a through service between New York, Washington, Miami, Panama and nine key cities in South America. The service, inaugurated in September, eliminates the necessity of changing planes at Miami on flights between North and South America. San Francisco became a gateway to Latin America in December when Pan American opened service from there to Caracas.

In other air activity in Latin America, Pan American inaugurated nonstop flights from New York to Ciudad Trujillo, capital of the Dominican Republic, and linked Panama City, Kingston, Jamaica, and Miami with a direct tourist service.

Besides steadily stepping-up its trans-Atlantic cargo flights until, by the end of the year, they totalled six departures a week from New York, Pan American improved its cargo service in other areas. All-cargo services were inaugurated in December to Latin America from San Francisco and Los Angeles, and from Houston.

Figures compiled after the first 18 months of operation of the pioneering "Pan Am Pay Later Plan" showed that 16,500 passengers had flown abroad on the installment system since it went into effect in May, 1954. There were no defaults in payments. First begun for United States residents, the Pan American plan now is available in England, Ireland, Puerto Rico, Canada, Australia, and Panama.

During the year Pan American put into service a new fleet of seven 353-mile-an-hour DC-7Bs, fastest transports flying between the United States and Europe. Carrying 71 passengers, the planes cut 1½ hours from the New York-Paris flight time, and 1 hour, 15 minutes from the New York-London time.

Pan American also has on order 33 advanced-type DC-7Cs, the first of which is to enter service in the spring of 1956. The Seven Seas are a longer-range (5,000 miles), improved version of the DC-7Bs, have a fuel capacity of 7,860 gallons, and can carry 56 passengers in standard configuration and 83 in tourist.

Shortly after going into service the DC-7B Clippers started establishing new unofficial commercial speed records. Their most striking single day of fast flights occurred on October 5 when a flight from New York to London was clocked in 8 hours, 52 minutes; one to Paris in 9 hours, 20 minutes, and to Prestwick in 8 hours, 10 minutes.

Airborne radar, costing $3-million, was ordered for DC-6 and DC-7 Clippers already in service as well as all planes now on order. The weather-probing radar was designed to provide a smoother, faster and safer flight when heavy weather is encountered.

Trans World Airlines

Trans World Airlines in 1955—its 30th Anniversary year—used as its underlying theme "Thirty Years of Service" in the air transportation industry. A year-long program, based on this theme, was studded with highlight events, innovations and record progress in nearly every phase of the airline's global operations.

TWA launched its $100,000 Cosmic Contest, one part of which invited the public to express its views about current air transportation; the other encouraged conjecture about aviation 30 years from now in 1985. Over 100,000 entries from almost every country in the world were microfilmed and stored for judging and awarding of a $50,000 prize in 1985.

Preliminary figures for the year showed record increases in air traffic well beyond the best of 1954.

An estimated total of over 4-million passengers were flown almost 3.5-billion passenger miles over TWA's United States and international routes. The number of passengers was an increase of 13.4 percent over the number flown in 1954. Passenger mileage showed an increase of 8.5 percent.

Trans World Airlines new Super-G Constellation

In the United States, TWA's coast-to-coast routes accounted for over 2.8-billion passenger miles—8.9 percent above the 1954 figure. International passenger miles flown were estimated at about 615-million—an increase of over 7 percent over last year.

Still on the increase was TWA's passenger mileage flown in Sky Tourist low-cost service. Increases of 10.3 percent on domestic routes, and 9.2 percent on trans-Atlantic routes to Europe and the Middle East were recorded.

Healthy gains were recorded in domestic air express and freight, with air express ton mileage increasing some 10.6 percent over that of 1954; and air freight ton mileage, some 12.5 percent.

A highlight factor in this progress and a stride into the future was made when, in April, TWA inaugurated first-class, non-stop coast-to-coast service with the nation's newest and most luxurious airliner, the turbo-compound Super-G Constellation. Twenty of these ultra-modern aircraft were in service by midsummer, augmenting TWA's fleet to 101 Super and standard-size Constellation aircraft.

Addtional orders were placed for eight more Super-G's, to be delivered starting next June, and an order for 24 extra-long-range model 1649 Constellations, due in the spring of 1957.

Keeping pace with the rapid growth of aerial communications and navigation, TWA in 1955 installed in its entire fleet over \$2.5-million worth of electronic radio and radar equipment, including weather surveillance radar equipment for all Super-G Constellations.

Summer flight schedules reached a record 181 daily United States passenger flights to meet the unprecedented demand. Internationally, TWA scheduled a peak of 96 weekly flights. Of the total number of TWA summer domestic flights, nearly 25 percent were tourist services; of international flights, some two-thirds were tourist.

TWA implemented in September the low transcontinental air fare of \$80 one way. This new excursion fare provides Sky Tourist service on regular scheduled flights between New York and Los Angeles or San Francisco, with similar excursion rates to the West Coast from Boston, Philadelphia, Baltimore, Washington, and to the East Coast from Fresno and Oakland, Calif.

TWA also introduced a scheduled non-stop tourist service between New York and California cities of Los Angeles and San Francisco with its huge new Super-G Constellations providing a multiple service on United States routes. The forward section of the Super-G provides accommodations for tourist passengers at \$80 each way, while all other compartments, including the sumptuous lounge, are available to first class passengers. Multiple service with the Super-G is also provided to and from six other cities — Philadelphia, Pittsburgh, Chicago, St. Louis, Kansas City and Dayton.

Overnight intercontinental air service was introduced Nov. 1 direct from California to London and Frankfurt with a fleet of long-range Super-G Constellations. Multiple service—first class and tourist service—is provided. The service will be expanded to include Paris and Rome in January, 1956, and Athens and Cairo in March.

Detroit and Cleveland were added to TWA's transcontinental schedules. In 1955, CAB approval was also given TWA to serve Denver.

Internationally, TWA received unanimous approval by the CAB to operate beyond Frankfurt to Zurich. The service is expected to begin in the near future.

Recognition of TWA's subsidy-free role in conducting both its domestic and international routes came from the United States Post Office Department. A special scroll and citation signed by the Postmaster General was presented to TWA Board Chairman Warren Lee Pierson and President Ralph S. Damon in Washington.

Another event was the publication of a memory-evoking pictorial history of the past 30 years, built around the story of TWA's growth over these years to its present global operations over 33,000 miles of routes on four continents, entitled "Thirty Years of Service."

Looking ahead, TWA exhibited a rocket ship permanently at Disneyland, Anaheim, Calif. The design is a serious, scientifically accurate representation of what experts predict for some 30 years from now.

United Air Lines

The 1955 progress of United Air Lines generated many significant events but the one overshadowing all others occurred October 25, when the board of directors approved a $175-million order for 30 Douglas DC-8 jets and spare parts.

W. A. Patterson, United's president, said that delivery of the new aircraft will begin in the spring of 1959, followed by scheduled jetliner service that fall. Passenger capacity will range from 112 in first-class cabin configurations to 140 in coach versions. Cruising speed will reduce transcontinental nonstop time to 4½ hours.

Nine months prior to the jetliner commitment, United had received the last of 25 DC-7's, ordered in 1952. On order for delivery in 1956 and 1957 were five all-cargo DC-6A's, 17 DC-7's, and 21 DC-6B's, costing $64.8-million. With these aircraft, the company will have a fleet of 219 modern planes for expansion until delivery of the DC-8's.

United's 1955 traffic climbed beyond the highs of all previous years. Summer schedules were based on 17,597,000 airplane seat miles daily, a 17 percent increase over summer of 1954. On July 1, the peak day, 20,114 passengers were flown a record-making 14,692,319 revenue passenger miles. The company operated almost 90,000 flights in the year.

Operating results, based on ten months' figures, and estimates for November and December, were the best in history. Revenue passenger miles totaled 4-billion, 20.5 percent ahead of 1954; mail tons reached 26.3-million, an increase of 11 percent; express ton miles climbed to 12.5-million, up 19 percent; freight ton miles soared to 43.5-million, a gain of 27 percent. The number of revenue passengers totaled 5.5-million, an increase of 15 percent.

Nonstop DC-7 flights from New York to San Francisco were begun in May, clipping off an hour from the previous one-stop time of 9¾ hours. In July, Mainliner Convairs began providing Ely, Nev., with its first scheduled airline service. The first plane-auto travel packages, representing a reduction of approximately 15 percent in both air fare and car rental fees, became available between ten cities on October 1. Thirty days later, after removal of a CAB restriction on such service, United began nonstop flights between the Midwest and Pacific Northwest.

Air coach service was expanded. Nine first-class DC-6 Mainliners were converted to 72-passenger coaches. During the summer peak, the company's daily coach mileage amounted to a 39 percent increase over the same season of the previous year. Nonstop coach service between Chicago and Las Vegas began in September. Near the end of the same month, excursion coach fares of $80 each way on round-trip transcontinental flights became effective.

Of major importance was the decision in April to equip United's entire fleet with airborne C-band radar. Two hundred C-band units were ordered from the Radio Corporation of America for $2.5-million, with an additional $1.5-million earmarked for installation costs.

United's first plane to be equipped with radar emerged from the company's San Francisco maintenance base in July. The aircraft—a Convair 340—was dispatched to key cities across the country for demonstrations to groups of newspapermen. Training of 1,785 pilots in the use of C-band radar began in September.

Communications aloft and on the ground were substantially improved.

United negotiated interline agreements with Iranian Airways, Lufthansa German Airlines, Faucett Airlines and Malayan Airways, bringing the total of such pacts to 136. Resumption of United's operations at Eureka, Monterey and Santa Barbara was ordered by the CAB, which had temporarily suspended Mainliner service at those cities in January, 1952. The company complied on December 8.

An agreement in March between United and the Air Express International Corporation provided shippers in many cities with the first through international air freight rates. Depending on the type of commodity, this resulted in rate reductions of from 10 to 40 percent. Swissair and Airwork Limited were added to the company's international reserved air freight program in July, after similar pacts with Pan American, KLM, Sabena and Qantas.

Mr. Patterson announced plans for a $6-million expansion at San Francisco, which will include additional shops and hangars at the maintenance base. In September, the company signed a lease with the Port Authority of New York for 27 acres at Idlewild Airport on which a unit terminal building would be constructed at a cost of $5.5-million. The company's Idlewild facilities already consisted of a $6-million hangar and operations building. Operations also were begun at Chicago's O'Hare Airport, where United leased two hangars and office space in the terminal building.

CHAPTER EIGHT

Utility Aircraft

BUSINESS USE OF AIRCRAFT continued high in 1955 promising prosperity for the utility aircraft manufacturers as well as the producers of accessories and parts.

Hourly use of the business airplane was expected to reach an all-time high of 4.2-million hours in 1955, exceeding the 1954 total of 3.9-million. CAA traffic forecasts for the next decade predicted that by 1960 total hours logged will climb to 7.2-million.

Aircraft shipments by lightplane manufacturers added up to about $67.5-million for 1955, more than $17-million over the 1954 figure. For the first time since 1948, number of units shipped hit about 4,200. CAA estimates that shipments will climb to 5,000 planes in 1960 and 6,000 in 1965 with the dollar value soaring first to $140-million and later to $240-million.

Greatest boost to the business plane and testimonial to the safety of the small twin transport came from the White House when the Air Force assigned an Aero Commander for President Eisenhower's use on short trips. This marked the first time in aviation history that the chief executive was permitted to fly in anything smaller than a four-engine transport.

The high dollar volume in lightplane shipments compared to the conservatively smaller increase in number of units shipped further attested to the small twin's acceptability by business and industry. Demonstration of the demand for the plane was reflected in production and sales plans of the manufacturers. Piper Aircraft Co. plotted its 1956 program around its Apache. Setting distributor sales quota at an all-time $30-million high (sales in 1955 were $20-million), Piper announced that production would be boosted to two-a-day; a new plant expansion is earmarked for Apache final assembly; and a Piper-sponsored service program for distributors gets under way early in 1956.

The 150 hp Apache for 1956 continues to cruise at 160 mph, but extra fuel tanks, being offered as optional equipment, increase range up to 1,100 miles.

To provide further safety and utility in the twins, manufacturers concentrated on increasing speeds and safety features in their standard models.

Aero Design & Engineering Co. goes into production on its new Model 580 Aero Commander with supercharged engines which will provide a top speed of about 260 mph, approaching that of the Convair liners.

Beech, late in 1955, announced its Model D50 Twin-Bonanza which is the basic Model C50 configuration with Hartzell three-blade props and two Lycoming high compression 495 hp engines which raise cruise speed to 203 mph and a top speed to 214 mph. The C50, cruising at 195 mph, will continue in production.

Despite the concentration on the multi-engine equipment, single-engine airplanes weren't overlooked. Piper announced that it would fly a prototype of its first all-metal aircraft in 1956 with production scheduled for 1957. Although details are not known, it will be a high performance, medium-priced aircraft called the Comanche.

The Bonanza was further speeded up by Beech for 1956 sale by using the more powerful Continental 225 hp Continental engine, formerly offered as optional, which boosts speed to 190 mph at 75 percent power. Cessna announced the Model 172 which is the company's first tricyle geared single engine aircraft.

An interesting trend began to take form in 1955 in the leasing of aircraft. The sudden surge of interest in leasing planes to business, industry and commercial aviation was generally credited to the tightening up of business capital. Manufacturers, airlines, fixed base operators, used aircraft dealers, and business plane fleet owners were offering a great variety of lease plans. For example, National Airlines announced a packaged deal whereby it would lease executive Lodestars complete with crews and stewardesses. Other plans called for leasing of just equipment on monthly, seasonal, long term, or other terms. The best leasing business, however, was concentrated, again on the small twins. To stimulate further distributor and dealer sales, Beech and Cessna took the unprecedented step of working out nation-wide leasing plans for their distributors.

Beech entered into an exclusive agreement with American Leasing Corp. of Hartford, Conn., whereby a distributor can offer a lease program to a customer unable to put out a cash outlay for a self-owned plane. When such a customer signs a four-year lease for one of Beech's planes, ALC buys the aircraft from the customer's distributor.

Cessna operated in a different way. The company set up a wholly owned subsidiary which acts as a financing house for distributors. National Aero Finance, as it has been incorporated, will finance two year or four year leases on any new Cessna equipment with appropriate options. To date, users of Cessna twin Model 310 have been the biggest takers on lease.

With business flying well established as an industry, the long-hungry fixed base operators, now flourishing, were showing a willingness to make large capital investments in airport facilities to accommodate the group. Business flying centers were springing up in major cities throughout the country. The centers, representing investments of on an average $500,000, provide small terminal buildings, pilot facilities, office space, maintenance and overhaul in one packaged unit.

Piper's new Apache model

Also, the economic and operational importance of business flying has seen a strengthening of the organization that represents more than 300 companies. A reorganization of the National Business Aircraft Association has resulted in the top executives of the company members being brought into association activities.

Primarily a pilots' group heretofore, the council will give the actual users of the aircraft a strong voice in association activities, which, of course, includes government representation.

In addition, NBAA has set up the machinery for regional groups to be organized to deal with local problems and activities.

While agricultural flying hours took a slight dip in 1954 because of weather conditions, estimates for 1955 had it coming back up to about 722,000 hours. CAA forecasts 1.1-million hours for commercial agricultural activities by 1960, going up another 200,000 hours by 1965. Dusting and spraying activities accounted for more than 500,000 of the 1955 estimates.

Piper continued during the year to produce its PA-18A Super Cub for spraying and dusting. There was no other new equipment coming on the market in 1955.

Passenger, air taxi, and cargo charter flying maintained a level of 650,000 hours in 1955. CAA conservatively predicts that this may rise to 850,000 hours in 1960 and probably up to 1-million in 1965.

Patrol and survey flying is expected to continue its expansion, but on a much smaller scale than in 1954 when it registered a 32 percent increase. With 400,000 hours flown in 1954, CAA predicts 550,000 hours by 1960 and possibly 650,000 hours by 1965.

An upturn in pleasure flying was noted in 1953 and 1954, after its nosedive in 1947. It now accounts for between 20 and 25 percent of all general aviation activity. About 2-million hours were logged in 1954 and this may go as high as 2.8-million hours in the next decade.

The aircraft as a specialized tool of general aviation has now become an estabilshed factor in the industry. The business fleet now totals about 22,000 aircraft with all of general aviation using 61,000 civil planes. All of general aviation flew about 9-million hours in 1955. Its magnitude shows up when compared to the 2.6-million revenue hours chalked up the U. S. scheduled airlines during the same period.

HELICOPTERS

In the vertical take-off field, helicopter development shared the spotlight with convertiplanes which incorporate helicopter take off and landing characteristics with in-flight resemblance to fixed wing. Announcing convertiplane experimental developments during the year was Bell with its tilting rotor XV-3 and McDonnell with its XV-1.

Greatest interest in the convertiplane was evidenced by the Army, the greatest user of helicopters, when it invested close to $16-million in the XV-1 and XV-3. The Army also awarded a contract to Anton Flettner, German aircraft designer, to draw up design blueprints of a 40-passenger convertiplane.

But while these developments were underway helicopter production was booming—for the military. While the civilians talked, the military was buying and planning. The Marine Corps announced that the helicopter would change the whole complexion of amphibious landings. Adding to its base of small, medium and large transport type, the Marines announced a requirement for a one-man helicopter at one end and a flying crane type to carry huge tactical equipment at the other. Marine officials pointed out that troop carriers, because of the helicopter, could disperse farther away from shore and at wider range.

The Army, pushing hard for a more powerful air arm for greater air mobility, was pinning its hopes on the helicopter since at this time the weight limitation of 5,000 lbs. imposed on its fixed wing airplanes, does not apply to helicopters. Spelling out its plans, the Army broke its helicopter transportation companies into three categories: (1) light, having a payload of 1½ tons and including such rotorcraft as the Piasecki H-21 and the Sikorsky H-34; (2) medium, with a three-ton payload using the Sikorsky H-37; and (3) heavy, with five-ton payloads using the Piasecki H-16.

Commercial use of helicopters still remained in the planning stage. Mohawk and National airlines, who had acquired several helicopters for experimentation, gave up during 1955 and sold the equipment. National's reason was high cost of operation and spokesman added they would like larger equipment as it became available before going back into helicopter shuttle service.

The three helicopter carriers, Los Angeles Airways, New York Airways, and Chicago's Midway airlines were the only active helicopter operators in the civilian field. Los Angeles expanded its routes throughout its area during the year for passenger, as well as mail service. New York Airways joined forces with Northwest Airlines with the trunk carrier supplying free transfer service from New York airports to White Plains, N. Y. Service to passengers to three other points was available at an additional charge.

But manufacturers were preparing for civilian demand. It is still predicted that helicopters will be in widespread commercial use beginning in about five years. Piasecki moved toward CAA certification of its H-21; Cessna had its small CH-1 certificated in the summer. The 21-passenger H-21 and the 12-passenger Sikorsky S-58 are available for civil use and are moving close to what the airlines want.

Non-carrier aviation was reportedly using close to 200 helicopters, mainly for patrol and survey work, flying about 40,000 hours. A few were being utilized in dusting and spraying operations and agricultural aviation was predicting wider use in this field. There are about 30 commercial operators in the U. S.

Rep. Carl Hinshaw (R-Calif.), keynoted the need for accelerating commercial helicopter development in a major speech before the American Helicopter Society. He noted that "no one has come up yet with the helicopter that fills either the present day or future commercial transportation needs." He stated that the "most important function of the helicopter" is "connecting transportation" and that it is the helicopter's function "to complement, augment and to help improve the other forms of transportation—by linking them together and by extending their service beyond their

Cessna CH-1 Helicopter

terminal points of departure and arrival through to the outlying communities. . . . While the helicopter is a specialty vehicle and most efficient on short hauls, it makes it possible for the long haul carriers to do their jobs right."

Outside of the current lack of civilian production, problems of navigation aids and heliports were yet to be worked out. Although various reports have been written on heliport specifications, it is generally conceded that actual operational evaluation of the type of equipment to be used is necessary first.

Stressed, however, is the need for enacting legislation on local levels that would obsolete zoning laws prohibiting aircraft operations at low altitudes and in cities to allow helicopters to go into cities, once put into service.

The International Air Transport Association, noting that helicopter development and introduction into transport service "is likely to be much more rapid" than that of previous vehicles, urged that a helicopter traffic control "highway" system be developed. Requirements for such highways to be one-way roads would be: (1) Main routes should not penetrate into the center they service but should bypass them with short secondary feeder routes connecting the centers to the main highway. (2) All routes should be clearly defined and easy to follow. (3) There should be no level crossings which complicate the structures and its operation. (4) There should be underpasses and overpasses for crossing routes.

The IATA helicopter group found that the easiest solution would be to establish a number of parallel lanes in the most strategic positions taking into consideration economy of distance, which is essential with the relatively low cruising speeds being achieved by helicopters.

Helicopter traffic control should be exercised in terminal areas and at heliports in a manner similar to methods used in controlling surface traffic, while in other areas precise navigational aids together with adequate enroute flight procedures would avoid collision hazard.

The Civil Aeronautics Board during 1955 circulated a proposed brief on airworthiness rules for transport helicopters which divided rotorcraft into three categories. Proposed CAR's were patterned on current requirements for fixed wing. The three categories are:

1. Normal Category, limited to 6,000 pounds gross weight. Helicopter would be eligible for all passenger and cargo operations, for hire, except in certificated scheduled and irregular carrier service, restricted to helicopter visual rules.

2. Category A would have no limitation on weight. Helicopters in this group must be multi-engine and subject to compliance with appropriate performance operation limitations. This category would be eligible for all types of operations under both visual and instrument regulations.

3. Category B would be limited to 17,500 pounds or less gross weight. It would be eligible for all types of operations only under visual flight, would be subject to compliance with performance operation limitations, and have certain route limitations.

CHAPTER NINE

Planes in Production

WHILE THE MILITARY continued to represent 85 to 90 percent of aircraft production, unit production was off from the 1954 figure of 9,600 to 8,400 in 1955. The reduction had little effect on dollar volume, owing to increased cost and size of military aircraft. The industry also shared largely in the increased production of guided missiles.

Sale of civilian utility aircraft hit another new all-time high of 4,500, and although there was a slight decrease in the number of commercial transports delivered, sales led all other nations of the world and a huge backlog was built for future jet orders.

The future looked bright at year-end, although further reduction in military orders was anticipated for 1956. Anticipated aircraft orders of approximately 8,000 will, it is expected, be offset by increased orders for guided missiles.

At the end of September, 1955, the industry had unfilled orders totalling $13.9-billion, as compared with the backlog of $14.9-billion at the end of 1954. A total of $11.1-billion represented military orders and $2.8-billion civil orders. Comparable figures for the end of the year, 1954, show $12.8-billion in military backlog, $2.1-billion civil.

AERO DESIGN AND ENGINEERING CO.

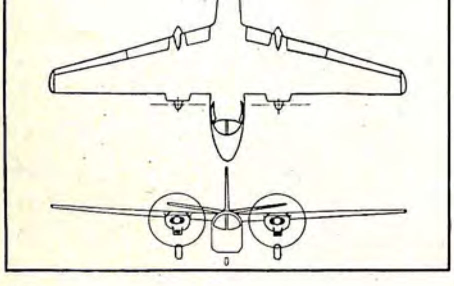
Oklahoma City, Okla.

New Aero Commander Model 560A

TYPE • **Five-Seven place**

DESIGNATION • **Model 560-A (L-26B)**

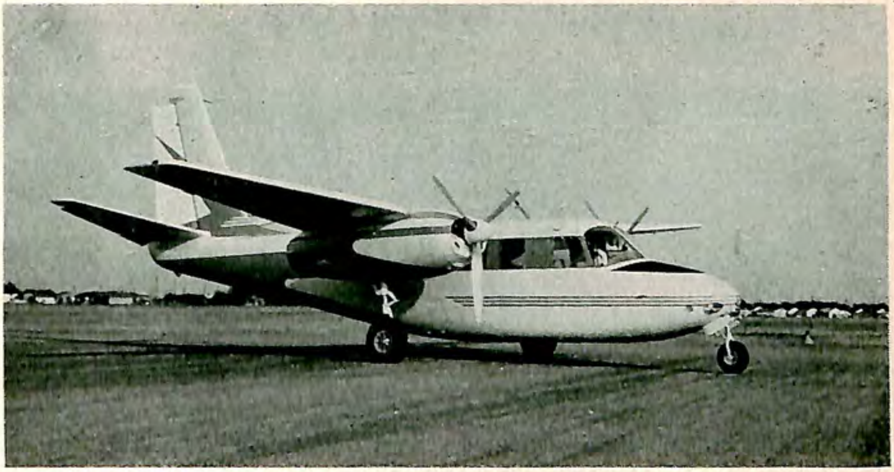
SPECIFICATIONS • **Span 44 ft.; Length 35 ft. 5 in.; Height 14 ft. 9 in.; Empty Weight 4181 lb.; Gross Weight 6000 lb.; Overload Gross Weight 6000 lb.; Wing Loading 24.7 lb. per sq. ft.; Power Loading 10.9 lb. per bhp; Engines (2) Lycoming GO-480-D1A 260 ea. hp normal rated or, 275 ea. hp at 3400 rpm takeoff; Fuel Capacity 156 gal.; Propeller Hartzell 3-blade; Main Tire 8.50 x 10; Nose Tire 6.00 x 6; Wing Area 242 sq. ft;. Aileron Area 20.52 sq. ft.; Flap Area 32.70 sq. ft.; Fin Area 38.20 sq. ft.; Rudder Area 15.40 sq. ft.; Stabilizer Area 33.06 sq. ft.; Elevator Area 20.54 sq. ft.**



PERFORMANCE • **Maximum Speed 206 mph at 275 hp ea. at 3400 rpm at S. L.; Cruise Speed 197 mph at 70 percent hp at 10,000 ft.; Stall Speed 68 mph.; Rate of climb 1400 fpm at S. L.; Service Ceiling 21,900 ft.; Range with Maximum Payload 1050 mi. with 30 min. reserve; Range with Maximum Fuel Load 1650 mi. with optional long range tanks.**

REMARKS

Several structural changes have been made between the 560 and the 560A. The most noticeable: a 10 in. section inserted in the fuselage forward of the wing to provide a 10 in. longer cabin and larger more streamlined nacelles. Three-blade propellers are standard. Convertible to cargo in 30 minutes.



Aero Commander Model 680 Super

TYPE • Five-Seven place

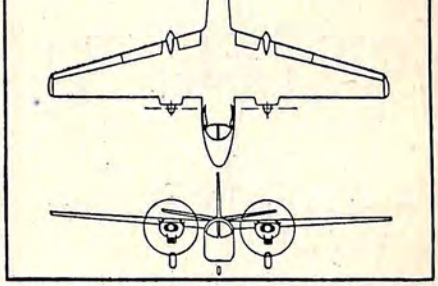
DESIGNATION • Model 680 Super

SPECIFICATIONS • Span 44 ft.; Length 35 ft. 5 in.; Height 14 ft. 9 in.; Empty Weight 4340 lb.; Gross Weight 7000 lb.; Overload Gross Weight 7000 lb.; Wing Loading 28.8 lb. per sq. ft.; Power Loading 10.3 lb. per bhp; Engines (2) GSO-480-A1A-6, 320 hp normal rated, or 340 hp at 3400 rpm takeoff; Fuel Capacity 223 gal.; Propeller 3-blade Hartzell HC-83X20-2A/9333C; Main Tire 8.50 x 10; Nose Tire 6.00 x 6; Wing Area 242 sq. ft.; Aileron Area 20.52 sq. ft.; Flap Area 32.70 sq. ft.; Fin Area 38.20 sq. ft.; Rudder Area 15.40 sq. ft.; Stabilizer Area 33.06 sq. ft.; Elevator Area 20.54 sq. ft.

PERFORMANCE • Maximum Speed 260 mph at 15,000 ft.; Stall Speed 71 mph; Rate of Climb 1600 fpm at S. L.; Service Ceiling 24,200 ft.; Range with Maximum Payload 1600 mi.; Range with Maximum Fuel Load 1600 mi.

REMARKS

The fastest aircraft produced exclusively for business in the United States today. Basically the same structure as the 560A. First in its category to use supercharged engines. 15,000 ft. single engine ceiling. Convertible to cargo in 30 minutes. Oxygen system and three blade propllers standard equipment.



BEECH AIRCRAFT CORP.

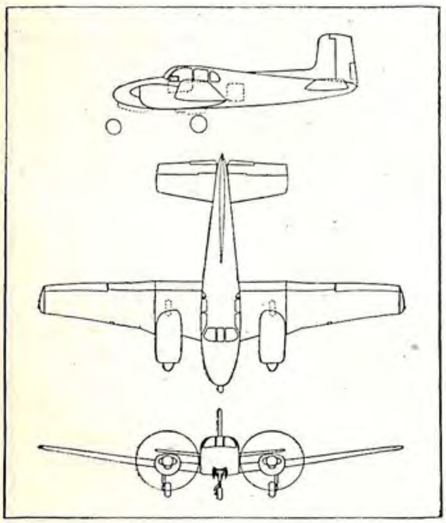
Wichita, Kans.

Beechcraft Model C50 Twin Bonanza

TYPE • **Six place**

DESIGNATION • **C50**

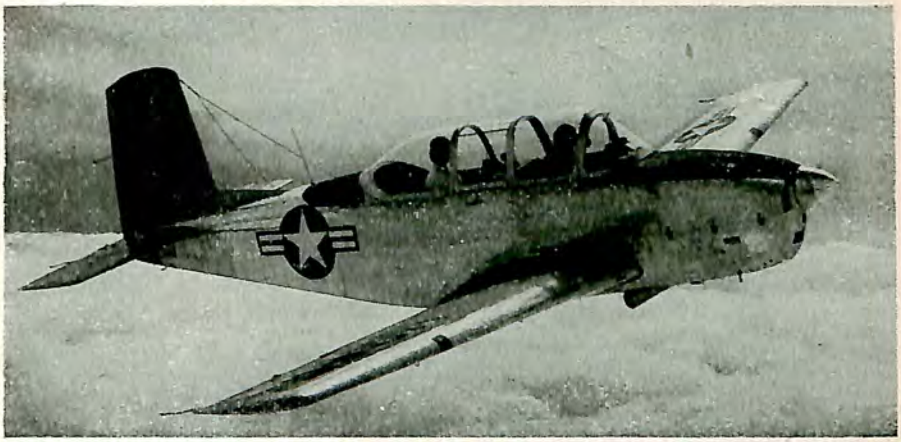
SPECIFICATIONS • **Span 45 ft. 3⅜ in.; Length 31 ft. 6½ in.; Height 11 ft. 4 in.; Empty Weight 3928 lb.; Gross Weight 6000 lb.; Wing Loading 21.66 lb. per sq. ft.; Power Loading 11.32 lb. per bhp.; Engines (2) Lycoming GO-480-F6 hp. at 3100 rpm at S. L.; Fuel Capacity 134 gal. plus 46 gal. in optional auxiliary wing tanks; Propeller Beech full feathering constant speed with electric driven feathering pump; Gear tricycle retractable; Wing Area 277.06 sq. ft.; Aileron Area 13.89 sq. ft.; Flap Area 37.80 sq. ft.; Fin Area 14.25 sq. ft.; Rudder Area 12.77 sq. ft.; Stabilizer Area 47.25 sq. ft.; Elevator Area 17.49 sq. ft.**



PERFORMANCE • **Maximum Speed 210 mph at 265 hp at 3100 rpm at 2500 ft.; Cruise Speed 200 mph at 176 hp at 2750 rpm at 10,000 ft.; Landing Speed 69 mph; Rate of Climb 1450 fpm at S. L.; Service Ceiling 20,000 ft.; Range with Maximum Payload 1100 mi.**

REMARKS

First flown on Nov. 15, 1949, the C50 executive transport is the commercial version of the U. S. Army L-23B, which serves the U. S. Army Ground Forces as a light personnel transport and is easily modified into a twin-engine trainer, photographic, ambulance, or cargo airplane. Noted for its economy in initial cost, maintenance and operation, this airplane has been structure-tested to an 8G flight load factor.



Beech T-34A Mentor

TYPE • **Trainer**

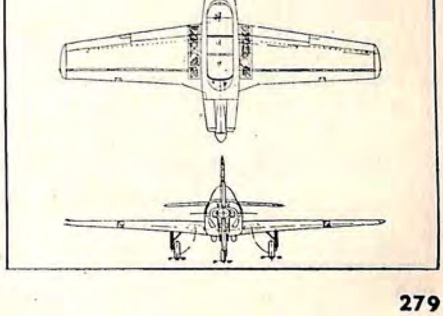
DESIGNATION • **T-34A (Air Force)**

SPECIFICATIONS • **Span 32 ft. 10 in.; Length 25 ft. 11 in.; Height 9 ft. 7 in.; Empty Weight 2170 lb.; Gross Weight 2900 lb.; Wing Loading 16.33 lb. per sq. ft.; Power Loading 12.89 lb. per bhp; Engine Continental O-470-13, 225 hp at 2600 rpm; Fuel Capacity 50 gal.; Propeller Beech constant speed; Gear tricycle; Wing Area 177.6 sq. ft.; Aileron Area 11.5 sq. ft.; Flap Area 23.3 sq. ft.; Fin Area 10.39 sq. ft.; Rudder Area 6.54 sq. ft.; Stabilizer Area 22.25 sq ft.; Elevator Area 15 sq. ft.**

PERFORMANCE • **Maximum Speed 189 mph at 225 hp at 2600 rpm at S. L.; Cruise Speed 173 mph at 135 hp at 2300 rpm at 10.000 ft.; Landing Speed 54 mph; Rate of Climb 1230 fpm at S. L.; Service Ceiling 20,000 ft.; Range with Maximum Payload 736 mi. at 10,000 ft. 60 percent power.**

REMARKS

The T-34 Mentor, developed by Beech as a private venture, has now been adopted as the official primary trainer for the U. S. Air Force, U. S. Navy, and the air services of Canada, Chile, Colombia, El Salvador and Japan. It has won every evaluation contest in which it has participated since the first prototype flight, Dec. 2, 1948. The Beechcraft T-34B is the official primary trainer of the U. S. Navy. This airplane is a modified version of the USAF T-34A also used by the air services of five foreign nations. First production aircraft deliveries were made to the Navy in June, 1955.

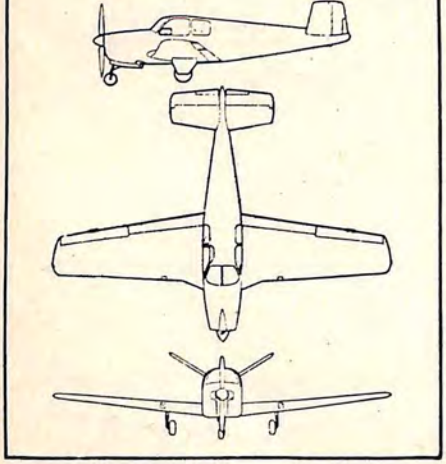


Beechcraft F35 Bonanza

TYPE • **Four place**

DESIGNATION • **F35**

SPECIFICATIONS • **Span 32 ft. 10 in.; Length 25 ft. 2 in.; Height 6 ft. 6½ in.; Empty Weight 1697 lb.; Gross Weight 2750 lb.; Wing Loading 15.5 lb. per sq. ft.; Power Loading 13.4 lb. per bhp; Engine (standard) Continental E-185-11, 205 hp takeoff —(optional) Continental E-225-8, 225 hp takeoff; Fuel Capacity 39 gal. (59 gal. with auxiliary tank); Propeller Beech electrically controlled; Gear tricycle, fully retractable. Wing Area 177.6 sq. ft.; Fin-Stabilizer Area 23.8 sq. ft.; Rudder-Elevator Area 12 sq. ft.**



PERFORMANCE • **Maximum Speed (standard engine) 190 mph at 185 hp at 2300 rpm at S. L.—(optional engine) 194 mph at 185 hp at 2300 rpm at 3000 ft.; Cruise Speed (standard engine) 180 mph at 139 hp at 2150 rpm at 6000 ft.—(optional engine) 184 mph at 146 hp at 2300 rpm at 8000 ft.; Landing Speed 55 mph; Rate of Climb (standard engine) 1100 fpm at S. L.—(optional engine) 1300 fpm at S. L.; Service Ceiling (standard engine) 18,000 ft.—(optional engine) 19,000 ft.; Range with Maximum Payload 1180 mi. at 10,000 ft. at 165 mph.**

REMARKS

The Bonanza was first flown Dec. 22, 1945. It holds the lightplane non-stop world's distance record of 4,957.240 mi. (see RECORDS). Popular with the business executive, the Bonanza has also had a successful feederline operational history.

Beechcraft Super 18

TYPE • **Eight place**

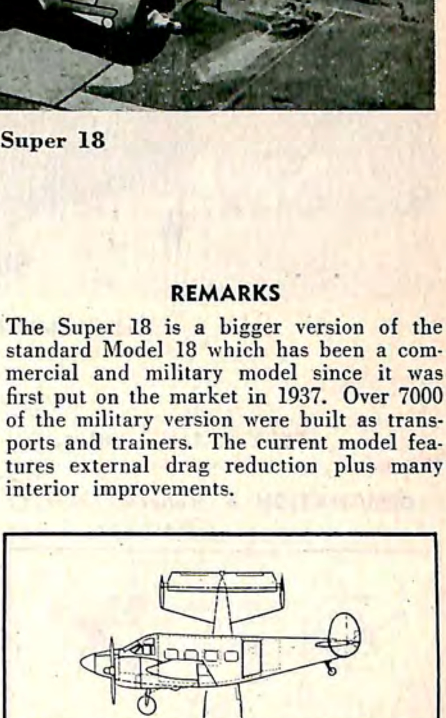
DESIGNATION • **Super 18 (Model E18S)**

SPECIFICATIONS • **Span 49 ft. 8 in.; Length 35 ft. 2½ in.; Height 9 ft. 6 in.; Empty Weight 6050 lb.; Gross Weight 9300 lb.; Wing Loading 25.76 lb. per sq. ft.; Power Loading 10.33 lb. per bhp; Engines (2) Pratt and Whitney 450 hp at 2300 rpm takeoff; Fuel Capacity 286 gal.; Propeller Hamilton Standard hydromatic; Gear conventional; Wing Area 361 sq. ft.; Aileron Area 17.48 sq. ft.; Flap Area 28.12 sq. ft.; Fin Area 20.08 sq. ft.; Rudder Area 13.50 sq. ft.; Stabilizer Area 49.58 sq. ft.; Elevator Area 22 sq. ft.**

PERFORMANCE • **Maximum Speed 234 mph at 450 hp at 2300 rpm at 3300 ft.; Cruise Speed 215 mph at 300 hp at 2000 rpm at 10,000 ft.; Landing Speed 86 mph; Rate of Climb 1490 fpm at S. L. at 8750 lb. gross; Range with Maximum Payload 1460 mi. at 10,000 ft., 44.5 percent power. 45 min. reserve.**

REMARKS

The Super 18 is a bigger version of the standard Model 18 which has been a commercial and military model since it was first put on the market in 1937. Over 7000 of the military version were built as transports and trainers. The current model features external drag reduction plus many interior improvements.



BELL AIRCRAFT CORP.

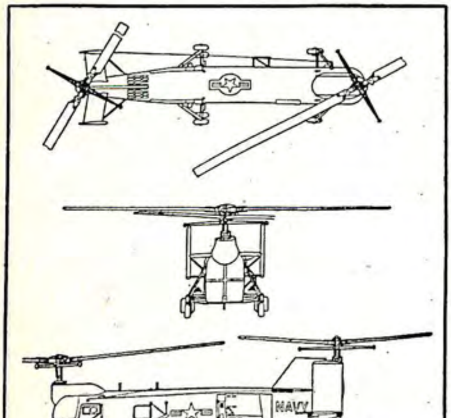
HELICOPTER DIVISION

Fort Worth, Tex.

Bell Model 61 Twin Tandem

TYPE • Anti - Submarine Combat

DESIGNATION • Model 61 (HSL-1) (Navy)



SPECIFICATIONS • Main Rotor Diameter 51 ft. 5 in.; Length 40 ft.; Height 14 ft. 6 in.; Engine Pratt and Whitney R-2800, 1900 hp normal rated; Fuel Capacity 425 gal.

PERFORMANCE • Maximum Speed 173 mph; Range 4 hr. endurance.

REMARKS

This is the first helicopter specifically designed for anti-submarine warfare, and marks Bell's first departure from the single main rotor configuration. Navy HSL-1 rotor system has the standard Bell rigid two-blade rotor and automatic stabilizer system. The engine is mounted in conventional position in the aft section of the fuselage. The rotors can be folded rearward, the rear blades folding forward for compact carrier stowage. Stabilizing fins are provided for directional stability in high speed flight.

Bell Model 47H-1

TYPE • Three place

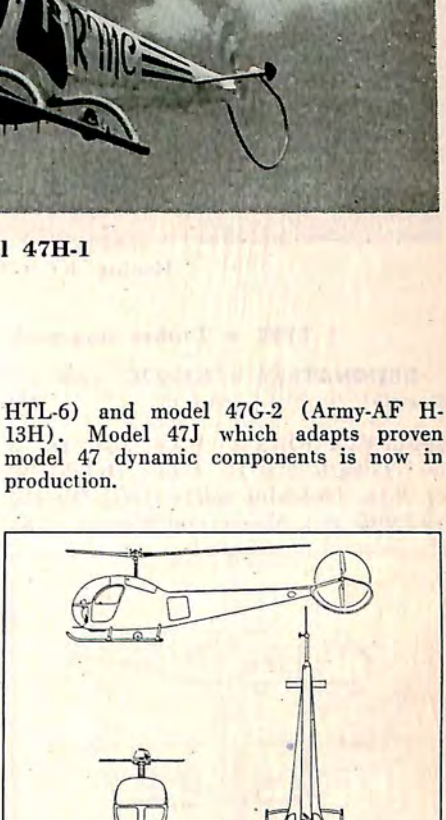
DESIGNATION • 47H

SPECIFICATIONS • Main Rotor Diameter 35 ft. 1½ in.; Anti-Torque Rotor Diameter 5 ft. 8 in.; Length 31 ft. 4 in.; Height 9 ft. 3 in.; Empty Weight 1465 lb.; Gross Weight 2350 lb.; Engine Franklin 6V4-1200-C32, 200 hp.; Fuel Capacity 35 gal.

PERFORMANCE • Maximum Speed 100 mph; Cruise Speed 90 mph; Rate of Climb 950 fpm at S. L.; Maximum Range 207 mi.

REMARKS

Streamlined fuselage including semi-monocoque tail boom, arched skid gear, faired gas tanks and other refinements give this new model a substantial range and cruise advantage over previous models. Later model of 47G (Army-AF H-13G; Navy HTL-6) and model 47G-2 (Army-AF H-13H). Model 47J which adapts proven model 47 dynamic components is now in production.



BOEING AIRPLANE CO.

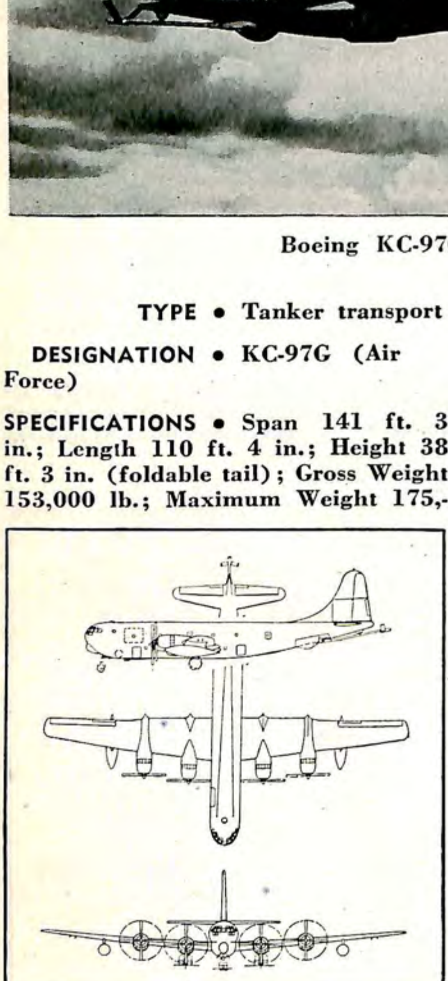
Seattle, Wash.

Boeing KC-97G Stratofreighter

TYPE • Tanker transport

DESIGNATION • KC-97G (Air Force)

SPECIFICATIONS • Span 141 ft. 3 in.; Length 110 ft. 4 in.; Height 38 ft. 3 in. (foldable tail); Gross Weight 153,000 lb.; Maximum Weight 175,000 lb.; Engine (4) Pratt and Whitney R-4360-59 Wasp Major, 3500 hp at takeoff; Fuel capacity, 9190 gals.; Propellers Hamilton Standard, four blade, full feathering and fully reversible.



PERFORMANCE • Maximum Speed 375 mph; Cruising Speed over 300 mph; Service Ceiling over 35,000 ft.; Range 43000 mi.

REMARKS

Flying boom controls and boom operator's station are mounted as a single unit which can be easily removed. Internal fuel tanks are located so that the airplane may also carry cargo while in the tanker configuration. By removing the pod and installing cargo doors in its place, the airplane can serve as a cargo, troop or hospital transport. Chief difference between G and earlier models is the provision for two droppable wing tanks and the relocation of internal fuel tanks. Cargo version carries a maximum of 68,500 lb. of heavy cargo such as jeeps, trucks and artillery. Passenger version carries 130 men, ambulance model up to 79 litter patients and attendants.

Boeing B-52 Stratofortress

TYPE • Heavy bomber

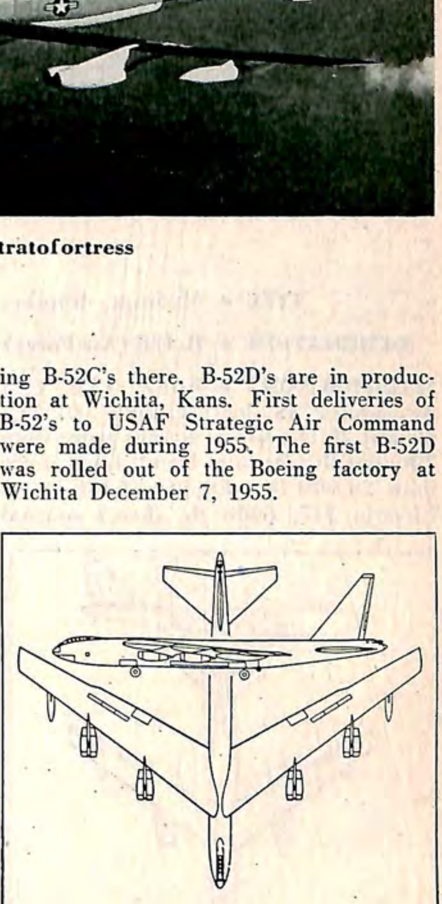
DESIGNATION • B-52 (Air Force)

SPECIFICATIONS • Span 185 ft.; Sweepback 35 deg,; Length 156 ft.; Height 48 ft.; Gross weight more than 350,000 lb.; Engine (8) Pratt and Whitney J57 turbojet, 10,000 lb. thrust class; Gear eight main wheels in tandem with single outrigger wheels near wing tips.

PERFORMANCE • Can be described only as "a very-high speed, long-range heavy bomber with a service ceiling over 50,000 ft. and speed more than 650 mph."

REMARKS

Two experimental prototypes of this airplane and a number of B-52's continued to undergo Boeing and Air Force test programs at year end. First initial flight April 15, 1952 reversing the usual order. It was ordered in quantity production before the first flight. Boeing has produced B52A's and B's at Seattle, Wash. It is now building B-52C's there. B-52D's are in production at Wichita, Kans. First deliveries of B-52's to USAF Strategic Air Command were made during 1955. The first B-52D was rolled out of the Boeing factory at Wichita December 7, 1955.

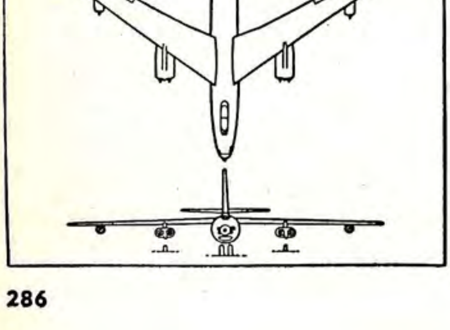


Boeing RB-47E Stratojet (foreground) and B-47E

TYPE • Medium Bomber

DESIGNATION • B-47E (Air Force)

SPECIFICATIONS • Span 116 ft.; Sweepback 35 deg.; Length 107 ft.; Height 28 ft.; Gross Weight more than 200,000 lb.; Normal Bomb Load more than 20,000 lb.; Engine (6) General Electric J47, 6000 lb. thrust normal rated; provisions for 33 external ATO units, 1000 lb. each and water injection systems providing 17 percent power increase; Gear dual main wheels in tandem with a single outrigger under each inboard pod.



PERFORMANCE • Maximum Speed more than 600 mph; Service Ceiling over 40,000 ft.; Range more than 3000 mi.

REMARKS

The B-47 is the fastest operational medium bomber in the word. The first XB-47 flight took place Dec., 1947 and more than 1200 have been built. Another model, the RB-47E, differs from the standard model in having longer nose, more windows and air-conditioned camera compartment in place of bomb bay. Crew for this model is pilot, co-pilot riding in tandem and observer-photographer. Among the features of the B-47 are the thin flexible wings which have a drooped appearance on the ground changing to a slight dihedral in flight. A B-47 set a new jet endurance record during 1954 with a 21,000 mi. flight in 47 hours and 35 minutes with the aid of aerial refueling. Crew: 3.

Boeing 707 Tanker-Transport Prototype

TYPE • Tanker Transport

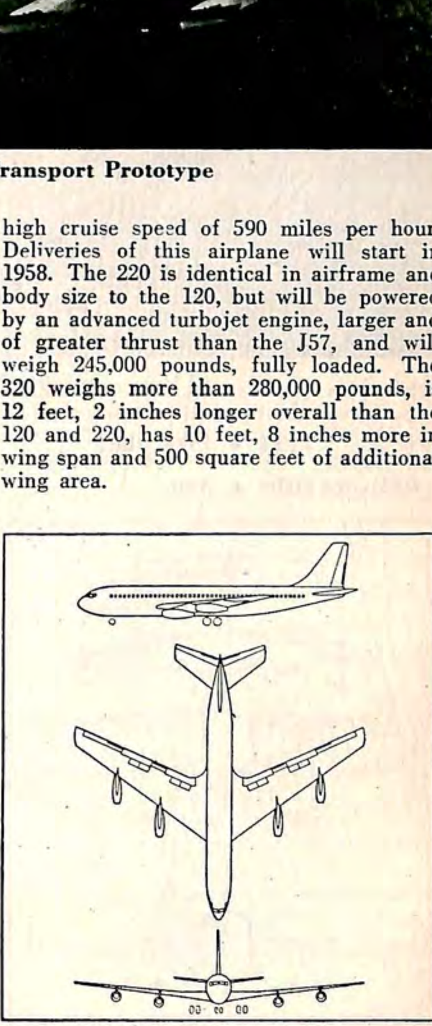
DESIGNATION • KC-135 (Air Force) this is the advanced version of the 707 transport, details of which are not released.

SPECIFICATIONS • Span 130 ft.; Sweepback 35 deg.; Length 128 ft.; Height 38 ft. 3 in.; Gross Weight 190,000 lb.; Engine (4) Pratt and Whitney J-57 turbojet, 10,000 lb. thrust class; Gear tricycle, main undercarriage units, four-wheel trucks, dual nose wheels.

PERFORMANCE • Cruising Speed 550 mph; Service Ceiling over 42,000 ft.

REMARKS

America's first jet tanker-transport was rolled from Renton, Wash. plant May 14, 1954, and made its maiden flight July 15, 1954. It was flown at altitudes of more than 42,000 ft. and speeds of over 550 mph in early flight tests. It was ordered into production Sept. 1, 1954. Three-view drawing below is 707. The three other 707's are the -120, the -220 and the -320. The Boeing -120 Jet Stratoliner weighs more than 230,000 pounds and is principally intended for continental use. Its four Pratt & Whitney J57 turbojet engines give it a high cruise speed of 590 miles per hour. Deliveries of this airplane will start in 1958. The 220 is identical in airframe and body size to the 120, but will be powered by an advanced turbojet engine, larger and of greater thrust than the J57, and will weigh 245,000 pounds, fully loaded. The 320 weighs more than 280,000 pounds, is 12 feet, 2 inches longer overall than the 120 and 220, has 10 feet, 8 inches more in wing span and 500 square feet of additional wing area.



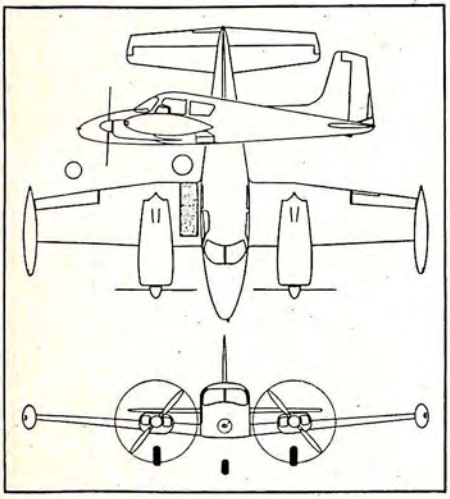
CESSNA AIRCRAFT CO.

Wichita, Kans.

Cessna Model 310

TYPE • **Five place**

DESIGNATION • **310**



SPECIFICATIONS • **Span 36 ft.; Length 27 ft.; Height 10.5 ft.; Empty Weight 2850 lb.; Gross Weight 4600 lb.; Wing Loading 26.2 lb. per sq. ft.; Power Loading 9.6 lb. per bhp; Engine (2) Continental O-470-B, 240 hp normal rated at 2600 rpm; Fuel Capacity 100 gal. carried in wing tip tanks, no inboard fuel as standard; Propeller constant speed full feathering; Gear tricycle; Wing Area 175 sq. ft.**

PERFORMANCE • **Maximum Speed over 220 mph; Cruise Speed over 205 mph; Rate of Climb 1700 fpm; Service ceiling 20,000 ft.; Range with Maximum Payload 875 mi.**

REMARKS

Outstanding performance and over 205 mph cruise is standard on this model. Wing tip tanks, augmenter exhaust tubes, and fully-enclosed retractable gear plus internal antennae. This is the lowest priced all-metal five passenger twin on the U. S. market.

Cessna Model 180

TYPE • Four place

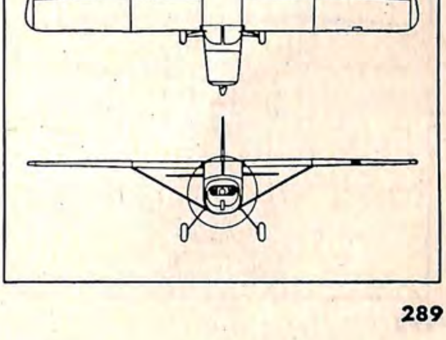
DESIGNATION • 180

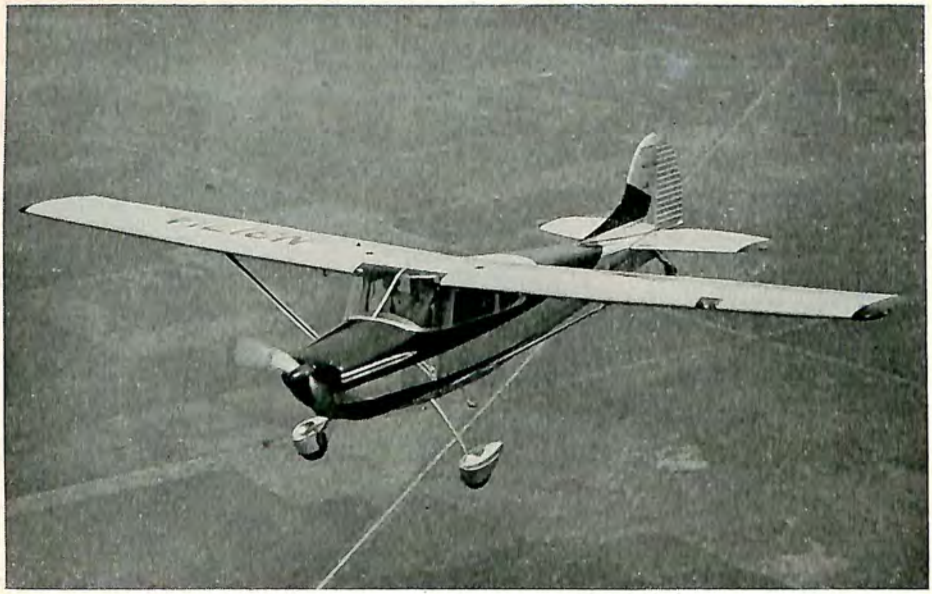
SPECIFICATIONS • Span 36 ft.; Length 26 ft.; Height 7 ft. 6 in.; Empty Weight 1480 lb.; Gross Weight 2550 lb.; Wing Loading 14.6 lb. per sq. ft.; Power Loading 11.3 lb. per bhp; Engine Continental 0470-J, 230 hp at 2550 rpm; Fuel Capacity 60 gal.; Propeller All-Metal constant speed; Wing Area 175 sq. ft.

PERFORMANCE • Maximum Speed over 165 mph; Cruise Speed over 150 mph; Rate of Climb 1150 ft. at S. L.; Cruising Range over 4½ hrs.; Service Ceiling 19,800 ft.

REMARKS

Design improvements on the reliable Continental engine, the new 0470-J, allows lower power settings with the same cruising speeds. New "Hush-Flight" features, such as a re-located muffler exhaust feeding out of a single stack with new engine mounts, give a much quieter cabin ride. Trim operates full horizontal stabilizer. Equipped with Cessna "Para-Lift" flaps with 20-30-40 deg. This model is available on floats.



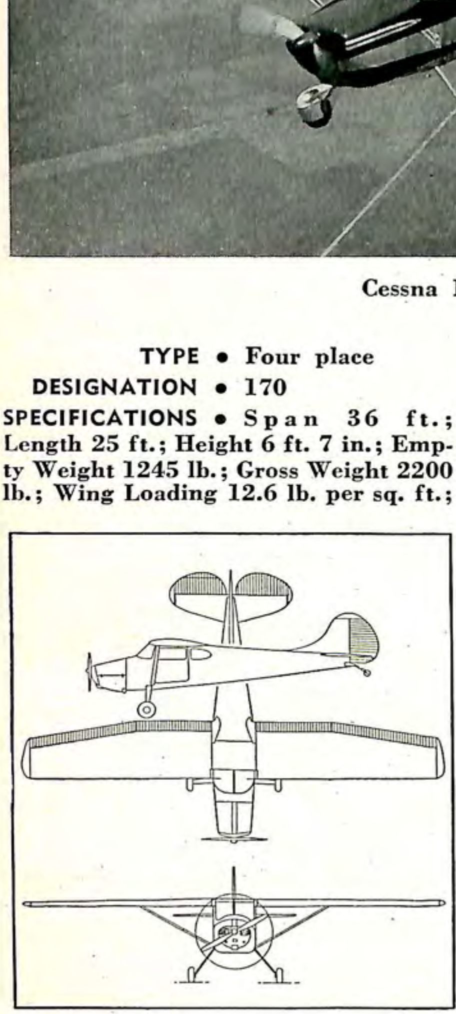


Cessna Model 170

TYPE • Four place

DESIGNATION • 170

SPECIFICATIONS • Span 36 ft.; Length 25 ft.; Height 6 ft. 7 in.; Empty Weight 1245 lb.; Gross Weight 2200 lb.; Wing Loading 12.6 lb. per sq. ft.; Power Loading 15.2 lb. per bhp; Engine Continental O-300-A, 145 hp at 2700 rpm at takeoff; Fuel Capacity 42 gal.; Propeller All-Metal fixed pitch; Wing Area 175 sq. ft.



PERFORMANCE • Maximum Speed over 140 mph; Cruise Speed over 120 mph; Stalling Speed 53 mph; Rate of Climb 690 ft. at S. L.; Service Ceiling 15,500 ft.; Range over 4½ hrs.

REMARKS

Current model features four position (10-20-30-40 deg.) "Para-lift" flaps. Maintenance-free one piece spring steel landing gear is standard on this model. Lowest priced All-Metal four passenger airplane on American market. Optional equipment including skis, floats, cross-wind gear, blind flying hood, and spraying equipment plus provisions for vertical or oblique aerial photography and mapping. (Note: Model 172, Cessna's latest entry in business market, has "Land-O-Matic" gear for excellent performance on or off paved runways.)

Cessna Model OE-2

TYPE • **Two place tandem**

DESIGNATION • **OE-2 (USMC)**

SPECIFICATIONS • **Span 36 ft.; Length 25 ft.; Height 7 ft. 6 in.; Empty Weight 1835 lb.; Gross Weight 2650 lb.; Wing Loading 15.2 lb. per sq. in.; Power Loading 10 lb. per bhp; Engine Continental O-470-2, 265 bhp at 2600 rpm; Fuel Capacity 51 U. S. gal.; Propeller All-Metal constant speed; Wing Area 174 sq. ft.**

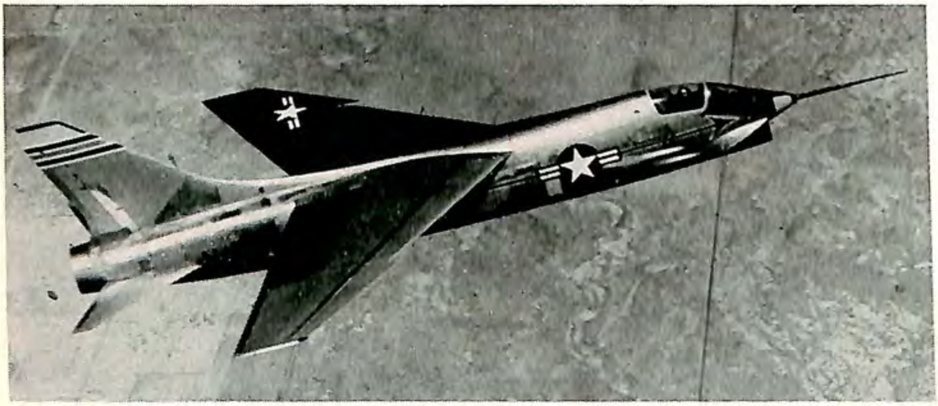
PERFORMANCE • **Maximum cruise at 10,000 ft. is 161 knots; Cruise at 70% of METO power at 5000 ft., 132 knots; Service Ceiling 22,350 ft.; Time to climb to 20,000 ft. (gross weight), 22.6 min.**

REMARKS

This airplane will be used by the Marine Corps and is powered by a Continental 0-470-2 single stage belt-driven supercharger developing 265 bhp at 2600 rpm at take-off. Flack curtains and armor plate give greater protection for pilot and observer. This Cessna military reconnaissance airplane is equipped with Cessna's "Para-lift" flaps. Single-piece steel landing gears are maintenance-free. Range at cruising speed at 10,000 feet equals 500 nautical miles.

CHANCE VOUGHT AIRCRAFT, INC.

Dallas, Tex.



Chance Vought F8U-1 Crusader

TYPE • Fighter

DESIGNATION • F8U-1 (Navy)

REMARKS

In production at Chance Vought during the year was the F8U-1 powered by a Pratt and Whitney J-57 engine. The Crusader is the Navy's newest medium-size day fighter capable of flying faster than the speed of sound in level flight. This high-winged aircraft is designed for carrier operations. The air scoop is located underneath a cone-shaped nose, a feature that makes the Crusader easily recognizable. It can carry missiles as well as convention guns for armament. Specifications and performance data have not been released.

TYPE • Fighter

DESIGNATION • F7U-3 (Navy)

SPECIFICATIONS • Span 39 ft. 8½ in.; Length 44 ft. 3½ in.; Height 14 ft. 7.44 in.; Gross Weight 23,300 lb.; Engine (2) Westinghouse J46-WE-2, 4800 lb. thrust unaugmented, 8200 lb. thrust with afterburners; Gear tricycle; Wing Area 540 sq. ft.; Alivator Area 74.4 sq. ft.; Speed Brake Area 36.1 sq. ft.; Fin Area 131.5 sq. ft.; Rudder Area 12.9 sq. ft.

PERFORMANCE • Maximum Speed over 650 mph; Rate of Climb over 13,000 fpm; Service Ceiling combat approved 45,000 ft.

REMARKS

The F7U-3 continued in production this year with large numbers going to the Fleet. The Cutlass has a dual power control hydraulic system rather than a single system with a separate manual control system. Each system is completely independent of the other. Ailavators combine ailerons and elevators and provide longitudinal and lateral control. Leading edge wing slats replace conventional landing flaps for low stalling speeds.

CONVAIR

A DIVISION OF GENERAL DYNAMICS CORPORATION

San Diego, Calif.

Convair F-102A Delta Wing Interceptor

TYPE • Fighter

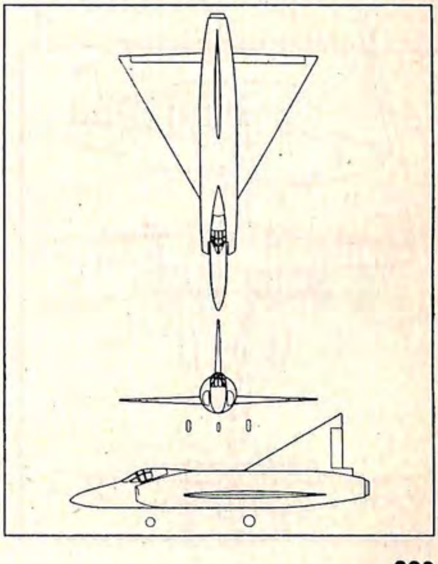
DESIGNATION • F-102A (Air Force)

SPECIFICATIONS • Span 37 ft.; Length 52 ft.; Height 18 ft.; Gross Weight 25,600 lb.; Engine Pratt & Whitney J-57.

PERFORMANCE • All data are classified.

REMARKS

The F-102A is a large delta wing interceptor designed for either piloted or pilotless flight. It uses the Hughes guidance equipment and mounts the Hughes Falcon missile. The first production model was completed in March, 1954. First all-weather supersonic interceptor for the Air Force, the F-102A electronic and armament improvements make it a lethal weapon in any kind of weather.

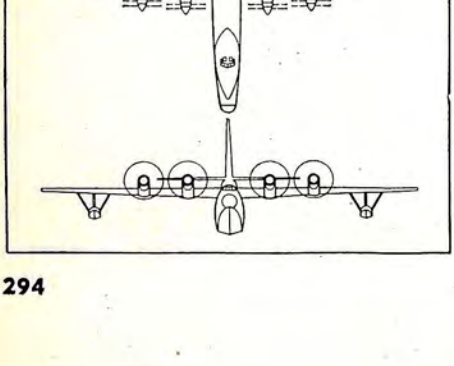


Convair R3Y-2 Tradewind

TYPE • **Transport**

DESIGNATION • **R3Y-2 (Navy)**

SPECIFICATIONS • **Span 145 ft. 9 in.; Length 139 ft. 8 in.; Height 51 ft. 5 in.; Empty Weight 80,000 lb.; Gross Weight 150,000 lb.; Overload Gross Weight 160,000 lb.; Engine (4) Allison T40A-10, 5500 hp takeoff; Propeller Aero Products three blade.**



PERFORMANCE • **Maximum Speed 386 mph at 25,000 ft.; Cruise Speed 300 mph; Rate of Climb 2500 fpm; Range with Maximum Payload 2300 mi.**

REMARKS

The new production version of the XP5Y-1 features extensive redesign with completely refaired bow, new high aspect ratio vertical tail, new engine installations, modified float support structure. The R3Y-2 loads from the bow and is the assault transport version. The original model was the first multi-engine turboprop airplane. It made its initial flight April, 1950. Design features high length-beam ratio hull for low drag in flight and improved water handling characteristisics. Cargo flying boat.

Convair Model 440 Metropolitan

TYPE • Transport

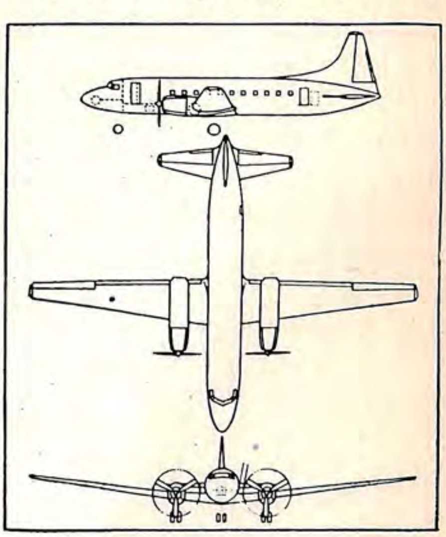
DESIGNATION • 440

SPECIFICATIONS • Span 105 ft. 4 in.; Length 79 ft. 2 in.; Height 28 ft. 1 in.; Empty Weight 31,305 lb.; Gross Weight 49,100 lb.; Wing Loading 53.3 lb. per sq. ft.; Power loading 9.82 lb. per bhp; Engines (2) Pratt and Whitney R-2800-CB-17, 2500 hp normal rated; Fuel Capacity 1730 gal.; Propeller Hamilton-Standard, hydromatic; Main Tire 12.5 x 16; Nose Tire 7.5 x 14; Wing Area 920 sq. ft.; Aileron Area 43.8 sq. ft.; Flap Area 182.5 sq. ft.; Fin Area 86.2 sq. ft.; Rudder Area 41 sq. ft.; Stabilizer Area 175.4 sq. ft.; Elevator Area 58.6 sq. ft.

PERFORMANCE • Cruise Speed 289 mph; Stalling Speed 86 mph; Rate of climb 1230 fpm at S. L.; Service Ceiling 25,000 ft.; Range with Maximum Payload 400 mi.; Range with Maximum Fuel Load 2450 mi.

REMARKS

Latest in the series of twin-engine Convair transports is the Model 440 Metropolitan. Tailored to give quiet, safe and economical service over medium- and short-range routes, the new Metropolitan has been purchased by major European scheduled airlines, as well as air carriers in the United States. Sound suppression improvements, including new Convair-designed engine exhaust mufflers, make the Metropolitan passenger cabin exceptionally comfortable. They may be equipped with weather mapping nose radar that permits the pilot to "see" bad weather and prominent terrain features as far as 150 miles ahead.

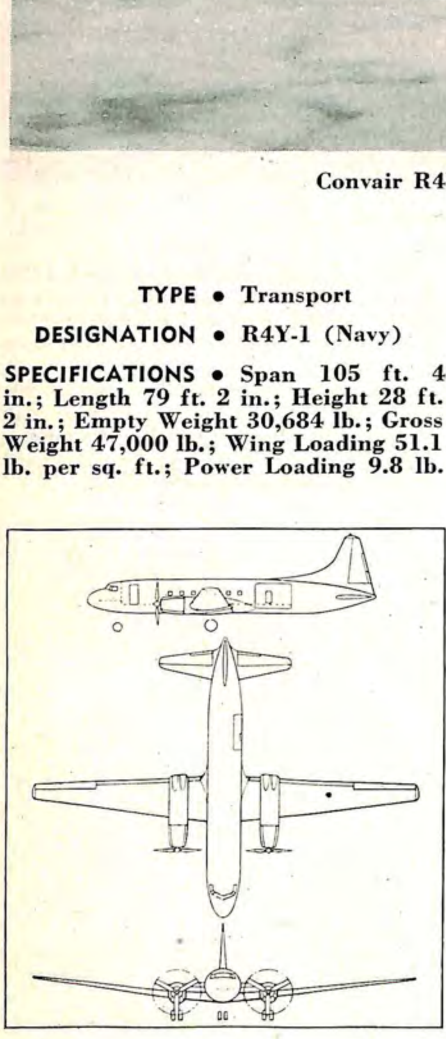


Convair R4Y-1 Transport

TYPE • Transport

DESIGNATION • R4Y-1 (Navy)

SPECIFICATIONS • Span 105 ft. 4 in.; Length 79 ft. 2 in.; Height 28 ft. 2 in.; Empty Weight 30,684 lb.; Gross Weight 47,000 lb.; Wing Loading 51.1 lb. per sq. ft.; Power Loading 9.8 lb. per bhp; Engines (2) Pratt and Whitney R-2800-52W, 2400 hp normal rated; Fuel Capacity 1730 gal.; Propeller Hamilton-Standard, hydromatic; Main Tire 12.5 x 16; Nose Tire 7.5 x 14; Wing Area 920 sq. ft.; Aileron Area 43.8 sq. ft.; Flap Area 182.5 sq. ft.; Fin Area 86.2 sq. ft.; Rudder Area 41 sq. ft.; Stabilizer Area 175.4 sq. ft.; Elevator Area 58.6 sq. ft.



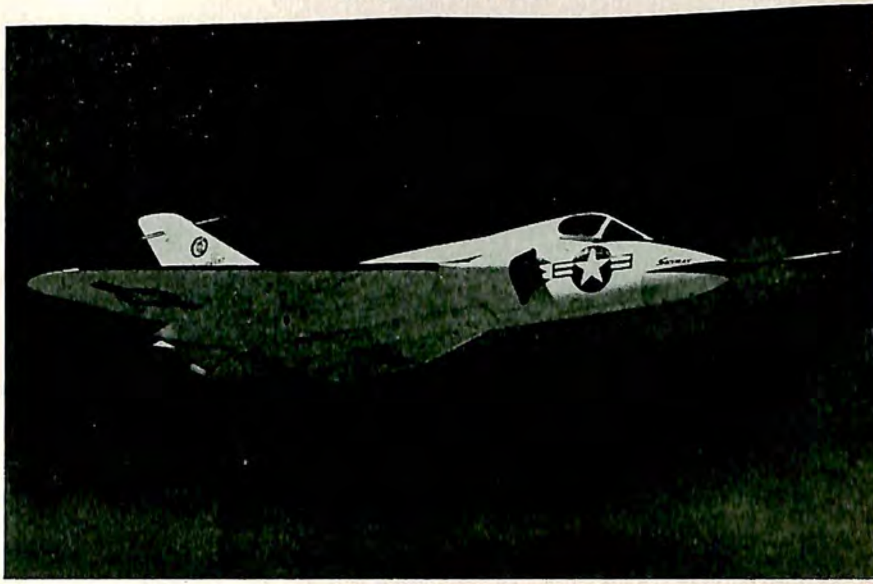
PERFORMANCE • Maximum Speed 221 mph at 1570 hp at 2600 rpm at 16,000 ft.; Cruise Speed 203 mph at 1200 hp at 2300 rpm at 16,000 ft.; Stalling Speed 65 mph; Rate of climb 1220 fpm at S. L.; Service Ceiling 23,400 ft.; Range with Maximum Payload 390 mi.; Range with Maximum Fuel Load 1370 mi.

REMARKS

Navy cargo version of the Convair-Liner 340. The R4Y-1, which is being built in volume at Convair-San Diego for the Navy, can be used as a personnel transport with rearward facing seats, an evacuation plane equipped with litters or as a cargo carrier. Seats and litters may be removed or installed quickly. The plane also is equipped with a 120-inch wide cargo door on the left side, largest ever installed in this type of Convair plane.

DOUGLAS AIRCRAFT CO., INC.

Santa Monica, Calif.



Douglas F4D-1 Skyray

TYPE • Fighter

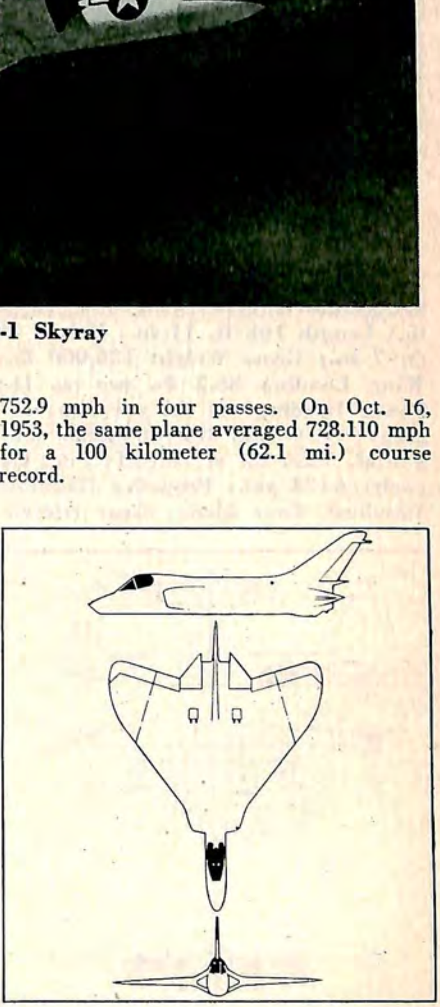
DESIGNATION • F4D-1 (Navy)

SPECIFICATIONS • Span 33 ft. 6 in.; Length 45 ft. 8.3 in.; Height 13 ft.; Gross Weight about 20,000 lb.; Engine Pratt and Whitney J57.

PERFORMANCE • All data are classified.

REMARKS

Named the Skyray because of its resemblance to the ocean dwelling manta ray, the F4D is a supersonic fighter interceptor. Its delta-like wing provides a low aspect ratio, maximum sweep and minimum thickness. Air scoops are located at either side of the fuselage and elevons on the trailing edges of the wings combine aileron and elevator functions. It is the first carrier-based airplane ever to hold the world's speed record. On Oct. 3, 1953, the F4D set the world's official speed record over a three kilometer (1.863 mi.) course averaging 752.9 mph in four passes. On Oct. 16, 1953, the same plane averaged 728.110 mph for a 100 kilometer (62.1 mi.) course record.

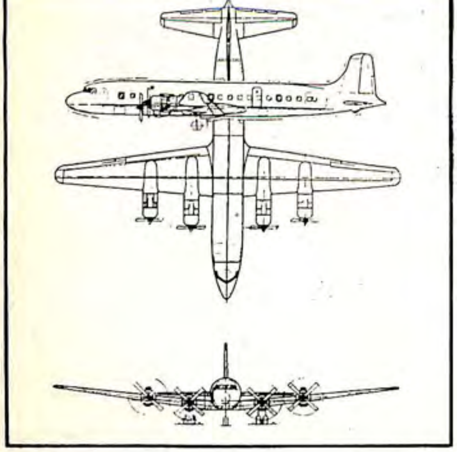


Douglas DC-7 Transport

TYPE • Passenger

DESIGNATION • DC-7

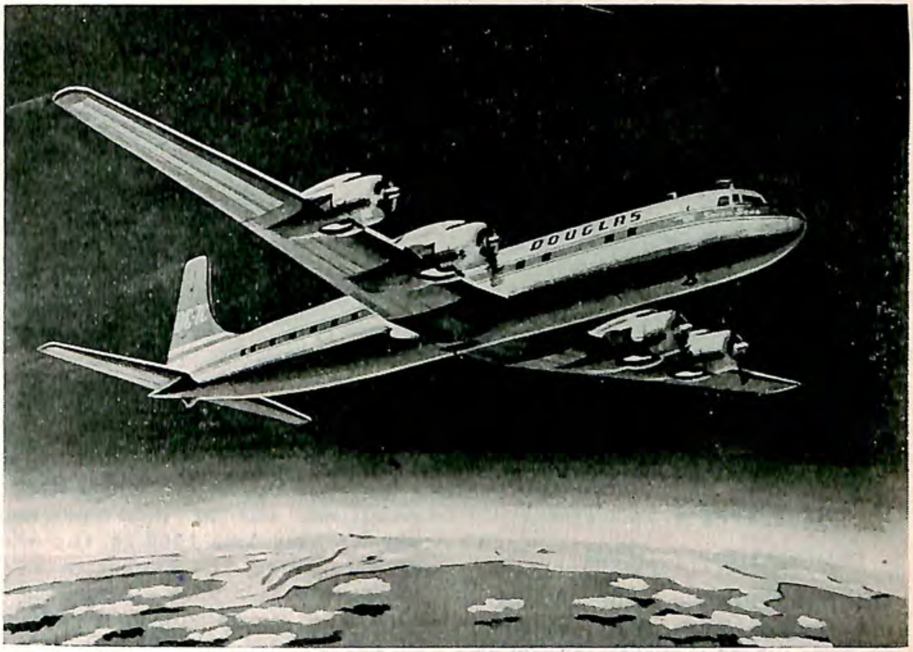
SPECIFICATIONS • Span 117 ft. 6 in.; Length 108 ft. 11 in.; Height 28 ft. 7 in.; Gross Weight 126,000 lb.; Wing Loading 86.2 lb. per sq. ft.; Power Loading 9.7 lb. per bhp; Engine (4) Wright R-3350 turbo compound, 3250 hp at takeoff; Fuel Capacity 6478 gal.; Propeller Hamilton Standard, four blade; Gear tricycle, two sets of dual main wheels; Wing Area 1463 sq. ft.; Aileron Area 85 sq. ft.; Flap Area 229 sq. ft.; Fin Area 101 sq. ft.; Rudder Area 67 sq. ft.; Stabilizer Area 156 sq. ft.; Elevator Area 155 sq. ft.



PERFORMANCE • Maximum Speed 405 mph at 2450 hp at 2600 rpm at 22,700 ft.; Cruise Speed 359 mph at 1800 hp at 2400 rpm at 24,300 ft.; Landing Speed 122 mph; Rate of Climb 1673 fpm at S. L.; Service Ceiling 28,400 ft.; Absolute Ceiling 29,400 ft.; Range with Maximum Payload 3565 mi.; Range with Maximum Fuel Load 5164 mi.

REMARKS

The DC-7 is a development of the DC-6 series. The DC-7 is eight feet longer and has several technical improvements. First DC-7 flight was on May 18, 1953. It entered airline service six months later and made possible non-stop transcontinental flights. The DC-7B is equipped with saddle tanks for greater range. Third model is the DC-7C with a ten ft. greater wing span, 40 in. longer fuselage. Added fuel carried in the extended wing root increases operating range to 5000 mi. with reserves. Engine modifications provide a total of 400 greater climb hp. Carries 64 to 95 passengers.



Douglas DC-7C Seven Seas

TYPE • **Transport**

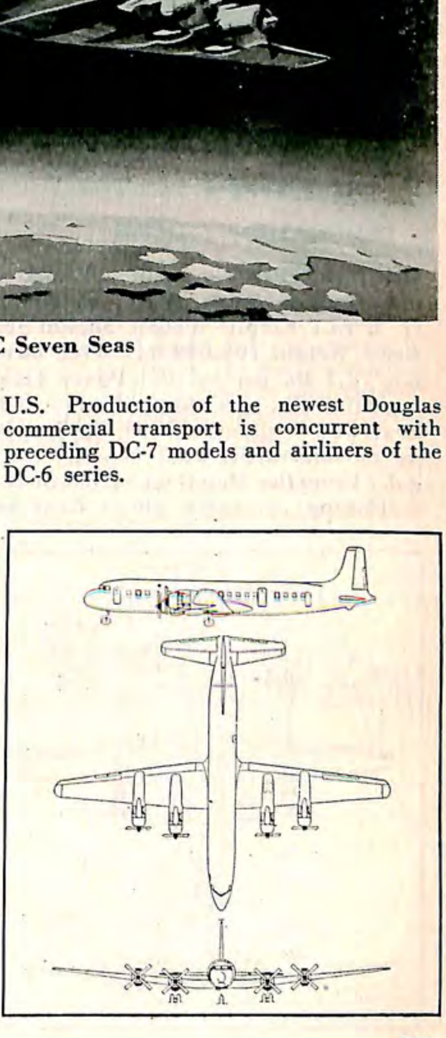
DESIGNATION • **DC-7C**

SPECIFICATIONS • **Span 127 ft. 6 in.; Length 112 ft. 3in.; Height 31 ft. 10 in.; Wing area including aileron 1637 sq. ft. Empty weight 72,150 lb.; Gross weight 140,000 lb.; Wheel base 39 ft. 6 in. Powerplant Wright R-3350 compound-type EAI; Takeoff 3400 BHP each; Propeller Hamilton Standard 4-bladed.**

PERFORMANCE • **Maximum speed 406 mph with rated power; Cruise speed 359 mph; Landing speed 99 mph at S.L.; Rate of Climb 845 fpm at 20,000 ft.; Service ceiling 28,000 ft.**

REMARKS

Success of earlier DC-7 models in domestic U.S. operations led to development of a larger version especially designed for long-range, intercontinental airline service. This version is capable of flying non-stop between most cities of Europe and the U.S. Production of the newest Douglas commercial transport is concurrent with preceding DC-7 models and airliners of the DC-6 series.

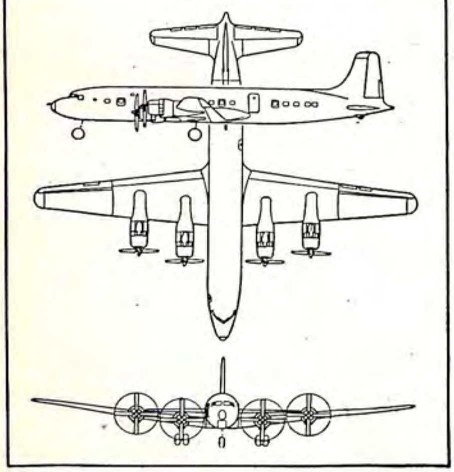


Douglas DC-6B

TYPE • **Passenger**

DESIGNATION • **DC-6B**

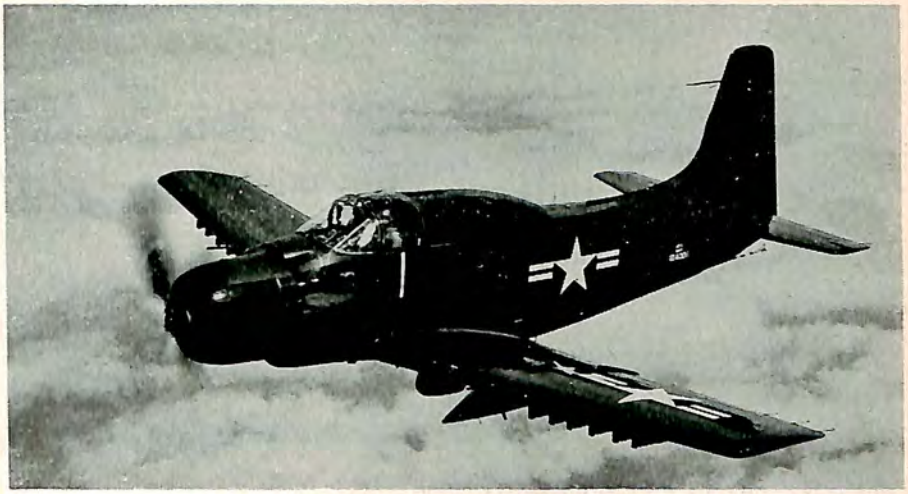
SPECIFICATIONS • **Span 117 ft. 6 in.; Length 106 ft. 6 in.; Height 28 ft. 8 in.; Empty Weight 58,340 lb.; Gross Weight 107,000 lb.; Wing Loading 73.1 lb. per sq. ft.; Power Loading 10.7 lb. per bhp; Engine (4) Pratt and Whitney R-2800-CB17, 2500 hp normal rated; Fuel Capacity 5512 gal.; Propeller Hamilton Standard full feathering reversible pitch; Gear tricycle, two sets of dual-type main wheels; Wing Area 1463 sq. ft.; Aileron Area 89 sq. ft.; Flap Area 229.4 sq. ft.; Fin Area 93.4 sq. ft.; Rudder Area 49 sq. ft.; Stabilizer Area 210.9 sq. ft.; Elevator Area 108.9 sq. ft.**



PERFORMANCE • **Maximum Speed 360 mph at 1750 hp at 2300 rpm at 18,700 ft.; Cruise Speed 315 mph at 1200 hp at 2300 rpm at 22,400 ft.; Landing Speed 106 mph; Rate of Climb 1100 fpm at S. L.; Service Ceiling 21,900 ft.; Range with Maximum Payload 3393 mi.; Range with Maximum Fuel Load 4968 mi.**

REMARKS

The DC-6A and DC-6B transports are enlarged versions of the DC-6s which first flew Feb. 15, 1946. First step in the evolution was the DC-6A Liftmaster first flown on Sept. 29, 1949. This was followed by the DC-6B, first flown Feb. 10, 1951. Twenty-seven of the world's leading airlines have purchased 270 airplanes of the DC-6B configuration and 12 commerial airlines have ordered mor than 44 of the DC-6A cargo carriers. Commercial sales of the DC-6 are past the 500 mark. The military has ordered the DC-6A series, designated C-118 by the Air Force and R6D-1 by the Navy. These can be converted to troop transports or hospital planes. 54 to 89 passengers.



Douglas AD-5 Skyraider

TYPE • **Carrier-based attack bomber**

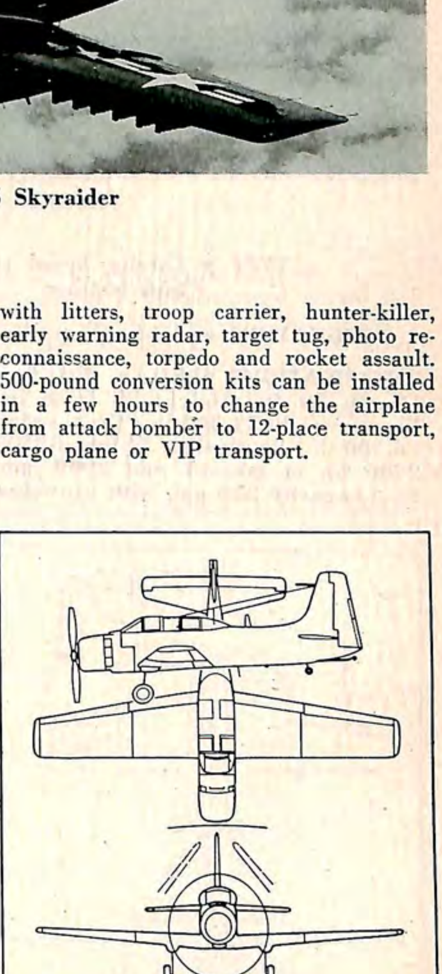
DESIGNATION • **AD-5 (Navy)**

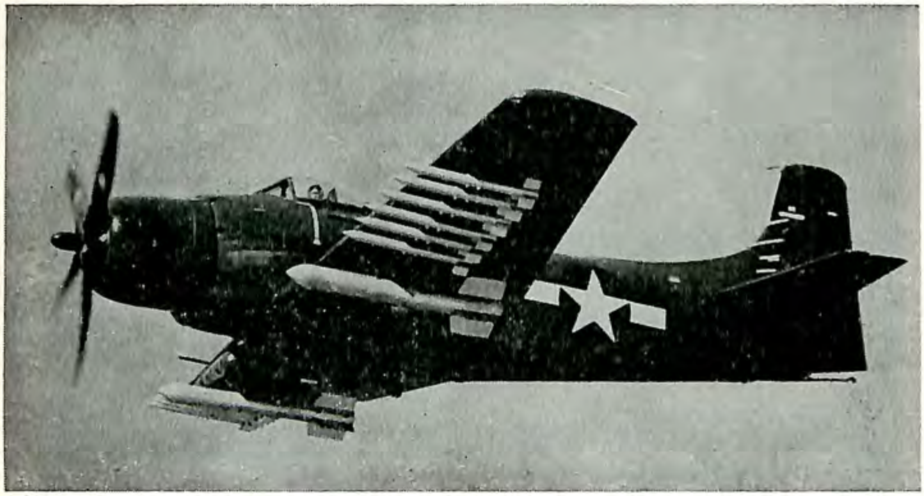
SPECIFICATIONS • **Span 50 ft.; Length 40 ft.; Height 15 ft. 9⅝ in.; Gross Weight 18,799 lb.; Engine Wright R-3550, 2700 hp normal rated; Fuel Capacity 380 gal.; Propeller Aeroprop four blade; Gear conventional.**

PERFORMANCE • **(Estimated) Maximum Speed 365 mph; Cruising Speed 300 mph; Combat Radius 500 mi.**

REMARKS

AD Skyraiders have been produced in quantity including AD-1s, -2s, -3s, -4s, -5s and -6s since late 1945. Numerous versions have been turned out ranging from attack-dive bombers, night attack, radar countermeasures, airborne early warning, anti-submarine and target towing to the extremely different AD-5 "Multiplex" which can be used as an attack fighter, attack bomber, passenger transport, air ambulance with litters, troop carrier, hunter-killer, early warning radar, target tug, photo reconnaissance, torpedo and rocket assault. 500-pound conversion kits can be installed in a few hours to change the airplane from attack bomber to 12-place transport, cargo plane or VIP transport.



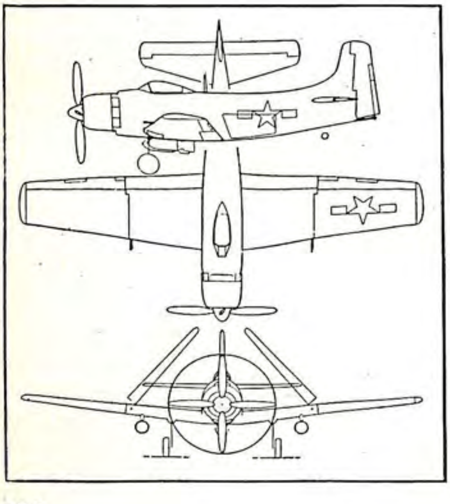


Douglas AD-6 Skyraider

TYPE • **Carrier - based attack bomber**

DESIGNATION • **AD-6 (Navy)**

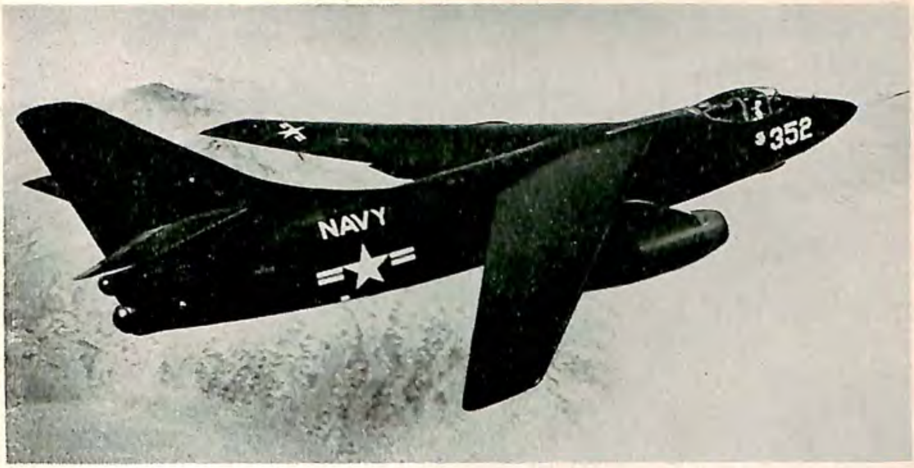
SPECIFICATIONS • **Span 50 ft.; Length 39 ft.; Height 15 ft. 8 in.; Empty weight 11,800 lb.; Gross weight 18,000 lb.; Powerplant Wright R3350, 2700 hp at take-off and 2900 rpm. Fuel capacity 380 gal. with provisions for two 150 gal. drop wing-tip tanks; propeller Aero-products, 4 blades; Gear conventional retractable.**



REMARKS

Over 2500 AD Skyraiders have been produced at Douglas' El Segundo Division, including AD-1s, -2s, -3s, -4s, -5s and -6s, since late 1945. Numerous versions have been designed and produced, ranging from attack-dive bombers, night attack, radar counter-measures, airborne early warning, anti-submarine, and target towing to the extremely different AD-5 "Multiplex" which can perform over a dozen distinct jobs. The AD-6 is a single place dive bomber capable of carrying a variety of weapons at a single loading on its fifteen bomb racks.

An AD-4 set a new world record for loads carried by a single-engine aircraft on May 21, 1953, when it carried a bomb load of 10,500 lb. and a useful load of 14,941 lb. Its basic weight was 11,798 lb. Originally produced to meet a 1,000-lb. load spec, ADs regular carried 8,000 and 9,000-lb. bomb loads off carriers in Korea. On July 10, 1953, in San Francisco, it was revealed that AD-4B Skyraiders are equipped to carry atomic bombs and had been in operation aboard Navy carriers for nearly a year.



Douglas A3D-1 Skywarrior

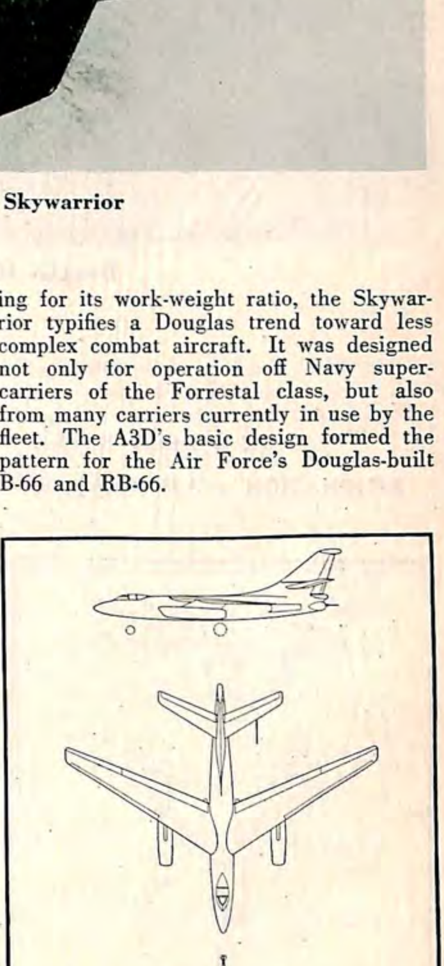
TYPE • Attack bomber

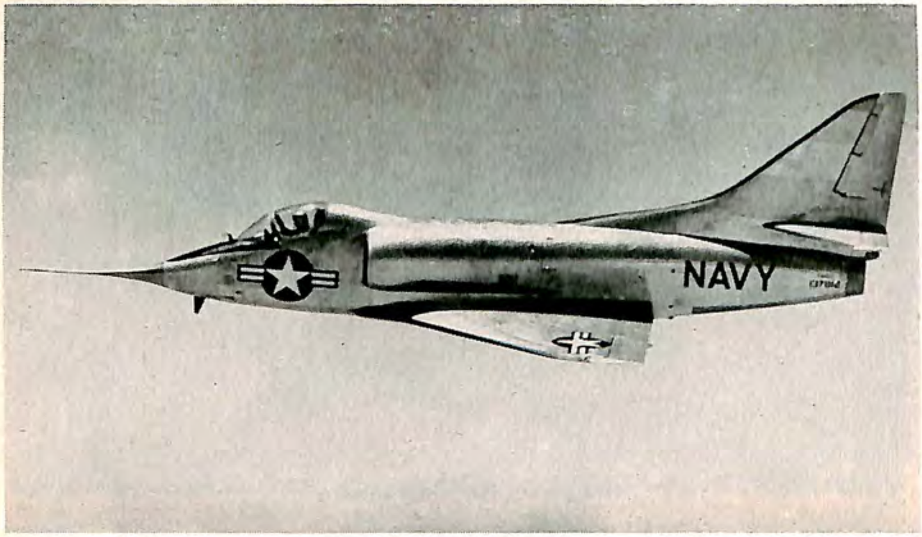
DESIGNATION • A3D-1 (Navy)

SPECIFICATIONS • Span 72 ft. 6 in.; Length 74 ft. 5 in.; Height 22 ft. 9 in.; Engines Pratt & Whitney J-57. All other data are classified.

REMARKS

The Douglas A3D Skywarrior is a powerful Navy carrier-based bomber. Rated in the 600-700 mph class, it is capable of flying long-range missions at altitudes above 40,000 feet. The swept wing twin jet has an internal bomb bay which can carry all types of bombs, torpedoes, or munitions utilized on Navy carriers. The Skywarrior, which is swifter than many jet fighters, was designed as an atom-bomber but it is so versatile that it can be used for many other missions. Now in accelerated production at the El Segundo, Calif., Division of Douglas Aircraft Company, Inc., Skywarriors are equipped with two Pratt and Whitney J-57 turbojet engines and can carry a crew of three—pilot, co-pilot-bombardier and gunner-navigator. The A3D has a simple slide-type escape chute as well as an upper ditching hatch. Both the wings and vertical tail of the great Navy bomber fold for ease of handling aboard carriers. Compact in design and outstanding for its work-weight ratio, the Skywarrior typifies a Douglas trend toward less complex combat aircraft. It was designed not only for operation off Navy supercarriers of the Forrestal class, but also from many carriers currently in use by the fleet. The A3D's basic design formed the pattern for the Air Force's Douglas-built B-66 and RB-66.

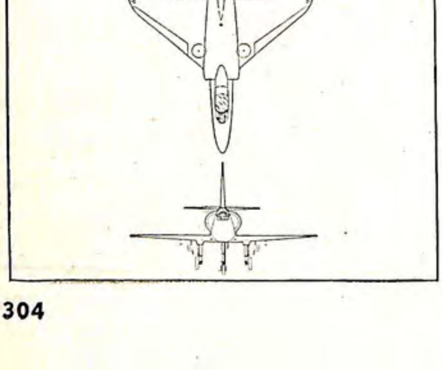




Douglas A4D-1 Skyhawk

TYPE • **Attack bomber**

DESIGNATION • **A4D (Navy)**



SPECIFICATIONS • **Gross Weight 14,400 lb.; Engine Wright J65. All other specifications classified.**

REMARKS

The A4D Skyhawk, smallest and lightest U. S. jet combat plane ever built, was developed by the Douglas El Segundo Division. It required only 18 months to design and build the first model, and the first flight on June 22, 1954, took place two weeks after the tiny plane came off the production line. Although designed for carrier operations, the Skyhawk is small enough to omit the traditional folding wings of that type. The A4D is less than half the size of many current operational jet fighters but has a performance superior to many of them and a combat radius greater than many current propeller driven attack planes. All other data are classified. On Oct. 15, 1955, the A4D set a new speed record for the 500-kilometer closed circuit course, of 695.163 mph, at Edwards Air Force Base, Calif. The airplane was piloted by U. S. Navy Lieutenant Gordon Gray of La Jolla, Calif.

Douglas Air Force B-66B

TYPE • **Light bomber**

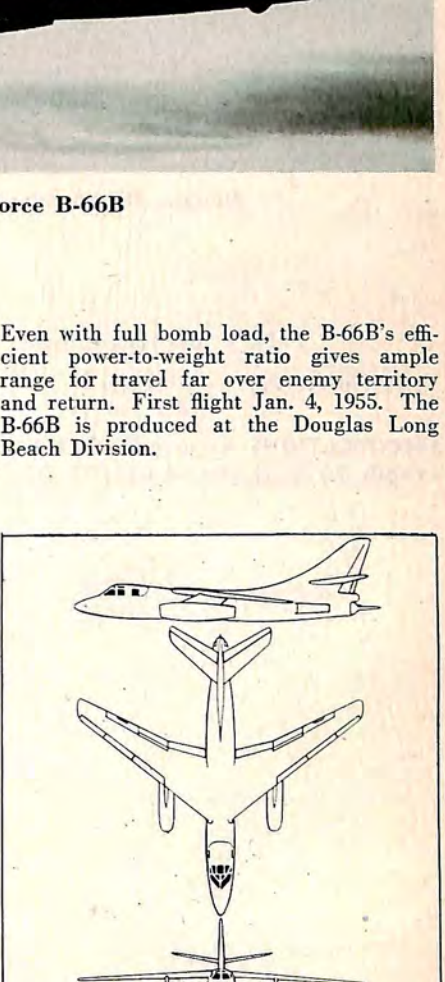
DESIGNATION • **B-66B**

SPECIFICATIONS • **Span 72 ft. 6 in.; Length 75 ft. 2 in.; Height 23 ft. 7 in.; Empty Weight 40,338 lb.; Design Gross Weight 78,000 lb.; Overload Gross Weight 82,000 lb.; Wing Loading 100 lb. per sq. ft.; Power Loading 4.07 lb. per lb. thrust (takeoff); Engines (2) Allison J 71-A-9, 8090 lb. thrust at 5950 rpm normal rated, or 9570 lb. thrust at 6100 rpm takeoff; Fuel Capacity 4650 gal.; Main Tire 49 x 17 extra high-pressure; Nose Tire 36 x 11 extra high pressure; Wing Area 780 sq. ft.; Aileron Area 32.6 sq. ft.; Flap Area 108.8 sq. ft.; Fin Area 129.9 sq. ft.; Rudder Area 32.5 sq. ft.; Stabilizer Area 114.8 sq. ft.; Elevator Area 52.2 sq. ft.**

PERFORMANCE • **All data are classified.**

REMARKS

The B-66B, a companion model of the RB-66, was built expressly for tactical bombing missions. It is specially designed to permit a wide selection of bomb combinations. Even with full bomb load, the B-66B's efficient power-to-weight ratio gives ample range for travel far over enemy territory and return. First flight Jan. 4, 1955. The B-66B is produced at the Douglas Long Beach Division.

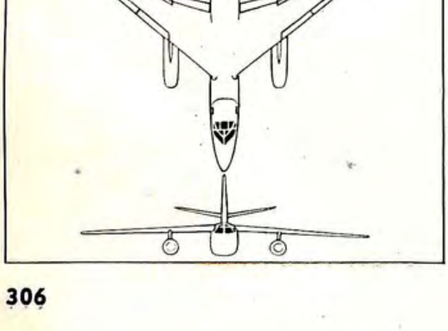


Douglas RB-66 Swept-wing Twin-jet Bomber

TYPE • Reconnaissance

DESIGNATION • RB-66 A, B, C (Air Force)

SPECIFICATIONS • Span 72 ft. 6 in.; Length 75 ft. 2 in.; Height 23 ft. 7 in.; Empty Weight 39,735 lb.; Gross Weight 70,000 lb.; Overload Gross Weight 79,000 lb.; Wing Loading 90 lb. per sq. ft.; Engine (2) Allison YJ71-A-9; Gear tricycle; Wing Area 780 sq. ft.; Aileron Area 32.6 sq. ft.; Flap Area 108.8 sq. ft.; Fin Area 129.9 sq. ft.; Rudder Area 32.5 sq. ft.; Stabilizer Area 114.8 sq. ft.; Elevator Area 52.2 sq. ft.

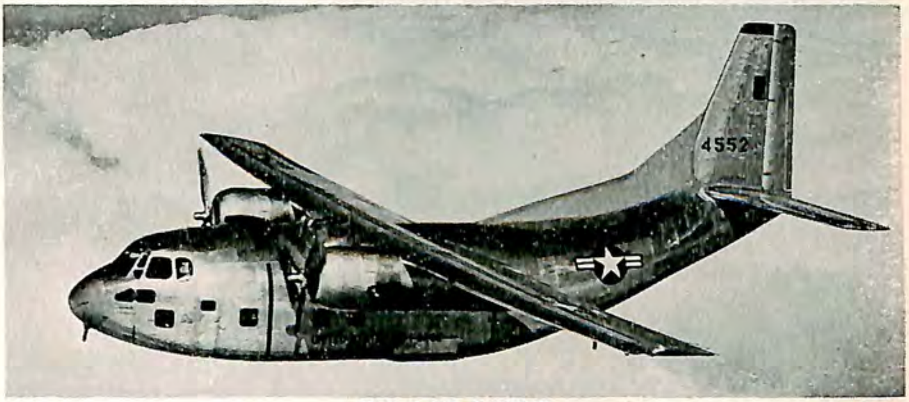


PERFORMANCE • All data are classified.

REMARKS

The swept-wing, twin-jet RB-66 is designed in various versions to perform numerous specialized reconnaissance missions. Powered by two Allison J-71 engines slung in pods beneath its wings, the RB-66 is in the 600-700 mph class and can perform well at all altitudes up to 45,000 feet. It was re-engineered from the basic design of the Douglas A3D. First flight, June 28, 1954. The RB-66A and B are manufactured at the Douglas Long Beach Division. The RB-66C is produced at the Douglas Tulsa Division. It made its first flight Oct. 29, 1955.

FAIRCHILD AIRCRAFT DIVISION
FAIRCHILD ENGINE & AIRPLANE CORP.
Hagerstown, Md.



Fairchild C-123B

TYPE • **Transport**

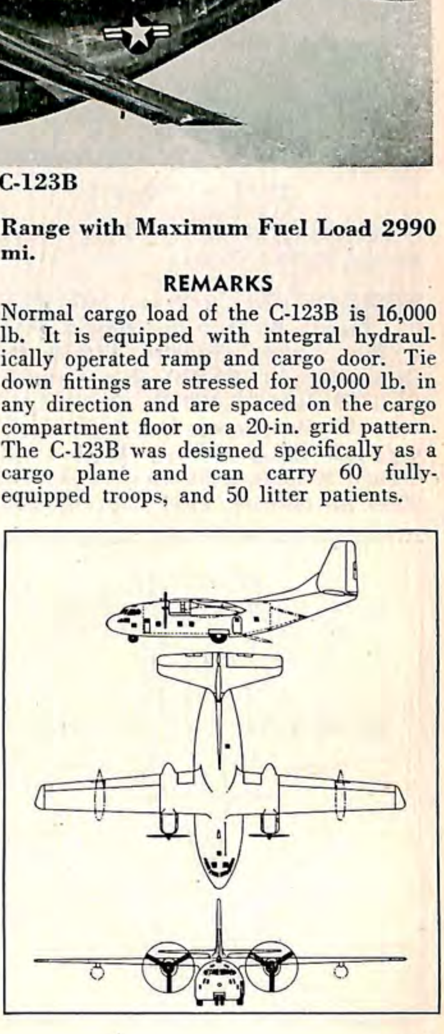
DESIGNATION • **C-123B (Air Force)**

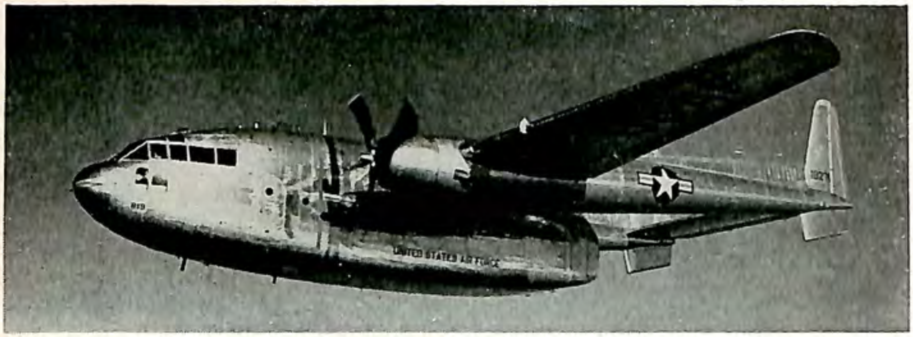
SPECIFICATIONS • **Span 110 ft.; Length 76 ft. 3 in.; Height 34 ft. 1 in.; Empty Weight 30,812 lb.; Gross Weight 54,000 lb.; Overload Gross Weight 60,000 lb. (estimate); Wing Loading 44 lb. per sq. ft.; Power Loading 10.8 lb. per bhp; Engine (2) Pratt and Whitney R-2800, 1900 hp normal rated 2500 hp takeoff; Fuel Capacity 2414 gal. (includes auxiliary wing tanks); Propeller Hamilton Standard three blade; Gear tricycle dual wheels; Wing Area 1223.2 sq. ft.; Aileron Area 83.3 sq. ft.; Flap Area 128 sq. ft.; Fin Area 186.7 sq. ft.; Rudder Area 59.2 sq. ft.; Stabilizer Area 217.7 sq. ft.; Rudder Area 59.2 sq. ft.; Elevator Area 127.9 sq. ft.**

PERFORMANCE • **Maximum Speed 253 mi. at 1800 hp at 2600 rpm at 13,000 ft.; Cruise Speed 186 mi. at 1150 hp at 2150 rpm at S. L.; Landing Speed 85 mi.; Rate of Climb 1100 fpm at S. L.; Service Ceiling 29,000 ft.; Absolute Ceiling 30,000; Range with 18,000 lb. Payload 1000 mi.; Range with Maximum Fuel Load 2990 mi.**

REMARKS

Normal cargo load of the C-123B is 16,000 lb. It is equipped with integral hydraulically operated ramp and cargo door. Tie down fittings are stressed for 10,000 lb. in any direction and are spaced on the cargo compartment floor on a 20-in. grid pattern. The C-123B was designed specifically as a cargo plane and can carry 60 fully-equipped troops, and 50 litter patients.



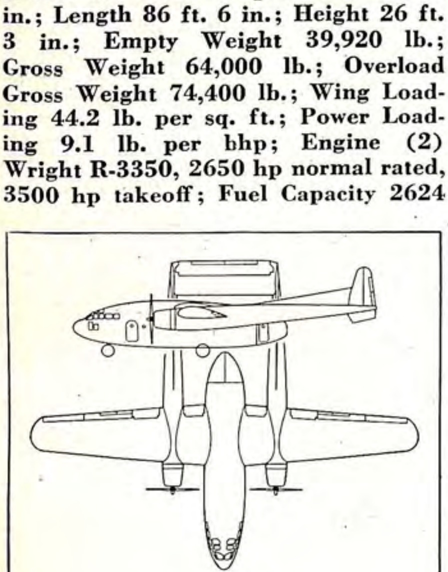


Fairchild C-119G Flying Boxcar

TYPE • **Transport**

DESIGNATION • **C-119G (Air Force), R4Q-2 (Navy)**

SPECIFICATIONS • **Span 109 ft. 3 in.; Length 86 ft. 6 in.; Height 26 ft. 3 in.; Empty Weight 39,920 lb.; Gross Weight 64,000 lb.; Overload Gross Weight 74,400 lb.; Wing Loading 44.2 lb. per sq. ft.; Power Loading 9.1 lb. per bhp; Engine (2) Wright R-3350, 2650 hp normal rated, 3500 hp takeoff; Fuel Capacity 2624 gal.; Propeller Aeroproducts four blade; Gear tricycle dual main gear; Wing Area 1447 sq. ft.; Aileron Area 33.7 sq. ft.; Flap Area 60 sq. ft.; Fin Area 357 sq. ft.; Rudder Area 55.6 sq. ft.; Stabilizer Area 172.34 sq. ft.; Elevator Area 113.86 sq. ft.**



PERFORMANCE • **Maximum Speed 294 mph at 2250 hp at 2600 rpm at 15,500 ft.; Cruise Speed 230 mph at 1800 hp at 2300 rpm at 10,000 ft.; Landing Speed 92 mph; Rate of Climb 1600 fpm at S. L.; Service Ceiling 30,000 ft.; Asolute Ceiling 31,000 ft.; Range with Maximum Payload 2000 mi. (with 18,000 lb. cargo — maximum cargo is 29,400 lb.); Range with Maximum Fuel Load 3048 mi.**

REMARKS

The Flying Boxcar is also used by the U. S. Marine Corps as R4Q-2, and by the Royal Canadian Air Force. It was developed from the wartime C-82A. Versatility is available in the box car fuselage, equipped with an electrically-operated monorail for rapid aerial delivery of cargo packs, light artillery, jeeps or 42 paratroops. In 20 minutes the cabin can be converted to carry 38 litter patients with four attendants. The C-119G model made its appearance in 1953 and is also in use with the Belgian, Italian and Indian air forces. Flying Boxcars have been in continuous production since 1944 when the first C-82 flew. Crew: 5.

GRUMMAN AIRCRAFT ENGINEERING CORP.

Bethpage, L. I., N. Y.

Grumman F9F-8 Cougar

TYPE • Fighter

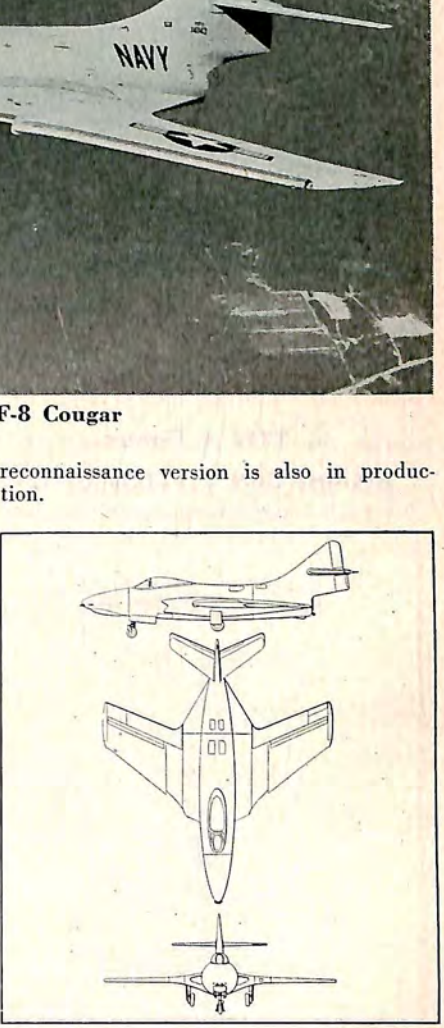
DESIGNATION • F9F-8 (Navy)

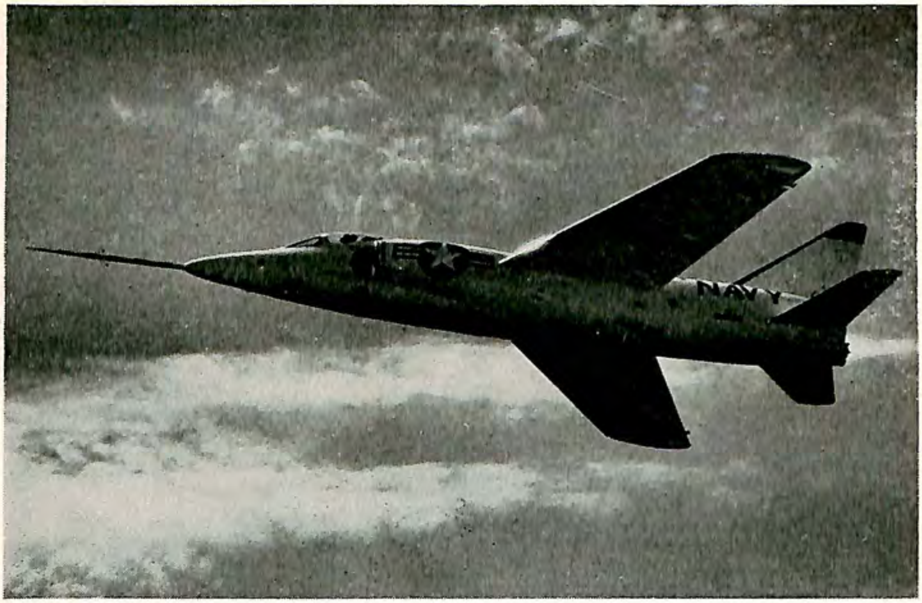
SPECIFICATIONS • Span 34 ft. 6 in.; Length 41 ft. 7 in.; Height 12 ft. 3 in.; Engine Pratt and Whitney J48-P-8, 7250 lb. thrust.

PERFORMANCE • All data are classified.

REMARKS

The F9F-8 has greater range, speed and is more maneuverable than the earlier F9F-6. Changes included replacing the movable wing slats with fixed cambered leading edges, extending the trailing edges, and lengthening the fuselage eight inches. The Cougar, the Navy's first operational swept-wing fighter, carriers a wide variety of external stores and has four 20 mm cannons mounted in its nose. An F9F-8P photo reconnaissance version is also in production.

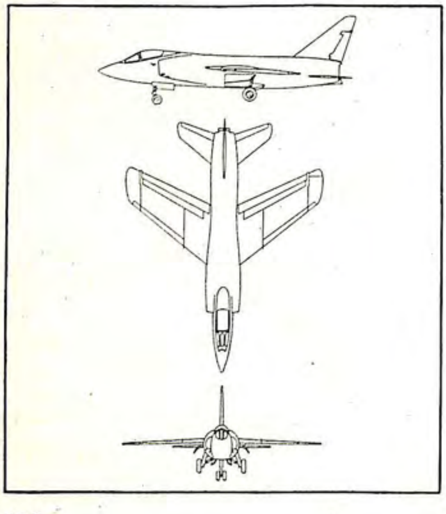




Grumman F11F-1 Tiger

TYPE • Fighter

DESIGNATION • F11F-1 (Navy)



SPECIFICATIONS • Span 31 ft. 7 in.; Length 40 ft. 10 in.; Height 12 ft. 8 in.; Engine Wright J65-W-6 with afterburner.

PERFORMANCE • All data are classified.

REMARKS

The F11F-1 Tiger was the nation's first aircraft to use the "area rule" or indented fuselage concept. Originally designated F9F-9. Simplicity of design is evident throughout. Wings, swept to same degree as Cougars, are extremely thin. Entire upper and lower wing skins are machined from single sheets of aluminum alloy. Small portion of wing near the tip folds down manually for carrier storage. First flight was made July 30, 1954. Capable of carrying the most modern external stores, including air-to-air and air-to-ground missiles.

Grumman SA-16A Albatross

TYPE • **Utility**

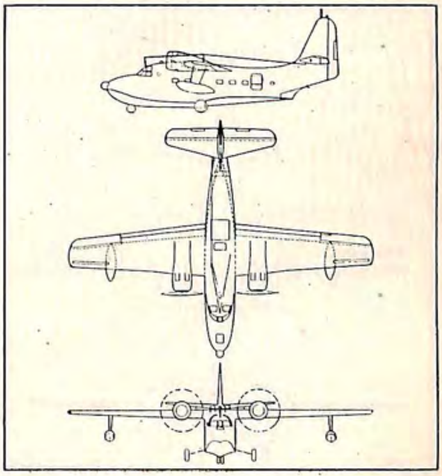
DESIGNATION • **SA-16A (Air Force), UF-1 (Navy), UF-1G (Coast Guard)**

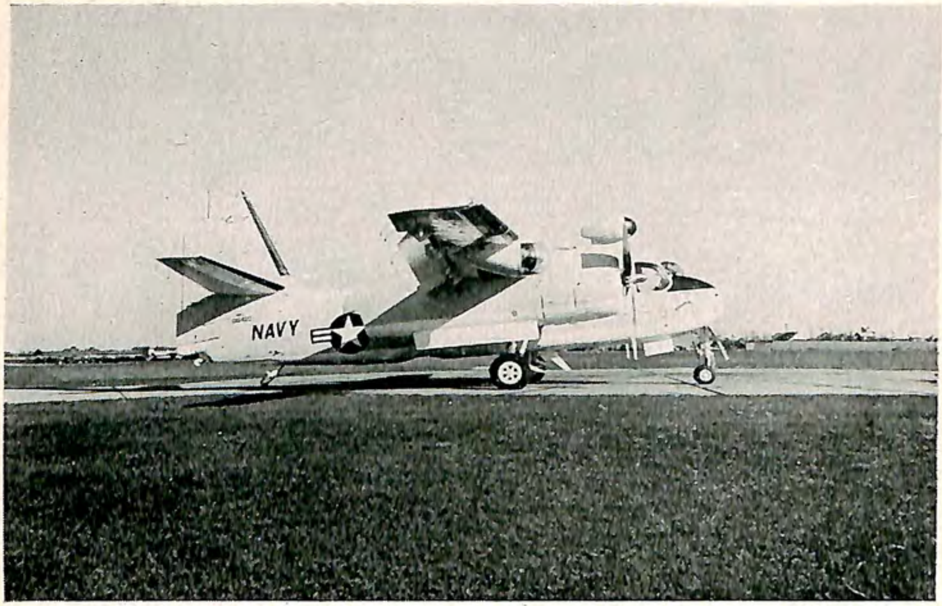
SPECIFICATIONS • **Span 80 ft.; Length 61 ft. 4 in.; Height 24 ft. 5 in.; Engine (2) Wright R-1820-76, 1425 hp takeoff.**

PERFORMANCE • **Maximum Speed 277 mph; Cruise Speed 230 mph.**

REMARKS

The Albatross, Grumman's largest amphibian, was the first aircraft adopted by the unified Naval-Air Force command. It is used by the Air Force, Navy and Coast Guard as a general utility aircraft capable of performing as a hospital plane or for air-sea rescue, cargo, transport or photographic duty. It carries the widest variety of communication and navigation equipment found in the air today. On active service with every Air Force, Air Rescue Squadron throughout the world. Crew: 6.

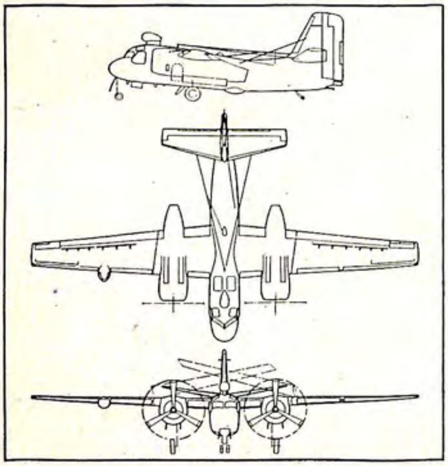




Grumman S2F-1 Sub-killer

TYPE • Anti-submarine

DESIGNATION • S2F-1 (Navy)



SPECIFICATIONS • Span 69 ft. 8 in.; Length 42 ft. 3 in.; Height 16 ft. 3 in.; Engine (2) Wright R-1820-82, 1525 hp takeoff.

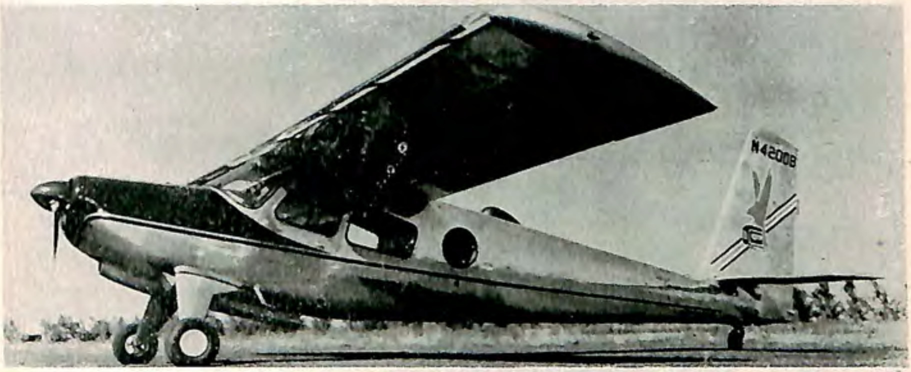
PERFORMANCE • All data are classified.

REMARKS

First carrier aircraft combining search and attack elements in one plane. Carries crew of four. Exceptional single-engine performance. Can land and takeoff from smallest carriers. Two modifications of S2F-1 also in production: S2F-2 features enlarged torpedo bay, while TF-1 is a passenger-cargo trainer-utility version.

HELIO AIRCRAFT CORP.

Norwood, Mass.



Helio All-metal Courier

TYPE • Four place

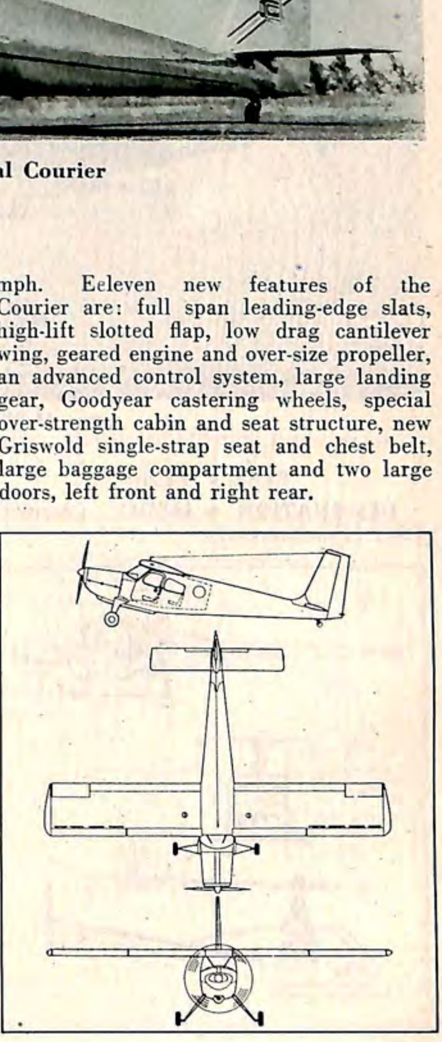
DESIGNATION • Courier

SPECIFICATIONS • Span 39 ft.; Length 30 ft.; Height 8 ft. 10 in.; Empty Weight 1880 lb.; Gross Weight 2800 lb.; Overload Gross Weight 3500 lb. (per CAR 08); Engines Lycoming GO435C2B, 240 hp normal rated, or 260 hp at 3400 rpm takeoff; Fuel Capacity 60 gal.; Propeller constant speed; Main Tire 6.50 x 8 Crosswind; Wing Area 231 sq. ft.; Flap Area 74 percent span.

PERFORMANCE • Cruise Speed 142 mph at 75 percent hp at S. L. Cruise Speed 157 mph at 72 percent hp at 8500 ft.; Landing Speed 30 mph; Rate of climb 1250 fpm at first ft.; Service Ceiling 25,600 ft.; Range with Maximum Fuel Load 800 mi. at average true airspeed 98 mph.

REMARKS

This all-metal "helioplane" combines high speed and long range economy with stall-proof, slow flight and ultra short field utility. Take-off and landing distance over 50 ft. obsctacle, no wind, at sea level, at gross weight, is 165 yards. The plane has full controlability down to speeds of 30 mph. Eeleven new features of the Courier are: full span leading-edge slats, high-lift slotted flap, low drag cantilever wing, geared engine and over-size propeller, an advanced control system, large landing gear, Goodyear castering wheels, special over-strength cabin and seat structure, new Griswold single-strap seat and chest belt, large baggage compartment and two large doors, left front and right rear.



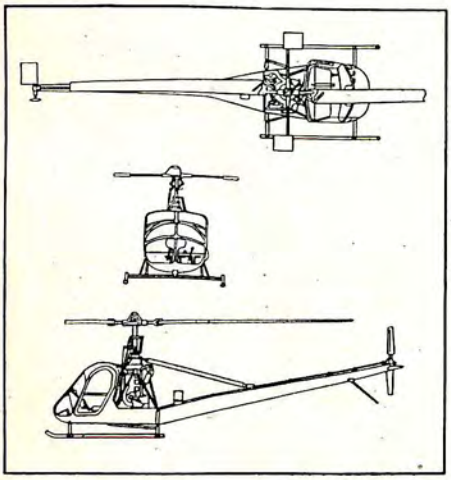
HILLER HELICOPTERS

Palo Alto, Calif.

Army H-23C (Hiller 12-C)

TYPE • Utility

DESIGNATION • H-23C (Army); 12-C (Commercial)



SPECIFICATIONS • Main Rotor Diameter 35 ft.; Anti-Torque Rotor Diameter 5.5 ft.; Length 38.7 ft.; Height 9.8 ft.; Empty Weight 1642 lb.; Useful Load 858 lb.

PERFORMANCE • Maximum Speed 84 mph at S. L.; Cruise Speed 71 mph at S. L.; Rate of Climb 770 fpm at S. L.; Service Ceiling 1200 ft.; Range 135 mi.

REMARKS

The 12-C is the three-place commercial version of this model. Accessories are available for agricultural spraying and dusting, evacuation work, night flying and executive use. The H-23B is used as a helicopter trainer. A number are also in service with many foreign governments. 3-view drawing is the -B model.

Hiller H-32 Hornet

TYPE • Trainer

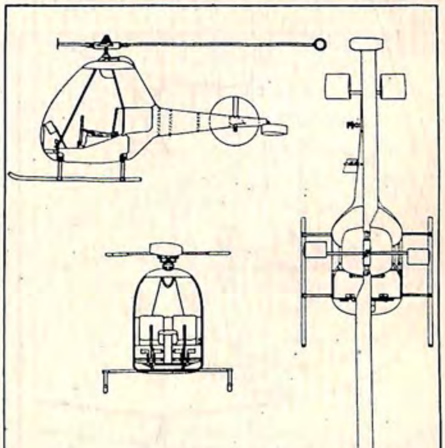
DESIGNATION • H-32 (Army)
HOE-1 (Navy)

SPECIFICATIONS • Main Rotor Diameter 23 ft.; Tail Rotor Diameter 2 ft. 8 in.; Length 23 ft.; Height 7 ft. 10 in.; Empty weight 544 lb.; Useful load 536 lb.

PERFORMANCE • Maximum Speed 61 mph; Cruise Speed 37 mph; Rate of Climb 700 ft.; Range 28 mi.

REMARKS

Army and Navy have ordered several Hornets for evaluation and study of the ramjet helicopter principle and performance in actual service. Services will determine suitability of the two-place jet machine for lightweight reconnaissance and liaison work. Small anti-torque rotor is belt-driven from main rotor.



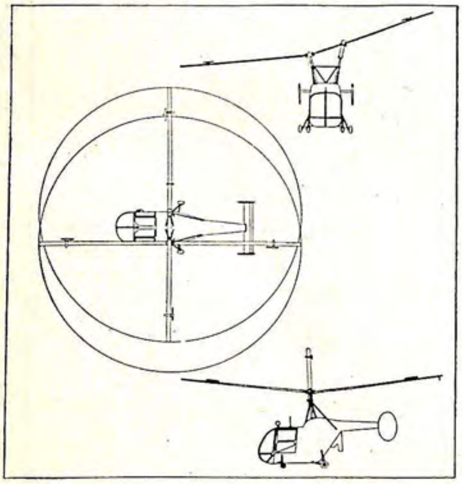
KAMAN AIRCRAFT CORP.

Bloomfield, Conn.

Kaman HOK-1

TYPE • Utility

DESIGNATION • HOK-1 (Navy)



SPECIFICATIONS • Rotor Diameter 47 ft.; Length 22 ft. 7 in.; Height 12 ft. 6in.; Engine Pratt and Whitney R-1340, 600 hp at 2700 rpm.

PERFORMANCE • All data are classified.

REMARKS

General utility design can be readily converted to ambulance version carrying two litter patients and one medical attendant or an additional ambulatory patient, in addition to the pilot. The HOK-1 uses the patented Kaman servo-flap for blade control. The twin vertical fins provide directional stability in high speed flight. Stabilizer controllable from collective pitch control.

LOCKHEED AIRCRAFT CORP.

Burbank, Calif.

Lockheed 1649A Super Constellation

TYPE • Transport

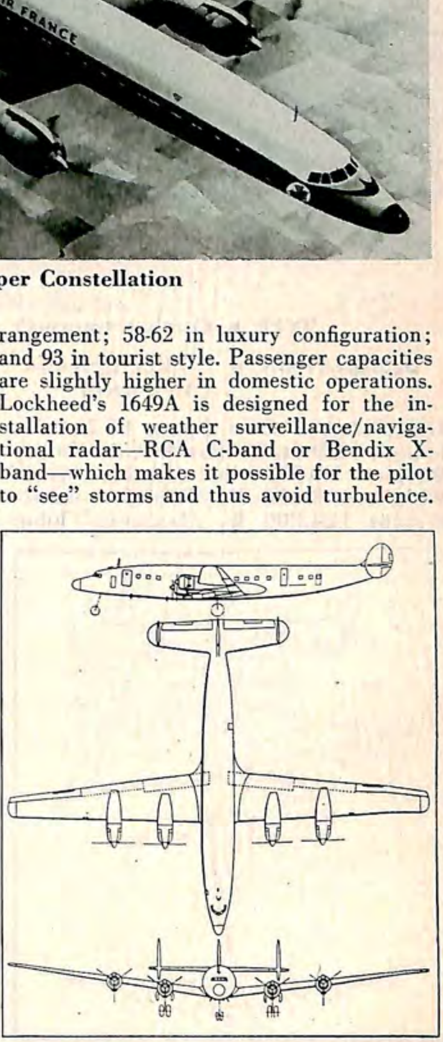
DESIGNATION • 1649A

SPECIFICATIONS • Span 150 ft.; Length 116 ft. 2 in.; Height 24 ft. 9 in.; Gross Weight 156,000 lb.; Engines (4) Wright EA-2 R-3350 turbo compound, 3400 hp; Fuel Capacity 9600 gal.; Wing Area 1850 sq. ft.

PERFORMANCE • Maximum Speed 377 mph at 20,000 ft.; Cruise Speed 350 mph at 22,600 ft.; Landing Speed 101 mph.; Rate of climb 1080 fpm at S. L.; Service Ceiling 25,300 ft.; Range with Space Limit 5030 mi.; Range with Maximum Fuel Load 6400 mi. plus reserve.

REMARKS

The model 1649A represents a major change over previous Super Constellations by having a completely new wing. It embodies the most modern aerodynamic principles for added speed and range and is of sginificantly different construction. For added range, the 1649A holds 9600 gallons of fuel, 50 percent more than pervious models. Featuring four separate passenger compartments, the transport will carry 46 passengers in intercontinental siesta arrangement; 58-62 in luxury configuration; and 93 in tourist style. Passenger capacities are slightly higher in domestic operations. Lockheed's 1649A is designed for the installation of weather surveillance/navigational radar—RCA C-band or Bendix X-band—which makes it possible for the pilot to "see" storms and thus avoid turbulence.

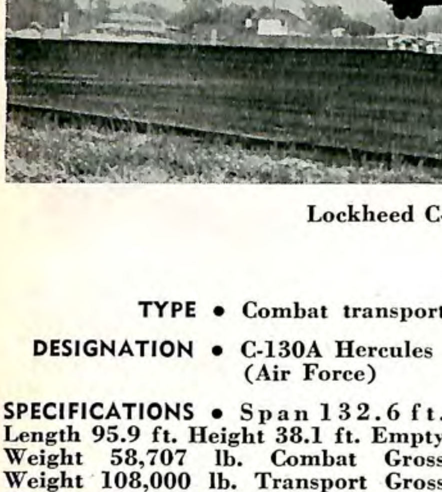


Lockheed C-130A Hercules

TYPE • Combat transport

DESIGNATION • C-130A Hercules (Air Force)

SPECIFICATIONS • Span 132.6 ft. Length 95.9 ft. Height 38.1 ft. Empty Weight 58,707 lb. Combat Gross Weight 108,000 lb. Transport Gross Weight 124,200 lb. Maximum Wing Loading 71.2 lb. per sq. ft. Maximum Power Loading 8.27 lb. per eshp. Engines (4) T56-A-1 Allison Turbo-Prop, 3375 eshp normal rated, or 3750 eshp at 13,820 rpm takeoff. Propeller CT634S-E Curtiss Turbolectric. Main Tire 20:00-20 (20 ply). Nose Tire 12:50-16 (10 ply).



PERFORMANCE • All data are classified.

REMARKS

First production aircraft are scheduled for delivery to the Tactical Air Command in 1956. The first prototype flew at Burbank, Calif., in 1954 and the first C-130A, the production version, flew at Marietta, Ga., in April, 1955. The first American transport designed from the beginning as an aerial friegther, utilizing prop-jet power plants, the C-130A's military missions for the Tactical Air Forces include transport of personnel and material for delivery by parachute or landing as required. It can airlift up to 20 tons gross in a cargo compartment which has a clear cubage 41 ft. by 10 ft. by 9 ft. Up to 92 troops can be accommodated. As an aerial ambulance, it has provisions for quick installation of 74 litters. Normal crew is four: pilot, co-pilot, systems manager and navigator.

Lockheed F-94C Starfire

TYPE • All weather interceptor.

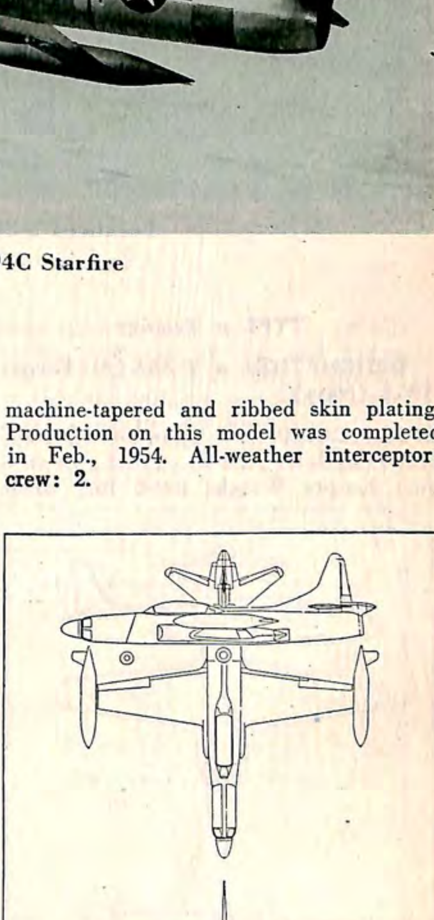
DESIGNATION • F-94C (Air Force)

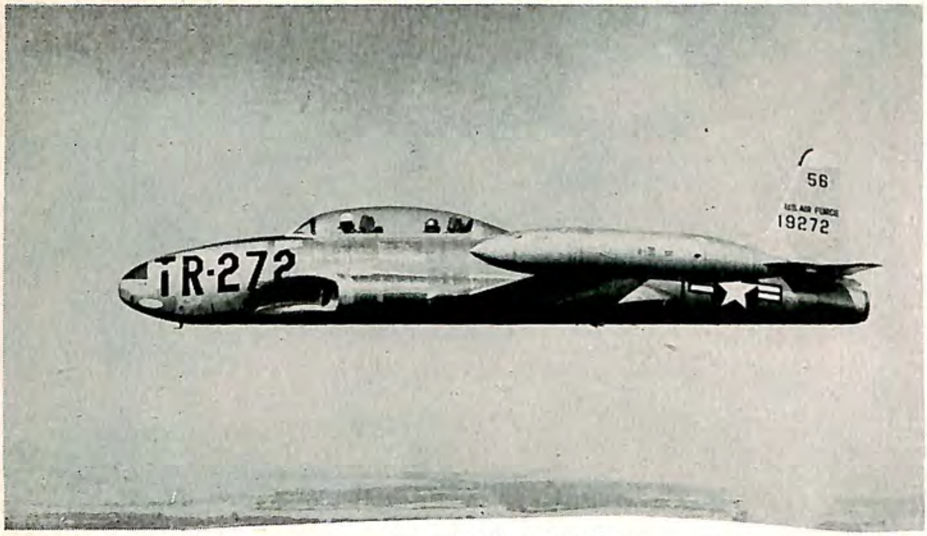
SPECIFICATIONS • Span 41 ft.; Length 41 ft. 5 in.; Height 13 ft. 7 in.; Engine Pratt and Whitney J48-P-5,; Gear tricycle. All other specifications classified.

PERFORMANCE • In the 600 plus mph class. All other performance data classified.

REMARKS

The F-94C Starfire has many changes over earlier F-94A and -B models including improved electronic equipment, thinner wing and swept tail. The plane does not carry guns, but mounts 24 2.75 in. rockets in barrel launcher in nose plus 24 more in special wing pods. The F-94C is the first production fighter equipped with a deceleration parachute. It is a development of the original mass-produced F-80 Shooting Star. The wing uses special Lockheed machine-tapered and ribbed skin plating. Production on this model was completed in Feb., 1954. All-weather interceptor; crew: 2.



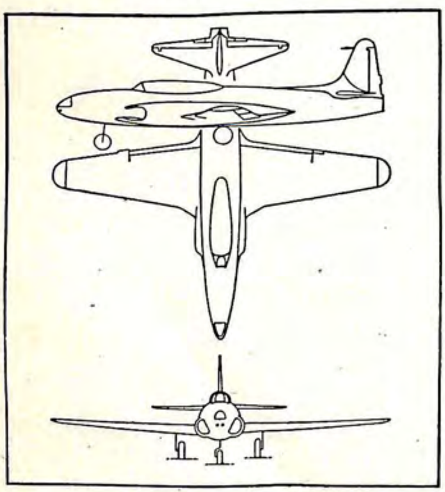


Lockheed T-33A Shooting Star

TYPE • **Trainer**

DESIGNATION • **T-33A (Air Force) TV-2 (Navy)**

SPECIFICATIONS • **Span 38 ft. 10½ in.; Length 37 ft. 8 in.; Height 11 ft. 8 in.; Empty Weight 8400 lb.; Gross Weight 15,000 lb.; Wing Loading 60.8 lb. per sq. ft.; Engine Allison J-33-35, 5400 lb. thrust at 11,750 rpm at S. L.; Fuel Capacity 683 gal. including tip tanks.**



PERFORMANCE • **Maximum Speed 580 mph; Rate of Climb 5525 fpm; Service Ceiling 45,000 ft.; Range 1345 mi.**

REMARKS

The T-33 is a development of the F-80 Shooting Star, first standard jet plane in the military services. It has been in service since 1948 and is now being built for both the Air Force and Navy and also several foreign powers through the Mutual Defense Assistance Pact. T-33s are also being produced by Canadair Ltd., Montreal for the Royal Canadian Air Force. In addition to being the standard jet trainer in this country, T-33s have been used to train pilots from Holland, France, Belgium, Turkey, Greece, Denmark, Norway, Italy, Portugal, Spain, Yugoslavia, Nationalist China, Japan, Thailand, and the Philippines. Crew: 2.

Lockheed R7V-2 Turboprop Super Constellation

TYPE • Transport

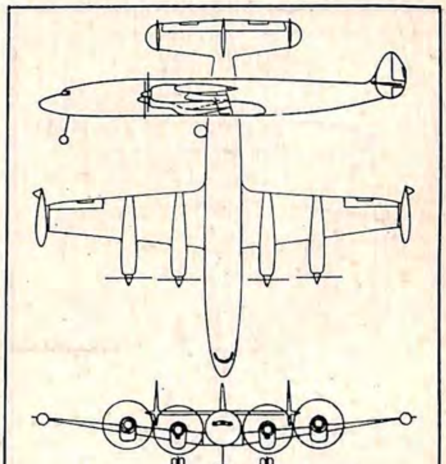
DESIGNATION • R7V-2 (Navy); YC-121F (Air Force)

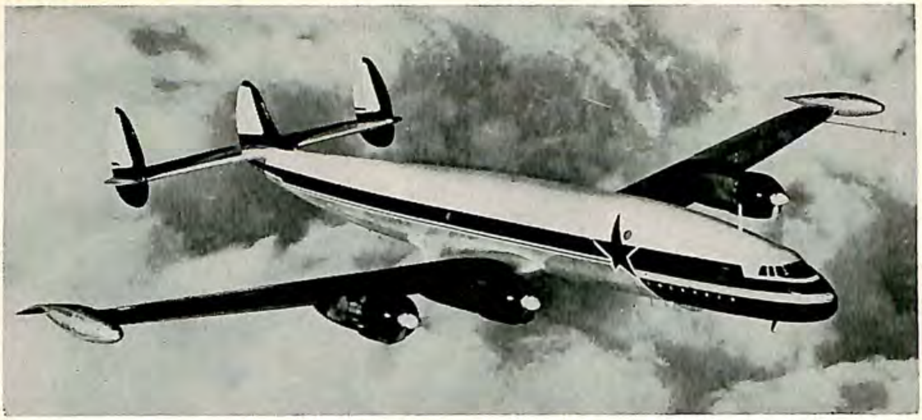
SPECIFICATIONS • Span 117 ft.; Length 116 ft. 2 in.; Height 24.5 ft.; Gross Weight 150,000 lb.; Engine (4) Pratt and Whitney T-34 turboprop, 5550 hp; Fuel Capacity 8750 gal. including two 600 gal. tip tanks; Propeller Hamilton Standard three blade.

PERFORMANCE • Cruise Speed 440 mph; Service Ceiling 35,800 ft.

REMARKS

The R7V-2 carries 36,000 lb. in 5400 cu. ft. of storage space. In over-water configuration it can carry 97 passengers and overland, 106. As a mercy plane, it can carry 73 patients in litter beds and four attendants. Normal cruising altitude is 25,000 ft. It can fly 16-ton loads across the continent in less than six hours. The ordinary cabin supercharger system has been eliminated in this model. Each engine is an air compressor, developing 70 psi; cabin pressurization lines require only 27 psi for full actuation. Lockheed at year end had a contract for two R7V-2 prototypes with the Navy and was building an additional two (YC-121F) for the Air Force.



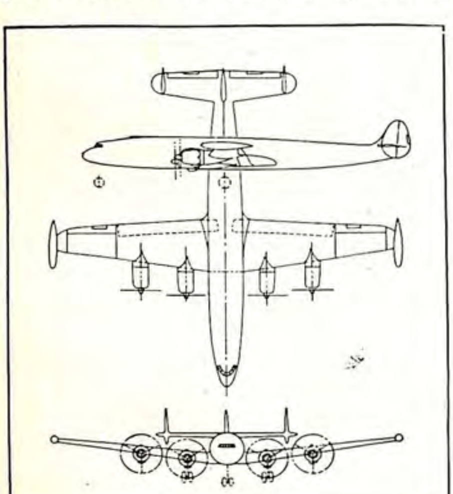


Lockheed 1049G Super Constellation

TYPE • **Transport**

DESIGNATION • **1049G**

SPECIFICATIONS • **Span 123 ft. 5 in.; Length 113.7 ft.; Height 24.7 ft.; Empty Weight 73,016 lb.; Gross Weight 137,500 lb.; Wing Loading 83 lb. per sq. ft.; Power Loading 10.56 lb. per bhp; Engine (4) Wright 3250 hp (DA3) turbo-compound, 3250 hp takeoff; Fuel Capacity 7750 gal. with provisions for two 600 gal. tip tanks; Propellers Hamilton Standard three blade; Gear tricycle; Wing Area 1654 sq. ft.; Aileron Area 99.6 sq. ft.; Flap Area 295.4 sq. ft.; Fin Area 211.6 sq. ft.; Rudder Area 91.2 sq. ft.; Stabilizer Area 356.8 sq. ft.; Elevator Area 106.8 sq. ft.**



PERFORMANCE • **Maximum Speed 371 mph; Cruise Speed 335 mph; Landing Speed 101 mph; Rate of Climb 1600 fpm; Service Ceiling 30,-100 ft.; Absolute Ceiling 31,200 ft.; Range with Maximum Payload 4630 mi.; Range with Maximum Fuel Load (absolute) 5580 mi.**

REMARKS

Introduced in the fall of 1954, the Super Constellation 1049G is the first transport to use Wright turbo-compound engines. Military versions of the new model will carry 106 passengers and a crew of four. The 1049Gs have provisions for surveillance radar. 47 to 99 pasengers. The 1049H cargo is the version of the 1049G with a major difference in the fuselage, where the 1049H is specially designed and stressed for cargoloads. Easily convertible to 92 passenger (crew of 9) configuration. Normal payload: 34,623 lbs. Overload: 39,623 lbs. It is the largest, fastest and most economical cargo transport in world aviation.

Lockheed P2V-7 Neptune

TYPE • Patrol

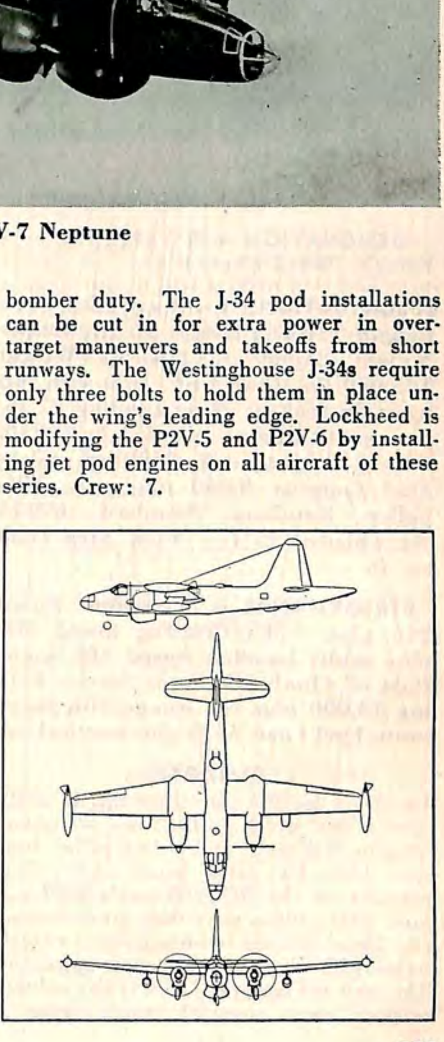
DESIGNATION • P2V-7 (Navy)

SPECIFICATIONS • Span 103 ft. (includes tip tanks); Length 91 ft. 5 in.; Height 29 ft. 4 in.; Empty Weight 43,950, with jet pod engines 47,450 lb.; Gross Weight 72,000 lb., with jet pod engines 75,500 lb.; Engine (2) Wright R3350-32W turbo-compound, 3250 hp and (2) Westinghouse J-34 engines in pods, 3400 lb. thrust; Propeller Hamilton Standard three blade; Wing Area 1000 sq. ft.

PERFORMANCE • Maximum Speed 300 mph (without pods); Service Ceiling 22,000 ft. (without pods).

REMARKS

The P2V-7 is the latest in the Neptune anti-submarine warfare series. Identifying features are double-bubble pilot canopy, jet pod engines supplementing its turbo-compound powerplants and elongated tail housing MAD gear (magnetic airborne detector) for locating underwater submarines. Like previous Neptunes, the P2V-7 is a versatile plane which can be converted for patrol, mine laying or torpedo bomber duty. The J-34 pod installations can be cut in for extra power in over-target maneuvers and takeoffs from short runways. The Westinghouse J-34s require only three bolts to hold them in place under the wing's leading edge. Lockheed is modifying the P2V-5 and P2V-6 by installing jet pod engines on all aircraft of these series. Crew: 7.



Lockheed EC-121 Super Constellation

TYPE • Reconnaissance

DESIGNATION • EC-121 (Air Force) WV-2 (Navy)

SPECIFICATIONS • Span 123 ft.; Length 116 ft.; Height 26 ft.; Empty Weight 81,000 lbs.; Gross Weight 145,000 lbs. (based on claim with two wing tip tanks); Wing Loading 87 lb. per sq. ft.; Engine (4) Wright R3350-34; 3250 hp takeoff, 2600 hp cruise; Fuel Capacity 8,000 plus gal.; Propeller Hamilton Standard 6903A three-bladed 15 ft.; Wing Area 1650 sq. ft.

PERFORMANCE • Maximum Speed 270 plus mph; Cruising Speed 200 plus mph; Landing Speed 105 mph; Rate of Climb 800 fpm; Service Ceiling 20,000 plus ft.; Range with Maximum Fuel Load 3500 plus nautical mi.

REMARKS

Lockheed has also announced the RC-121D, new series which added two 600-gallon wingtip fuel tanks and a 1000-gallon fuselage tank for extra hours aloft. Fuel capacity on the RC-121D totals 8750 gallons, 2200 gallons more than previous models. These altitude reconnainssance aircraft bulge with electronic detection apparatus. The craft are designed to carry the military services' most powerful search radar to high altitudes where radar beams (which cannot bend over the horizon) attain their maximum effectiveness in spotting either surface or air targets. Exact effective range of the radar was not revealed. RC-121's are special versions of Lockheed's Super Constellation. The Air Force version will be used to give air-defense forces extra-early warning of approaching targets. The WV-2's will be used by the Navy primarily to screen U. S. fleets. Two complete flight crews plus a group of electronics specialists, a total of 31 men in all, make up the flying ship's complement. No three-view drawings of the plane were available when the Year Book went to press.

TYPE • Fighter

DESIGNATION • F-104

REMARKS

Design details and performance characteristics are classified information. The only facts which have been cleared for release to date include: (1) The airplane is a supersonic fighter; (2) It is a specialized type of plane which trades weight and complexity for greater speed and maneuverability; (3) It has a Curtiss-Wright J-65 engine plus afterburner in prototype. No photographs have been released on the airplane. General Nathan F. Twining, Chief of Staff, USAF, said "we feel confident that it is the fastest, highest-flying fighter in the air anywhere."

Lockheed Electra

TYPE • Transport

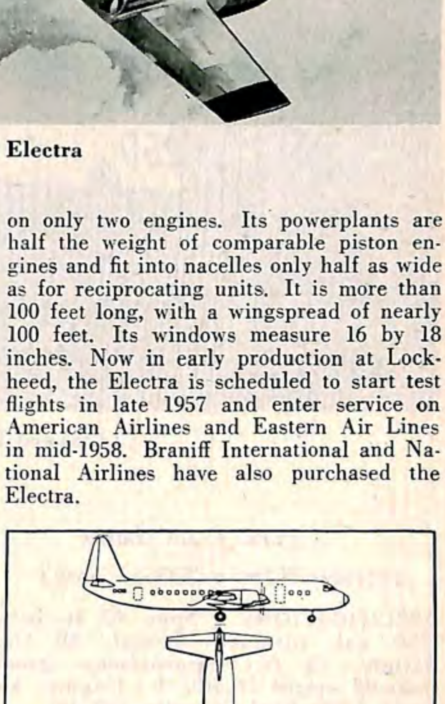
DESIGNATION • Electra

SPECIFICATIONS • Span 99 ft.; Length 104 ft. 2 in.; Height 32 ft. 3 in.; Empty Weight 54,000 lb.; Gross Weight 110,000 lb.; Engines (4) Allison 501-D13 prop-jet, 3750 hp normal rated; Fuel Capacity 5280 gal.; Wing Area 1300 sq. ft.

PERFORMANCE • Maximum Speed 452 mph; Cruise Speed 410 mph; Rate of climb 2400 fpm; Service Ceiling 30,000 ft.; Range with Maximum Payload 2440 mi.; Range with Maximum Fuel Load 3000 mi. with reserves.

REMARKS

The Electra was designed with a wide variety of operational capabilities. Among major advancements in its design progression are: extension of range capabilities to include transcontinental nonstop operation; growth of the wing to 1300 square feet of lift area; and increase of its total fuel capacity to 5280 gallons. This is the first all-new four-engine transport ordered by U. S. airlines in a decade. It carries from 66 to 91 passengers. The four Allison 501 turboprop engines pictured on the model above generate 3750 hp each. They operate on the turbine principle, with their turbine wheels linked to propellers. The plane can fly over the highest mountains in the U. S. on only two engines. Its powerplants are half the weight of comparable piston engines and fit into nacelles only half as wide as for reciprocating units. It is more than 100 feet long, with a wingspread of nearly 100 feet. Its windows measure 16 by 18 inches. Now in early production at Lockheed, the Electra is scheduled to start test flights in late 1957 and enter service on American Airlines and Eastern Air Lines in mid-1958. Braniff International and National Airlines have also purchased the Electra.



Lockheed T2V-1 Trainer

TYPE • Jet trainer

DESIGNATION • T2V-1 (Navy)

SPECIFICATIONS • Span 42 ft. incl. 230 gal. tiptanks; Length 38 ft.; Height 13 ft.; Approximate gross takeoff weight 16,400 lb.; Engines Allison J-33; Fuel Capacity 760 gal.

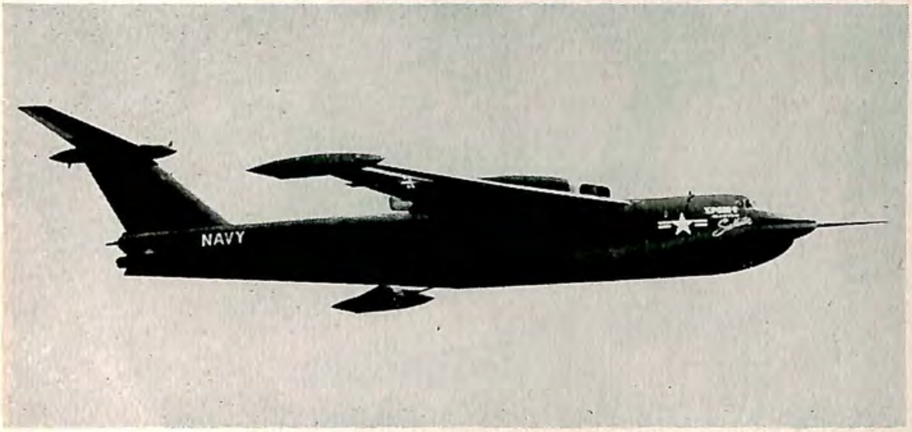
PERFORMANCE • Maximum Speed 600 mph; Landing Speed 97 mph; Approximate range 900 mi.

REMARKS

The T2V-1 is the first U. S. production airplane with boundary layer control as standard equipment, and the first two-place jet trainer for pilot training on seagoing aircraft carriers. The sea-going T2V-1, which flies its student-instructor crew at a 600 mph clip but lands at only 97 mph, can perform all the maneuvers of a standard Navy fighter. Its boundary layer control system by which compresed air from the engine is channeled into the wing and squirted through tiny holes directed at the flaps causes normal airflow to hug the control surfaces and provide greater lift as well as improved anti-stall performance. Other new features are a raised rear seat to give the "back-seat driver" fuller vision; movable slats on the wing's leading edge, for better low-speed stability; an arresting hook for carrier landings; a higher and larger horizontal stabilizer than on previous Lockheed jet trainers; and a simplified cockpit with instruments which give two readings from one dial. T2V-1s are now in production at Lockheed's California Division, Burbank, Calif.

MARTIN CO.

Baltimore, Md.



Martin P6M-1 SeaMaster

TYPE • Attack seaplane

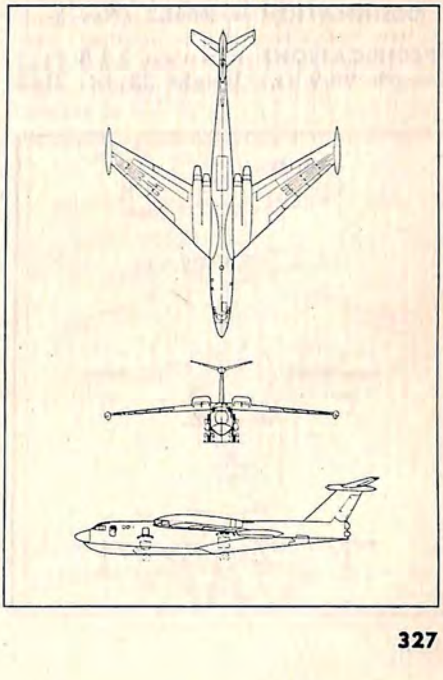
DESIGNATION • P6M-1 (Navy)

SPECIFICATIONS • Span 100 ft.; Length 134 ft.; Height 31 ft.; Payload 30,000 lb.; Engines (4) Allison J-71 turbojets; Wing Area 1900 sq. ft.; Vertical tail area 213 sq. ft.

PERFORMANCE • Maximum Speed over 600 mph; Normal cruise altitudo 40,000 ft.

REMARKS

Features long slender hull with a high T-shaped tail and twin sets of streamlined engine nacelles atop swept-back wings Has water-tight rotary mine door on which a variety of weapons, including mines or camera pod, can be installed interchangeably while the plane is afloat or on its beaching gear. Fixed wing-tip floats pro vide buoyancy while the plane is at rest in the water. Hydroflaps on both sides of the hull afterbody act as a brake when opened together, or as a rudder to permit short turns when opened separately. Hinged panels extending the full length and width of engine nacelles permit engine changes while afloat.

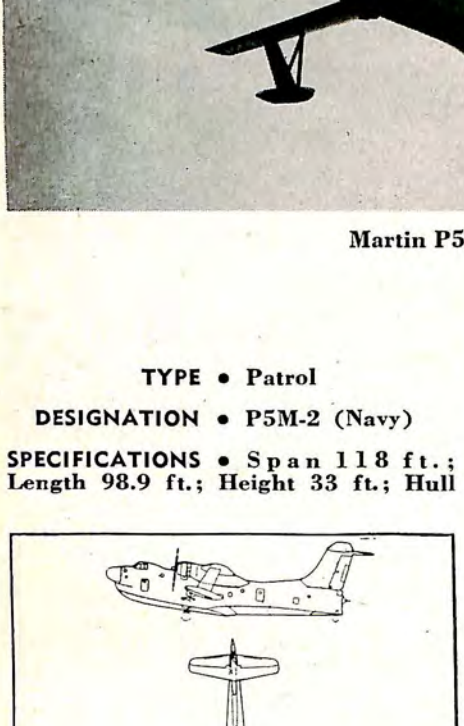


Martin P5M-2 Marlin

TYPE • Patrol

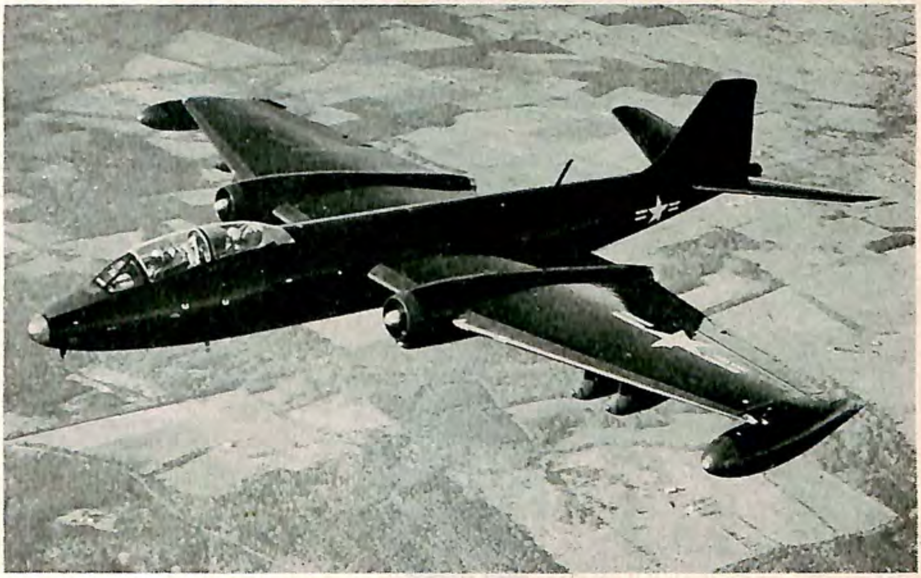
DESIGNATION • P5M-2 (Navy)

SPECIFICATIONS • Span 118 ft.; Length 98.9 ft.; Height 33 ft.; Hull Width 10 ft.; Gross Weight over 73,000 lb.; Engine (2) Wright R-3359-32W; Propeller Hamilton Standard 4-blade reversible.



PERFORMANCE • Maximum Speed 250 mph; Landing Speed 97 mph; Range 2500 nautical miles; Fuel capacity 2815 gals.; Take-off Power 3400 bhp.

The Marlin is an advanced anti-submarine warfare seaplane in service with Navy patrol squadrons in both Atlantic and Pacific fleets. Plane carries the newest electronic search and detection gear, including a radar scanner in its bow radome and a Magnetic Airborne Detector unit on its tail assembly. Marlin is the first seaplane with the "New Look" in hull design, featuring an extended hull afterbody. Hydroflaps installed on both sides of this afterbody near the tall T-shaped tail serve as a brake when opened together, or as a rudder when opened separately. Plane carries a crew of seven, and a substantial load of depth charges, bombs, torpedoes, rockets, and/or mines.



Martin B-57B

TYPE • **Light bomber**

DESIGNATION • **B-57B (Air Force)**

SPECIFICATIONS • **Span 64 ft.; Length 65 ft. 5 in.; Height 16 ft.; Gross Weight more than 50,000 lb.; Engine (2) Wright J65-W-1, 7220 lb. thrust.**

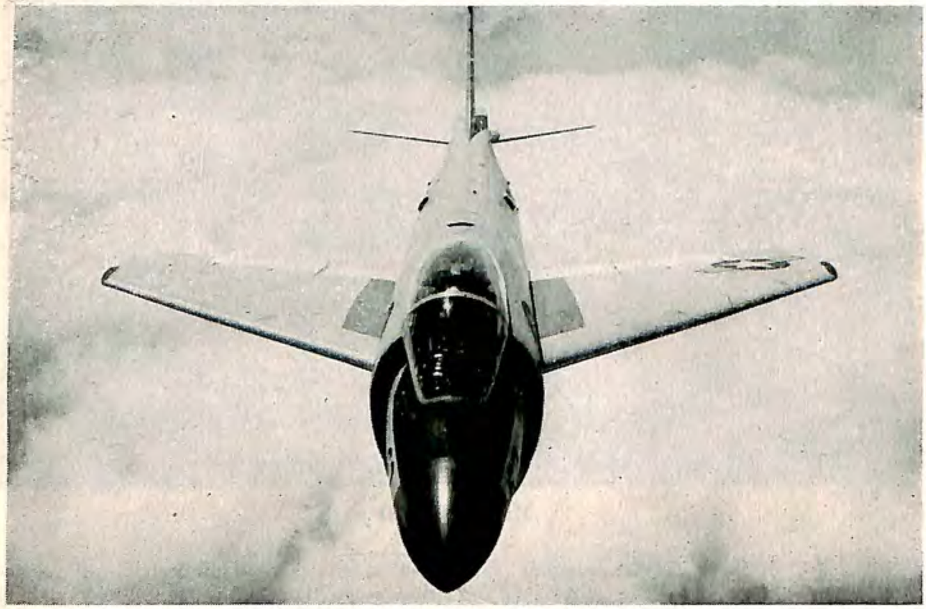
PERFORMANCE • **Maximum Speed more than 600 mph; Service Ceiling more than 45,000 ft.; Range more than 2,000 nautical mi.**

REMARKS

The B-57B differs from earlier versions in that it has a completely redesigned cockpit and canopy and has speed brakes on both sides of the fuselage. Primary advantage of the new cockpit is greatly improved visibility for the two crew members. Seating is a tandem arrangement, with the second officer directly behind and slightly higher than the pilot. The speed brakes give more control during low altitude operations and landing approaches. Included in the armament is a rotary bomb door which is removable and preloaded before being replaced in position. Bombs or rockets are carried internally until release time when the door is turned over making the stores external. Additional armament includes four 20 mm wing cannons, rockets and bombs on wing pylons. Other versions: B-57A, test vehicles; RB-57, reconnaissance type; B-57C, has dual controls, otherwise similar to B-57B.

McDONNELL AIRCRAFT CORP.

St. Louis, Mo.



McDonnell F3-H-2N Demon

TYPE • Fighter

DESIGNATION • F3H-2N (Navy)

SPECIFICATIONS • Engine Allison J-71 in the 10,000 lb. class; Armament 20mm cannon.

PERFORMANCE • Maximum Speed in the 600 mph class. All other data classified.

REMARKS

A powerful single-jet carrier-based fighter, the new Demon is the first airplane to have the Navy gray and white color treatment. A newer, more powerful turbo-jet engine, the Allison J-71, will power the F3H-2N. In the 10,000 pound thrust class, this engine was developed to provide good fuel economy with maximum thrust output. An afterburner installation augments the engine thrust considerably. Like its predecessor, the F3H-1N, the new Demon is an all-weather, high-performance fighter combining interceptor speed and fighter maneuverability with the pay-load of an attack bomber. Thin wings and tail surfaces are swept sharply back to place the big fighter in the 600-mph speed class. The large internal fuel capacity provides the Demon with the range necessary for fighter-bomber missions. Rapid firing, high velocity 20 mm cannon as well as a large number of rockets and combinations of external stores make the Demon a formidable aerial wepon. Improved radar and latest developments in computing and fire control equipment enable the fighter to operate under all weather conditions. Now under production at the McDonnell plant, the new Demon series is scheduled for delivery to Navy operational units through 1956.

McDonnell F-101A Voodoo

TYPE • Fighter

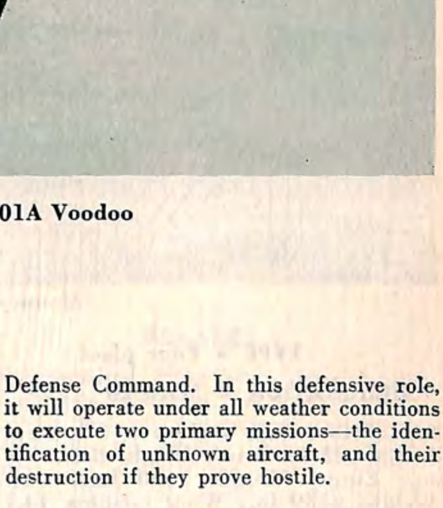
DESIGNATION • F-101A (Air Force)

SPECIFICATIONS • Span 39.7 ft.; Length 67.4 ft.; Height 18 ft.; Engine (2) Pratt & Whitney J57, 10,000 lb. thrust.

PERFORMANCE • All data are classified.

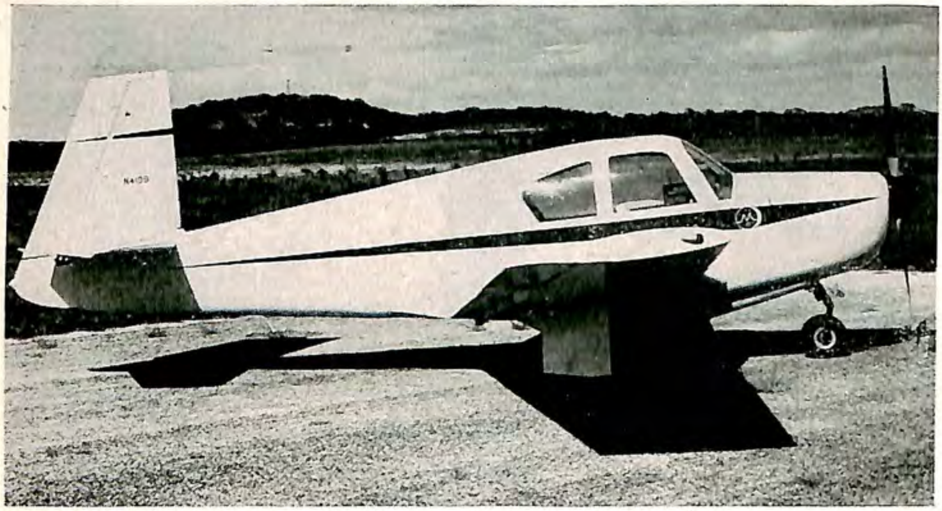
REMARKS

The F-101A is a long range, strategic fighter. Designed to have versatile combat capabilities enabling it to perform a variety of missions, the Voodoo is in the supersonic class and is capable of carrying atomic weapons. Wings are swept 35 deg. A photo reconnaissance version, the RF-101A, is now in production. On Sept. 30, 1955, McDonnell announced an initial quantity order for F-101B long-range interceptor fighters. Although details of this airplane are classified, it can be stated that the new F-101B is designed for duty with the Air Defense Command. In this defensive role, it will operate under all weather conditions to execute two primary missions—the identification of unknown aircraft, and their destruction if they prove hostile.



MOONEY AIRCRAFT, INC.

Kerrville, Tex.

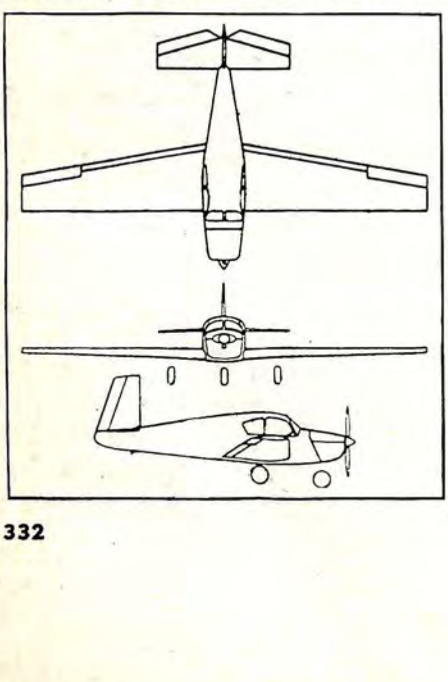


Mooney Mark 20

TYPE • **Four place**

DESIGNATION • **Mark 20**

SPECIFICATIONS • **Span 35 ft.; Length 23 ft. 2 in.; Height 8 ft. 4½ in.; Empty Weight 1400 lb.; Gross Weight 2450 lb.; Wing Loading 14.7 lb. per sq. ft.; Power Loading 16.3 lb. per bhp; Engine Lycoming O-320, 150 hp normal rated, or 150 hp at 2700 rpm takeoff; Fuel Capacity 50 gal.; Propeller Constant Speed Hartzell; Main Tire 6.00 x 6, 6 ply; Nose Tire 5.00 x 5, 4 ply; Wing Area 167 sq. ft.; Aileron Area 11.1 sq. ft.; Flap Area 17.2 sq. ft.; Fin Area 7.9 sq. ft.; Rudder Area 5.0 sq. ft.; Stabilizer Area 21.5 sq. ft.; Elevator Area 12.0 sq. ft.**



PERFORMANCE • **Maximum Speed 170 mph at 150 hp at 2700 rpm at S. L.; Cruise Speed 165 mph at (75%) 112.5 hp at 2450 rpm at 4900 ft.; Landing Speed 57 mph; Rate of climb 900 fmh at S. L.; Service Ceiling over 18,000 ft.; Absolute Ceiling over 20,000 ft.; Range with Maximum Payload 900 mi.; Range with Maximum Fuel Load 900 mi.**

REMARKS

This new four placer attains its high speed and economy of operation through the utilization of an NACA laminar-flow wing design and the 150 hp Lycoming engine, which is noted for its low operating cost and low fuel consumption. It has the advantages of speed, comfort and economy.

Mooney Mite M-18C

TYPE • Single seat

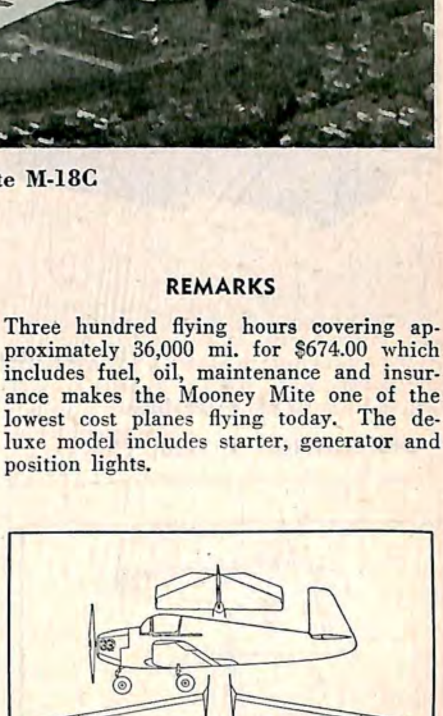
DESIGNATION • M-18C

SPECIFICATIONS • **Span 26 ft. 10½ in.; Length 17 ft. 8 in.; Height 6 ft. 3¼ in.; Empty Weight 540 lb.; Gross Weight 850 lb.; Wing Loading 8.9 lb. per sq. ft.; Power Loading 13.1 lb. per bhp; Engine Continental A65-8, 65 hp; Fuel Capacity 13.5 gal.; Propeller Flottorp; Wing Area 95.05 sq. ft.; Aileron Area 6.62 sq. ft.; Flap Area 10.54 sq. ft.; Fin Area 4.87 sq ft.; Rudder Area 2.26 sq. ft.; Stabilizer Area 12.15 sq. ft.; Elevator Area 5.94 sq. ft.**

PERFORMANCE • **Maximum Speed 142 mph at 2300 rpm at S. L.; Cruise Speed 125 mph at 2250 rpm at 10,000 ft.; Landing Speed 45 mph; Rate of Climb 1000 fpm at S. L.; Service Ceiling 21,000 ft.; Absolute Ceiling 22,500 ft.; Range with Maximum Payload 325 mi.; Range with Maximum Fuel Load 475 mi.**

REMARKS

Three hundred flying hours covering approximately 36,000 mi. for $674.00 which includes fuel, oil, maintenance and insurance makes the Mooney Mite one of the lowest cost planes flying today. The deluxe model includes starter, generator and position lights.



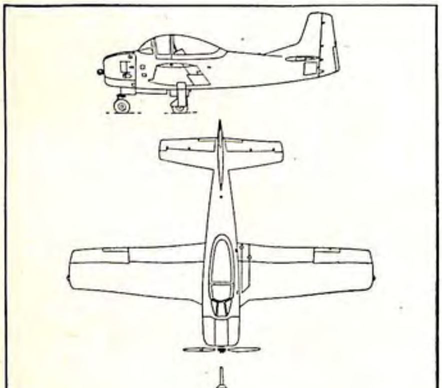
NORTH AMERICAN AVIATION, INC.

Los Angeles, Calif.

North American T-28C Trainer

TYPE • Trainer

DESIGNATION • T-28C (Navy)

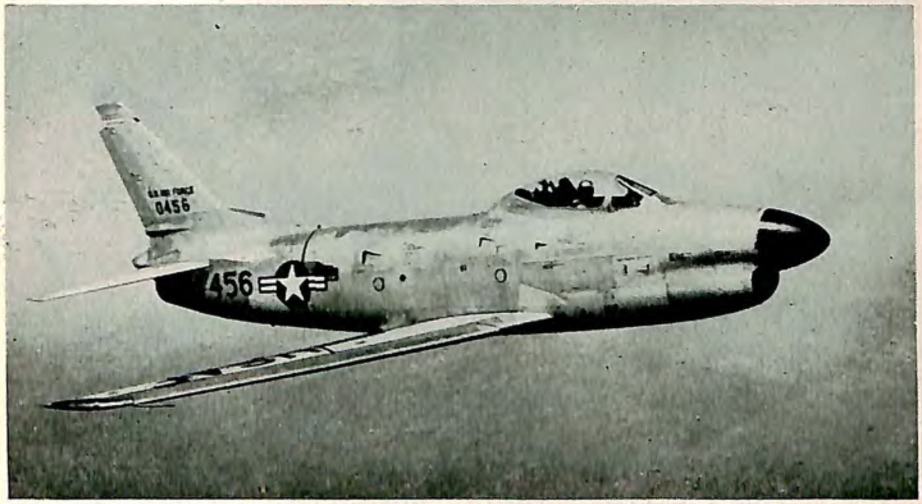


SPECIFICATIONS • Span 40 ft. 6 in.; Length 34 ft. 3 in.; Height 12 ft. 6 in.; Gross Weight 8247 lb.; Engine Wright R-1820, 1425 hp; Gear tricycle.

PERFORMANCE • Maximum Speed 346 mph; Cruise Speed 190 mph; Stalling Speed 72 mph; Rate of Climb 2060 fpm; Service Ceiling 35,000 ft.; Range with Maximum Payload 860 mi.

REMARKS

An improvement over the T-28B, the T-28C now enables the U. S. Navy to extend the training of pilots to shipboard work by addition of a tailhook. Carrier training can be added to the various other tasks assigned to it by the Navy: basic, advanced, instrument, tactical transition, and gunnery flight training. Armament for the T-28C, like the T-28B, provides accessory kit for bombs, 2.25 in. SCA rockets, 50 cal. machine guns. The first flight of the T-28C was September 19, 1955. It is now in production at North American's Columbus, Ohio, plant.



North American F-86D Sabre

TYPE • Fighter

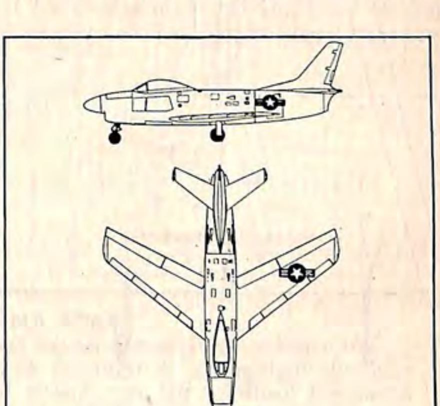
DESIGNATION • F-86D (Air Force)

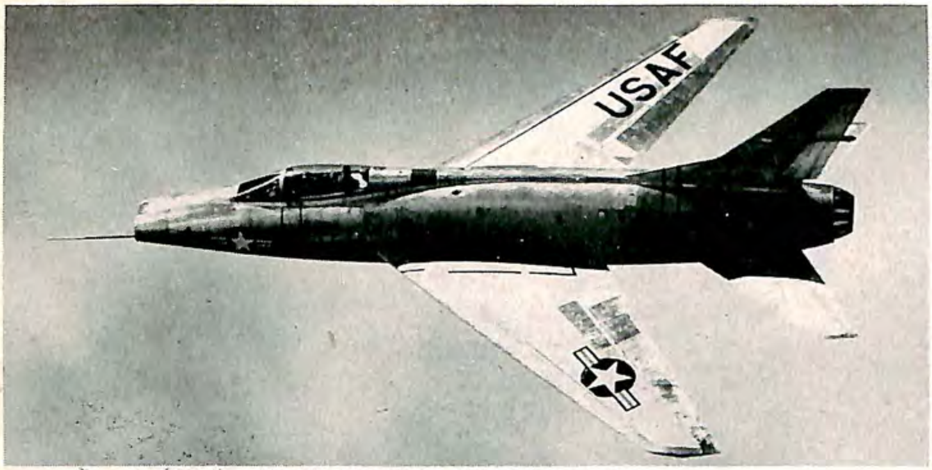
SPECIFICATIONS • Span 37 ft. 1 in.; Length 41 ft. 8 in.; Height 15 ft.; Gross Weight 18,000 lb.; Engine General Electric J47-17, 7650 lb. thrust with afterburner.

PERFORMANCE • Maximum Speed 680 mph; Tactical Radius over 500 mi.; Service Ceiling over 45,000 ft.

REMARKS

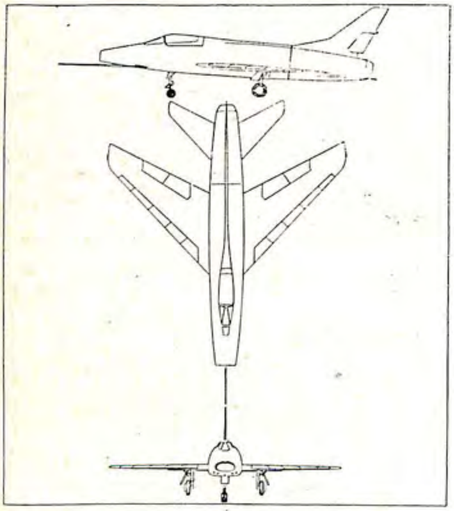
The F-86D Sabre interceptor was virtually a new design over previous models coming equipped with afterburner and search radar in the nose. The -F model was designed for use as either a fighter or low-level fighter bomber. Navy version of this model is the FJ-2 Fury which is a carrier based, folding wing fighter assigned to the Marines. The FJ-3 is similar to the -2 except for the installation of a Wright J-65 Sapphire engine. The FJ-4 was announced late in 1954. Latest in the F-86 series is the -K model which flew for the first time Sept. 10, 1954. All F-86 and FJ models have the all-flying tail in which the elevator and stabilizer are a single controllable surface. Trainer version, TF-86F, was created by adding a five ft. extension to the fuselage plus training aids.





North American F-100 Super Sabre

TYPE • Fighter



DESIGNATION • F-100A (Air Force)

SPECIFICATIONS • Span 38 ft.; Length 47 ft.; Height 15 ft.; Engine Pratt & Whitney J57-P7.

PERFORMANCE • Maximum Speed supersonic, in level flight; Service Ceiling 50,000 ft.; Range with Maximum Fuel Load 1000 statute mi.

REMARKS

First put into production at North American's Los Angeles plant in mid-1953. The first delivery of F-100As to the USAF Tactical Air Command was made on September 29, 1954. The fighter was the first production airplane in the world to fly regularly at supersonic speed in both level and climbing flight. It features a 45 degree swept wing, uses tail braking parachute, "solid" stabilizer and large ventral air brake.

North Amercian F-100C

Air superiority fighter designed for maximum climb, maneuverability, altitude and high speed. A transonic day fighter that can be fitted with external armament loads for use as a fighter bomber. Differs from the F-100A Super Sabre in that it contains inflight refueling system, provisions to carry extra fuel drop tanks and bombs. On August 20, 1955, Colonel Horace A. Hanes, USAF, set a new official world's speed record in the F-100C at the Air Force Flight Test Center, Edwards AFB, Calif. Colonel Hanes made two high altitude runs of 860.627 mph. and 773.644 mph. over an 18 kilometer (11 mile) course to set the new world's record of 822.135 mph.

NORTHROP AIRCRAFT, INC.

Hawthorne, Calif.

Northrop F-89D Scorpion

TYPE • Interceptor fighter

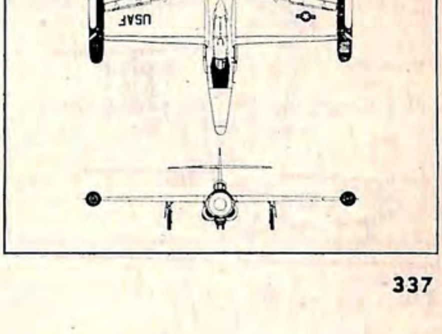
DESIGNATION • F-89D (Air Force)

SPECIFICATIONS • Span 56 ft. 2 in.; Length 53 ft. 4 in.; Height 17 ft. 7 in.; Gross Weight over 40,000 lb.; Engine (2) Allison J35-A-35 with afterburners; Wing Area over 600 sq. ft.

PERFORMANCE • Maximum Speed more than 600 mph; Service Ceiling over 45,000 ft.

REMARKS

The F-89D is America's most heavily armed fighter type airplane. It carries 104 2.75 in. folding air-to-air rockets in permanently mounted wing tip pods. Placement of the rockets in wing tip pods instead of in conventional fuselage or under wing locations provides additional combat advantages. Not only can large number of rockets be carried, but firing does not interfere with vision of the crew, nor are the engine air intakes exposed to smoke and debris produced by the firing. The rockets can be fired in a single, giant volley, or can be fired in groups. This enables the Scorpion to make as many as three passes at a single targets. The Scorpion uses decelerons combining the functions of ailerons and air brakes in the split, lateral control surfaces. F-89Ds are on assignment with fighter interceptor squadrons of the Air Defense Command, Northeast Air Command and Alaskan Air Command. F-89H and J are the latest versions of this fighter interceptor. Crew: 2.



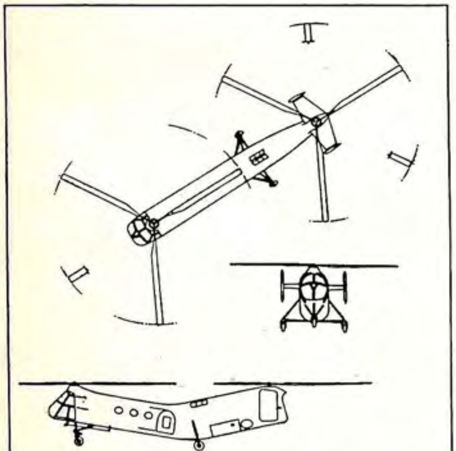
PIASECKI HELICOPTER CORP.

(See REMARKS)
Morton, Pa.

Piasecki H-21C Workhorse

TYPE • **Transport**

DESIGNATION • **H-21C (Army)**
H-21B (Air Force)
H-21B (RCAF)



SPECIFICATIONS • **Rotor Diameter 44 ft.; Length 52 ft. 6 in.; Height 16 ft.; Empty Weight 8500 lb.; Gross Weight 13,300 lb.; Overload Gross Weight 15,000 lb.; Engine Wright R-1820-103, 1425 hp takeoff; Fuel Capacity 300 gal.; Gear fixed tricycle.**

PERFORMANCE • **Maximum Speed 135 mph at S. L.; Cruise Speed 98 mph at S. L.; Rate of Climb 960 fpm; Service Ceiling 10,000 ft.; Range over 450 mi.**

REMARKS

New company name of Vertol Aircraft Corp. being submitted to shareholders for approval as Year Book went to press. The H-21B is the Air Force model in this series, and is similar to the H-21C. The fuselage is of all metal stressed skin, semi-monocoque construction. The cockpit has side-by-side seating with the pilot on the right and complete hydraulic controls. In addition, the H-21B has an autopilot. The main entrance door is located on the left side at the rear of the cabin.

PIPER AIRCRAFT CORP.

Lock Haven, Pa.

Piper PA-18 Super Cub

TYPE • **Two-place**

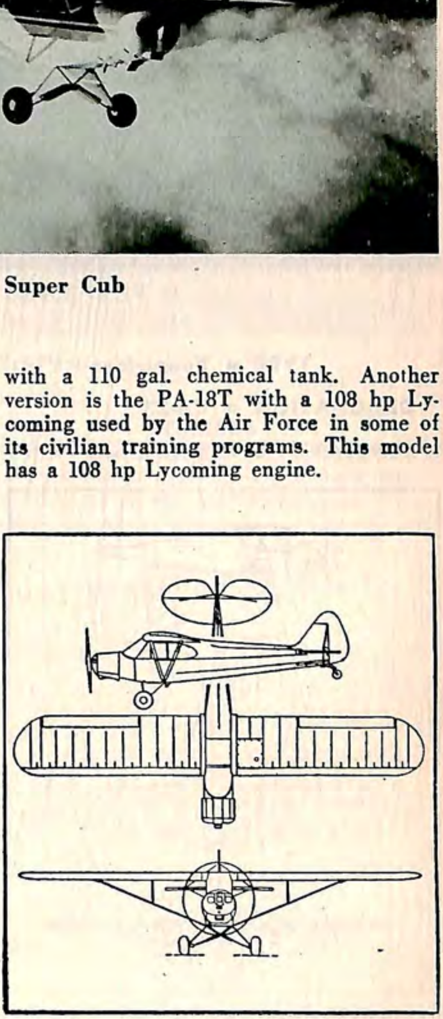
DESIGNATION • **PA-18**

SPECIFICATIONS • **Span 35.3 ft.; Length 22 ft. 5 in.; Height 6 ft. 7 in.; Empty Weight 930 lb.; Gross Weight 1750 lb.; Wing Loading 10 lb. per sq, ft.; Power Loading 11.6 lb. per bhp; Engine Lycoming O-320, 150 hp at 2700 rpm at S. L.; Fuel Capacity 36 gal.; Projeller Sensenich: Gear conventional.**

PERFORMANCE • **Maximum Speed 130 mph; Cruise Speed 115 mph at 75 percent power at 7,000 ft.; Landing Speed 43 mph; Rate of Climb 960 fpm at S. L.; Service Ceiling 19,000 ft.; Range 460 mi.**

REMARKS

This series also comes as an agriculture model with a gross of 2,070 lb, equipped with a 110 gal. chemical tank. Another version is the PA-18T with a 108 hp Lycoming used by the Air Force in some of its civilian training programs. This model has a 108 hp Lycoming engine.

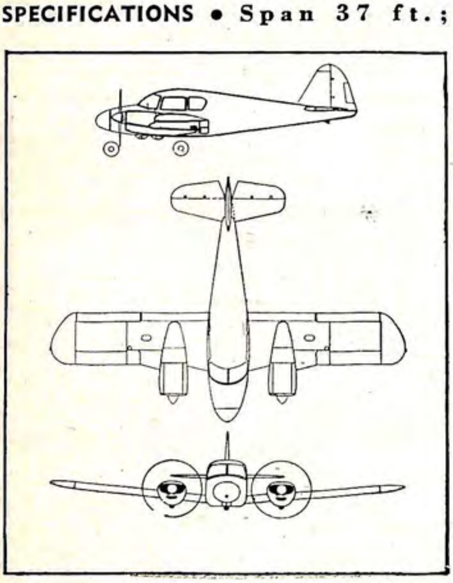


Piper PA-23 Twin Apache

TYPE • **Four-place**

DESIGNATION • **PA-23**

SPECIFICATIONS • **Span 37 ft.; Length 27.1 ft.; Height 9.5 ft.; Engine (2) Lycoming O-320, 150 hp at 2700 rpm; Gross Weight 3500 lb.; Empty Weight 2180 lb.; Useful Load 1320 lb.; Wing Loading 17.2 lb. per sq. ft.; Power Loading 11.6 lb. per hp; Wing Area 204 sq. ft.; Baggage 196 lb.; Fuel capacity 108 gal. with auxiliary tanks.**



PERFORMANCE • **Cruise Speed more than 165 mph.**

REMARKS

This new Piper twin Apache is all-metal design with short takeoff characteristics and slow landing speed for short field operations. It is capable of maintaining altitude at full gross weight on one engine. The rear seat can be removed in less than two minutes to provide 80 cu. ft. of unobstructed stowage space. The model can be converted into an ambulance plane with room for one stretcher and attendant in the rear seat. The cabin has been built so that a hatch can be cut in the floor for camera installation. Flap and landing gear controls are shaped as an airfoil and wheel respectively for positive identification.

Piper PA-22 Tri-Pacer

TYPE • Four-place

DESIGNATION • PA-22

SPECIFICATIONS • Span 29.3 ft.; Length 20.4 ft.; Height 6.2 ft.; Empty Weight 1100 lb.; Gross Weight 2000 lb.; Wing Loading 13.5 lb. per sq. ft.; Power Loading 13.3 lb. per bhp; Engine Lycoming O-320, 150 hp at 2700 rpm takeoff; Fuel Capacity 36 gal.; Propeller Aeromatic or Sensenich controllable pitch; Gear tricycle.

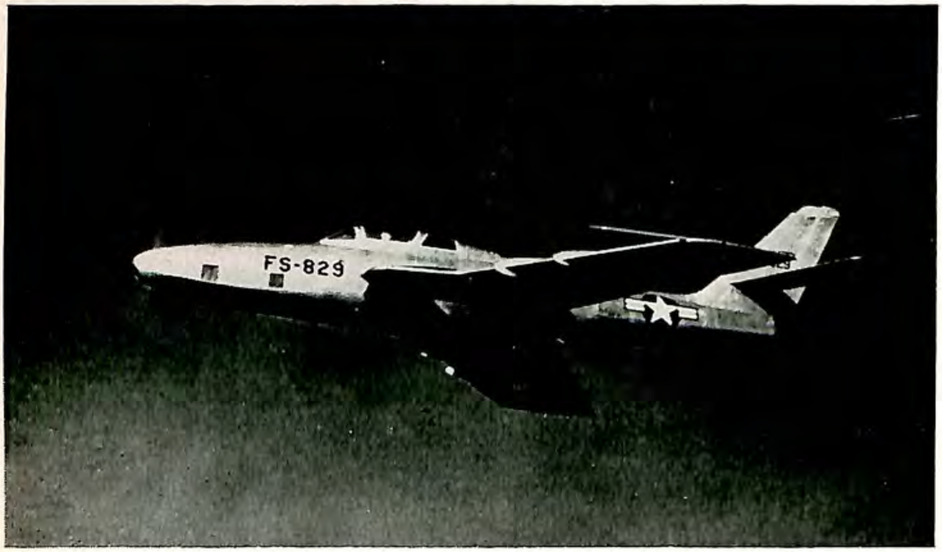
PERFORMANCE • Maximum Speed 137 mph; Cruise Speed 123 mph at 75 percent power at 7,000 ft.; Landing Speed 48 mph; Rate of Climb 800 fpm at S. L.; Service Ceiling 15,500 ft.

REMARKS

Tri-Pacer offers auxiliary gas tank 8 gals. As optional equipment. Production continued heavy on the Tri-Pacer during 1955.

REPUBLIC AVIATION CORP.

Farmingdale, L. I., N. Y.

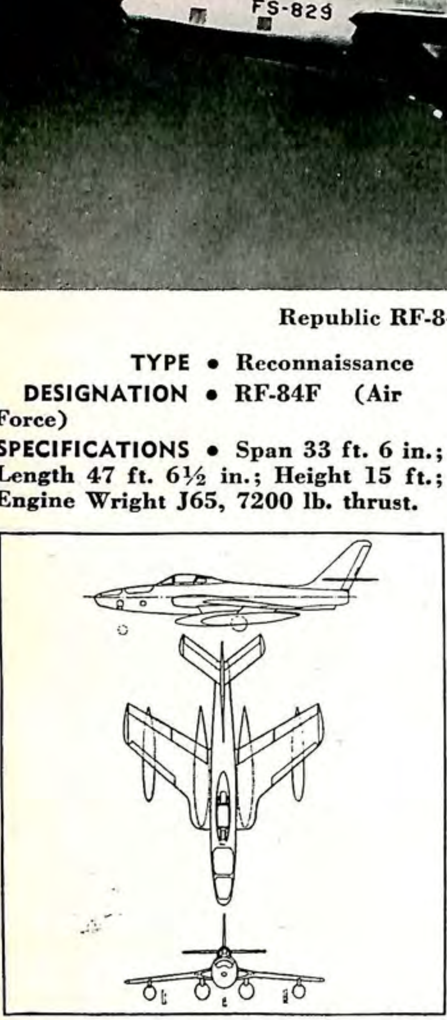


Republic RF-84F Thunderflash

TYPE • Reconnaissance

DESIGNATION • RF-84F (Air Force)

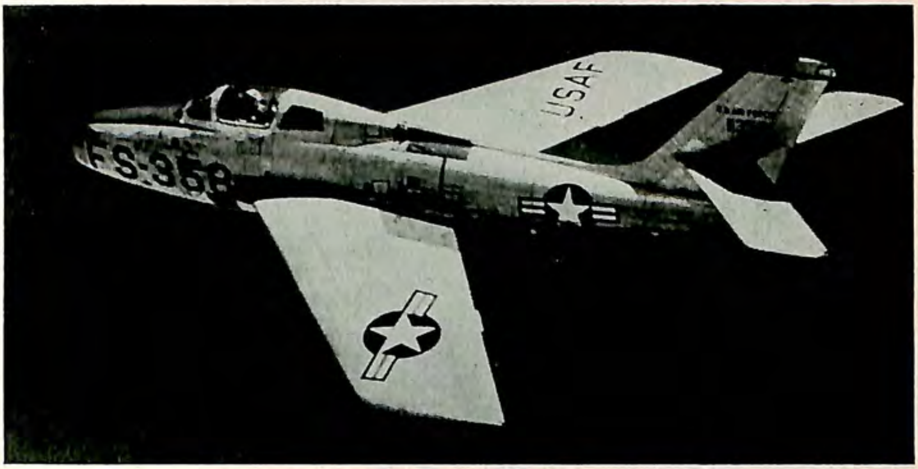
SPECIFICATIONS • Span 33 ft. 6 in.; Length 47 ft. 6½ in.; Height 15 ft.; Engine Wright J65, 7200 lb. thrust.



PERFORMANCE • Maximum Speed more than 650 mph; Service Ceiling over 45,000 ft.; Range with Maximum Fuel Load over 2000 mi.

REMARKS

The RF-84F Thunderflash is the first reconnaissance aircraft equipped with the whole combination of standard aerial cameras plus the dicing camera. It is also the first fighter-type aircraft equipped with the Tri-Metrogon camera. The RF-84F was designed to meet requirements for a high speed, high or low altitude, day or night photo plane capable of getting vital intelligence photos. It mounts four .50 caliber machines guns to fight its way to and from the target—if necessary. Wing root air intakes enable installation of a sweep variety of cameras from among 15 day and night types. Teamed with the Convair B-36 carrier plane in the composite known as FICON, it joins the 10,000-mile range of the bomber with its own 2,000-mile range, speed and maneuverability. It can take off and land from the mother plane in mid-air. The Thunderflash serves in the U. S. Air Force and the air forces of NATO nations.



Republic F-84F Thunderstreak

TYPE • **Fighter bomber**

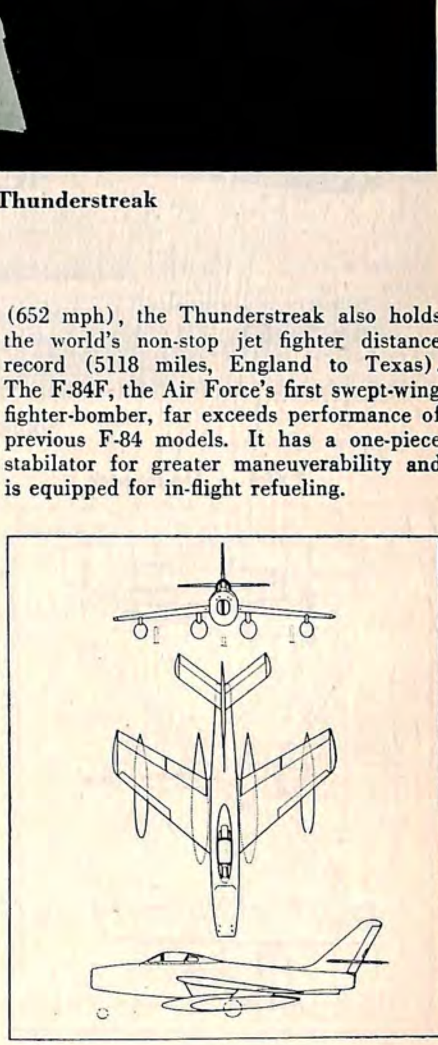
DESIGNATION • **F-84F (Air Force)**

SPECIFICATIONS • **Span 33 ft. 6 in.; Length 43 ft. 4 in.; Height 14 ft. 4 in.; Gross Weight 25,000 lb.; Engine Wright J65-W-3, 7200 lb. thrust.**

PERFORMANCE • **Maximum Speed more than 650 mph; Service Ceiling 45,000 ft.; Range with Maximum Payload over 2000 mi.**

REMARKS

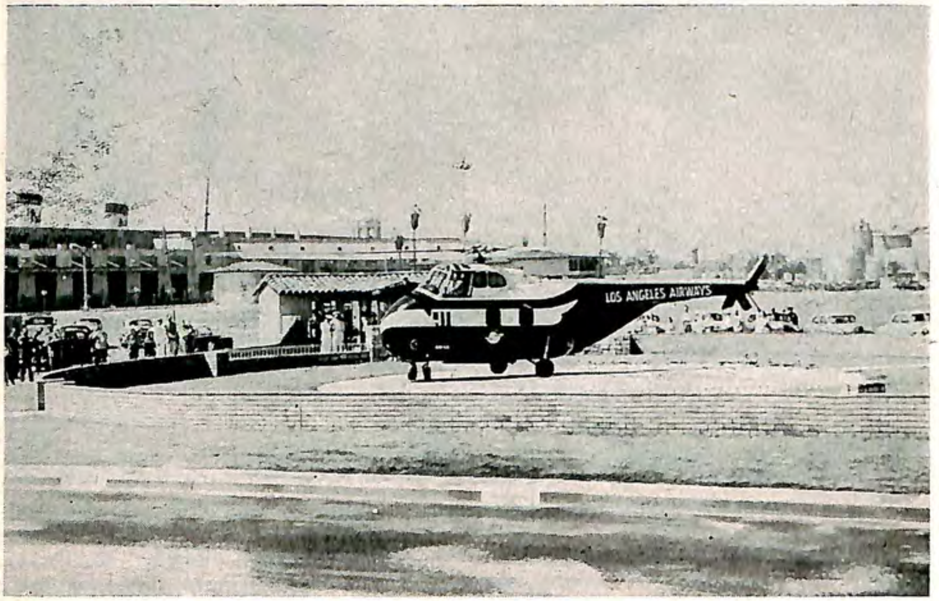
The F84-F has a primary mission as fighter-bomber, but its performance and versatility make it adaptable for interception and escort missions. It is armed with six .50 caliber machine guns and can carry more than 6000 lb. of bombs, rockets and napalm. In addition, it is listed as capable of carrying the atomic bomb. It is in service with six USAF commands and the air forces of NATO nations. Holder of the official U. S. transcontinental speed record (652 mph), the Thunderstreak also holds the world's non-stop jet fighter distance record (5118 miles, England to Texas). The F-84F, the Air Force's first swept-wing fighter-bomber, far exceeds performance of previous F-84 models. It has a one-piece stabilator for greater maneuverability and is equipped for in-flight refueling.



SIKORSKY AIRCRAFT DIVISION

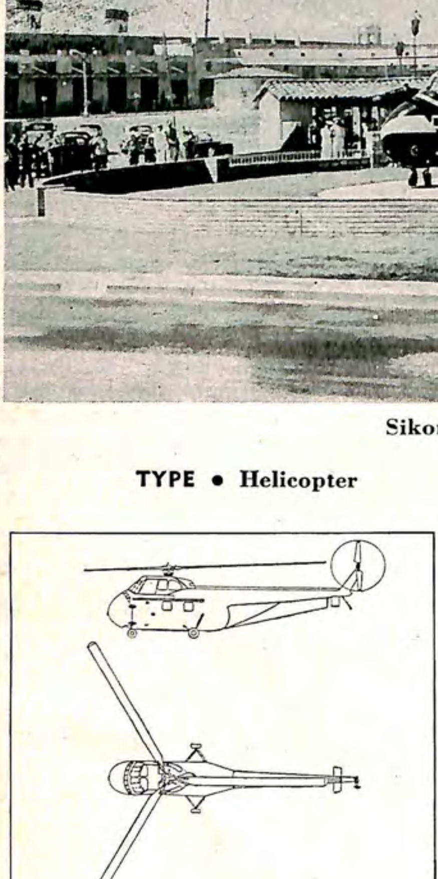
UNITED AIRCRAFT CORP.

Bridgeport, Conn.



Sikorsky S-55

TYPE • Helicopter



DESIGNATION • S-55 (Army); H-19 (Air Force, Army); HRS (Marines); HO4S (Navy, Coast Guard)

SPECIFICATIONS • Main Rotor Diameter 53 ft.; Tail Rotor Diameter 8 ft. 9 in.; Length 42 ft. 2 in; Height 13 ft. 4 in. Empty Weight 4,795 lb.; Gross Weight 7,200 lb.; Engine Pratt & Whitney Wasp S1H2 with 600 bhp; Fuel Capacity 185 gal.

PERFORMANCE • Maximum Speed 101 mph; Cruise Speed 86 mph; Maximum Rate of Climb at Sea Level 780 fpm; Range 405 st.mi.

REMARKS

The S-55 has a seating capacity of crew (pilot and copilot) passengers (military—10 (commercial)—7, with alternate cargo capacity of 340 cubic feet. Military models have Wright R1300 engine.

Sikorsky XH-39

TYPE • Helicopter

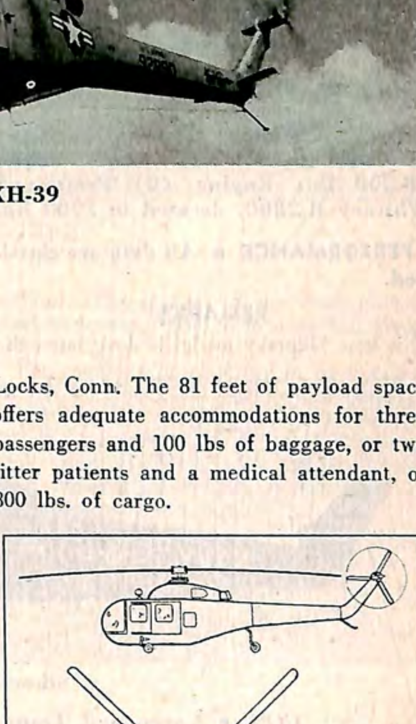
DESIGNATION • S-59
XH-39 (Army)

SPECIFICATIONS • Main Rotor Diameter 35 ft.; Tail Rotor Diameter 6 ft. 4 in.; Length 30 ft. 3 in.; Height 9 ft. 8 in.; Empty Weight 2,200 lb.; Gross Weight 3625 lb.; Engine Turbomeca Artouste II with maximum power rating 425 hp at 35,000 rpm, continous power rating 323 hp at 35,000 rpm.

PERFORMANCE • High speed at sea level 127 knots, cruising 120 knots; Maximum rate of climb 2300 fpm; Cruising range 290 miles.

REMARKS

The XH-39 set the world's speed record for helicopters when it flew at 156.005 mph over the 3 kilometer course at Windsor Locks, Conn. The 81 feet of payload space offers adequate accommodations for three passengers and 100 lbs of baggage, or two litter patients and a medical attendant, or 800 lbs. of cargo.



Sikorsky HR2S

TYPE • **Transport**

DESIGNATION • **HR2S-1 (Navy)**

SPECIFICATIONS • **Rotor diameter 72 ft.; Length 60 ft.; Gross Weight 28,500 lb.; Engine (2) Pratt and Whitney R-2800, derated to 1900 hp.**

PERFORMANCE • **All data are classified.**

REMARKS

This new Sikorsky model is designated the S-56 commercially. The HR2S-1 carries two Marine squads (26 ment) or three jeeps plus crew. Commercial version, projected for 1958-59, will carry 34 passengers in airline service. Rotor and tail fold for carrier stowage. Autopilot and anti-icing equipment are standard. Clam-shell nose doors permit cargo and troop loading with greater ease than in previous side door loading models. Retractable main landing gear is the first on a production helicopter. Five bladed main rotor and four bladed tail rotor are all-metal and fold mechanically for stowage.

Sikorsky HSS-1

TYPE • **Cargo and Transport Helicopter Anti-Submarine**

DESIGNATION • **S-58 HSS-1 (Navy); H-34 (Army); HUS (Marines)**

SPECIFICATIONS • **Length 47 ft. 2 in. (Tail Pylon not Folded); Height 14 ft. 2 in.; Empty Weight 7530 lb. (With Standard Equipment); Gross Welight 12,600 lb.; Payload 5070 lb.; Engine Wright Cyclone C-9, 1275 hp normal rated at 2500 rpm or 1425 hp at 2800 rpm takeoff; Fuel Capacity 220 gal.; Main Rotor Diameter 56 ft.; Main Tires 11.00 x 12; Tail Wheel 6.00 x 6.**

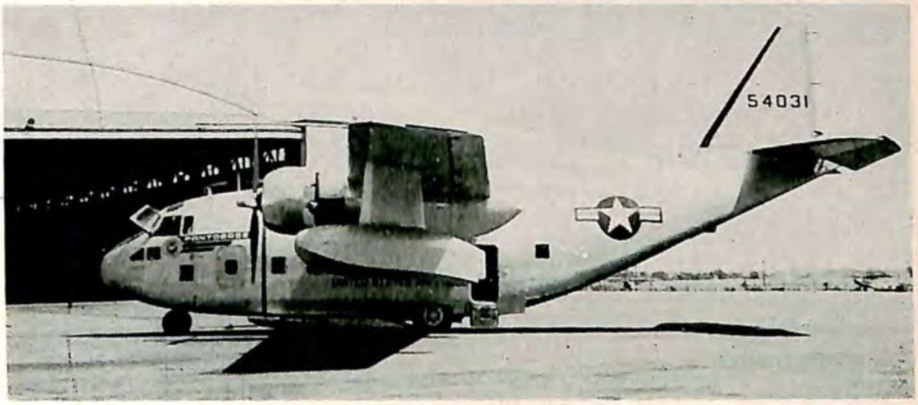
PERFORMANCE • **Maximum Speed 115 mph at 1275 hp at 2500 rpm at 3500 ft.; Cruise Speed 90 mph at 2500 rpm; Maximum Rate of climb 1100 fpm at S. L.**

REMARKS

Specifications and performance data of the HSS-1, Navy version using a Wright R-1820 engine are classified.

STROUKOFF AIRCRAFT CORP.

West Trenton, N. J.



Stroukoff YC-123-E

TYPE • Assault transport

DESIGNATION • MS-18
YC-123E (USAF)

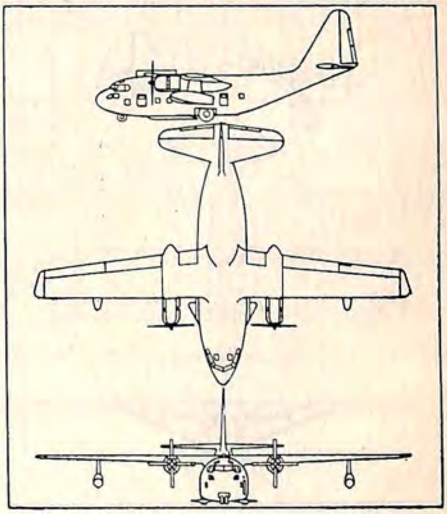
SPECIFICATIONS • Span 110 ft.; Length 72 ft. 2 in.; Height 32 ft. 10 in.; Gross Weight 52,600 lb.; Engines (2) Pratt and Whitney R-2800-99W; Propeller Hamilton Standard 4-blade; Wing Area 1223.2 sq. ft.

PERFORMANCE • Cruise Speed 179 mph; Range 1500 mi.

REMARKS

The YC-123E represents the latest design by the Stroukoff Aircraft Corporation of its C-123 series transports for the United States Air Force. The first flight demonstration took place at the air base of the U. S. Naval Aircraft Station in Philadelphia. The ship performs successfully from both land and water and is capable of landing or taking off from ice, snow, sand or unprepared natural landing surfaces, as well. The familiar wing tip floats of a seaplane are on the wings of the YC-123E, but absent are the usual massive boat hull or main floats. Instead, two water skis are tucked up underneath the belly of the plane in flight and during land operations, then lowered a couple of feet for water operations. The bottom of the fuselage has been made watertight to provide full buoyancy.

The company is currently in production, for the Air Force, of a service test quantity of military air transports, which will incorporate the Stroukoff designed Boundary Layer Control Wing, with the Pantobase gear, creating an entirely new concept of close-in support aircraft.



TAYLORCRAFT, INC.

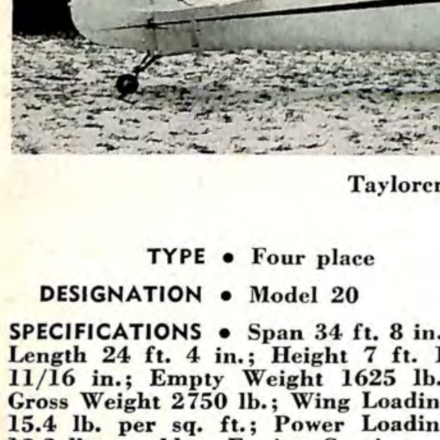
Conway, Pa.

Taylorcraft Model 20

TYPE • **Four place**

DESIGNATION • **Model 20**

SPECIFICATIONS • **Span 34 ft. 8 in.; Length 24 ft. 4 in.; Height 7 ft. 1-11/16 in.; Empty Weight 1625 lb.; Gross Weight 2750 lb.; Wing Loading 15.4 lb. per sq. ft.; Power Loading 12.2 lb. per bhp; Engine Continental O-470-J, 225 hp normal rated; Fuel Capacity 66 gal.; Propeller McCauley, fixed; Main Tire 7.00 x 6 Cleveland C2000H; Wing Area 178.5 sq. ft.; Aileron Area 14.38 sq. ft.; Flap Area 14.3 sq. ft.; Fin Area 9.35 sq. ft.; Rudder Area 9.36 sq. ft.; Stabilizer Area 15.84 sq. ft.; Elevator Area 13.98 sq. ft.**



PERFORMANCE • **Maximum Speed 160 mph at 100 percent hp at 2550 rpm at S. L.; Cruise Speed 150 mph at 70 percent hp at 2450 rpm at S. L.; Landing Speed 60 mph; Rate of climb 1000 fpm at S. L.; Service Ceiling 15,000 ft.; Absolute Ceiling 16,000 ft.; Range with Maximum Payload 300 mi.; Range with Maximum Fuel Load 675 mi.**

REMARKS

This advanced structural achievement in aircraft manufacturing has been made possible through the development of molded fiberglas, the first all new aircraft structural tural material to be perfected in over 30 years. Wings, fuselage, cowl, doors, seats, gas tanks and other structures of the new Taylorcraft models are made of molded fiberglas. A bridge-type frame of welded steel tubing together with the fiberglas structure forms a rugged fuselage of unequaled safety. This same regard for safety has been engineered in the wing and tail structures.

TEMCO AIRCRAFT CORP.

Dallas, Tex.

Temco D-16A

TYPE • **Four place**

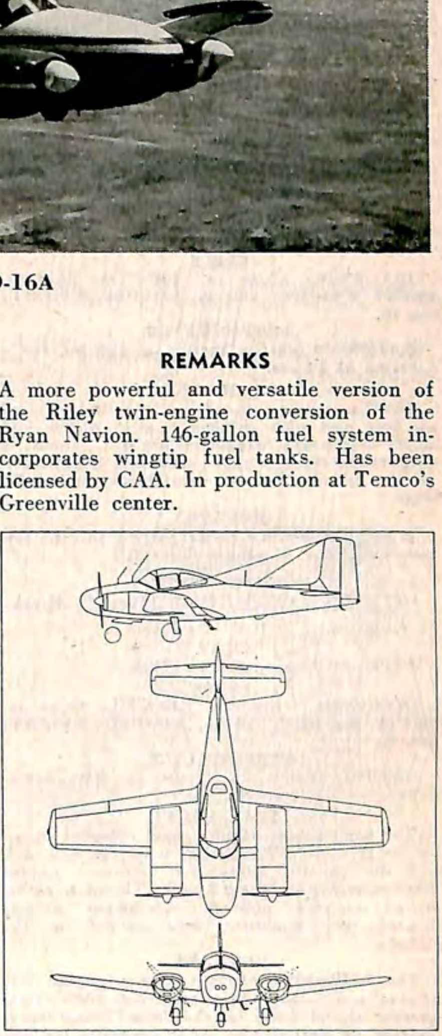
DESIGNATION • **D-16A**

SPECIFICATIONS • **Span 33 ft. 4½ in.; Length 27 ft. 2 in.; Height 9 ft. 6½ in.; Empty Weight 2350 lb.; Gross Weight 3600 lb.; Wing Loading 20.2 lb. per sq. ft.; Power Loading 10.6 lb. per bhp; Engines (2) O-340-A1A Lycoming, 170 hp (each) normal rated, or 170 hp at 2700 rpm takeoff; Fuel Capacity 146 gal.; Propeller Hartzell HC82X6 full feather constant speed; Main Tire 7.00 x 6, 6 ply; Nose Tire 6.00 x 6, 6 ply; Wing Area 178.3 sq. ft.**

PERFORMANCE • **Maximum Speed 180 mph at 340 hp at 2700 rpm at S. L.; Cruise Speed 170 mph at 238 hp at 70 percent power at 7000 ft.; Landing Speed 60 mph (flaps down/stall with 2 engines); Rate of climb 1400 fpm at S. L.; Service Ceiling 20,000 ft.; Absolute Ceiling 21,000 ft.; Range with Maximum Payload 900 miles with 106 gal. fuel system; Range with Maximum Fuel Load 1200 mi. with 146 gal. fuel system.**

REMARKS

A more powerful and versatile version of the Riley twin-engine conversion of the Ryan Navion. 146-gallon fuel system incorporates wingtip fuel tanks. Has been licensed by CAA. In production at Temco's Greenville center.



CHAPTER TEN

Engines in Production

The following list of aircraft engines includes only those in production during the year. Unless otherwise noted the specifications are the manufacturers'.

AEROJET-GENERAL CORP.

Azusa, Calif.

MODEL: 14AS-1000 Jet-Assisted Takeoff (JATO) Unit.

DATA

TYPE: Solid-propellant rocket.

SPECS

DIAMETER: 10.25 in. **LENGTH:** 35.4 in. **EMPTY WEIGHT:** 120 lb. **LOADED WEIGHT:** 200 lb.

PERFORMANCE

RATING: 1,000 lb. thrust, or 330 hp, for a duration of 14 sec.

EQUIPMENT

JATO motor consists of a steel cylinder closed on fore end with exhaust nozzle, igniter and safety diaphragm located on aft end. Thrust is transmitted through three mounting lugs welded on the cylinder to the aircraft attachment fittings.

REMARKS

A reliable low-cost rocket engine for the jet-assisted takeoff of piloted aircraft.

MODEL: 15KS-1000 Aircraft Rocket Engine.

DATA

TYPE: Solid-propellant rocket.

SPECS

DIAMETER: 10.30 in. **LENGTH:** 33.45 in. **EMPTY WEIGHT:** 72 lb. **LOADED WEIGHT:** 144 lb.

PERFORMANCE

RATING: 1,000 lb. thrust, or 400 horsepower, for 15 seconds.

EQUIPMENT

The engine consists of a steel cylinder closed on the fore end. The igniter is on the fore end, and the exhaust nozzle and pressure release diaphragm are on the aft end. Thrust is transmitted to the aircraft attachment fittings through two mounting lugs welded on the cylinder.

REMARKS

The 15KS-1000 aircraft rocket engine was originally developed as a smokeless JATO (jet-assisted takeoff unit) for the United States Navy, Bureau of Aeronautics. It is currently the only rocket engine certificated by the CAA for use as standby power on business and commercial aircraft.

MODEL: 5KS-4500 Jet-Assisted Takeoff (JATO) Unit Motor.

DATA

TYPE: Solid-propelant rocket.

SPECS

DIAMETER: 9.38 in. **LENGTH:** 54.31 in. **EMPTY WEIGHT:** 111 lb. **LOADED WEIGHT:** 225 lb.

PERFORMANCE

RATING: 4,500 lb. thrust for 5 seconds.

EQUIPMENT

The engine consists of a steel cylinder closed on the fore end. The igniter is on the fore end, and the canted exhaust nozzle and the pressure release diaphragm are on the aft end. Thrust is transmitted to the aircraft attachment fittings by two mounting lugs welded on the cylinder.

REMARKS

5KS-4500 units are used for the assisted takeoff of carrier-based aircraft, or whenever high thrust is required for short duration. These engines are also employed to propel high-velocity deceleration sleds.

MODEL: AJ10-24 Booster rocket engine.

DATA

TYPE: Liquid bi-propellant rocket, gas or chemically pressurized.

SPECS

DIAMETER: 15 in. **LENGTH:** 130 in.

EQUIPMENT

Assembly consists of a cylindrical section which contains the oxidizer, fuel and pressurizing tanks. The pressure regulator and rocket motor are attached to the tank section.

REMARKS

This powerplant is used to propel the Aerobee high-altitude sounding rocket in investigations of the upper atmosphere.

AIRCOOLED MOTORS, INC.

Syracuse, N. Y.

MODEL: Franklin 6AG4-185B12.

DATA

TYPE: 6 cylinder, air-cooled, horizontally opposed. **CAA TYPE CERTIFICATE:** 238.

SPECS

LENGTH: 40 19/32 in. **FUEL GRADE:** 80 octane. **BORE:** 4.5 in. **STROKE:** 3.5 in. **DISPLACEMENT:** 335 cu. in. **COMPRESSION RATIO:** 7:5:1. **DRY WEIGHT:** 360 lbs. with hub and accessories. **WEIGHT PER HP:** 1.86 lbs.

PERFORMANCE

TAKE-OFF POWER, 185 hp at 3,100 rpm **CRUISE:** 135 hp. **FUEL CONSUMPTION:** .51 lbs. per hp hr. **OIL CONSUMPTION:** .002 lbs.

EQUIPMENT

CARBURETOR: Marvel-Schebler MA4-5 or Bendix PS5-C. **IGNITION:** Dual Scintilla. **STARTER:** Delco-Remy. **GENERATOR:** Delco-Remy. **FUEL PUMP:** A. C.

MODEL: Franklin 6A4-165-B3.

DATA

TYPE: 6 cylinder, air-cooled, horizontally opposed. **CAA TYPE CERTIFICATE:** 238.

SPECS

LENGTH: 27 13/32 in. **FUEL GRADE:** 80 octane. **BORE:** 4.5 in. **Stroke:** 3.5 in. **DISPLACEMENT:** 335 cu. in. **COMPRESSION RATIO:** 7:1. **DRY WEIGHT:** 324 lb. with hub and accessories. **WEIGHT PER HP:** 1.97 lb.

PERFORMANCE

TAKE-OFF POWER: 165 hp at 2,800 rpm. **CRUISE:** 124 hp at 2,200 rpm. **FUEL CONSUMPTION:** .5 lb. per hp hr. **OIL CONSUMPTION:** .002 lb. per hp hr.

EQUIPMENT

CARBURETOR: Marvel-Schebler MA4-5 or Bendix PS5-C. **IGNITION,** Dual Scintilla S6N21. **STARTER:** Delco-Remy. **GENERATOR:** Delco-Remy. **FUEL PUMP:** AC.

MODEL: Franklin 6V4-200-C32, C33.

DATA

TYPE: 6 cylinder, air-cooled, horizontally opposed. **CAA TYPE CERTIFICATE:** 244.

SPECS

LENGTH: 29 1/32 in. **FUEL GRADE:** 91 octane. **BORE:** 4.5 in. **STROKE:** 3.5 in. **DISPLACEMENT:** 335 cu. in. **COMPRESSION RATIO:** 8.5:1. **DRY WEIGHT:** 333 lb. with hub and accessories. **WEIGHT PER HP:** 1.66 lb.

PERFORMANCE

TAKE-OFF POWER: 200 hp. **FUEL CONSUMPTION:** .52 lb. per hp hr. **OIL CONSUMPTION:** .002 lb. per hp hr.

EQUIPMENT

CARBURETOR: Marvel-Schebler MA4-5 or Bendix PS5-C. **IGNITION:** Dual Scintilla S6-RN21. **STARTER:** Delco-Remy. **GENERATOR:** Delco-Remy. **FUEL PUUMP:** Weldon.

REMARKS

This model was designed for helicopter installations.

MODEL: Franklin 6V4-178-B32 and B-33.

DATA

TYPE: 6 cylinder, air-cooled, horizontally opposed; 178 hp; **CAA TYPE CERTIFICATE:** 244.

SPECS

LENGTH: 34¾ in. **FUEL GRADE:** 80 octane. **BORE:** 4.5 in. **STROKE:** 3.5 in. **DISPLACEMENT:** 335 cu. in. **COMPRESSION RATIO:** 7:1. **DRY WEIGHT:** 308 lb. with hub and accessories. **WEIGHT PER HP:** 1.73 lb.

PERFORMANCE

TAKE-OFF POWER: 178 hp. **FUEL CONSUMPTION:** .52 lb. per hp hr. **OIL CONSUMPTION:** .002 lb. per hp hr.

EQUIPMENT

CARBURETOR: Marvel-Schebler MA4-5 or Bendix PS5-C. **IGNITION,** Dual Scintilla S6RN21. **STARTER:** Delco-Remy. **GENERATOR:** Delco-Remy. **FUEL PUMP:** Weldon. Designed for helicopter installation.

MODEL: Franklin 6V6-245-B16F.

DATA

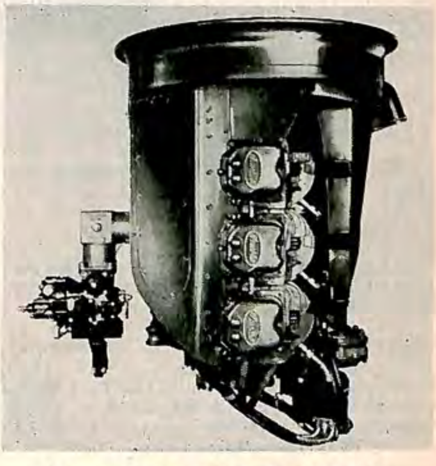
TYPE: 6 cylinder, air-cooled, horizontally opposed. **CAA TYPE CETIFICATE:** 258.

SPECS

LENGTH: 39 7/32 in. **FUEL GRADE:** 80 octane. **BORE:** 4.75 in. **STROKE:** 4 in. **DISPLACEMENT:** 425 cu. in. **COMPRESSION RATIO:** 7.5:1. **DRY WEIGHT:** 353 lb. with hub and accessories. **WEIGHT PER HP:** 2.26 lb.

PERFORMANCE

TAKE-OFF POWER: 245 hp at 3,275 rpm.



Franklin O-425-1 (Military) 6V6-245-B16F (Commercial)

FUEL CONSUMPTION: .52 lb. per hp hr. OIL CONSUMPTION: .002 lb. per hp hr.

EQUIPMENT

CARBURETOR: Bendix PS-7BD, IGNITION: Dual Eisemann LA-6. Designed for helicopter installation.

MODEL: Franklin 6A4-150-B3.

DATA

TYPE: 6 cylinder, air-cooled, horizontally opposed. CAA TYPE CERTIFICATE: 238.

SPECS

LENGTH: 37⅜ in. FUEL GRADE: 80 octane. BORE: 4.5 in. STROKE: 3.5 in. DISPLACEMENT: 335 cu. in. COMPRESSION RATIO: 7:1. DRY WEIGHT: 321 lb. with hub and accessories. WEIGHT PER HP: 2.14 lb.

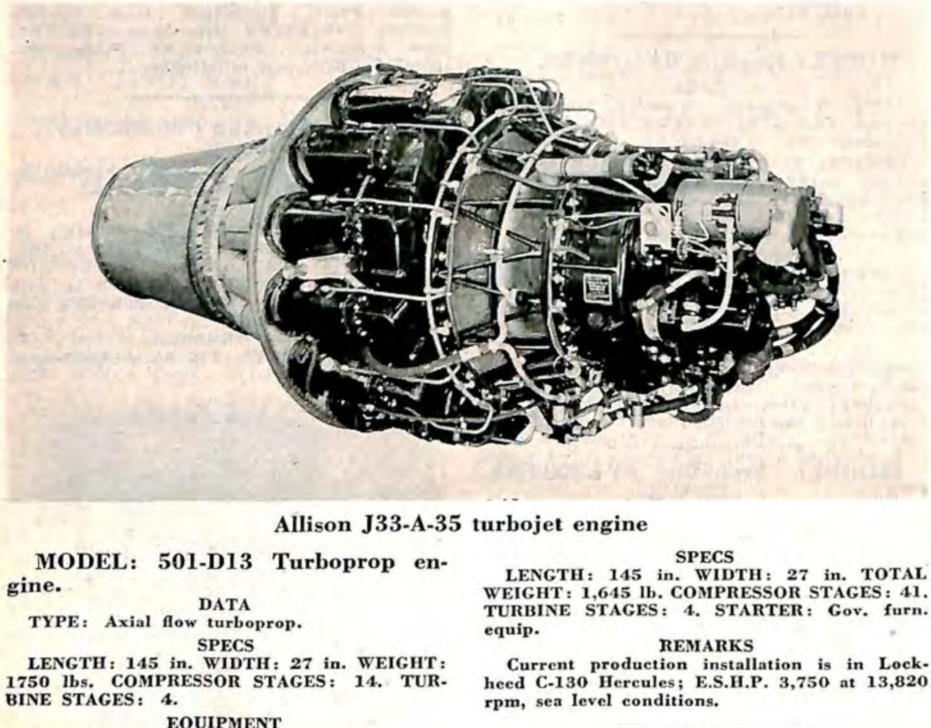
PERFORMANCE

TAKE-OFF POWER: 150 hp at 2,600 rpm. CRUISE: 113 hp at 2,350 rpm. FUEL CONSUMPTION: .5 lb. per hp hr. OIL CONSUMPTION: .002 lb. per hp hr.

EQUIPMENT

CARBURETOR: Marvel-Schebler MA-3SPA. IGNITION: Dual Eisemann LA-6 or Scintilla S6RN21. STARTER: Delco-Remy. GENERATOR: Delco-Remy. FUEL PUMP: A. C.

ALLISON DIVISION
GENERAL MOTORS CORP.
Indianapolis, Ind.



Allison J33-A-35 turbojet engine

MODEL: 501-D13 Turboprop engine.

DATA

TYPE: Axial flow turboprop.

SPECS

LENGTH: 145 in. WIDTH: 27 in. WEIGHT: 1750 lbs. COMPRESSOR STAGES: 14. TURBINE STAGES: 4.

EQUIPMENT

STARTER: Air turbine.

REMARKS

Scheduled for installation in Lockheed Electra commercial transport; ESHP 3,750 at 13,820 rpm, sea level conditions.

MODEL: T56-A-1.

DATA

TYPE: Axial flow turbo-prop.

SPECS

LENGTH: 145 in. WIDTH: 27 in. TOTAL WEIGHT: 1,645 lb. COMPRESSOR STAGES: 41. TURBINE STAGES: 4. STARTER: Gov. furn. equip.

REMARKS

Current production installation is in Lockheed C-130 Hercules; E.S.H.P. 3,750 at 13,820 rpm, sea level conditions.

MODEL: J33-A-35.

DATA

TYPE: Centrifugal flow turbo-jet.

SPECS

LENGTH: 106 in. WIDTH: 48 in. TOTAL WEIGTH: 1,820 lb. COMPRESSOR STAGES: dual inlet single. TURBINE STAGES: 1. STARTER: Gov. furn. equip.

REMARKS

Current production installation is in Lockheed T-33A trainer; Thrust 4,600 lbs. max. at sea level.

MODEL: J33-A-20.

DATA

TYPE: Centrifugal flow turbo-jet.

SPECS

LENGTH: 105 in. WIDTH: 48 in. TOTAL WEIGHT: 1,800 lb. COMPRESSOR STAGES: dual inlet single. TURBINE STAGES: 1. STARTER: Gov. furn. equip.

REMARKS

Current production installation is in Lockheed TV2 trainer; Thrust 4,600 max. at sea level conditions.

MODEL: J33-A-37.

DATA

TYPE: Centrifugal flow turbo-jet.

SPECS

LENGTH: 156 in. WIDTH: 48 in. TOTAL WEIGHT: 1,800 lb. COMPRESSOR STAGES: dual inlet single. TURBINE STAGES: 1. STARTER: Gov. furn. equip.

REMARKS

Current production installation is in Martin TM-61A & C Matador. Thrust 4,600 lbs. max. at sea level conditions.

MODEL: J33-A-18A.

DATA

TYPE: Centrifugal flow turbo-jet.

SPECS

LENGTH: 94 in. WIDTH: 49 in. TOTAL WEIGHT: 1,790 lb. COMPRESSOR STAGES: dual inlet single. TURBINE STAGES: 1. STARTER: Gov. furn. equip.

REMARKS

Current production installation is in Chance Vought Regulus; Thrust 4,600 lbs. max. at sea level conditions.

MODEL: J71-A-11.

DATA

TYPE: Axial flow turbo-jet.

SPECS

LENGTH: 192 in. WIDTH: 40 in.

REMARKS

Current production installation is in Douglas B-66 bomber and RB-66 reconnaissance bomber.

MODEL: J71-A-2.

DATA

TYPE: Axial flow turbo-jet.

SPECS

LENGTH: 285 in. WIDTH: 42 in.

REMARKS

Current production installation is in McDonnell F3H-2N Demon.

CONTINENTAL MOTORS CORP.

Muskegon, Mich.

MODEL: XT 51-T-5.

DATA

TYPE: Shaft Turbine.

SPECS

LENGTH: 47.0 in. WIDTH: 16.5 in. TOTAL WEIGHT: 460 lb. COMPRESSOR STAGES: 1. TURBINE STAGES: 2.

PERFORMANCE

TAKEOFF: Shaft hp, 400, rpm 35,000; SFC 1.00; NORMAL: Shaft hp 328, rpm 33,800, SFC 1.11.

REMARKS

Possible installation: Helicopters, turboprops, pump and generator drives.

MODEL: J 69-T-9.

DATA

TYPE: Turbojet.

SPECS

LENGTH: 50.5 in. WIDTH: 27.0 in. TOTAL WEIGHT: 364 lb. COMPRESSOR STAGES: 1. TURBINE STAGES: 1. STARTER: Breeze.

PERFORMANCE

TAKEOFF: Thrust (lb.) 920, rpm 22,700, SFC 1.13; NORMAL: Thrust (lb.) 725, rpm 21,000, SFC 1.06.

REMARKS

Current production installation: Cessna T-37 USAF Intermediate Trainer Aircraft.

MODEL: J 69-T-19.

DATA

TYPE: Turbojet.

SPECS

LENGTH: 43.3 in. WIDTH: 22.3 in. TOTAL WEIGHT: 349 lb. COMPRESSOR STAGES: 1. TURBINE STAGES: 2.

PERFORMANCE

TAKEOFF: Thrust (lb.) 1,000, rpm 21,250, SFC 1.27; NORMAL: Thrust (lb.) 795, rpm 20,000, SFC 1.25.

REMARKS

Current production installation: Ryan Q-2 Target Drone.

MODEL: XT 51-T-1

DATA

TYPE: Shaft Turbine.

SPECS

LENGTH: 23.0 in. WIDTH: 20.5 in. TOTAL WEIGHT: 215 lb. COMPRESSOR STAGES: 1. TURBINE STAGES: 2.

PERFORMANCE

TAKEOFF: Shaft hp 280, rpm 35,000, SFC .97; NORMAL: Shaft hp 260; rpm 35,000; SFC 1.07.

REMARKS

Current experimental installation: Cessna XL-19C Liaison Aircraft and Bell XH-13F Helicopter.

MODEL: XT 51-T-3.

DATA

TYPE: Shaft Turbine.

SPECS

LENGTH: 44.3 in. WIDTH: 23.2 in. TOTAL WEIGHT: 250 lb. COMPRESSOR STAGES: 1. TURBINE STAGES: 2.

PERFORMANCE

TAKE-OFF: Shaft hp 425, rpm 34,800, SFC .98.

REMARKS

Current experimental installation: Sikorsky XH-39 Helicopter.

MODEL: 320.

DATA

TYPE: Turbo-jet.

SPECS

LENGTH: 41.6 in. WIDTH: 16 in. TOTAL WEIGHT: 137 lb. COMPRESSOR STAGES: 1. TURBINE STAGES: 1.

PERFORMANCE

TAKE-OFF: Thrust (lb.) 350, rpm 34,000, SFC 1.18; NORMAL: Thrust (lb.) 290, RPM 31,500, SFC 1.10.

REMARKS

Possible installation: Missile or aircraft.

MODEL: 420.

DATA

TYPE: Ducted Fan.

SPECS

LENGTH: 47.7 in. WIDTH 25.9 in. TOTAL WEIGHT: 315 lb. COMPRESSOR STAGES: 1. TURBINE STAGES: 2.

PERFORMANCE

TAKE-OFF: Thrust (lb.) 790, rpm 34,500, SFC .55; NORMAL: Thrust (lb.) 660, RPM 34,500, SFC .53.

REMARKS

Possible application: Propulsion of aircraft or missiles. (A version of this engine is being used as an air pump in experimental boundary layer control application.)

MODEL: FSO-470-A.

DATA

TYPE: 6 Cylinders, Supercharged, Fan Cooled, Horizontally opposed. CAA TYPE CERTIFICATE: 281.

SPECS

LENGTH: 39.64 in. WIDTH: 33.62 in. DISPLACEMENT: 471 in. BORE: 5.00 in. STROKE: 4.00 in. COMPRESSION RATIO: 6.0:1. FUEL GRADE: 91/96. DRY WEIGHT: 583.39 lb. CARBURETOR: Bendix #PSH7BD. MAGNETO: Scintilla #S6RN-26. STARTER: Delco Remy #X11046, 24. PERFORMANCE RATING: 260 hp at 3,000 rpm at sea level.

REMARKS

Current installation: Cessna Aircraft (Helicopter).

MODEL: O-470-B.

DATA

TYPE: 6 Cylinder, Air-Cooled, Horizontally opposed, CAA TYPE CERTIFICATE: 273.

SPECS

LENGTH: 43.31 in. WIDTH: 33.62 in. DISPLACEMENT: 471 in. BORE: 5.00 in. STROKE: 4.00 in. COMPRESSION RATIO: 8.0:1. FUEL GRADE: 91/96. DRY WEIGHT: 450 lb. CARBURETOR: Bendix #PSD-5C. MAGNETO: Scintilla #S6RN-25. PERFORMANCE RATING: 225 hp at 2,600 rpm at sea level.

REMARKS

Current installation: Cammair Model 480, J. Ray McDiarmid and Company (conversion Grumman Wigon).

MODEL: O-470-J.

DATA

TYPE: 6 Cylinders, Air Cooled, Horizontally opposed, CAA TYPE CERTIFICATE: 273.

SPECS

LENGTH: 36.03 in. WIDTH: 33.32 in. DISPLACEMENT: 471 in. BORE: 5.00 in. STROKE: 4.00 in. COMPRESSION RATIO 7.0:1. FUEL GRADE: 80 Octane. DRY WEIGHT: 415 lb. CARBURETOR: Marvel MA-4-5. MAGNETO: Scintilla S6RN-25. STARTER: Delco Remy. GENERATOR: Delco Remy. PERFORMANCE RATING: 225 hp at 2,550 rpm at sea level.

REMARKS

Current installation: Taylor Craft.

MODEL: O-470-M.

DATA

TYPE: 6 Cylinders, Air-Cooled, Horizontally opposed, CAA TYPE CERTIFICATE: 273.

SPECS

LENGTH: 43.31 in. WIDTH: 33.56 in. DISPLACEMENT: 471 in. BORE: 5.00 in. STROKE: 4.00 in. COMPRESSION RATIO: 8.0:1. FUEL GRADE: 91/96. DRY WEIGHT: 450 lb. CARBURETOR: Bendix #PSD-50. MAGNETO: Scintilla #S6RN-25. STARTER: Delco Remy #11046. GENERATOR: Delco Remy #1118949 24V-15A. PERFORMANCE RATING: 240 hp at 2,600 rpm at sea level.

REMARKS

Current installation: Cessna Aircraft Model 310.

MODEL: O-300-A & B.

DATA

TYPE: 6 Cylinder, Air-Cooled, Horizontally opposed, CAA TYPE CERTIFICATE: 253.

SPECS

LENGTH: 36.38 in. WIDTH: 31.50 in. DISPLACEMENT: 301.37 in. BORE: 4.0625 in. STROKE: 3.875 in. COMPRESSION RATIO: 7.0:1. FUEL GRADE: 80. DRY WEIGHT: 310.88 lb. CARBURETOR: Marvel #MA-3SPA. MAGNETO: Scintilla #S6LN-21. PERFORMANCE RATING: 145 hp at 2,700 rpm at sea level.

REMARKS

Current installation: Cessna Aircraft Model 170 for "A" Series, Model 172 for "B" Series. Both engine series are identical except provisions for controllable prop.

MODEL: O-470-Series K and L.

DATA

TYPE: 6 Cylinder, Air-Cooled, Horizontally opposed, CAA: TYPE CERTIFICATE: 273.

SPECS

LENGTH: 36.03 in. WIDTH: 33.56 in. DISPLACEMENT: 471 in. BORE: 5.00 in. STROKE: 4.00 in. COMPRESSION RATIO: 7.0:1. FUEL GRADE: 80/87. DRY WEIGHT: 438 lb. CARBURETOR: Marvel #MA-4-5. MAGNETO: Scintilla #S6RN-25. STARTER: Delco Remy #10816. GENERATOR: Delco Remy #X1428. PERFORMANCE RATING: 230 hp at 2,600 rpm at sea level.

REMARKS

Current installation: Cessna Aircraft Model 180 for "K" Series and Model 182 for "L" Series. Both engines are identical except for carburetor location.

MODEL: A65-8F.

DATA

TYPE: 4 cylinder, air-cooled, horizontally opposed. CAA TYPE CERTIFICATE: 205.

SPECS

LENGTH: 30.41 in. FUEL GRADE: 73 octane. BORE: 3.875 in. STROKE: 3.625 in. DISPLACEMENT: 171 cu. in. COMPRESSION RATIO: 6.3:1 DRY WEIGHT: 176 lb. with hub and accessories. WEIGHT PER HP: 2.7 lb.

PERFORMANCE

TAKE-OFF POWER: 65 hp at 2,300 rpm. CRUISE: 53 hp at 2,150 rpm. FUEL CONSUMPTION: .49 lb. per hp hr.

EQUIPMENT

CARBURETOR: Stromberg NA-S3B. IGNITION: Eisemann AMA or J. I. Case 4-CAM. FUEL PUMP: A. C. Spark Plug Co.

MODEL: C85-12F.

DATA

TYPE: 4 cylinder, air-cooled, horizontally opposed. CAA TYPE CERTIFICATE: 233.

SPECS

LENGTH: 32 in. FUEL GRADE: 73 octane. BORE: 4.062 in. STROKE: 3.625 in. DISPLACEMENT: 188 cu. in. COMPRESSION RATIO: 6.3:1. DRY WEIGHT: 186 lb. with hub and accessories. WEIGHT PER HP: 2.14 lb.

PERFORMANCE

TAKE-OFF POWER: 85 hp at 2,575 rpm. CRUISE: 63 hp at 2,400 rpm. FUEL CONSUMPTION: 5.4 gal. per hr.

EQUIPMENT

CARBURETOR: Bendix-Stromberg NA-S3A1. IGNITION: Scintilla S4LN-21. STARTER: Delco-Remy. GENERATOR: Delco-Remy. FUEL PUMP: A. C. Spark Plug Co.

MODEL: C90-12F.

DATA

TYPE: 4 cylinder, air-cooled. horizontally opposed. CAA TYPE CERTIFICATE: 252.

SPECS

LENGTH: 31¼ in. FUEL GRADE: 80 octane. BORE: 4.062 in. STROKE: 3.875 in. DISPLACEMENT: 200.91 cu. in. COMPRESSION RATIO: 7:1. DRY WEIGHT: 186 lb. with hub and accessories. WEIGHT PER HP: 2.07 lb.

PERFORMANCE

TAKE-OFF POWER: 90 hp at 2,475 rpm. CRUISE: 68 hp at 2,350 rpm. FUEL CONSUMPTION: .52 lb. per hp hr.

EQUIPMENT

CARBURETOR: Bendix-Stromberg NA-S3A1. IGNITION: Scintilla S4LN-21. STARTER: Delco-Remy. GENERATOR: Delco-Remy. FUEL PUMP: A. C. Spark Plug Co.

MODEL: C145-2.

DATA

TYPE: 6 cylinder, air-cooled, horizontally opposed. CAA TYPE CERTIFICATE: 253.

SPECS

LENGTH: 41 in. FUEL GRADE: 80 octane. BORE: 4.062 in. STROKE: 3.875 in. DISPLACEMENT: 301.37 cu. in. COMPRESSION RATIO: 7:1. DRY WEIGHT: 265 lb. WEIGHT PER HP: 1.77 lb.

PERFORMANCE

TAKE-OFF POWER: 145 hp at 2,700 rpm; CRUISE: 108 hp at 2,450 rpm; FUEL CONSUMPTION: .5 lb. per hp hr.

EQUIPMENT

CARBURETOR: Marvel MA-3SPA. IGNITION: Scintilla S6LN-21. STARTER: Delco-Remy. GENERATOR: Delco-Remy. FUEL PUMP: A. C. Spark Plug Co.

MODEL: E185.

DATA

TYPE: 6 cylinder, air-cooled, horizontally opposed. CAA TYPE CERTIFICATE: 246.

SPECS

LENGTH: 46.66 in. FUEL GRADE: 80 octane. BORE: 5 in. STROKE: 4 in. DISPLACEMENT: 471 cu. in. COMPRESSION RATIO: 7:1. DRY WEIGHT: 350 lb. WEIGHT PER HP: 1.89 lb.

PERFORMANCE

TAKE-OFF POWER: 205 hp at 2,600 rpm. CRUISE: 130 hp at 2,050 rpm. FUEL CONSUMPTION: .5 lb. per hp hr.

EQUIPMENT

CARBURETOR: Bendix-Stromberg PS-5C. IGNITION: Scintilla S6LN-21. STARTER: Provisions for direct cranking starter. GENERATOR: Delco-Remy. FUEL PUMP: Thompson or Romec. This engine also available with full AN accessory section.

MODEL: E-225.

DATA

TYPE: 6 cylinder, air-cooled, horizontally opposed. CAA TYPE CERTIFICATE: 267.

SPECS

LENGTH: 48.4 in. FUEL GRADE: 80/86 octane. BORE: 5 in. STROKE: 4 in.

PERFORMANCE

TAKE-OFF POWER: 225 hp at 2,650 rpm. CRUISE: 170 hp at 2,400 rpm. FUEL CONSUMPTION: .5 lb. per hp hr.

EQUIPMENT

CARBURETOR: Bendix-Stromberg PS-5-C. IGNITION: Scintilla S6LN-21. STARTER: Eclipse Type 397-13. GENERATOR: Delco-Remy. FUEL PUMP: Romec. This engine also available with full AN accessory section.

MODEL: O-470-A.

DATA

TYPE: 6 cylinder, air cooled, horizontally opposed. CAA TYPE CERTIFICATE: 273.

SPECS

FUEL GRADE: 80/86 Octane. BORE: 5 in. STROKE: 4 in. DISPLACEMENT: 471 cu. in. COMPRESSION RATIO: 7.01 to 1. DRY WEIGHT: 357 lbs. WEIGHT PER HP: 1.59 lb.

PERFORMANCE

TAKE-OFF POWER: 225 hp at 2,600 rpm. CRUISE: 175 hp at 2,400 rpm. FUEL CONSUMPTION: .5 lb. per hp hour.

EQUIPMENT

CARBURETOR: Marvel MA-4-5. IGNITION: Bendix-Scintilla S6RN-25. STARTER: Delco-Remy. GENERATOR: Delco-Remy. OIL COOLER: Harrison. FUEL PUMP: Romec. Provisions included for prop. governor.

REMARKS

This model which powers both the new Cessna 180 and 310 is the first of Continental's new 0-470 series to reach production. Among the design improvements are a new oil cooler integrally attached to the crankcase which uses the down flow of air, as do the cylinder fins and a full flow type oil filter mounted within the crankcase at the former location of the screen which it supplants. Supercharging can be provided at minimum cost by the addition of a belt-driven external supercharger. Other models in the series are:

MODEL 0-470-B. Similar to 0-470-A, but with Bendix-Stromberg PS5C carburetor mounted at back of engine. Designed for wing-type installation. PERFORMANCE: 235 hp at 2,600 rpm with compression ratio of 8:7 and 91 Octane fuel. MODEL SO-470. Similar to O-470-B, but with supercharger. Rating: 265 hp at 2,600 rpm at 10,000 ft. for take-off and normal rating. MODEL GSO-470. Similar to SO-470, but with geared prop. drive. Rating: 300 hp at 3,000 rpm at 10,000 ft. take-off and normal rating.

MODEL: Continental Model 140.

DATA

TYPE: Gas Turbine Air Compressor.

SPECS

DIAMETER: 19.7 in. LENGTH: 41.8 in. COMPRESSOR: single-sided, centrifugal. TURBINE: two-stage, solid disc, axial flow. COMBUSTOR: Annular, straight-through flow. AIR DELIVERY: 2.3 lb sec. at 50 psi, std. day. WEIGHT: 210 lb.

PERFORMANCE

AIR HP: 205 at 34,000 rpm, std. day. TOTAL AIR FLOW: 6.8 lb. sec., std. day. FUEL FLOW: 280 lb. hr. at max. rpm, std. day. TURBINE EXIT TEMP.: 1025° F at 34,000 rpm, 205 air hp.

REMARKS

The air generator is presently being used as a starting unit for F-100, F-101, and F-102 aircraft.

FAIRCHILD ENGINE DIVISION
FAIRCHILD ENGINE & AIRPLANE CORP.

Deer Park, Long Island, New York

MODEL: J44

DATA

TYPE: Turbojet.

SPECS

LENGTH: 82 in. WIDTH: 22 in. TOTAL WEIGHT: 335 lb. COMPRESSOR STAGES: 1. TURBINE STAGES: 1.

PERFORMANCE

STATIC THRUST: 1,000 lb. at 15,780 rpm. NORMAL RATED THRUST: 1,000 lb. at 15,780 rpm. AFTERBURNER THRUST: None.

EQUIPMENT

STARTER: Comp. Air or Electric.

GENERAL ELECTRIC CO.

Cincinnati, Ohio

MODEL: J47-GE-25.

DATA

TYPE: Axial flow turbojet.

SPECS

WEIGHT: 2,500 lbs. (approx.); LENGTH; 145 in.; DIAMETER: 36.75 in.; COMPRESSION RATIO: 5.35 : 1; COMPRESSOR STAGES: 12; TURBINE: Single Stage; INLET AIR FLOW: 103.5 lbs. per sec.

PERFORMANCE

Dry Thrust: Over 5,970 lbs. Water Alcohol Injection For Take-Off: Over 6,970 lbs. Specific Fuel Consumption: 1,060 lb./hr./lb. thrust.

MODEL: J73.

DATA

TYPE: Axial flow turbojet.

SPECS

DIAMETER: 36.75 in. length: 146 in.

PERFORMANCE

STATIC THRUST: 9,000 lb. thrust class. Detailed performance information is classified.

LYCOMING DIVISION
AVCO MFG. CORP.
Stratford, Conn.

MODEL: SO-580-A1B (O-580-3).

DATA

TYPE: 8 cylinder, air cooled, opposed, supercharged, for horizontal or vertical helicopter installation, 400 hp CAA TYPE CERTIFICATE: 285.

SPECS

LENGTH: 46.67. WIDTH: 33.12. HEIGHT: 24.58. BORE: 4.875. STROKE: 3.875. COMPRESSION RATIO: 7.3:1. DISPLACEMENT: 578 cu. in. WEIGHT: 578 lbs. FUEL GRADE: 100/130.

PERFORMANCE

TAKE-OFF POWER: 400 hp. at 3,300 rpm. RATED POWER: 350 at 3,000 rpm. FUEL CONSUMPTION: 16.5 gal per hr. at rated speed and 89 percent rated power.

EQUIPMENT

CARBURETOR: Bendix PS-9BDE. MAGNETOS: Scintilla (2) S4LN-20 and (2) S4RN-21.

MODEL: O-290-D2B.

DATA

TYPE: 4 cylinder, air cooled, horizontally opposed, direct drive, 140 hp CAA TYPE CERTIFICATE: 229.

SPECS

LENGTH: 29.56. WIDTH: 32.24. HEIGHT: 22.81. BORE: 4.875. STROKE: 3.875. COMPRESSION RATIO: 7.0:1. DISPLACEMENT: 289.0 cu. in. WEIGHT: 264 lbs. FUEL GRADE: 80/87.

PERFORMANCE

TAKE-OFF POWER: 140 hp. at 2.800. RATED POWER: 135 hp. at 2,600 rpm. FUEL CONSUMPTION: 6.5 gal. per hr. at 2250 rpm., economy cruise.

EQUIPMENT

CARBURETOR: Marvel-Schebler MA-3FPA. MAGNETOS: Scintilla S4LN-20 and S4LN-21. GENERATOR: Delco-Remy 12 volt. STARTER: Delco-Remy.

MODEL: O-340-A1A.

DATA

TYPE: 4 cylinder, air cooled, horizontally opposed, direct drive, 170 hp CAA TYPE CERTIFICATE: 277.

SPECS

LENGTH: 30.09. WIDTH: 32.55. HEIGHT: 24.68. BORE: 5.125. STROKE: 4.125. COMPRESSION RATIO: 8.5:1. DISPLACEMENT: 340.4 cu. in. WEIGHT: (with starter and generator) 278 lbs. FUEL GRADE: 91/96.

PERFORMANCE

TAKE-OFF and RATED POWER: 170 hp. @ 2700 rpm. FUEL CONSUMPTION: 8.5 gal. per hr. at 2,350 rpm and 65 percent rated power.

EQUIPMENT

CARBURETOR: Marvel-Schebler MA4-5. MAGNETOS: Scintilla S4LN-20 and S4LN-21. GENERATOR: Delco-Remy 12 volt. STARTER: Delco-Remy.

MODEL: GO-480-B1B.

DATA

TYPE: 6 cylinder, horizontally-opposed, air cooled, gear drive, 270 hp CAA TYPE CERTIFICATE: 275.

SPECS

LENGTH: 38.64 in. WIDTH: 33.12 in. HEIGHT: 28.02 in. BORE: 5.125 in. STROKE: 3.875 in. DISPLACEMENT: 479.7. COMPRESSION RATIO: 7.3:1. WEIGHT: 436 lbs. FUEL GRADE: 80/87.

PERFORMANCE

TAKE-OFF POWER: 270 hp at 3,400 rpm. (2,180 prop rpm.). RATED POWER: 260 at 3,000 rpm. FUEL CONSUMPTION: 14.1 gal. per hr. at 2,600 rpm., economy cruise.

EQUIPMENT

CARBURETOR: Bendix-Stromberg PS-5BD. MAGNETOS: Scintilla S6LN-50 and S6LN-51.

MODEL: GO-480-C2C6.

DATA

TYPE: 6 cylinder, gear drive, horizontally opposed, air cooled, 275 hp., CAA TYPE CERTIFICATE: 275.

SPECS

LENGTH: 42.18. WIDTH: 33.12. BORE: 5.125 in. STROKE: 3.875 in. COMPRESSION RATIO: 8.85:1. DISPLACEMENT: 479.7 cu. in. WEIGHT: 447 lbs. FUEL GRADE: 100/130.

PERFORMANCE

TAKE-OFF POWER: 295 hp at 3,400 rpm. RATED POWER: 285 hp. at 3,100 rpm. FUEL CONSUMPTION: 13.5 gal. per hr. at rated speed and 60 percent rated power.

EQUIPMENT

CARBURETOR: Bendix-Stromberg PS-58D. MAGNETOS: Scintilla S6LN-50 and S6LN-51.

MODEL: GO-480-C1B.

DATA

TYPE: 6 cylinder, reduction gear drive, horizontally opposed, air cooled, 295 hp CAA TYPE CERTIFICATE: 275.

SPECS

LENGTH: 40.29. WIDTH: 33.12. HEIGHT: 27.46 in. BORE: 5:125 in. STROKE: 3.875 in. COMPRESSION RATIO: 8.85:1. DISPLACEMENT: 479.7 cu. in. WEIGHT: 458 lbs. FUEL GRADE: 100/130.

PERFORMANCE

TAKE-OFF POWER: 295 hp at 3,400 rpm. RATED POWER: 280 hp at 3,000 rpm. FUEL CONSUMPTION: 13.0 gal. per hr. at rated speed and 60 percent rated power.

EQUIPMENT

CARBURETOR: Bendix-Stromberg PS-58D. MAGNETOS: Scintilla, S6LN-20 and S6RN-21.

MODEL: O-320.

DATA

TYPE: 4 cylinder, air cooled, horizontally opposed, direct drive, 150 hp CAA TYPE CERTIFICATE: 274.

SPECS

LENGTH: 29.56. HEIGHT: 23.12. WIDTH: 32.24. BORE 5.125. STROKE: 3.875. DISPLACEMENT: 319 cu. in. COMPRESSION RATIO: 70:1. WEIGHT: 272 lbs. FUEL GRADE: 80/87.

PERFORMANCE

TAKE-OFF and RATED POWER: 150 hp at 2.700 rpm. FUEL CONSUMPTION: 8.2 gal. per hr. at 2,350 rpm., economy cruise.

EQUIPMENT

CARBURETOR: Marvel-Schebler MA4SPA. MAGNETOS: Scintilla S4LN-20 and S4LN-21. GENERATOR: Delco-Remy, 12 volt. STARTER: Delco-Remy.

MODEL: GSO-480-A1A6.

DATA

TYPE: 6 cylinder, horizontally opposed, geared, supercharged, 340 hp. CAA TYPE CERTIFICATE: 284.

SPECS

LENGTH: 49.37. HEIGHT: 34.34. WIDTH: 33.12. BORE: 5.125. STROKE: 3.875. DISPLACEMENT: 479.7. COMPRESSION RATIO: 7.3:1. WEIGHT: 495 lbs. FUEL GRADE: 100/130.

PERFORMANCE

TAKE-OFF POWER: 340 hp at 3,400 rpm. (2,180 prop. rpm). RATED POWER: 320 hp. at 3.200 rpm. FUEL CONSUMPTION: 16.0 gal. per hr. at 60 percent rated power at 2,600 rpm.

EQUIPMENT

CARBURETOR: Bendix PSH-7BDE. MAGNETOS: Scintilla S6LN-20 and S6RN-21.

MODEL: GO-480-F6.

DATA

TYPE: 6 cylinder, gear drive, horizontally opposed, air cooled. 275 hp CAA TYPE CERTIFICATE: 275.

SPECS

LENGTH: 42.18 in. FUEL GRADE: 80/87. BORE: 5.125 in. STROKE: 3.875. DISPLACEMENT: 479.7. COMPRESSION RATIO: 7.38:1. WEIGHT 442 lbs.

PERFORMANCE

TAKE-OFF POWER 275 hp at 3,400 rpm (218 prop. rpm). RATED POWER 265 at 3100 rpm. FUEL CONSUMPTION 14.0 gal per hr. at 2,600 rpm and 60 percent rated power.

EQUIPMENT

CARBURETOR: Bendix-Stromberg PS-5-BD. MAGNETOS: Scintilla S6LN-50 and S6LN-51.

MODEL: VO-435-A1B (O-435-23).

DATA

TYPE: 6 cylinder, air cooled, horizontally opposed, for vertical helicopter installation, 260 hp. CAA TYPE CERTIFICATE: 279.

SPECS

HEIGHT: 35.17 in. WIDTH: 33.32. DEPTH: 25.19. FUEL GRADE: 80/87. BORE: 4.875. STROKE: 3.875. DISPLACEMENT: 434 cu. in. COMPRESSION RATIO: 7.3:1. WEIGHT: 400 lbs.

PERFORMANCE

TAKE-OFF: 260 hp. at 3,400 rpm. RATED POWER: 250 hp at 3,200 rpm. FUEL CONSUMPTION: 20.0 gal. per hr. at 80 percent rated power.

EQUIPMENT

CARBURETOR: Marvel-Schebler MA4-5. MAGNETOS: Scintilla S6LN-20 and S6RN-21. Hand cranking provisions optional.

MODEL: O-360-A1A.

DATA

TYPE: 4 cylinder, horizontally opposed, air cooled, 180 hp CAA TYPE CERTIFICATE: 286.

SPECS

LENGTH: 29.56 in. WIDTH: 33.37 in. DISPLACEMENT: 361 cu. in. BORE: 5.125 in. STROKE: 4.375. COMPRESSION RATIO 8.50:1. FUEL GRADE: 91/96. DRY WEIGHT: 282 lb.

EQUIPMENT

CARBURETOR: Marvel-Schebler MA4-5. MAGNETOS: Scintilla S4LN-20, S4LN-21. STARTER: Delco-Remy. GENERATOR: Delco-Remy.

MODEL: GO-435-C2B (O-435-17).

DATA

TYPE: 6 cylinder, horizontally opposed, geared, air cooled. APPROVED TYPE CERTIFICATE 228, 240 hp.

SPECS

LENGTH: 40.04 in. WIDTH: 33.12 in. DISPLACEMENT: 430.0 in. BORE: 4.875 in. STROKE: 3.875. COMPRESSION RATIO: 7.3:1. FUEL GRADE: 80/87. DRY WEIGHT: 430 lb.

EQUIPMENT

CARBURETOR: Marvel-Schebler MA4-5. MAGNETOS: Scintilla S6LN-50.

MODEL: GO-480-D1A.

DATA

TYPE: 6-clinder, horizontally opposed, air cooled. 275 hp TYPE CERTIFICATE: 275.

SPECS

LENGTH: 40.29 in. WIDTH: 33.12 in. DISPLACEMENT: 479.7 cubic in. BORE: 5.125 in. STROKE: 3.875. COMPRESSION RATIO: 7.3:1. FUEL GRADE: 80/87. DRY WEIGHT: 453 lb.

EQUIPMENT

CARBURETOR: Bendix-Stromberg PS-5BD. MAGNETOS: Scintillla S6LN-20. STARTER: accessories cross-wise mounted.

MODEL: O-235-C1.

DATA

TYPE: 4 cylinder, air-cooled, horizontally opposed; 115 hp CAA TYPE CERTIFICATE: 223.

SPECS

LENGTH: 29.56 in. FUEL GRADE: 80 octane. BORE: 4.375 in. STROKE: 3.875 in. DISPLACEMENT: 233.3 cu. in. COMPRESSION RATIO: 6.75:1. DRY WEIGHT: 236 lb. with hub and accessories. WEIGHT PER HP: 2.05 lb.

PERFORMANCE

TAKE-OFF POWER: 115 hp 2,800 rpm. CRUISE: 86 hp at 2,350 rpm. FUEL CONSUMPTION: .52 lb. per hp hr. OIL CONSUMPTION: .012 lb. per hp hr.

EQUIPMENT

CARBURETOR: Marvel-Schebler MA-3A. IGNITION: Dual Scintilla S4LN-21. STARTER: Delco-Remy. GENERATOR: Delco-Remy.

MODEL: O-435-A.

DATA

TYPE: 6 cylinder, air-cooled, horizontally opposed. CAA TYPE CERTIFICATE: 228.

SPECS

LENGTH: 38.10 in. FUEL GRADE: 80 octane. BORE: 4.875 in. STROKE: 3.875 in. DISPLACEMENT: 434 cu. in. COMPRESSION RATIO: 6.5:1. DRY WEIGHT: 392 lb. with hub and accessories. WEIGHT PER HP: 2.06 lb.

PERFORMANCE

TAKE-OFF POWER: 190 hp at 2,550 rpm. CRUISE: 145 hp at 2,300 rpm. FUEL CONSUMPTION: .52 lb. per hp hr. OIL CONSUMPTION: .0012 lb. per hp hr.

EQUIPMENT

CARBURETOR: Marvel Schebler MA-4-5 IGNITION: Dual Scintilla SFGLN-8. STARTER: Delco-Remy. GENERATOR: Delco-Remy.

MODEL: GSO-580-D.

DATA

TYPE: 8 cylinder, air-cooled, horizontally opposed, geared, super charged. CAA TYPE CERTIFICATE: 256.

SPECS

LENGTH: 57.08 in. FUEL GRADE, 100/130 octane. BORE: 4.875 in. STROKE: 3.875 in. DISPLACEMENT: 578 cu. in. COMPRESSION RATIO: 7.30:1. WEIGHT: 610 lb.

PERFORMANCE

TAKE-OFF POWER: 400 hp. FUEL CONSUMPTION: .57 lb. per hr.

EQUIPMENT

CARBURETOR: Bendix. IGNITION: Scintilla. FUEL PUMP: Pesco.

MODEL: O-320.

DATA

TYPE: 4 cylinder, air-cooled, horizontally opposed. CAA TYPE CERTIFICATE: 274.

SPECS

LENGTH: 29.40 in. FUEL GRADE: 80/87 octane. BORE: 5.125 in. STROKE: 3.875 in. DISPLACEMENT: 319.8 cu. in. COMPRESSION RATIO: 7.00:1. DRY WEIGHT: 272 lb.

PERFORMANCE

TAKE-OFF POWER: 150 hp. FUEL CONSUMPTION: .53 lb. per hr.

EQUIPMENT

CARBURETOR: Marvel-Schebler. IGNITION: Delco-Remy. FUEL PUMP: AC.

MODEL: SO-480.

DATA

TYPE: 6 cylinder, aircooled, supercharged, helicopter engine for horizontal or vertical installation.

SPECS

DISPLACEMENT: 479.7 cu. in. BORE: 5.125 in. STROKE: 3.875 in. COMPRESSION RATIO: 7.3:1. FUEL GRADE: 100/130. DRY WEIGHT: 444 lb. WIDTH: 33.12 in. LENGTH: 38.53 in.

PERFORMANCE

CONTINUOUS HP: 325 at 3,200 rpm. FUEL CONSUMPTION: 25 gals./hr. at 80 percent normal, 3.200 rpm.

EQUIPMENT

CARBURETOR: Bendix PS7BD. MAGNETOS: Scintilla S6RN20, 21.

MODEL: -76A & -76B.

DATA

TYPE: R-1820, 9 (radial) cylinder aircooled; 1,275 rated hp.

SPECS

LENGTH: 48.50 in. HEIGHT: 54.95 in dia. BORE: 6.125 in. STROKE: 6.875 in. DISPLACEMENT: 1,820. COMPRESSION RATIO: 6.80:1. FUEL GRADE: 100/130. WEIGHT: 1,380:0 lb.

PERFORMANCE

TAKE-OFF POWER and SPEED: 1,425 at 2,700 rpm. RATED POWER and SPEED: 1275 at 2500 rpm. FUEL CONSUMPTION: .700 lb. per bhp. per hr.

EQUIPMENT

CARBURETOR: PD12K18. MAGNETO: Bosch 59LU-3.

MODEL: -80.

DATA

TYPE: R-1820, 9 (radial) cylinder aircooled, 1,275 rated hp. CAA TYPE CERTIFICATE: 259.

SPECS

LENGTH: 48.50 in. HEIGHT: 54.95 in. dia. BORE: 6.125 in. STROKE: 6.875 in. DISPLACEMENT: 1,820. COMPRESSION RATIO: 6.80:1. FUEL GRADE 100/130. WEIGHT: 1,404 lb.

PERFORMANCE

TAKE-OFF POWER and SPEED: 1,475 bhp. at 2,800 rpm. RATED POWER and SPEED: 1,275 bhp. at 2,500. FUEL CONSUMPTION: .700 lb/bhp. hr.

EQUIPMENT

CARBURETOR: PD12K18. MAGNETO: Bosch S9LU-3.

MODEL: -82.

DATA

TYPE: R-1820, 9 (radial) cylinder aircooled, 1,275 rated hp. CAA TYPE CERTIFICATE: 259.

SPECS

LENGTH: 50.10 in. HEIGHT: 55.74 in. dia. BORE: 6.125 in. STROKE: 6.875 in. DISPLACEMENT: 1,820. COMPRESSION RATIO: 6.80:1. FUEL GRADE: 115/145. WEIGHT: 1,469 lb.

PERFORMANCE

TAKE-OFF POWER and SPEED: 1,525 at 2,800 rpm. RATED POWER and SPEED: 1275 at 2,500 rpm. FUEL ONSUMPTION: .677 lb/bhp./hr.

EQUIPMENT

CARBURETOR: PD12K18. MAGNETO: Scintilla Model D9LN-2.

MODEL: -84.

DATA

TYPE: R-1820, 9 (radial) cylinder aircooled, 1,275 rated hp. CAA TYPE CERTIFICATE: 259.

SPECS

LENGTH: 52.00 in. HEIGHT: 55.74 in. dia. BORE: 6.125 in. STROKE: 6.875 in. DISPLACEMENT: 1,820. COMPRESSION RATIO:

6.80:1. FUEL GRADE: 115/145. WEIGHT: 1,405 lb.

PERFORMANCE

TAKE-OFF POWER and SPEED: 1,525 at 2,800 rpm. RATED POWER and SPEED: 1,275 at 2,500. FUEL CONSUMPTION: .677 lb/bhp./hr.

EQUIPMENT

CARBURETOR: PD12R1. MAGNETO: Scintilla D9LN-2. 39° from horizontal nose up.

MODEL: -86.

DATA

TYPE: R-1820, 9 (radial) cylinder aircooled, 1,275 rated hp. CAA TYPE CERTIFICATE: 243.

SPECS

LENGTH: 48.50 in. HEIGHT: 54.95 in. dia. BORE: 6.125 in. STROKE: 6.875 in. DISPLACEMENT: 1,820. COMPRESSION RATIO: 6.80:1. FUEL GRADE: 100/130. WEIGHT: 1,385 lb.

PERFORMANCE

TAKE-OFF POWER and SPEED: 1,425 at 2,700 rpm. RATED POWER and Speed: 1275 at 2,500. FUEL CONSUMPTION: .695 lb/bhp./hr.

EQUIPMENT

CARBURETOR: PD12K18. MAGNETO: Bosch S9LU-3.

MODEL: -103.

DATA

TYPE: R-1820, 9 (radial) cylinder aircooled, 1,275 rated hp. CAA TYPE CERTIFICATE: 243.

SPECS

LENGTH: 48.50 in. HEIGHT: 54.95 in. dia. BORE: 6.125 in. STROKE: 6.875 in. DISPLACEMENT: 1,820. COMPRESSION RATIO: 6.80:1. FUEL GRADE: 100/130. WEIGHT: 1,350 lb.

PERFORMANCE

TAKE-OFF POWER and SPEED: 1,425 at 2,700 rpm. RATED POWER and SPEED: 1,275 at 2,500. FUEL CONSUMPTION: .700 lb/bhp./hr.

EQUIPMENT

CARBURETOR: PD12K19. MAGNETO: Bosch S9LU-3.

MODEL: -3.

DATA

TYPE: R-1300, 7 (radial) cylinder aricooled, 700 bhp. rated hp.

SPECS

LENGTH: 49.68 in. HEIGHT: 50.45 in. dia. BORE: 6.125 in. STROKE: 6.312 in. DISPLACEMENT: 1,300. COMPRESSION RATIO: 6.20:1. FUEL GRADE: 91/96. WEIGHT: 1,080 lb.

PERFORMANCE

TAKE-OFF POWER and SPEED: 800 bhp. at 2,600 rpm. RATED POWER and SPEED: 700 bhp. at 2,400 rpm. FUEL CONSUMPTION: .700 lb/bhp./hr.

EQUIPMENT

CARBURETOR: Bendix PD9G1. MAGNETO: Bosch S7LU-3.

MODEL: -4.

DATA

TYPE: R-1300, 7 (radial) cylinder aircooled, 700 bhp. rated hp.

SPECS

LENGTH: 48.12 in. HEIGHT: 50.45 in. dia. BORE: 6.125 in. STROKE: 6.312 in. DISPLACEMENT: 1,300. COMPRESSION RATIO: 6.20:1. FUEL GRADE: 91/96. WEIGHT: 1,092 lb.

PERFORMANCE

TAKE-OFF POWER and SPEED: 800 bhp. at 2,600 rpm. RATED POWER and SPEED: 700 bhp. at 2,400 rpm. FUEL CONSUMPTION: .720 lb/bhp./hr.

EQUIPMENT

CARBURETOR: Bendix PD9F1. MAGNETO: Bosch S7LU-3.

PRATT & WHITNEY AIRCRAFT
DIVISION OF UNITED AIRCRAFT CORP.

East Hartford, Conn.

MODEL: Twin Wasp D Series, (R-2000).

DATA

TYPE: 14 cylinder, air-cooled, radial. CAA TYPE CERTIFICATE: 230.

SPECS

DIAMETER: 49.1 in. LENGTH: 59.66 in. FUEL GRADE: 100/130. BORE: 5.75 in. STROKE: 5.5 in. DISPLACEMENT: 2,004 cu. in. COMPRESSION RATIO: 6.5:1. DRY WEIGHT: Single speed, 1,585 lb.; two speed, 1,605 lb.

PERFORMANCE

TAKE-OFF: 1,450 at 2,700 rpm and 2,800 ft. NORMAL RATED POWER: 1,200 hp at 2,550 rpm and 6,400 ft.

EQUIPMENT

CARBURETOR: Stromberg PD-12F13. IGNITION: two Scintilla SF-14LN-8.

REMARKS

Powers Douglas C-54 military transport, workhorse of World War II, the Berlin Airlift and the Trans-Pacific Airlift in support of the Korean campaign.

MODEL: Double Wasp CA and CB series, (R-2800)

DATA

TYPE: 18 cylinder, air-cooled, radial. CAA TYPE CERTIFICATES: 231 and 264.

SPECS

DIAMETER: 52.8 in. LENGTH: 81.40 in. FUEL GRADE: 100/130 or 108/135. BORE-5.75 in. STROKE: 6 in. DISPLACEMENT: 2.804 cu. in. COMPRESSION RATIO: 6.75 to 1. DRY WEIGHT: Two speed, 2,390 lb.; single speed, 2,357 lb.

PERFORMANCE (CB3)

TAKE-OFF POWER: 2,400 hp at 2,800 rpm at 4,000 ft. with water injection; 2,050 hp at 2.700 rpm at 6,000 ft. dry. NORMAL RATED POWER: 1,800 hp at 2,600 rpm at 8,500 ft.

EQUIPMENT

CARBURETOR: Stromberg PR-58E5. IGNITION: Scintilla DLN-10 low tension. CB16, same in low, but has maximum continuous rating in high of 1,700 hp.

REMARKS

The CA series includes the -3, -15, and -18 models. The CB series includes the -3, -4, -16 and -17 models. Essential differences are in supercharger gear ratios and weights. Most other parts are interchangeable. Military versions of the Double Wasp power the following production aircraft: Beech T-36, Bell XHSL-1 helicopter, Chase C-123 transport. Convair T-29 trainer, Douglas C-118A cargo, Grumman AF-2S and -2W hunter-killer teams, North American AJ-1 carrier bomber and Vought F4U-5N and AU-1 fighter-bombers. Commercial versions power the Convair 240 and 340 transports, Douglas DC-6, -6A, and -6B transports and Martin 2-0-2A and 4-0-4 transports.

MODEL: Turbo-Wasp J48 (JT-7)

DATA

TYPE: Centrifugal-flow turbojet.

SPECS

DIAMETER: 50.50 in. LENGTH: 109.75 in. COMPRESSOR: double-entry, single-stage, centrifugal-flow. WEIGHT: 2,080 lb. FUEL: Kerosene, gasoline or special jet fuel.

PERFORMANCE

TAKE-OFF POWER: 7,250 lb. thrust. MILITARY RATING: 7,250 lb. thrust. NORMAL RATING: 5,600 lb. thrust. CRUISE RATING: 3,750 lb. or 3,100 lb. thrust.

REMARKS

The J48 powers the Navy's Grumman F9F-5 Panther and the swept-wing F9F-6 and F9F-8 and the Lockheed F-94C all-weather interceptor for the Air Force.

MODEL: Turbo-Wasp PT-2 (T34).

DATA

TYPE: Axial-flow turboprop.

SPECS

DIAMETER: 34.06 in. LENGTH: 157.4 in. COMPRESSOR: 13-stage axial-flow. TURBINE: three-stage, axial-flow. PROPELLER REDUCTION GEAR: two-stage, 11:1 ratio. WEIGHT: 2,564 lb. FUEL: Kerosene, gasoline or special jet fuel.

PERFORMANCE

TAKE-OFF POWER: 5,700 hp. FUEL CONSUMPTION: 0.62 lb. hp hr.

REMARKS

Engine thrust is divided 90 percent to propeller turbine and 10 percent to jet nozzle. Stainless steel is used almost exclusivly throughout the engine structure. This model is no longer offered commercially.

MODEL: Turbo-Wasp J57 (JT-3)

DATA

TYPE: Twin-spool axial-flow turbojet.

REMARKS

Specifications and performance are still classified other than mention that engine is in the 10,000 lb. thrust class. It powers the Air Force's Boeing B-52 long-range bomber, the North American F-100, McDonnell F-101, Convair F-102, and the Navy's Douglas F4D fighter, A3D bomber and Chance Vaught XF8U fighter. The J-57 also powers the Boeing 707. The fighter aircraft are powered by afterburner versions of the J-57 engine.

WESTINGHOUSE ELECTRIC CORP.
AVIATION GAS TURBINE DIVISION

Philadelphia, Pa.

MODEL: J34-WE-36.

DATA

TYPE: Axial-flow turbojet.

SPECS

DIAMETER: 27 in. LENGTH: 111.4 in. HEIGHT: 34.7 in. WEIGHT: 1,207 lb. COMPRESSION RATIO: 4.35.

PERFORMANCE

TAKE-OFF THRUST: 3,400 lb. at 12,500 rpm. OPERATING ALTITUDE: 45,000 ft.

MODEL: XJ81-WE-3.

DATA

TYPE: Axial-flow turbojet.

SPECS

Small, light-weight turbojet initially designed for drones and missiles.

PERFORMANCE

All other information classified.

MODEL: PD-33.

DATA

TYPE: Axial-flow turbojet.

SPECS

Medium size, light-weight turbojet designed for high altitude piloted aircraft.

PERFORMANCE

All other information classified.

WRIGHT AERONAUTICAL DIVISION
CURTISS WRIGHT CORP.
Wood-Ridge, N. J.

MODEL: R-1300-1.

DATA

TYPE: 7-Cylinder, Air-Cooled, Radial.

SPECS

LENGTH: 48.12 in. WIDTH: 50.45 in. WEIGHT: 1,045 lb. DISPLACEMENT: 1,300 cu. in. BORE: 6.125 in. STROKE: 6.312 in. COMPRESSION RATIO: 6.2:1. FUEL GRADE: 91/98. CARBURETOR: Stromberg SD9F1. MAGNETO: Dual Bosch SF-7LU-2.

PERFORMANCE

TAKEOFF HP: 800 at 2,600 rpm. NORMAL RATED HP: 700 at 2,490 rpm; CRUISE RATED HP 420. FUEL SONSUMPTION .48 lb. per hp hr. OIL CONSUMPTION: .015 lb. per hp. hr.

MODEL: R-1300-2.

DATA

TYPE: 7-Cylinder, Air-cooled, Radial.

SPECS

LENGTH: 48.10 in. WIDTH: 50.45 in. WEIGHT: 1,056 lb. DISPLACEMENT: 1,300 cu. in. BORE: 6.125 in. STROKE: 6.312 in. COMPRESSION RATIO: 6.2 to 1. FUEL GRADE: 91/96. CARBURETOR: Stromberg SD9F1. MAGNETO: Dual Bosch SF-7LU-2.

PERFORMANCE

TAKEOFF HP: 800 at 2,600 rpm. NORMAL RATED HP: 700 at 2,400 rpm. CRUISE RATED HP: 420. FUEL CONSUMPTION: 0.451 lb. per hp hr. OIL CONSUMPTION: .020 lb. per hp hr.

REMARKS

This engine designed for blimp and helicopter installations; also the R-1300-3.

MODEL: R-1300-4.

DATA

TYPE: 7 Cylinder, Air Cooled, Radial.

SPECS

LENGTH: 48.12 in. WIDTH: 50.45 in. WEIGHT: 1,092 lb. DISPLACEMENT 1,300 cu. in. BORE 6.125 in. STROKE: 6.312 in. COMPRESSION RATIO: 6.2 to 1. FUEL GRADE: 91/96. CARBURETOR: Bendix PD9F1. MAGNETO: Amer. Bosch S7LU-3.

PERFORMANCE

TAKEOFF HP: 800 at 2,600 rpm. NORMAL RATED HP: 700 at 2,400 rpm. CRUISE RATED HP: 490 at 2130 rpm. FUEL CONSUMPTION: .438 lb. per hp hr. OIL CONSUMPTION: .020 lb. per hp hr.

REMARKS

Current production installation is Goodyear ZP5K Blimp.

MODEL: R-1820-76A & B.

DATA

TYPE: 9 Cylinder, Air Cooled, Radial.

SPECS

LENGTH: 47.69 in. WIDTH: 54.95 in. WEIGHT: 1,365 lb. DISPLACEMENT: 1,820 cu. in. BORE: 6.125 in. STROKE: 6.875 in. COMPRESSION RATIO: 6.8 to 1. FUEL GRADE: 100/130. CARBURETOR: Stromberg PD12K14. MAGNETO: Dual Scintilla S9LU-5.

PERFORMANCE

TAKEOFF Hp: 1,425 at 2.700 rpm. NORMAL RATED HP: 1,275 at 2,500 rpm. CRUISE RATED HP: 890 at 2.300 rpm. FUEL CONSUMPTION: .46 lb. per hp hr. OIL CONSUMPTION: .020 lb. per hp hr.

REMARKS

Installations include blimps, helicopters, military trainers. This R-1820 engine is one in a long line of R-1820 power plants introduced more than ten years ago. This model is also built with a 2-speed supercharger and optional reduction gear ratios. Other military designations include: R-1820-86; -103 (9HD series); -80; 82; -84 (9HE series). Commercial designations include: 977C9HD1; 987C9HD1 (9HD series); 982C9HEI; 989C9HEI (9HE series).

MODEL: R-3350-24W.

DATA

TYPE: 18 Cylinder, Air Cooled, Radial.

SPECS

LENGTH: 78.52 in. WIDTH: 56.59 in. WEIGHT: 2,884 lb. DISPLACEMENT: 3.350 in. BORE: 6.125 in. STROKE: 6.3125 in. COMPRESSION RATIO: 6.5 to 1. FUEL GRADE: 100/130. CARBURETOR: Bendix No. 135091 direct fuel injection. MAGNETO: Scintilla DLN-9.

PERFORMANCE

TAKEOFF HP: 2,500 at 2,800 rpm. NORMAL RATED HP: 2200 at 2600 rpm. CRUISE RATED HP: 1,470 at 2,300 rpm. FUEL CONSUMPTION: .45 lb. per hp hr. OIL CONSUMPTION: .015 lb. per hp hr.

MODEL: R-3350-26W.

DATA

TYPE: 18 Cylinder, Air Cooled, Radial.

SPECS

LENGTH: 81.93 in. WIDTH: 55.62 in. WEIGHT: 2,848 lb. DISPLACEMENT: 3,350 cu. in. BORE: 6.125 in. STROKE: 6.312 in. COMPRESSION RATIO: 6.5 to 1. FUEL GRADE: 115/145. CARBURETOR: PR58U1. MAGNETO: Scintilla DLN-9.

PERFORMANCE

TAKEOFF HP: 2,700 at 2,900 rpm. NORMAL RATED HP: 2,300 at 2,600 rpm. FUEL CONSUMPTION: .560 lb. per hp hr. OIL CONSUMPTION: .020 lb, per hp hr.

MODEL: R-3350-30W-30WA-85 (Turbo Compound).

DATA

TYPE: 18 Cylinder, Air Cooled, Radial.

SPECS

LENGTH: 89.53 in. WIDTH: 56.59 in. WEIGHT: 3,514 lb. DISPLACEMENT: 3,350 cu. in. BORE: 6.125 in. STROKE: 6.312 in. COMPRESSION RATIO: 6.7 to 1. FUEL GRADE: 115/145. CARBURETOR: Stromberg UR58T1. MAGNETO: Scintilla DLN-9.

PERFORMANCE

TAKEOFF HP: 3,250 at 2,900 rpm. NORMAL RATED HP: 2,600 at 2,600 rpm. FUEL CONSUMPTION: 395 lb. per. hp hr. OIL CONSUMPTION: .018 lb. per hp hr.

REMARKS

Military version of the turbo compound; ratings for the military turbo compound are up to 3,700 hp. Installations include: R7U1, P5M, C-119, P2U series, C & RC-121, WV 1, 2 & 3.

MODEL: 972TC18DA1 & 3 (Commercial Turbo Compound).

DATA

TYPE: 18 Cylinder, Air Cooled, Radial.

SPECS

LENGTH: 89.52 in. WIDTH: 56.59 in. WEIGHT: 3,557 lb. DISPLACEMENT: 3,350 cu. in. BORE: 6.125 in. STROKE: 6.312 in. COMPRESSION RATIO: 6.7 to 1. FUEL GRADE: 115/145. CARBURETOR: Bendix PR5852. MAGNETO: Bendix-Scintilla DLN-9.

PERFORMANCE

TAKEOFF HP: 3,250 at 2,900 rpm. NORMAL RATED HP: 2,700 at 2,600 rpm. CRUISE RATED HP: 1,910 at 2,400 rpm. FUEL CONSUMPTION: .395 lb. per hp hr. OIL CONSUMPTION: .018 lb. per hp hr.

REMARKS

Model DA-1 installations include Lockheed 1049C Series of Super Constellations; DA2 turbo compound installations in Douglas DC7; DA-3 in production for Super Constellations 1049 E, F and G.

MODEL: 972TC18DA4.

DATA

TYPE: 18 Cylinder, Air Cooled, Radial.

SPECS

LENGTH: 89.53 in. WIDTH: 56.59 in. WEIGHT: 3,549 lb. DISPLACEMENT: 3,350 cu. in. BORE: 6.125 in. STROKE: 6.312 in. COMPRESSION RATIO: 6.7 to 1. FUEL GRADE: 115/145. CARBURETOR: Bendix DR5852. MAGNETO: Bendix-Scintilla DLN-9.

PERFORMANCE

TAKEOFF HP: 3,250 at 2,900 rpm. NORMAL RATED HP: 2,700 at 2,600 rpm. CRUISE RATED HP: 1,910 at 2,400 rpm. FUEL CONSUMPTION: .395 lb. per hp hr. OIL CONSUMPTION: .018 lb. per hp hr.

REMARKS

Installations include Douglas DC-7B.

MODEL: 981TC18EA1 and 2.

DATA

TYPE: 18 Cylinder, Air Cooled, Radial.

SPECS

LENGTH: 89.53 in. WIDTH: 56.59 in. WEIGHT: 3,615 lb. DISPLACEMENT: 3,350 cu. in. BORE: 6.125 in. STROKE: 6.312 in. COMPRESSION RATIO: 6.7 to 1. FUEL GRADE: 115/145. CARBURETOR: Bendix PR58S2. MAGNETO: Bendix-Scintilla DLN-9.

PERFORMANCE

TAKEOFF HP: 3,400 at 2,900 rpm. NORMAL RATED HP: 2,850 at 2,600 rpm. CRUISE RATED HP: 1,910 at 2,400 rpm. FUEL CONSUMPTION: .645 lb. per hp hr. at 2,800 rpm. OIL CONSUMPTION: .022 lb. per hp hr.

REMARKS

Reduction gear ratio of EA-1 is 0.4375 to 1; EA-2 reduction gear ratio is 0.355 to 1.

MODEL: J65-W-1.

DATA

TYPE: Axial-Flow Turbojet.

SPECS

LENGTH: 114.83 in. DIA.: 37.5 in. WEIGHT: 2,595 lb. COMPRESSOR STAGES: 13 of 29.375 in. TURBINE STAGES: 2 of 30.5 in. STARTER: Electrical starter-generator, located at front.

PERFORMANCE

STATIC THRUST: 7,220-7,800 lb at 8,300 rpm. TAKEOFF THRUST: 7,220 lb. at 8,300 rpm. NORMAL RATED THRUST: 6,400 lb. at 8,000 rpm. CRUISE RATED THRUST: 4,800 lb. at 7,49 rpm.

REMARKS

Current production installation of various J65 models include Grumman F11F-1, Douglas A4D, Martin B-57, North American FJ-3 & 4, Republic RF84-F and F84-F. The J65W4 is rated at 7,800 lb. thrust; afterburner versions of the J65 are classified.

MODEL: J65-W-1, -1A.

DATA

TYPE: Axial Flow Turbojet.

SPECS

LENGTH: 130.66 in. WIDTH: 37.75 in. TOTAL WEIGHT: 2,595 lb. COMPRESSOR STAGES: 13 of 29.375 in. TURBINE STAGES: 2 of 30.5.

REMARKS

Current production installation: F84F; production installations of various J65 models include Grumman F11F-1, Douglas A4D, Martin B-57, North American FJ-3 and 4, Republic RF84-F and F84F. Versions of the J65 are rated up to 7,800 pounds thrust.

MODEL: YJ67-W1.

All data classified.

1955 DAY BY DAY CHRONOLOGY

(NOTE: The following chronology is condensed principally from *American Aviation Daily*, only daily in the aviation field, published by American Aviation Publications, Inc., Wayne W. Parrish, Editor.)

JANUARY

Jan. 3

Military Air Transport Service carried 500,000 patients and other passengers and airlifted more than 90,000 tons of cargo and mail on three divisions in 1954.

John G. Lee, assistant, appointed director of research for United Aircraft Corp., succeeding Frank W. Caldwell, retired.

Jan. 4

Navy Bureau of Aeronautics awards Lockheed Aircraft Corp. $38,688,072 contract for undisclosed number of WV-2 radar picket planes, versions of Super Constellations.

Air Transport Association announces a perfect safety record for U. S. international lines and a new low fatality rate for domestic carriers in 1954, setting all-time safety record for U. S. certificated carriers.

J. S. Parker appointed general manager of General Electric's aircraft gas turbine division, replacing C. W. LaPierre, vice president named head of newly created atomic energy and defense products group.

Beech Aircraft makes delivery of first of Navy's T-34B trainers six months after receiving $9-million contract.

Jan. 5

Glenn L. Martin Company reveals Navy XP6M-1 jet attack seaplane (four Allison J71's) in 600 mph-plus speed range, has 15-ton payload.

Convair identifies F-102A as fighter which flew supersonically in level flight in shakedown tests at Edwards Air Force Base.

Diana Bixby, noted woman pilot, killed in crash of converted A-20 in Gulf of California.

Jan. 6

General Electric announces completion of full-scale engine testing of J47 thrust spoiler for in-flight braking of B-47 Stratojets.

Navy Bureau of Aeronautes awards $18-million contract to Westinghouse Electric Corp. for turret systems.

Air Force announces long-rance plans call for 24 combat flying wings in the AF reserve and 27 in Air National Guard, with all reserve fighter squadrons scheduled to be jet-equipped by end of year.

Jan. 7

President Eisenhower designates Chan Gurney as acting chairman of CAB.

President Eisenhower, in State of Union message, declares forthcoming military budget to emphasize new weapons, especially those of rapid and destructive striking power, and assure maintenance of effective military force as principal deterrent to overt aggression.

Jan. 10

Robert E. Gross, president and chairman of Lockheed Aircraft, elected president of the Institute of the Aeronautical Sciences for 1955.

Jan. 11

Air Force Secretary Talbott announces Douglas XC-132 turboprop transport will have 80-ton capactiy, more than three times the payload of the C-124B Globemaster.

Jan. 12

Ryan Aeronautical Co. reports receipt of Air Force contract for development of first jet-powered vertical take-off aircraft, designated as Model 69.

Elwood R. Quesada, Lockheed vice president, predicts guided missiles will fly at speeds approaching escape velocity (about 25,000 mph) within a decade.

Jan. 13

Carl G. A. Rosen, consultant to the president of Caterpillar Tractor Co., elected president of the Society of Automotive Engineers.

Jan. 14

Hans E. Quenzer, one-time chief preliminary design engineer for Focke-Wulf in Germany, joins Lockheed Aircraft's military operations research division.

General John K. Cannon, board chairman of Fletcher Aviation and former head of AF Tactical Air Command, dies in Arcadia, Calif.

Jan. 17

Major Arthur Murray, holder of wolrd's altitude record (in Bell X1a), appointed chief of programs division at USAF Flight Test Center, Edwards AFB.

Hughes Aircraft makes first deliveries of new E-9 fire control system to enable Northrop F-89D's to use guided missiles.

Robert B. Hotz appointed editor of Aviation Week to succeed Robert H. Wood.

Glenn L. Martin Company receives $5-million Navy contract for research and development on XP6M-1 jet seaplane.

Jan. 18

President Eisenhower submits fiscal 1956 budget message to Congress, asking $6,853,-000,000 in new money for Navy and Air Force for aircraft and related procurement items. Amount sought for air power and related programs largest in peacetime history.

Jan. 20

Chance Vought Aircraft receives $16-million Navy contract for Regulus guided missiles.

First production model of Allison T56 turboprop engine (for Lockheed C-130A) delivered to USAF ahead of schedule.

Charles M. Green, executive vice president and general manager, elected president of Sperry Gyroscope Co., succeeding Preston R. Bassett.

Kaman Aircraft Corp. develops device known as "Rotochute" for dropping supplies accurately from high-speed aircraft at low altitudes.

First postwar training of Japanese pilots in jet planes starts at Tsuiki AFB.

Captain Jane Herveux, first woman to solo (as student of Bleriot in 1909), dies in London hospital.

Jan. 25

Canadian Pacific Air Lines' application for a trans-polar route between Vancouver and Amsterdam approved by Canadian government.

Link Aviation unveils DC-2 navigation simulator to train Air Force navigators in high-speed, high-altitude celestial navigation.

Jan. 27

Aircraft Industries Association reports industry producing 65 different types of military planes and 26 civil types.

Dr. Theodore von Karman resigns as chairman of U. S. Air Force Scientific Advisory Board, becoming chairman emeritus.

Jan. 28

Air Research & Development Command establishes flight control laboratory at Dayton, Ohio, headed by Colonel John L. Martin, Jr.

Dr. H. Guyford Stever, associate professor of aeronautical engineering at M.I.T., named Air Force chief scientist.

FEBRUARY

Feb. 1

Milton W. Arnold, Air Transport Association vice president engineering and operations, predicts a $5-million beacon procurecent and installation program as result of decision by 31 scheduled airlines to equip aircraft with identification radar beacons. Colonel J. Francis Taylor, Air Navigation Development Board director, says military ground radars will be equipped to identify airline aircraft carrying airborne transponders.

Feb. 3

Earl D. Johnson, president of Air Transport Association, becomes senior vice president for development and operations of General Dynamics Corp.

The RCAF announces four of its 12 F-86 Sabre squadrons will be re-equipped with Mark IV all-weather interceptors.

Feb. 4

New altitude climb record, 10,000 feet in 83 seconds, established by a North American FJ-3 Fury, piloted by Lieutenant Commander R. H. Moore at Miramar Naval Air Station near San Diego, who cuts 17 seconds from best previous attempt.

Feb. 7

President Eisenhower nominates Ross Rizley, former Oklahoma Congressman and official of Post Office and Agriculture Departments, to fill vacancy on Civil Aeronautics Board, succeeding Oswald Ryan.

Feb. 8

USAF re-orders North American Aviation's F-86F fighter-bomber, out of production since May, 1954.

General Nathan F. Twining, AF Chief of Staff, reports that "barring unexpected Soviet increases, 137 wings are enough to do the job, if—and this is a big if—if we have planes of superior quality, men of high skill, and enough up-to-date air bases from which to operate."

Feb. 9

Five-point course of action to clear path for adoption of TACAN as Common System short-range navigation aid announced by Air Navigation Development Board, ending civil-military dispute which lasted two years.

President Eisenhower modifies decision in West Coast-Hawaii case to provide for three-year renewal of Northwest Airlines' certificate between Seattle/Portland and Hawaii. He also changes original terms of Pan American World Airways' certificate for same route from five to three years.

Feb. 10

USAF Air Training Command reveals serious consideration being given to replacing all reciprocating engine aircraft currently used in basic training with Lockheed T-33 jet trainers, looking toward all-jet course within three to four years.

Australian director-general of civil aviation, Sir Richard Williams, announces that all new commercial aircraft coming into service in Australia after Dec. 31, 1956, will be required to have rearward-facing seats.

U. S. mayors on American Municipal Association's Airport Sponsors Committee vote to ask Congress for $100-million in federal aid for airport construction in fiscal 1956.

Feb. 11

Navy awards $44,473,000 contract to Pratt & Whitney for J-57 turbojet engines, and a $1,271,000 contract to Bell Aircraft for 24 HTL (H-13) helicopters.

McDonnell F3H-1N Demon establishes new unofficial world climb record of 71 seconds from standing start to 10,000 feet.

Feb. 14

Lockheed Aircraft receives a $10-million order from the Navy for P2V-7 patrol planes powered by two Wright R-3350 engines and two Westinghouse jets.

Feb. 15

Douglas Aircraft makes largest tax payment in its 34-year history, paying more than $19-million to the Internal Revenue Bureau and more than $1-million to the state of California.

Army Ordnance successfully fires 1,000 pound-thrust JATO motor with plastics body designed and built by Fairchild's Guided Missiles Division.

Feb. 16

Bell Aircraft declared winner of Army competition for development of a light-weight, closed cabin, single rotor, utility helicopter for front-line evacuation, utility missions and instrument training.

Longest non-stop flight by a jet fighter-bomber—2,390 miles—made by Republic F-84F from George AFB, Calif., to Langley AFB, Va. Speed averaged 605 mph.

Feb. 17

General Electric Company announces plan to speed $40-million in next five years to expand Aircraft Gas Turbine Division facilities at Evendale, Ohio, and Lynn, Mass., which already represent $60-million investment.

RTCA establishes a special committee to determine frequency channel requirements for a Common System short-range navigation aid.

Feb. 18

The Air Research & Development Command reveals first flight tests of an F-84 fitted with a reverse-thrust device.

James M. Riddle, Narco president, files strong protest against ANDB decision in favor of TACAN.

Feb. 23

51 nations bought more than $7-million worth of civil lightplanes from U. S. manufacturers in 1954, AIA reports. Leading customer was Chile.

Western Electric Co. named prime contractor for construction of Distant Early Warning Line.

Rolls-Royce delivers Avon RA28 engine for installation in Ryan's Type 69 experimental vertical takeoff jet, designated XF-109 by USAF and XF-3R1 by Navy.

Feb. 24

Aircraft obligations by the Air Force, Navy and Army in the first half of fiscal 1955 totaled $3,457,000,000, Defense Department reports. AF obligation was largest, amounting to $2,632,000,000.

Bendix Aviation Corp. plans $10-million expansion of its engineering facilities including $6-million at South Bend, Ind.

Douglas Aircraft makes first formal announcement that the C-133 turboprop transport is in production and announces establishment of a plant at Charlotte, N. C., as second source for the Nike missile.

Feb. 25

Air Force Secretary Talbott discloses AF to supply Navy's future jet needs with such powerplants as J75, J67 and J79.

Lester P. Faneuf, general manager and treasurer, elected vice president and director of Bell Aircraft Corp.

Robert H. Wood, former editor of Aviation Week, appointed assistant to the president of McDonnell Aircraft for public relations.

First YC-121F turboprop Super Constellation for Air Force rolled out by Lockheed Aircraft Corp.

Feb. 28

Ross Rizley confirmed by Senate to fill vacancy on CAB, and Louis S. Rothschild named Under Secretary of Commerce for Transportation.

Test Pilot Robert O. Rahn climbs Navy's Douglas F4D-1 to 1,000 feet in 56 seconds at Edwards AFB, bettering time of McDonnell F3H.

MARCH

Mar. 1

CAB certificates North Central Airlines to operate between Chicago and Detroit via five intermediate cities.

Grumman Aircraft Engineering Corp. establishes an industrial TV "network" linking two plants 50 miles apart on Long Island.

Mar. 2

Trevor Gardner sworn in as Assistant Air Force Secretary (Research and Development).

Rear Admiral James S. Russel confirmed by Senate to be chief of Bureau of Aeronautics for term of four years.

Stockholders informed by Hiller Helicopters that company developing a VTO-type aircraft for the Navy, a one-man helicopter (XROE-1) for Navy and Marine Corps, and a convertiplane.

Mar. 3

Boeing Airplane Company declared winner of AF jet tanker competition with the KC-135, and Lockheed Aircraft awarded a Phase I contract for design of an advanced jet tanker.

CAB chairman Ross Rizley names Robert L. Kunzig, former counsel to the House Committee on Un-American Activities, as his administrative assistant.

Mar. 4

First Boeing B-52 arrives at Edwards AFB to begin Phase VI tests.

Fairchild Aircraft Division proposes a carrier version of its C-123B Avitruc to augment air resupply of vital cargo and personnel.

Mar. 7

Boeing Airplane Co. announces plan to build a $2-million wind tunnel to test aircraft in the Mach 1.2 to Mach 4 range.

Dassault completing flight tests of a Mystere IV-A incorporating an all-flying tail with separate elevators.

Mar. 9

Boeing had its first billion-dollar sales year in 1954, and net income also reached an all-time high, President William M. Allen reports.

Mar. 10

The Air Force activates its first squadron of "parasite" fighters, using Republic RF-84F's equipped to be carried, launched and recovered in flight by RB-36's.

North American Aviation to build first nuclear reactor for private industrial research for the Armour Research Foundation on the campus of Illinois Institute of Technology.

AVRO Aircraft planning $5-million expansion for production of its supersonic CF-105 delta-wing jet.

Mar. 11

Convair reveals its proposed short-medium distance turboprop transport, using four Rolls-Royce RDA7 Dart engines, will cruise at 330 mph.

Navy Bureau of Aeronautics awards $12-million contract to Pratt & Whitney for additional development of J57 engines.

Mar. 14

Douglas Aircraft Co. receives an additional $8-million for work on existing F4D-2 contract.

Defense Department announces military services to spend $518-million for guided missiles in fiscal 1955 and $674-million next year.

Air Force awards AVCO's Lycoming Division new contracts totaling more than $5.2-million for Wright-licensed R-1820 piston engines.

Louis S. Rothschild, new Under Secretary of Commerce, named chairman of the Air Coordinating Committee.

Mar. 15

Air Traffic Conference members vote, 21 to 10, to repeal reservations reconfirmation rule.

Backlog of the aircraft industry for complete aircraft, engines and propellers was $14-billion as of Dec. 31. Military orders represented 93% of the aircraft backlog, 96 percent of engine orders, and 87 percent of propeller orders.

Walter H. Barling, designer and builder of the first U. S. heavy bomber, retires.

Mar. 16

Air Force announces that it has under accelerated development three missiles with intercontinental range — North American Navaho, Northrop Snark and Convair Atlas.

Chance Vought reports design of a simplified pilot ejection seat for Navy jet aircraft.

Defense Department sets up a titanium metallurgical laboratory under contract with the Battelle Memorial Institute.

Mar. 17

Slick Airways reveals plan for start of door-to-door air cargo service on a regularly scheduled basis within 30 days.

Hannibal Choate Ford, founder of Ford Instrument Co. and former chief engineer of Sperry Gyroscope Co., dies.

Trevor Gardner, Assistant Secretary of the Air Force, reports the USAF emerging into an era of a balanced aircraft-missile integrated force.

A new German jet propulsion research organization is formed in Stuttgart.

Mar. 18

Pentagon announces that Curtiss-Wright Corp. is participating under a USAF contract in design studies for the application of atomic power to aircraft propulsion.

BOAC announces its 20 new Comets will be Mark 4's, which are Comet 3's with Avon RA29 engines and with structural design changes resulting from findings in Comet 1 accidents.

North American Aviation reveals USAF contract for the long-range SM-64 missile, formerly designated B-64.

Mar. 21

Major General James Gavin appointed as Army's Deputy Chief of Staff for Plans and Research.

The Port of New York Authority reports that its four airports handled more than 9-million passengers, 122,000 tons of cargo and 40,000 tons of air mail in 1954, setting all-time records in each category.

Mar. 22

Air Coordinating Committee refers the TACAN VOR-DME dispute to its NAV panel and requests recommendations by April 15.

Mar. 23

Robert E. Gross, president of Lockheed Aircraft Corp., warns that the aircraft manufacturing industry may be in danger of being splintered off by new companies entering the business under the weapons system concept.

Speakers at IRE convention disclose that work is progressing on instrumentation for devices to be launched by the Rockaire technique, which calls for the launching of missiles from high altitude aircraft as a possible first step to establishing a space radio transmitter.

National Airlines applies to CAB for authority to conduct passenger helicopter operations in the Hampton Roads, Va., area for one year starting May 1.

Mar. 24

Convair announces work soon to begin on a $3.5-million "trisonic" wind tunnel to test models of aircraft and missiles up to Mach 4.5.

Navy reports a completely automatic escape sequence for the Lockheed and Convair VTO fighters, enabling pilots to eject safely at altitudes as low as 25 feet and airspeeds as low as 200 knots.

Mar. 25

President Eisenhower designates Joseph P. Adams as Vice Chairman of CAB.

TWA takes delivery of four new Model 1049G Super Constellations from Lockheed Aircraft Corp.

Mar. 28

General Electric Co. announces it is supplying for the USAF F-101 Voodoo an automatic electrical system that requires no attention from the pilot.

Bell Aircraft Corp discloses it is supplying rocket engines which power the Army's Nike surface-to-air missile.

Mar. 29

Bell Aircraft Corp. and the Navy develop and successfully test an electronic landing system for aircraft carrier use which has brought in several hundred aircraft in fully-automatic "hands-off" landings.

Army takes delivery of its first Sikorsky H-34 helicopter, military version of the S-58.

Air Research and Development Command, USAF and Sperry Gyroscope Co. announce an improved remote control of jet fighter aircraft on special "drone," pilotless interceptor or nuclear test missions.

Mar. 30

B. F. Goodrich claims development of first high pressure tubeless airplane tire capable of absorbing shock of landings and takeoffs at 300 mph.

Mar. 31

Air Force and Defense Department spokesmen tell Congressional Committee that its aircraft nuclear propulsion program is moving at high speed.

Dr. Theodore von Karman receives the Exceptional Service Award, highest award by the Air Force to a civilian, for his work as chairman of the Scientific Advisory Board.

APRIL

Apr. 1

National Aeronautic Association, U. S. representative of Federation Aeronautique Internationale, recognizes adjusted speed of 3 hours 44 minutes 53 seconds as official Los Angeles-New York speed record, set by Lieutenant Colonel Robert R. Scott, USAF, in Republic F-84F Thunderstreak on March 9.

Ford Instrument Co., division of Sperry Corp., awarded $9,313,485 Navy contract for computers.

Apr. 4

Northrop Aircraft gets $2,224,275 order from Air Force for new version of F-89H, the Scorpion.

Air Force awards $15-million contract to Convair Division, General Dynamics Corp., for unspecified number of F-102A aircraft, spare parts, related items. North American Aviation given order for 215 unspecified aircraft and related equipment, totaling $12,607,989. A $3-milion order given Sikorsky Aircraft for 55 H-19D helicopters, spares, GHE and data.

Hoover Commission urges maximum use of commercial air carriers by Defense Department and sharp reduction in operation of MATS.

Apr. 5

Ten Douglas DC-7C's ordered by KLM Royal Dutch Airlines for delivery between April and July, 1957. Order worth $31.5-million.

Piasecki Helicopter Corp. announces board of directors authorizes work required for CAA certification of H-21 helicopter, entering commercial transport helicopter field.

First production Navy FJ-4 Fury Jet makes initial flight at North American Aviation's Columbus division.

Development of small training drones, costing $500 to $600 apiece, to train operators in use of larger drones for gunnery practice, revealed in Pasadena, Calif.

Apr. 6

Expenditure of $120.4-million of aid from U. S. included in Britain's $4.3-million defense budget for 1955-56. This aid allocated to defense support aid, agriculture commodity aid, special aircraft purchase and additional RAF program.

"UNIVAC SCIENTIFIC," Remington Rand electronic computer added to missile test equipment at White Sands Proving Ground, N. M., expected to reduce date-processing time from weeks or months to hours.

Apr. 7

Air Force completes public phase of testimony before Senate Appropriations Defense Subcommittee with plea for more housing as most critical situation facing it.

Air Force Secretary Harold E. Talbott reports air defense systems in U. S. are nearing completion and can give minimum of two hours' warning when finished.

First Air Force unit equipped with Chase Fairchild C-123B's will be 16th Troop Carrier Squadron (Assault) of 463rd Troop Carrier Wing (Medium), stationed at Ardmore Air Force Base, Okla.

Atomic Energy Commission detonated prototype of air-to-air nuclear warhead missile more than 30,000 feet above Nevada proving ground.

Vice Admiral Thomas S. Combs, Deputy Chief of Naval Operations for Air, appointed member of National Advisory Committee for Aeronautics by President Eisenhower.

Apr. 8

Fairchild Aircraft Division asks CAA to start studies of Fokker-designed, F-27 Dart-powered turboprop transport to determine if it can be certificated for use in U. S.

Lockheed starts delivery in quantity to Navy of jet-pod-equipped P2V-7 Neptune. First unit to get anti-submarine patrol bombers is Patrol Squadron 18, Fleet Air Wing 11, Jacksonville, Fla.

Apr. 11

Navy reports that Hiller Helicopters has designed and built small wingless "flying platform" combining principle of weight shifting with ducted fan.

General Benjamin W. Childlaw, 54, commanding general of USAF Air Defense Command and new Continental Air Defense Command, to retire May 31 after 33 years in military service.

Glenn L. Martin Co. to start manufacture of pre-fabricated nuclear reactors, designed for simple assembly in field.

First production model of Lockheed Aircraft Corp's C-130-A turboprop transport for Air Force makes initial flight at Marietta, Ga.

Military Air Transport Service awarded Daedalian Trophy for 1954. USAF awarded National Safety Council's Award of Honor for fifth consecutive year.

Apr. 12

North American Aviation ends X-10(SM-62 Navaho) missile test work at Edwards Air Force Base. Entire test flight program on long-range, ramjet Navaho to be conducted at Patrick Air Force Base, Fla.

Apr. 13

United Air Lines announces details of $42.5-million equipment program involving purchase of 26 four-engine Douglas transports, supplementing 17 Douglas transports ordered last year.

USAF headquarters in Europe announces award of three major contracts to Italy's Fiat company, involving assembly of North Amercian F-86K all-weather fighters, repair and overhaul of General Electric J47 engines, and work on F-91 lightweight fighter.

H. Leslie Hoffman, president of Hoffman Electronics Corp., expresses major concern over invasion of electronics industry by airframe companies.

Production of T-33 trainers extended into late 1956 at Lockheed Aircraft Corp.'s California division by additional $10-million order from Air Force.

Apr. 14

International Telephone and Telegraph Corp. announces availability of TACAN, saying large scale production started by Federal Telephone and Radio Co., Stromberg-Carlson and Hoffman Radio Corp.

Business and Defense Services Administration's industry advisory committee on titanium urges Pentagon to push newest expansion program for metals.

Frye-Robertson Aircraft Co. formed in Newark, Texas, with Jack Frye, former TWA head and recently president of General Airline & Film Corp., as president.

Air Navigation Development Board begins testing of new system for distributing aviation weather information by teletypewriter, using automatic switching center and magnetic storage drum in Indianapolis.

Apr. 15

CAA type certificate awarded to Pratt & Whitney's J57 10,000 pound-thrust jet engine.

Victor Emanuel, president and chairman of Avco Manufacturing Corp., announces setting up of two scientific teams to work on electronics, guided missiles and atomic energy.

Modified C-46 of Aircraft Engineering Foundation crosses nation at average speed of 232 mph.

TWA authorized by CAB to close gap between Frankfurt, Germany, and Zurich, Switzerland, permitting transatlantic operations through London and Frankfurt to Zurich and points beyond. CAB denies Pan American's bid for Rome-Frankfurt authorization but approves PAA's application to serve Istanbul and Ankara, Turkey, as intermediates between Rome and Beirut.

Dr. Jerome C. Hunsaker, chairman of National Advisory Committee for Aeronautics, awarded Langley Gold Medal of Smithsonian Instittuion.

First flight photos of Convair F-102A released, showing coke-bottle configuration of supersonic Delta-wing fighter.

Defense Department revealed as largest holder of federal real property in the United States, accounting for $18.8-billion of total acquisition cost of $30.2-billion.

One of three Douglas D-558-1 Skystreak experimental planes being used as children's sliding pond at Walt Disney Elementary School in Tulleytown, Pa.

Absolute range of Lockheed's new Model 1049G Super Constellation equipped with tip tanks announced as 5,580 miles. Tanks hold 600 gallons each, add up to 850 extra miles.

Apr. 18

Three pilotless jet fighters, Lockheed QF-80 drones, sent into blast area during atomic test in Nevada desert. All three survive.

Aircraft Engineering Foundation estimates kit cost for C-46 operators to incorporate Super 46 engine and nacelle modifications to be about $20,000.

General Benjamin W. Childlaw, retiring head of Continental Air Defense Command, predicts U. S. will have evolved cruising and intercontinental ballistics missiles within next ten years.

Deutsche Lufthansa's first Super Constellation leaves Burbank for German airline's Hamburg base.

Australia's Avon-powered license-built North American F-86 Sabre to be equipped with guided missiles.

Apr. 19

Lockheed Aircraft Corp. gets $70-million order for 24 L-1649 Super Constellations for Trans World Airlines.

John S. Attinello, head of supersonics division of Navy's Bureau of Aeronautics, says low speed landing, coupled with thrust reversers, may soon eliminate need for special landing fields with long runways.

AiResearch Aviation Service division of The Garrett Corp. reports it has accomplished 12-mph increase in cruising speed of Beechcraft Bonanza at 8,000 feet in experimental application of geometric boundary layer control to wing leading edges.

Apr. 20

President Eisenhower approves CAB recommendations in New York-Balboa Through Service case, paving way for new interchange operations between New York and Latin America.

United Air Lines to become first airline to operate nonstop flights in both directions between New York and San Francisco, cutting full hour from present one-stop service.

Boeing Airplane Co. brings new complete flight test communications system into full-scale operation at flight test center at Boeing Field, Seattle.

L. B. Smith Aircraft Corp., aircraft conversion firm, and Air Carrier Engine Service, engine modification company, both of Miami, to begin final flight tests on C-46 aircraft leading to CAA certification under T-category for gross take-off weight of 50,000 pounds.

Apr. 21

First disclosure made of two USAF boundary layer control projects.

W. R. Rhoads, Lockheed-Marietta's chief military operations research engineer, says nation's air logistics transport fleet would be obsolete in event of military emergency.

First design and performance details of the Bristol Aeroplane Co.'s B. E. 25 "supercharged" turboprop engine revealed.

Details of new, improved high-altitude research rocket, the Aerobee-Hi, revealed.

Dr. Leslie A. Bryan elected new president of Amercian Association of Airport Executives.

Apr. 22

Douglas Aircraft Co. to produce both turbojet and turboprop commercial transports.

Navy and Marine Corps expect to take delivery of 2,616 air raft during fiscal 1956 and to place orders for 1,613 more during same period.

Powerplant difficulties blamed for abortive flights of rocket-powered aircraft in more than 200 flights during past ten years.

Apr. 25

Air Force Assistant Secretary Roger Lewis tells Senate Small Business Subcommittee that small business interests are being protected by Air Force under program, defending new "weapons system concept".

CAB grants one-year exemption to National Airlines to conduct helicopter operations within 100-mile radius of Patrick Henry Airport, Newport News, Va., conditioned on NAL serving at least two intermediates between Richmond and Norfolk or Newport News. Mail rights are excluded.

Boeing Airplane Co. begins extensive service tests of new Pratt & Whitney T34 turboprop engine.

Potential tactical applications of Ryan Aeronautical Co.'s Firebee 600-plus mph jet target drone disclosed.

USAF gives letter contract to Stroukoff Aircraft Corp., West Trenton, N. J., for work incorporating boundary layer control features and making other modifications to Fairchild-built C-123B assault transports.

Apr. 26

France's first jet large transport, the SNCA du Sud-Est Caravelle, undergoing pre-flight tests.

USAF announces it plans to order 2,333 new aircraft costing $3,552,000,000 during fiscal year beginning July 1.

R. Karl Honaman, on leave as director of publications for Bell Telephone Laboratories, appointed Deputy Assistant Secretary of Defense for Public Affairs, succeeding D. Walter Swan.

Greatly increased emphasis on air mobility within the service revealed by Army. It involves possibility of formation of Army air wing to provide transport and tactical support aircraft.

Eaton Manufacturing Co., Cleveland, purchases Fredric Flader, Inc., North Tonawanda, N. Y., research and engineering company, and will operate it as subsidiary.

Apr. 27

Current Air Force budget request includes funds for initial financing of new long-range high performance interceptor.

Atomic Energy Commission asks for proposals by private industry to finance, build and operate improved "engineering test reactor".

General Motors Corp.'s Buick-Oldsmobile-Pontiac plant at Kansas City, Kans., to cease production of Republic-licensed F-84F Thunderstreak latter part of year.

Apr. 28

More than 300 of Douglas B/RB-66 series ordered by Air Force.

Three-hour initial flight made by DC-7B at Santa Monica.

Deliveries of Douglas C-133 turboprop transport, powered by four Pratt & Whitney T57 engines, to begin late this year.

Army plans to train 900 helicopter pilots during fiscal 1956.

General Lemuel C. Shepherd, Corps Commandant, says Marine Corps is tailoring combat organiaztion to have capability of landing entire assault force of men and weapons by helicopter eventually.

Navy thinks Martin XP6M-1 has strategic, tactical and possibly logistical potentialities worth developing.

Cessna Aircraft Co. reveals performance figures for new CH-1 helicopter.

Apr. 29

Air Secretary Harold E. Talbott says new aircraft and guided missile production facilities should be constructed away from concentrated areas on east and west coasts.

Bell Aircraft Corp., Texas Division, discloses tests on flying wing helicopter model with side-by-side rotors.

Port of New York Authority to bar aircraft not equipped with brakes and functioning two-way radio from landing or taking off from its air terminals, except Teterboro, where aircraft equipped with radios capable only of receiving transmissions from control tower may be operated in daylight when weather permits "contact" operations. Ban will be waived in event of emergency.

MAY

May 2

Navy officials confirm "Navy-Air Force Ten-Year Powerplant Development Program."

William P. Gwinn, general manager of Pratt & Whitney Aircraft, reveals that division's nuclear propulsion research facility will be called Connecticut Aircraft Nuclear Engine Laboratory (CANEL) and will be located near Middletown, Conn.

De Havilland Aircraft Company offers delivery of Comet 4, jet transport, tank tested and with guaranteed fatigue life equivalent to ten years' service, at end of 1958.

Colonel William B. Bunker, Commandant of Transportation School, U. S. Army, Fort Eustis, Va., elected president of American Helicopter Society.

Air Material Command awards $10-million Air Force contract for B-57E airplanes, spare parts, special tools and GHE and data to Glenn L. Martin Company.

May 3

Don Berlin elected chairman of the board and president of Piasecki Helicopter Corp., also remaining a director and member of the executive committee.

Republic Aviation Corp. announces contract with the Air Force for development of RF-105, photo-reconnaissance version of F-105 advanced fighter-bomber.

Slick, Flying Tigers and Riddle, certificated all-cargo carriers, given exemptions, authorizing participation in 3¢-mail-by-air experiments, by CAB.

Silkorsky Aircraft Division of United Aircraft Corp. begins small-scale production of components for S-56 twin-engine helicopter at new plant in Stratford, Conn.

Funeral services held for John Henry Towers, retired admiral and president of Flight Safety Foundation, at Ft. Myer, Va., chapel.

May 5

Thomas Bayne Wilson, chairman of the board of TWA from 1938-1947, sworn in as Deputy to Under Secretary of Commerce for Transportation, Louis S. Rothschild.

Air Material Command awards $5-million Air Force contract for 28 TF-102A aircraft, spare parts and related data to Convair Division, General Dynamics Corp.

Charles A. Lowen, former Denver director of aviation, named organization and administration consultant to CAA Administrator Fred B. Lee.

CAB refused to underwrite Hawaiian Airlines' Convair 340 operations and effects sharp cuts in past and future mail pay of airline.

Bureau of the Census and CAA report that nation's aircraft industry in 1954 shipped 3,389 civilian planes worth $295.7-million.

Pan American World Airways and Trans World Airlines report success of fly-now-pay-later plans.

May 6

McDonnell Aircraft Corp.'s XV-1 convertiplane makes first successful conversion from helicopter to conventional airplane flight.

C. N. Sayen, president of Air Line Pilots Association, attacks CAB's waiver of eight-hour flight rule for non-scheduled airlines.

Louis Breguet, French aviation pioneer, dies at age of 75.

British Society of British Aircraft Constructors reports that production rate of Curtiss-Wright Corp.'s J65 jet engine, U. S. version of the British Armstrong Siddeley Sapphire built under license, is now more than 250 a month.

CAA certificates TEMCO Aircraft Corp's Riley '55 twin-engine Navion conversion, improved version of Riley Twin produced during 1953-54.

May 10

Sabena Belgian World Airlines receives contract from U. S. Forces in Europe for overhaul of U. S. military helicopters operated in Europe.

Convair starts production line for Model 340B, incorporating speed and sound inmprovements over present Convair Liner.

Cost of TACAN program at present time is estimated at $483,125,000 by Aircraft Owners & Pilots Association.

Douglas Aircraft Co.'s Long Beach division delivers last C-124 Globemaster to Air Force.

More than 300 plane owners and pilots sign up as charter members of National Pilots Association.

May 11

USAF to place first orders for standby machine tools for use in case of emergency.

Curtiss-Wright Corp. acquires sites for emergency assembly plant in Pennsylvania mountains and for bombproof headquarters and research facilities in Ramapo Hills.

Ivan Driggs, 61, winner last December of Navy League Annual Award of Merit for work in helping develop and demonstrate practicability of vertical take-off fighter aircraft, dies at Johnsville, Pa.

CAB reports that inadequate in-flight planning probably caused crash landing of Air France's Lockheed 1049 Constellation at Preston City, Conn., on August 3, 1954.

Bell Aircraft Corp.'s Model 47G helicopter officially designated as Model 47G-2 in accordance with CAA requirements.

Douglas Aircraft Co. and Lewis Flight Propulsion Laboratory, NACA, win first places in National Safety Council's aeronautical industries safety contest for 1954.

May 12

Bill passed by both houses of California legislature to prevent county governments from levying personal property taxes on airplanes in California for repair, modification, overhauling or servicing.

Sen. Joseph C. O'Mahoney (D-Wyo.), former counsel of North American Airlines, accuses CAB of maintaining "closed door" policy regarding entry into the airline industry.

Legal precedent may be established by jury verdict in Los Angeles superior court lawsuit in which eight couples were awarded $18,000 in damages from Lockheed because of noise from jet production flying.

Deutsche Lufthansa to move from temporary U. S. offices at 666 Fifth Avenue, New York, to permanent quarters at 555 Fifth Avenue.

A Fairchild C-123B assault transport is first plane to be equipped with Speed Control System, developed by Safe Flight Instrument Corp., White Plains, N. Y., a lift-measuring device that tells pilot best speed to fly on landing, take-off and other low-speed flight conditions.

Aircraft Owners and Pilots Association challenges one-the-record testimony on TACAN-VOR/DME controversy given by Major General Gordon Blake before House subcommittee on Air Force appropriations.

Major General Victor E. Bertrandias, recently retired as Deputy Inspector General of USAF, named vice president of Hammond Manufacturing Corp., Pasadena, and its newly formed subsidiary, Air Logistics Corp.

Straight lines of English Electric P-1 level supersonic fighter accentuated in first air-to-air photo released. Prototype powered by two Armstrong Siddeley Sapphire single-spool turbojets.

May 13

Trans-Canada Air Lines to start Viscount service to Chicago and Cleveland on June 20.

Under Secretary of Commerce Louis S. Rothschild calls airlines' support of TACAN a "self-interest maneuver" in testimony before House subcommittee on appropriations.

Lawrence D. Bell, Bell Aircraft Corp. president, and Air Force Lieutenant Colonel John P. Stapp, honored by Jet Pioneer Association of U.S.A.

Thirteen airlines, including eight local service carriers, to retain reconfirmation on all or parts of their systems. They are Colonial, Northeast, Bonanza, Lake Central, Mohawk, North Central, Piedmont, Southern and West Coast; also Eastern and Allegheny, EAL, National and Delta-C&S.

May 16

General Maxwell D. Taylor nominated to succeed General Matthew B. Ridgeway as Army Chief of Staff.

New Air Force regulation indicates that joint Armed Forces Special Weapons Project "is considered to be on the same command level as the major air commands."

Cessna Aircraft Co. received $5-million subcontract from Republic Aviation Corp. to build maneuverable horizontal stabilizers for F-84F Thunderjet fighter.

British European Airways announces first profit in its history—net of over $140,000 for fiscal year ending March 31, 1955.

May 17

Sen. Wayne Morse (D-Ore.) calls CAB "greatest drag on civil aviation since gravity".

Pan Amercian World Aidways applies to CAB for "polar" route from U. S. west coast to Europe.

Hoover Commission repeats recommendation to Congress that government competition with air transport industry should be minimized.

Dr. E. R. Piore, formerly chief scientist and deputy chief of Office of Naval Research, to head Avco Manufacturing Corp.'s team of top research scientists in fields of electronics, atomic energy and guided missiles.

Taylorcraft, Inc., of Conway, Pa., announces completion of CAA certification tests on its fiberglas airplane.

Donald F. Lowe, vice chairman of Port of New York Authority, named chairman to succeed Howard S. Cullman, who becomes honorary chairman.

May 18

Sen. Stuart Symington (D-Mo.) introduces resolution calling for Senate investigation of Defense Department's announcement on new Russian planes.

Cornell Aeronautical Laboratory, Buffalo, N. Y., reports development of new guided missile for ground troops.

USAF estimates that Lockheed's C-130 turboprop cargo plane will have ton mile cost of 5.3c for ranges of 1,000 nautical miles, 5.9c at 2,000 nautical miles and 21.4c at 3,000 nautical miles.

Louis S. Rothschild, Under Secretary of Commerce for Transportation, appointed by President Eisenhower to succeed Oswald Ryan as member of the National Advisory Committee for Aeronautics.

May 19

President Eisenhower enters dispute over relative strength of U. S. and Soviet air power, rejecting charges that this country has lost control of the air.

Boeing B-52 heavy bomber revealed as heaviest consumer of fuel and oil in Air Force's arsenal of aircraft, costing an estimated $328 per flying hour.

Air Transport Association urges use of compatible color television techniques in a radar beacon system for air traffic control in high density areas.

Roadable Corporation of America formed in Buffalo to develop a roadable aircraft design, and construction on full-size flight test model is under way. Chester R. Haig, Jr., is president and Harry A. Hamilton, Jr., secretary-treasurer.

Air Force awards $1,995,139 contract to Sikorsky Aircraft Division, United Aircraft Corp. for depot overhaul spare parts.

Deutsche Lufthansa starts international operations with two daily flights to London, three weekly schedules to Paris and three to Madrid.

May 20

Top Air Force officials and Senate leaders express concern over condition of U. S. air power relative to Soviet air strength.

House Appropriations Committee slashes proposed CAB airline subsidy program from $63-million to $40-milion for fiscal 1956.

CAB issues foreign air carrier permit to Aerovias Venezolanas, S. A. (Avense), permitting service between Venezuela and Miami via Netherlands West Indies and Jamaica and between Venezuela and New Orleans via Jamaica.

May 23

CAB announces "liberalization" of its trans-Atlantic charter policy for 1955 and also institutes investigation to determine if foreign-permit holders should be permitted to perform off-line charters.

General Nathan F. Twining hints new developments in Russian air power may cause USAF to expand beyond its present goal.

Forthcoming Tactical Air Command combat planes including fighter-bombers, day superiority fighters and light bombers, will be refuelable, reports General O. P. Weyland.

Canadair Ltd., Montreal, reported to have gone ahead with its design proposal for a side-by-side primary jet trainer for RCAF.

A Grumman S2F Sentinel revealed as first plane to make arrested landing on a canted deck of an aircraft carrier in the Pacific. Lieutenant Commander P. T. Gannon was pilot and Captain R. L. Newman, co-pilot.

Aviolanda Company, participating in Dutch license production of Hawker Hunter fighters, reveals development of a pilotless, radio-controlled target and liaison aircraft incorporating several new features.

May 24

Sen. Stuart Symington (D-Mo.) decleares that Russia is moving up on USAF in offensive and ahead on defensive airpower and urges Administration for an accounting.

A North American F-86 sets two transcontinental records: (1) as first aircraft to cross the U. S. round trip in daylight and (2) by flying east-west leg in 5 hrs., 27 mins., 37 secs., breaking previous record.

May 25

Pentagon reports 11 major aircraft companies received total of 41.1 percent of all military contracts awarded by U. S. government in 18 months ending Dec. 31, 1954.

Air Secretary Harold E. Talbott says atomic-powered airplane is definitely on its way.

Walter H. Johnson, Jr., vice president and sales manager of American Airlines, calls for new forward policy in airfreight to replace "fence-straddling policy of the recent past".

May 26

North American Aviation reports successful first flight of first F-86K assembled in Italy.

President Eisenhower accepts CAB recommendations in States-Alaska case for maintenance of a four-carrier network.

General Nathan F. Twining nominated by President Eisenhower for another two-year term as USAF Chief of Staff.

Rep. Chet Holifield (D-Calif.) requests Presidential and Congressional action to forestall large-scale buying of TACAN navigation equipment.

May 27

USAF Secretary Harold Talbott reveals to Senate Armed Services Committee in secret session plans for production speedup for B-52 and F-100 series.

Allison's J71 turbojet officially qualifies as 10,000-lb. thrust engine in USAF 150-hour tests.

A small group of British Army personnel to start six-month training course on Corporal 2 guided missile in the U. S. on July 1. They will be trained as instructors in connection with establishment in 1956 of British Army units equipped with the American missile.

Nearly 6,000 engineering employees of Boeing Airplane Co.'s Seattle and Wichita divisions vote to accept company's offer of salary increases of 2.75 percent retroactive to Oct. 1, 1954. Nearly 1,000 Wichita engineers will receive a 2¼ percent salary increase and a 2¾ percent increase retroactive to Oct. 1, 1954. Other Wichita benefits provide increase in overtime pay and inclusion in company's pension plan. Technical payroll employes receive more liberal overtime provisions and 2¼ percent salary increase. Terms are subject to Air Force approval.

North American Aviation offers new invention award plan to reward employes who suggest patentable ideas. Plan pays $100 to inventor (or inventors) of any idea for which company applies for a patent. If patent is issued, award is $500. If patent idea is licensed, additional sum may be paid in amount deemed fair by an Invention Award Plan Board, consisting of company executives. Highest amount approved at first meeting of board was $1,750 to William T. Barker of the wing group for invention of the Barker rivet.

New low-cost ground-control-approach radar SPAR (Super Precision Approach Radar) being demonstrated in all major European countries to military and civil aviation representatives under auspices of Bendix International Division and Laboratory for Electronics, Inc.

May 31

USAF Secretary Talbott's order to Boeing Airplane Co. to accelerate production of B-52 at Seattle and Wichita by 35 percent expected to be followed by similar order to Pratt & Whitney and Ford Aircraft Engine Division for J57 turbojets.

Construction starts on new rocket test stand capable of withstanding 1-million pounds of thrust at Air Force Flight Test Center, Edwards AFB. It is 150 feet in length, has vertical clearance of 150 feet and will be completed in about two years. It will be self-contained facility, with its own assembly shop, instrumentation shop, propellent distribtuion and high pressure gas systems and completely independent of present rocket test installations at Edwards. New, bigger test stand expected to be able to test any rocket engine to be developed in foreseeable future.

Scandinavian Airlines System president Henning Throne-Holst reports the airline has carried approximately 4,600 revenue passengers since starting direct service between Los Angeles and Europe last fall. Load factors have jumped from average of 40 percent in first couple of months to practically 100 percent eastbound and 60 percent westbound.

Captain Francis J. Black, Jr., airline pilot, urges campaign by traveling public against serving of liquor aboard airplanes.

Britain's Decca Navigator Co., Ltd., takes issue with VOR/DME and TACAN as effective part of an air traffic control system.

Australian authorities estimate next year's Olympic games at Melbourne will attract 10,000 visitors arriving by air in a matter of days. Plans are made to enlarge customs and quarantine facilities at airports at Melbourne, Darwin, Perth, Brisbane and Sydney for duration of the games.

A French guided missile, the SNCA du Nord (FECMAS SS10), said to be attracting interest of NATO. Can be used for air-to-air or air-to-ground missions.

JUNE

June 1

The SNCA du Sud-Est Caravelle, French jet transport, makes first flight May 27.

Hoover Commission warns Congress that "the Armed Services are not sufficiently daring and imaginative in approach to radically new weapons and weapon systems," adding that even stepped-up research and development programs may be too late to maintain U. S. supremacy in weaponry.

CAB gives Deutsche Lufthansa, German airline, a one-year foreign air carrier permit for operations between Germany and New York via Shannon and Gander.

Airwork Atlantic Limited revises thrice-weekly all-cargo scheduled service from New York to Europe to provide no-change-of-plane freight service to Dusseldorf, Germany.

Robert Thach, a founder of Pan American World Airways, dies in Charleston, S. C.

Charles Healy Day dies in Los Angeles after long career in aviation.

Edward L. (Swanee) Taylor, veteran barnstorming flier and pioneer aviation, dies at Bethesda Naval Hospital.

June 2

CAA spokesmen criticized for what Senate Appropriations Committee members called "pressure" exerted in effort to obtain restoration of funds cut by House.

Agreement revealed that role of air taxi operators shall be to fly irregular, demand-type service rather than scheduled operations and that they shall be permitted to use helicopters of certain size and weight.

William A. Cooke, vice president of Audio Products Corp., elected president of Aircraft Parts Manufacturers Association.

A. W. (Tony) LeVier named director of flying operations for California division of Lockheed Aircraft Corp.

June 3

Air Marshal C. R. Slemon, Canada's Chief of Air Staff, says U. S. and Canadian Air Defense Commands are integrated at most practical level and are heading toward unification under supreme commander.

United Air Lines economic analyst urges CAB to encourage interchange arrangements between airlines as substitute for new routes.

Avro Aircraft Ltd., Malton, Canada, tests free-flight models of CF-105 supersonic interceptor, firing scaled-down replicas from Nike rocket rigs.

June 6

Sen. Warren Magnuson (D-Wash.) charges the Administration has failed to recognize role of research and development in maintaining U. S. airpower.

Air Force officials begin investigation into appearance of detailed cut-away drawings of highly classified F-100A Super Sabre in May edition of Japanese publication Aireview.

Afterburner version of Curtiss-Wright J65 jet engine to be shown publicly for first time at Paris Air Show.

Lear, Inc., LearCal Div., develops new automatic direction finder, Model ADF-16, designed to meet CAA, military and airline specifications.

Vern Haugland of the Associated Press elected president of Aviation Writers Association.

Request by Federal Republic of Germany for admission to membership in ICAO tabled at ICAO General Assembly.

Australian Department of Supply places $22.5-million order for more Avon Sabre jet fighters and spares for RAAF with Commonwealth Aircraft Corp.

Russia indicates it will participate in 1956 Canadian International Air Show.

June 7

Air Vice Marshal John L. Plant of Royal Canadian Air Force fired from post as Air Member for Technical Services as result of speech before Aviation Writers Association.

USAF gives Italian government order for three Fiat G-91 lightweight fighters for use in NATO program.

CAA announces that pilots using Distance Measuring Equipment (DME) will be permitted to make straight-in approaches at airports having no low-approach facilities in near future.

CAB Chairman Ross Rizley reveals to Senate Commerce Committee that inadequate airport conditions have forced air carriers to suspend service at 88 points during past four years.

Eastern Air Lines adds "golden" theme to its "Great Silver Fleet" with new Douglas DC-7Bs.

June 8

Pentagon still undecided whether 35 percent increase in B-52 program will require comparable increase in J57 engine program.

Administration opens appeal for two-year extension of Renegotiation Act. Senate Finance Committee members charge that Defense Department reliance on negotiated contracts destroys competition.

Sen. Stuart Symington (D-Mo.) says U. S. is far ahead of Soviet Union only in medium bomber field and that "unless our entire program is accelerated and adjusted, they will surpass us in a relatively short time" in total air power.

Republic Aviation Corp. delivers 1,000th F-84F atom-capable Thunderstreak to U. S. Air Force.

Canadian Pacific Airlines, Ltd., willing to pay $2.8-million each for four Comet 4 jet airliners if they can be delivered by mid-1959.

Army orders first fixed-wing tactical transport company to be activated at Ft. Riley, Kans., at earliest practicable date.

Major General Robert W. Burns, Asst. Vice Chief of Staff of USAF, awarded Distinguished Service Medal for "substantial contributions to national security".

American Airlines protests to CAB against "device" employed by some carriers to "achieve unfair hearing priority for new route applications".

June 9

American Airlines becomes first U. S. carrier to buy U. S.-built turboprop transport with order for 35 four-engine Lockheed Electras at total value of about $65-million.

USAF starts retiring B-36 intercontinental bomber.

House Government Operations Committee report questions value of TACAN, urges Government to limit procurement and calls for joint Congressional investigation of dispute over a common system of air navigation.

Sen. Henry M. Jackson (D-Wash.) says Administration's 35 percent speed-up in production of B-52 is totally inadequate.

Fred Landgraf, helicotper designer and organizer and president of former Landgraf Helicopter Co., named project engineer on special projects for Ryan Aeronautical Co.

Governor Goodwin Knight signs bill passed by California legislature permitting airlines to serve liquor aloft, with meals, at no charge, on flights within California.

Pan American World Airways and New York Airways file agreement to allow connecting passengers to be flown by helicopter without additional cost between Idlewild and airports in New York-New Jersey area for connections to or from U. S. interior points.

California Association of Airport Executives passes resolution urging aircraft manufacturers, CAA and CAB to accelerate research and experimentation on JATO, arresting gear, barriers, reverse thrust, boundary layer control and other devices to assist in solving problem of increased runway lengths.

Report from Germany says revised Luftwaffe will have 1,326 planes, including fighters, fighter-bombers, all-weather fighters, reconnaissance and transports.

June 10

Atomic Energy Commission chairman Lewis L. Strauss says "major breakthrough" has been achieved in development of reactors for propulsion of military aircraft.

James H. Doolittle elected president of Wings Club in New York.

Asst. USAF Secretary Trevor Gardner says U. S. aircraft industry is spending too much time studying and too little time doing.

June 13

Agreement between U. S. and German negotiators in connection with bilateral air transport rights to be subject of Senate inquiry.

U. S. Air Force Air Materiel Command adopts Hytrol anti-skid braking system on Republic RF-84F, Douglas B-66 and North American F-100 aircraft. Plans confirmed for Hytrol adoption by Military Air Transport Service and first orders placed for Boeing C-97 installations.

Lufthansa German Airlines' first scheduled transatlantic flight since World War II completed.

June 14

Vickers Viscount formally certificated by CAA at ceremonies in England.

Production stopped at Westinghouse Electric Corp.'s aviation gas turbine division, Kansas City, Mo., following walkout of estimated 3,000 production CIO-Autoworkers.

House Armed Services Committee approves AF proposal to move ARDC headquarters from Baltimore to Wright-Patterson AFB in Dayton.

First U. S. flight demonstration of Morane Saulnier, twin-jet four passenger business plane, scheduled at Westchester County Airport, White Plains, N. Y.

June 16

Severance pay and pensions to have top priority in contract negotiations between United Auto Workers-CIO and aircraft manufacturers.

Navy Secretary Charles S. Thomas calls for start on vigorous program for development of atomic-powered aircraft.

State Department criticized for failing to have on staff top-level personnel with knowledge of air transport industry who could represent U. S. in air negotiations with other nations.

Western observers in Moscow report more new Russian aircraft over city, notably a heretofore-unseen twin-rotor helicopter with more than 50 passengers capacity and bombers of B-52 class and B-47 class.

Mandatory reconfirmation rule in effect on all domestic airlines expires.

Convair-Fort Worth begins development work on new multi-million dollar Air Force contract calling for conversion of fleet of 36 C-54 transport planes into air rescue craft for Air Rescue Service of MATS.

Charles F. Willis, Jr., resigns as assistant to the President to become assistant to the chairman of the board of W. R. Grace & Co.

In inaugural test, Republic Aviation Corp.'s new remotely-controlled runway crash barrier stops RF-84F Thunderflash photo-reconnaissance plane in 600 feet.

National Safety Council names 39 U. S. airlines as winner of its aviation safety award for completing operations during 1954 without a passenger or crew fatality.

French SO 9,000 Trident prototype tops 850 mph in level flight using only two of its three rockets.

June 17

Joint Chiefs of Staff considering whether USAF should expand its role of providing airlift for the Army.

Senate restores $15-million to CAB's subsidy fund, previously reduced to $40-million by the House.

Thorsten V. Kalijarvi, Deputy Assistant Secretary of State, admits disagreement over air routes given by U. S. to Germany in unsigned Civil Air agreement.

Gordon Bain, executive vice president of Slick Airways, says new-type turboprop equipment, perhaps turbojet, may lower ton mile cost of carrying airfreight to 3c or less as compared to present 6½c.

June 20

GE's 1,500-pound-thrust J79, desined for Lockheed F-104 and Convair B-58, reportedly being flown in B-45 test bed.

President Eisenhower approves CAB's recommendation certificating Seaboard & Western Airlines to operate scheduled all-cargo service across Atlantic for five years.

Panagra and National Airlines sign interchange agreement.

Major General Kenner F. Hertford, chief of Army research and development, reveals that Army has invested nearly $16-million in two experimental convertiplanes, McDonnell XV-1 and Bell XV-3.

Convair-San Diego's new $3.5-million "blowdown" wind tunnel to be able to test aircraft and missile models up to speeds of Mach 5, is designed for speeds beyond that range and will provide test runs ranging from 50 to 90 seconds.

New criterion for determining whether unclassified information should be revealed by Pentagon based on whether it would make "constructive" contribution to Defense Department's mission and whether it will be "useful."

Frederick B. Rentschler, chairman of United Aircraft Corp., says U. S. has not lost lead in airpower to Russia nor in jet engine development to the British.

Hoover Commission reports effective fiscal management in Defense Department is far from being realized and estimates improved procedures would result in estimated savings of $4-billion annually.

Douglas Aircraft Co. to start fleet deliveries on F4D-1 turbojet shipboard fighter the latter part of the year.

H. Leslie Hoffman, president of Hoffman Electronics Corp., elected president of reorganized board of directors of Radio-Electronics-Television Manufacturers Assn.

June 21

William M. Allen, president of Boeing Airplane Co., offers rebuttal to charges that aircraft industry is not truly competitive and that profits are too high.

Navy and Chance Vought Aircraft, Inc., release details about supersonic XF8U1.

June 22

Harold L. (Pete) Pearson elected president of Air Transport Association.

Air Force to step up output of McDonnell F-101 and Lockheed F-104.

Northrop Aircraft reports production streamlining and learning curve benefits have reduced cost of Air Force F-89 Scorpion to $19 a pound.

Boeing Airplane Co. test pilots fly second turboprop-equipped Strato-freighter on maiden flight.

Benson Aircraft Corp., Raleigh-Durham Airport, Raleigh, N. C., to market one-place helicopter, Model B-4 Sky Scooter, with 60 mph cruising speed.

June 23

General Benjamin W. Chidlaw, USAF-Ret., joins Thompson Products, Inc., as vice president and consultant on aircraft.

Senate Commerce Committee votes unanimous authorizartion for vastly increased Federal Airport Aid program.

Rep. Carl Hinshaw (R-Calif.) urges Government to "cease permitting Mexican air commerce entry into the United States" unless that country quits "shilly-shallying" and agrees to a "just and equitable over-all air route agreement".

C. R. Smith, president of American Airlines, reports AA will not order longer range turboprop transport but will be in market for Douglas DC-8 or other jet transport.

Approximately 120 USAF field grade officers from every major command conclude two-week course at Massachusetts Institute of Technology on "Noise Problems in Aviation."

USAF estimates cost of operating each 30-plane Boeing B-52 wing at $39.3-million a year.

Australian Department of Civil Aviation orders compulsory use of Distance Measuring Equipment by all domestic airlines engaged in regular transport operations.

Ian Mikardo, British Labor Member of Parliament, presses for inquiry into production of British aircraft.

European Association of Independent Airlines formally created. President is Air Commodore Griffith J. Powell.

June 24

U. S. Court of Appeals, District of Columbia, reverses order of CAB denying North American Airlines' application to engage in air transportation under name North American Airlines and to cease and desist from using that name or any combination of the word "American."

Senate subcommittee to begin hearings again on matter of a second airport to relieve congestion at Washington National Airport.

Robert E. Gross, Lockheed Aircraft Corp. president, says new approach to aircraft development may be answer to shortage of engineers.

Four-place Morane Saulnier 760 twin-jet executive transport to cost about $300,000 if and when Beech Aircraft Corp. decides to build it.

June 27

First flight of first Electra turboprop of Lockheed Aircraft Corp. planned for October, 1957. First delivery scheduled for August, 1958.

Defense Secretary Charles E. Wilson signs new directive establishing military policy governing development and application of gas turbine engines.

Cargo rates between U. S. and Europe to be cut an average of 20 percent as result of unanimous decision by IATA traffic conference.

Quarter-billion-dollar airport aid program approved unanimously by Senate.

National Aeraonautical Corp. unveils new Simplexer Model VC-27.

Pan American World Airways announces $2-million purchase of C-Band equipment from Radio Corp. of America.

Dwight P. Joyce, chairman and president of the Glidden Company, charges that aviation manufacturers and distributors have "lost sight of the fundamental activity that makes their business possible—the promotion of civilian flying in all its aspects."

June 29

Special Presidential Commission reports that federal aid to airports should be increased and recommends continuation of present federal-state-local cost sharing arrangements.

Sen. Henry J. Jackson asks Defense Secretary Charles E. Wilson for answers to series of questions regarding comparative U.S.-Soviet air strength and expresses fear of rapid progress Russia is making in field of air power.

Air Secretary Talbott, in semi-annual report to President Eisenhower, calls Boeing B-52 heavy bomber the best in the world.

USAF creates new Air Force Aircraft Engines Logistics Planning Board in attempt to make better forecasts of spare engine requirements.

Fairchild Engine Division to shut down Mineola, L. I., plant in July upon completion of $40-million contract with Atomic Energy Commission.

June 30

Orders totaling at least $300-million may be placed within near future for Douglas Aircraft Co.'s DC-8 jet transport.

Boeing Airplane Co. received $15-million follow-on order for KC-135 jet tanker aircraft, special tools, training items, data and tests.

Andre A. Priester, vice president of Pan American World Airways, elected chairman of technical committee of International Air Transport Association.

Aircraft locals of International Association of Machinists-AFL expected to demand 10 percent increase in all wages, 15 percent swing differential and company-paid health and welfare programs in contract negotiations.

Air Force issues letter of intent to Bell Aircraft Corp.'s Fort Worth division, calling for production of nearly $1.5-million worth of helicopters.

Stockholders of both companies approve merger of General Dynamics Corp. with Stromberg-Carlson Co., Rochester, N. Y.

JULY

July 1

David S. Teeple, former aide to AEC Chairman Strauss, charges more "laxity and negligence" in the nuclear-powered aircraft program than in the development of the hydrogen bomb.

Cessna revives L-19 instrument trainer production under $1-million USAF contract.

Crosley Division of Avco Mfg. Co. receives $5.4-million contract for MD-1 fire control systems.

July 5

Piasecki Helicopter Corp. announces plan to build 19-passenger version of military H-21 helicopter for commercial transport market.

USAF marks two milestones—acceptance of first Boeing B-52 bomber and delivery of first production model of Convair F-102A supersonic interceptor.

July 6

National Airlines announces a $95-million fleet and facilities expansion program, featuring turboprop and turbojet aircraft.

Moscow May-day fly-by discloses several new-type Russian helicopters, turboprop and turbojet aircraft.

CAB orders North American Airlines group to cease unlawful operations immediately and terminate all air service by Sept. 1.

The Navy lists Cessna, Fairchild, Hiller and North American as winners of contracts for design studies for new high-performance observation plane for Army and Marine Corps.

July 8

Controversial bilateral air transport agreement betwen U. S. and Germany signed.

U. S. contracts for three Italian Aerfer lightweight fighter prototypes at cost of $2.3-million.

Piasecki Aircraft Corp., new company formed by Frank N. Piasecki, chartered.

July 11

Harry F. Vickers, founder of Vickers, Inc., elected vice chairman; Kenneth R. Herman named president.

Administration urges lowering annual federal aid to airports to $42-million, balks at four-year authorization principle.

Republic Aviation and union agree on company-paid pension plan.

Senator Smathers describes air transport agreement with Germany as "unjustified give-away" by State Department.

July 12

Allison Division of GM awarded $50-million Air Force contract for production of T56 turboprop engines.

Frank N. Piasecki announces his new firm to concentrate in field of vertical lift aircraft for military services.

The Exceptional Services Award, highest USAF civilian honor, presented to Lawrence D. Bell at dinner marking Bell Aircraft's 20th anniversary.

July 13

House Appropriations Committee cuts deeply into AF 1956 building program, knocks out funds for Air Academy and new ARDC headquarters.

Lockheed Aircraft market researchers expect air travel to jump to 72-million revenue passenger miles by 1965.

July 14

Air Force gives Boeing Airplane Company green light to build commercial jet transport.

Sen. George A. Smathers named to head new inquiry into international air route agreements, including Lufthansa pact.

Convair Division of General Dynamics awarded $5.4-million to modify and modernize RB-36 aircraft.

July 15

Lockheed's XF-104 reported to have exceeded Mach 2 speed.

South African Air Force places $10-milllon contract with Canadair for 34 Sabre 6 fighters powered by Orenda 14.

W. R. Grace & Co. accuses Pan American World Airways of reducing Pan-American-Grace Airways from an airline to a "mere pipeline."

MATS reports over 1,000 hours of flight testing on two Convair YC-131C turboprop transports.

July 18

Senate begins inquiry into business connections of Air Force Secretary Talbott.

Air Force and CAA endorse legislation to provide flight training for ROTC cadets.

July 19

Don R. Berlin denies report that his company, Piasecki Helicopter Corp., will not be competitive with Piasecki Aircraft Corp., headed by Frank N. Piasecki.

July 20

Canadian Government places first pre-production order for a guided missile, an air-to-air weapon.

House Armed Services Committee approves legislation providing for flight training for AF ROTC cadets.

Bell Aircraft receives additional Navy contract for four-place HUL-1 utility helicopters.

North American makes delivery of first F-100C fighter-bombers to Foster AF Base.

July 21

Fairchild Aircraft Division announces plans for a light jet transport with a cruising speed of 560 mph to meet executive transport requirements.

White House accepts resignation of Roger Lewis as Assistant Secretary of the Air Force for materiel and nominates Dudley C. Sharp as successor.

Northrop Aircraft plans El Paso, Texas, plant for development of guided missiles.

American Airlines asks CAB for new service rights to Pittsburgh, Philadelphia and Cleveland.

Captain E. V. Rickenbacker predicts transport speeds of 120 mph and fares within reach of all in the foreseeable future.

Prototypes of a new device known as Aerial Delivery System delivered to the Air Force for tests.

July 22

Air Force Secretary Talbott offers to sever connection with New York engineering firm.

CAB counsel urges seven-year renewal of certificates for Slick Airways and Flying Tiger Lines, cargo carriers.

Dr. Theodore Theodrosen appointed director of scientific research for Republic Aviation Corp.

Ernest L. Jones, co-founder of Early Birds and aviation historian, dies.

July 25

Engine, engine parts, modification and repair contracts totaling $82.5-million have been awarded by the Air Force, Commerce Department reports.

Avro Aircraft's CF-100 all-weather fighter to be powered by P&W J75 pending availability of Orenda PS-13.

Rep. Hale Boggs requests sweeping probe of regulation of civil aviation.

First of C-121C Super Constellation transports for Air Force rolls off Lockheed assembly line.

Port of New York Authority reports 60 percent of 240,000 air passengers using its airports travel on business, 25 percent on vacation and 15 percent on other types of personal missions.

July 26

Defense Secretary Wilson gives USAF go-ahead to speed production of McDonnell F-101 and Lockheed F-104 supersonic fighters.

Avco Manufacturing Corp. announces its XT-53 turbine engine will power Army's Bell XH-40 utility helicopter.

First jet engine overhauled by a civilian base —Southwest Airmotive — accepted by the Air Force.

American Airlines, testifying in Slick-Tigers renewal case, reports every expectation of CAB in its all-cargo experiment has proved false.

Rear Admiral Apollo Soucek, chief of Navy Bureau of Aeronautics, dies.

July 27

Capital Airlines becomes first U. S. carrier to place turboprop transports in operation on its routes.

Lieutenant General Laurence C. Craigie, former USAF deputy chief of staff, joins Hydro-Aire, Inc., as vice president.

CAB Chairman Rizley admits bureau more liberal in route concessions to Germany than normal in such cases.

July 28

Engines on a Boeing B-47B become first on a multi-engine plane to pass 1,000 flying hours without major overhaul, AF and General Electric announce.

CAB rules fare differential between DC-4 and DC6B service not warranted.

CAA established instrument approach procedures for aircraft equipped with DME.

July 29

Convair receives USAF order for 10 Model 340 cargo-personnel aircraft.

Gordon Dean, former chairman of Atomic Energy Commission, elected a senior vice president of General Dynamics Corp.

Congress passes and sends to White House a foreign aid bill which reduces military assistance by $420-million.

E. W. Hudlow, chief of CAA's general safety division, dies.

AUGUST

Aug. 1

White House announces that U. S. plans to launch a small unmanned satellite about the size of a basketball sometime after July, 1957. Satellite will circle earth at altitudes between 200 and 300 miles.

CAB orders Capital Airlines to produce manufacturer's specifications for its Viscount aircraft.

Atomic Energy Commission reports that aircraft nuclear propulsion program has been accelerated, with construction of test area at Arco, Idaho.

Safe Flight Instrument Corp. demonstrates automatic power control system, providing maximum lift for low speed maneuvers.

Aug. 2

Allison Division of General Motors given $53-million Air Force contract for T56 turbo-prop engines.

Fairchild Aircraft Division awarded $12-million AMC Contract for C-123B aircraft.

General Electric forms a special defense projects department, with George F. Metcalf as general manager.

Chance Vought begins delivery of KDU-1, target drone version of Regulus missille, to the Navy.

Earle A. Ryder retires after 30 years of service with Pratt & Whitney Aircraft.

Aug. 3

Harold E. Talbott, Secretary of the Air Force, resigns.

Senate confirms appointment of Dudley C. Sharp as Assistant Secretary of the Air Force.

Pan American-Grace Airways DC-7B sets new record of 20 hours 2 minutes clapsed time between Buenos Aires and New York, averaging 329 mph.

Senate Interstate and Foreign Commerce Committee asks Commerce Department to plan for construction of a second Washington, D. C., airport.

Aug. 4

Boeing Airplane Company applies to CAA for approved type certificate for its 707 turbojet transport.

Defense Department allots $11.3-million to NATO for lightweight fighter aircraft.

Alfred S. Koch, CAA director of safety, resigns after 25 years of service.

President Eisenhower signs $232-million airport aid authorization bill, providing $60.5-million for fiscal 1956 airport projects.

USAF takes delivery of first Aero Commander and assigns it to White House for use by President Eisenhower.

Aug. 5

Grover Loening, aeronautical designer, awarded Air Force's exceptional civilian service award.

Plans for a $1-million hotel-motel at Chicago's Midway airport announced by Airways Hotels, Inc.

Aug. 8

Glenn L. Martin Co. reports that design techniques and components are at hand to create a multi-stage rocket required to launch planned satellite.

General Edward M. Powers resigns as vice president-engineering of Curtiss-Wright Corp.

Ralph S. Damon, president of TWA, named recipient of American Society of Mechanical Engineers' Spirit of St. Louis medal for meritorious service in the field of aeronautics.

Aug. 9

Convair-Fort Worth and union agree on one-year contract granting wage increases from six to eight cents an hour to 10,000 employees.

Royal Aircraft Corp. announced production and marketing of five-place Royal Gull amphibian to begin this month.

Douglas Aircraft Company and ARDC develop improved downward ejecting seat for supersonic X-3 experimental aircraft.

Aug. 10

Douglas reports its turbojet DC-8 will be economically superior to such late-type piston-powered aircraft as the DC-7.

Convair announced receipt of a multi-million dollar USAF production contract for F-102A supersonic delta wing interceptors and TF-102A trainers.

Aug. 11

National Airlines becomes first U. S. carrier to announce a firm order for Douglas DC-8 jets, reporting planes will cost $4.6-million apiece.

Six western railroads take exception to CAB recommendation for additional airline service in the Denver area.

First production Helio Courier, 4-place, stall-proof plane, delivered.

Aug. 15

General Nathan F. Twining, Air Force Chief of Staff, indicates that USAF may go beyond authorized 137-wing goal.

Varig becomes first Brazilian airline to operate into New York, flying Super Constellations once a week.

British aircraft companies reported engaged in development work and design studies on nuclear-powered aircraft.

Aug. 16

TWA proposes a new low one-way fare of $80 on its transcontinental route, asks CAB for approval.

Willie Ley, rocket expert, reports that Convair's Atlas, intercontinental missile, could be used to launch the first earth satellite.

The 61-day strike at Westinghouse Electric's Kansas City gas turbine plant settled.

Donald A. Quarles sworn in as Secretary of the Air Force, succeeding Harold E. Talbott.

Convair's Fort Worth plant sponsors research program to determine ultrasonic effects of jet noise on various aircraft materials.

Aug. 17

Harold R. Harris, former president of Northwest Airlines, joins Aviation Financial Services, Inc.

Gill Robb Wilson, editor and publisher of Flying Magazine, elected president of the Air Force Association.

Sabena, Belgian airline, seeks to become first western carrier to serve Russia.

Aug. 18

General Edwin W. Rawlings, head of Air Materiel Command, reports that Phase I development contracts for a successor to the Boeing B-52 long-range bomber are being prepared.

Boeing-Seattle receives $10.6-million contract for B-52 production facilities.

American Airlines and United Air Lines announce plans to establish an $80 transcontinental coach fare similar to that posted by TWA.

Twelve Republic F-84s fly 5,118 miles non-stop from England to Texas in 10 hours 48 minutes, using in-flight refueling.

Aug. 19

W. A. Patterson, president of United Air Lines, suggests that U. S. and foreign air carriers pool orders for jet transports with one U. S. manufacturer.

Senate Interior Committee staff report criticizes Air Force for "vacillation" in encouraging use of titanium in military aircraft.

Air Navigation Development Board releases first details of controversial TACAN navigation system developed for Navy.

Aug. 22

Lieutenant General Thomas S. Power, head of ARDC, reports AF policy of letting Phase I contracts for advanced aircraft to companies with background in that type of work will not freeze out other firms in field.

Bell Aircraft Corp. signs agreement with Nuclear Science & Engineering Corp. for advice and assistance.

Five aviation companies among 81 firms given access permits to restricted atomic data.

USAF Air Research and Development Command announces plans for construction of $1-million electronic testing and flight simulation laboratory at Wright-Patterson Air Development Center.

Aug. 23

New USAF regulation establishing guided missile policy declares reluctance to depart from development practices and planning for manned aircraft may prevent maximum progress in integrating missiles into Air Force.

The Air Materiel Command has spent more than $10-billion for the third successive year in logistics support of the Air Force, AMC reports.

Lieutenant General Bryant L. Boatner, soon to retire as Deputy Chief of Staff of the Air Force, receives Distinguished Service Medal.

Aug. 24

The Port of New York Authority has asked the New York Department of Marine and Aviation to issue a permit for a $50,000 temporary heliport on the West 30th Street waterfront.

Toronto Globe & Mail reports that the USAF Air Research and Development Command is backing Avro Aircraft's Project Y "flying saucer".

North American's F-100C establishes a new official world speed record over a measured course at Palmdale, Calif., exceeding 800 mph with Colonel Horace A. Haines at controls.

Hans Seebohm, West German transport minister, claims Soviet Union building better jet fighters than the U. S.

Aug. 25

Hoover Commission task force report criticizes U. S. Offshore Procurement program for plans to buy British fighter aircraft on grounds such planes would be obsolescent before delivery.

North American Airlines asks U. S. Court of Appeals to set aside CAB order calling for revocation of its letters of registration.

Bell Aircraft's XV-3 convertiplane, second of two prototypes ordered by Air Force, makes first flight at Fort Worth.

Aug. 26

The Handley Page Herald, DC-3 replacement, makes first flight powered by four Alvis Leonides engines.

New York city rejects Port of New York Authority request for permit to build temporary heliport on grounds of safety.

Aug. 29

Beech Aircraft Corp. announced as winner of Navy competition for a new type pilotless, remote-controlled target plane, the XKDB-1.

ARDC announces development of a miniature emergency radio, weighing 15 ounces, for use by fighter pilots in survival equipment.

Rolls-Royce Conway by-pass engine passes official type test at 13,000 lbs. thrust.

Aug. 30

Air Force lets $5-million contract to Convair to prepare for production of F-102B interceptor powered by P&W J75 engine.

The Glenn L. Martin Co. creates a new research laboratory to explore frontiers of knowledge, including space travel and ways of overcoming gravity.

William H. Martin named Director of Research and Development for the Army.

U.S.S. Forrestal, first of Navy' supercarriers, makes its first trial run at Newport News, Va.

The Mooney Mark 20, four-place, single-engine plane, receives its CAA type certificate.

Lieutenant Colonel John P. Stapp, USAF medical officer, receives AF's Cheney Award for his rocket-propelled sled experiments.

Aug. 31

The Defense Department spent $8.7-billion for aircraft and related equipment in the 1954-1955 fiscal year, W. J. McNeil, Assistant Secretary of Defense, reports.

SEPTEMBER

Sept. 6

Admiral Robert B. Carney, retired chief of naval operations, elected a director of Fairchild Engine & Airplane Corp.

CAB ends moratorium on route expansions by granting route extensions and lifting route restrictions in New York-Chicago Service Case decisions.

The de Havilland Gyron engine reported rated at 15,000 pounds thrust.

Sept. 7

Air Force Secretary Quarles advocates procurement program designed to give industry opportuniy to provide needed equipment without costly crash expansions or sharp cutbacks.

Aero Design & Engineering reveals supercharged verstion of Aero Commander with top speed of 260 mph.

Sept. 8

Pentagon confirms Adminstration effort to slash $1,750,000 from spending in current fiscal year. Sen. Chavez, chairman of Defense Appropriations subcommittee, attacks proposed cut as dangerous to national security.

British claim new altitude record for Class C aircraft after Canberra climbs to 65,876 feet.

Sept. 9

TWA, United and American get go-ahead from CAB on new low round-trip transcontinental coach fare ($160).

Sept. 12

NACA reports speed gains up to 25 percent have been attained by use of "area rule" concept in fuselage design, reveals its use in Grumman F11F-1 and Convair F-102A.

Domestic airlines, by major vote in Air Traffic Conference, decide to eliminate no-show penalty on air coach passengers.

Lockheed Aircraft Corp. delivers its 7,000th jet aircraft.

Federal Telecommunication Laboratories gives first public demonstration of military and private TACAN equipment.

Sept. 13

Navy announces that all jet fighters will be equipped with in-flight refueling capability.

Robert W. Prescott, president of Flying Tiger Line, predicts air freight carriers will cut rates in half and increase volume ten-fold in next ten years.

Gerardus Post Herrick, father of the convertiplane and president of Vertoplane Development Corp., dies.

Sept. 14

ARDC reveals rubber tubing stretched along leading edge of wing can cut landing distance one-third and take-off distance one-fifth on F-84F jet fighter.

Thompson Products, Inc., enters atomic energy field, establishing central staff to exploit new developments.

Sept. 15

Westinghouse Electric Corp., whose J40 and J46 engine contracts were eliminated by Navy, announces major objective is re-entry into the jet engine field.

Frye Corp. of Fort Worth announces plans to develop and produce transport Model F-1 as a replacement for DC-3.

CAA begins investigation of Ozark Air Lines complaint that Arthur Godfrey flew too close to one of its aircraft at Chicago Midway airport.

Sept. 16

Royal Gull amphibian becomes first foreign aircraft built to U. S. standards to receive type certificate.

Sept. 19

Captain Scott Flower of Pan American World Airways becomes first airline pilot to fly Boeing 707 jet transport.

Port of New York Authority presses fight for downtown heliport, supported by officials of industry and military.

Sept. 21

Comptroller General rules that Air Force did not have adequate authority when it leased telephone company services in development of the SAGE early-warning air defense systems.

NACA announces its $4.5-million research reactor to be on site of Plum Brook Ordnance Works near Sandusky, Ohio.

Sept. 22

North American Aviation receives first USAF order for small number of F-107 Fighters.

Sept. 23

Great Britain announces that U. S.-built commercial aircraft exported to the UK in 1956 will have to meet a list of special conditions similar to those imposed by CAA on Vickers Viscount turboprops.

David H. McCulloch, pioneer naval aviator and pilot of NC-3 which attempted to fly Atlantic in 1919, dies.

OCTOBER

Oct. 4

Lockheed Aircraft Corp. receives follow-on contract for C-130A Hercules turboprop transport, extending production into 1958.

U. S. Court of Appeals affirms lower court finding in favor of North American Aviation, Inc., in its "name" suit against North American Airlines.

Piasecki Helicopter Corp. recommends that stockholders approve company change in name to Vertiplane Corporation.

Oct. 5

Convair's first TF-102A, combat proficiency trainer for the F-102A all-weather jet interceptor, rolls out of San Diego plant.

Piasecki Aircraft Corp. establishes headquarters at Philadelphia International Airport.

Flying Tiger Line begins 11-hour direct transcontinental air freight service between New York and Los Angeles.

Oct. 6

Ralph L. Bell, Boeing sales manager, reports the 707 jet transport will have a direct operating cost below that of conventional 4-engine transports at ranges of 500 miles or more.

Pan American World Airways asks CAB to approve free helicopter shuttle service for LaGuardia and Newark passengers scheduled to depart from Idlewild Airport.

Oct. 7

The nation's airline subsidy bill for the current fiscal year will total only $48.5-million, according to revised CAB estimate.

The Glenn L. Martin Company awarded prime contract for a major part of earth satellite project sponsored by Army-Navy-Air Force. General Electric will provide the rocket engine.

Hamlin B. Johnston re-elected president of Aircoach Transport Association for third year.

Oct. 10

Lufthansa German Airlines carries 50,000 passengers and 250 tons of freight in first six months of operations.

Mooney Aircraft, Inc., delivers first Mark 20 aircraft.

Henry Boggess of Sinclair Refining Co. re-elected president of National Business Aircraft Association.

Oct. 11

Boeing's 707 jet transport flies 3,038-mile triangular course non-stop at average speed of 550 mph.

International Air Transport Association votes 10 percent increase in many first class fares, effective April 1, 1956.

Defense Secretary Wilson vetoes Army plan to procure jet aircraft on its own.

Oct. 12

Canadair, Ltd., confirms report it is making intensive study of pros and cons of a joint design for long-range turbo-prop transport with Bristol of England and Convair.

CAA Administrator Fred B. Lee receives citation from National Business Aircraft Association for outstanding contribution to aviation.

Fred M. Glass, former director of aviation for the Port of New York Authority, elected senior vice president of Empire State Building Corp.

Oct. 13

Air Force Secretary Quarles declares no intention to halt or delay achievement of 137 wings, despite reports of budget cuts.

Convar enlists aid of seven major companies as subcontractors for B-58 delta-wing supersonic AF bomber.

Oct. 14

Pan American World Airways becomes first U. S. carrier to place definite order for American-built jet transports, ordering 20 Boeing 707s and 25 Douglas DC-8s.

C. A. Moore of Mississippi elected president of National Association of State Aviation Officials.

Oct. 17

NACA disclosed existence of a new research aircraft, the Bell X-1E.

Congressional hearing on effects of automation hears witness urge long-range factual study into social and economic aspects of automation.

William A. Coulter, former president of Western Air Lines, dies in New York,

Oct. 18

Boeing Airplane Company announces it will deliver an X-type 707 jet transport to Pan American in the summer of 1958.

Increased wing area and related modifications place Lockheed Electra in 3,000-mile range category.

Martin and Convair awarded high priority contracts for development of nuclear powered seaplanes.

Boeing 707 prototype flies from Seattle to Andrews AFB, Md., in 3 hours 58 minutes, averaging 592 mph; makes westbound return at 570 mph.

Oct. 19

Defense Secretary Wilson lays down general guidelines of a program designed to save an estimated $500-million in military expenditures in fiscal years 1956 and 1957.

Sir Roy H. Dobson, board chairman of Avro-Canada, named chairman of Canadian Car & Foundry Co.

Navy A4D lightweight bomber sets new 500-kilometer closed course speed record of 695.163 mph at Edwards AFB.

Oct. 20

Frederick B. Rentschler, board chairman of United Aircraft Corp., raps foreign propaganda designed to prove U. S. is lagging behind in gas turbine development.

Sabena and New York Airways place orders for Sikorsky S-58, 12-passenger helicopters.

House Military Operations subcommittee requests Westinghouse and McDonnell Aircraft Corp. to supply witnesses prepared to testify at hearings into Navy's procurement of J40 powered F3H aircraft.

Oct. 21

Publication of Methodist Board of Temperance intensifies campaign against serving of alcoholic beverages in aircraft, urges followers to boycott lines serving drinks.

Plans for an accelerated five-year airways program to cost $500-million prepared by CAA and sent to Secretary of Commerce for approval.

Oct. 24

General Maxwell D. Taylor, Army Chief of Staff, and Lieutenant General James M. Gavin, chief of Army research and development, demand more air transportability for ground forces.

De Havilland Aircraft Company reports tests of Comet 2 completely successful.

Sperry Gyroscope Co. announced development of a miniature, fail-safe electronic flight control system for helicopters.

Oct. 25

Flight engineers call a strike against United Air Lines, which begins use of pilot-engineers as third men in cockpits.

Slick Airways shaves 1 hour 7 minutes off nightly westbound transcontinental schedule.

CAA evaluation report cites deficiencies in TACAN, reporting it too complex for civilian use.

Oct. 26

A $175-million order for 30 Douglas DC-8 jet transports placed by United Air Lines. Deliveries to begin in May, 1959.

Air Force places new $25-million order for Lockheed T-33 jet trainers.

Chief of Navy's Bureau of Aeronautics tells Congressional investigating committee the F3H-J40 Demon program was beneficial despite fact planes had to be permanently grounded.

Oct. 27

CAA receives formal application from Douglas Aircraft Co. for certification of two models of its DC-8, one for domestic and the other for overwater flights.

Air Secretary Quarles makes first official announcement that USAF is sponsoring development of Avro-Canada's "flying saucer" aircraft.

ALPA denies charge by George Meany, ALF president, that it is guilty of collusion in the United Air Lines flight engineers' dispute.

Pentagon discloses that new electronics and communications equipment worth $1.1-billion ordered during the year ending June 30.

Oct. 28

CAB amends its New York-Chicago case decision to add restrictions to route awards to TWA and Capital Air Lines.

Congressional committee closes inquiry into Navy's F3H-J40 Demon procurement program, reporting no evidence of fraud.

Major General Kingston E. Tibbets named Air Materiel Command comptroller.

Sikorsky Aircraft dedicates new $18-million plant at Stratford, Conn.

Oct. 31

American Airlinese announces its 1959 turbojet transports will make possible 4½-hour coast-to-coast schedule.

All American Engineering Co. announces idea for a flying submarine equipped with water skis, says design would not differ from standard swept-wing jet fighter plane.

NOVEMBER

Nov. 1

Secretary of State Dulles announces bilateral air transport agreement between U. S. and Soviet Union proposed at Big Four meeting in Geneva.

C. R. Smith disclosed that American Airlines expects to place an order for 20 turbojet transports, but is undecided on Boeing 707 or Douglas DC-8.

Prototype of SAAB-35 supersonic fighter makes first flight in Sweden.

Eastern Air Lines complete arrangements with Equitable Life Assurance Society for 20-year $90-million loan to finance equipment expansion program.

McDonnell Aircraft delivers first RF-101 prototype to USAF.

Nov. 2

Admiral Ardleigh A. Burke, Chief of Naval Operations, discloses that the Fairchild Petrel, air-to-underwater missile, is entering operational stage.

CAA's five-year airways plan, estimated to cost $500-million, referred to Nav Panel of Air Coordinating Committee.

Jack Frye announces that the new Frye F-1 transport, replacement for DC-3, probably wlll have 165 mph cruising speed.

Nov. 3

United Air Lines retains crime-lab explosives expert to assist in determining cause of DC-6B accident which claimed 44 lives.

Report of study by a Joint Legislative Committee on Carrier Taxation indicates that New York state may be planning heavier taxation on airlines.

Navy awards contract for fifth Forrestal-class aircraft carrier to New York Shipbuilding Corp.

First of the Navy's new T2V-1 jet trainers for carrier operations rolls off assembly line.

Nov. 4

Air Traffic Conference turns down proposal that domestic airlines adopt code of practice covering serving of alcoholic beverages aloft, takes no action on no-show penalty plan.

Dr. Theodore von Karman, senior scientific adviser on aeronautics to NATO, named a director of Gruen Precision Laboratories, Inc.

Nov. 7

Investigators uncover evidence of bomb-type explosion in cargo pit of United Air Lines DC-6 which crashed in Colorado.

William H. Martin, director of the Army's research and development, annouces the Army will increase spending for guided missiles research and development in current fiscal year.

Air Coordinating Committee Use Panel recommends that Detroit-Wayne Major Airport be developed as major air terminal serving Detroit and that air carriers transfer operations there from Willow Run.

Arthur F. Kelly, vice president of Western Air Lines, elected president of Air Traffic Conference.

Lieutenant Colonel Dean Ivan Lamb, holder of FAI pilot license No. 116 and a pioneer air mail pilot, dies.

Nov. 8

Air Secretary Quarles declares U. S. is ahead of Soviet Union in development of intercontinental missiles.

J. Russell Wiggins, executive editor of the Washington Post & Times Herald, tells House Government Information Subcommittee that a philosophy of secrecy pervades defense establishment.

National Airlines claims it will be first air carrier to offer jet transport service on east coast routes after it takes delivery of DC-8 in May of 1959.

Nov. 9

American Airlines placed $135-million order for 30 Boeing 707 jet transports, with first delivery scheduled for March, 1959.

House subcommittee begins check of reports that Navy air reservisets have refused to fly Grumman F9F-7 Cougar jets.

Nov. 10

The Air Force assigned responsibility for development of medium-range missiles, as well as long-range projects.

Canadair, Ltd., builds an experimental "wasp waist" F-86 Sabrejet for Canadian Air Force.

Nov. 11

William B. Davis, CAA deputy administrator in Region 3, named acting director of the Office of Aviation Safety.

Defense Department halts further contracts for long lead-time machine tools and other production equipment by military services.

CAB Bureau of Safety Regulation announces plan to undertake study of IFR and night flying regulations for non-carrier aviation.

Nov. 15

Convair and Aero-jet General Corp. file suit in Los Angeles for recovery of taxes imposed by the county on material in their plants destined for delivery to the government.

By unanimous action, the American Federation of Labor expels the Air Line Pilots Association for its refusal to honor picket lines set up against United Air Lines by striking AFL flight engineers.

John Gilbert Graham, charged by the FBI with sabotaging a United Air Lines DC-6 which crashed in Colorado, arraigned.

Nov. 17

KLM Royal Dutch Airlines becomes first foreign airline to buy American jet transports, placing order for eight Douglas DC-8s.

The British government decides to abandon the Vickers 1000 jet transport.

W. P. Thayer, vice president of Chance Vought Aircraft, declares the "survival barrier" of getting pilots out of high speed aircraft is a problem more in need of solution than the "thermal barrier" problem.

Nov. 18

France's Fouga company confirms that it has licensed Messerschmitt to manufacture the Fouga 170R Magister jet trainer in Germany.

French Air Force takes delivery of 40 Republic F-84F Thunderstreak jets.

Nov. 21

National Airlines drops option to buy 12 Vickers Viscount turboprop transports, indicates Lockheed Electra may be purchased.

Piper Aircraft announces that its first all-metal, low-wing, single-engine aircraft is in mock-up stage and that production is planned for 1957.

Nov. 22

First powered flight of the Bell X-2 rocket plane, designed to explore thermal barriers at more than 2,000 mph.

Ryan Aeronautical receives New Air Force contract which will assure production of Q-2A Firebee remote-controlled pilotless jet target drone missiles well into 1956.

Nov. 24

President Eisenhower appoints Dr. Clifford C. Furnas Assistant Secretary of Defense for Research and Development.

Nov. 29

McDonnell Aircraft awards Emerson Electric Mfg. Co. $37-million subcontract to engineer and manufacture nose assemblies for the supersonic F-101B Voodoo all-weather interceptor, expected to fly in about one year.

Nov. 30

President Eisenhower reappoints Ross Rizley as Chairman and Joseph P. Adams as Vice Chairman of the CAB for 1956.

DECEMBER

Dec. 1

Bell Aircraft Corp. names Kurt R. Stehling, rocket research engineer, director of rocket powerplant development for the Vanguard earth satellite project.

President Eisenhower renominates Lieutenant General James H. Doolittle (Ret.), and Detlev W. Bronk for new five-year terms on the National Advisory Committee for Aeronautics.

Defense Secretary Wilson sets up joint committee on aviation pathology to study role of disease as a factor in aircraft accidents.

Braniff Airways announces $30-million order for five Boeing 707 jet transports to be powered by Pratt & Whitney engines of "advanced design over the J57".

Dec. 4

Glenn L. Martin dies in Baltimore at the age of 69.

Dec. 6

Fairchild Aircraft announces receipt of multimillion-dollar subcontract to produce parts for the Boeing B-52 intercontinental jet bomber.

Dec. 7

Fletcher Aviation Corp. awarded $13-million contract by Air Materiel Command for jettisonable wing tanks for Air Force B-47s.

Martin XP6M-1 (Seamaster) prototype crashes while on routine test flight near Point Lookout, Md.

Dec. 8

Chance Vought Aircraft receives its first production order from the Navy for $100-million worth of F8U-1 supersonic day fighters.

Northrop Aircraft announces production of "Sky Screen," a new optomechanical device designed to increase many times the number of unidentified aircraft that can be tracked by a single radar operator.

Radio Corp. of America announces development of a new transistorized plug-in aircraft interphone system that weighs less than 15 oz.

Dec. 13

Charles J. Lowen, Jr., sworn in as Civil Aeronautics Administrator, succeeding Fred B. Lee.

The Navy and Glenn L. Martin Co. announces award of contract to Aerojet-General Corp. to design and build the second-stage rocket propulsion system for the Project Vanguard vehicle which will launch the U. S. earth-circling satellite into space.

Dec. 17

Dr. Hugh L. Dryden, Director of the National Advisory Committee for Aeronautics, receives the Wright Brothers Memorial Trophy for 1955.

Richard Travis Whitcomb awarded the Collier Trophy Award for the "greatest achievement in aviation in 1954."

The Frank G. Brewer Trophy awarded to Willis C. Brown "for contributing most to the development of air youth in the field of education and training."

Dec. 18

AIRCRAFT YEAR BOOK GOES TO PRESS.

A CHRONOLOGY
of
U. S. AVIATION

The following chronology was compiled and edited by the late Ernest J. Jones, (Lt. Col., ret.).

Although this chronology has been expanded considerably over previous editions, it still represents only brief excerpts from Colonel Jones' vast store of air data. Space has forced us to deal only with the highlights.

We are deeply indebted to Colonel Jones for his thorough knowledge of aeronautics in this country and the generosity with which he shared it.

We also wish to thank the National Air Museum, Smithsonian Institute for providing the photographs used in this section.

Caudron, French Bomber used by American Expeditionary Forces in World War I

United States Chronology

1784, Jan. 16—Airborne troops proposed by Benjamin Franklin in reporting on the first balloon ascents.

1784, July 17—First U. S. balloon flight in Peter Carnes' captive balloon, Baltimore, Md.

1784, Nov. 30—First ascent by an American abroad, by Dr. John Jefferies, physician, with French aeronaut Blanchard, at London. On Jan. 7, 1785, thev make the first Channel crossing by air.

1793, Jan. 9—Balloon flight by Jean Pierre Blanchard from Philadelphia, Pa., to Woodbury, N. J. (Letter from George Washington carried on this flight.)

1837, Sept. 18—First parachute demonstration in America when John Wise drops animals from a balloon at Philadelphia.

1838, Aug. 11—John Wise safely lands with his parachuted balloon at Easton, Pa.

1840, Sept. 8—Col. John H. Sherburne urges Secretary of War to use night balloons to locate Seminoles.

1842, Oct. 22—John Wise proposes to capture Vera Cruz by air.

1844, Oct. 16—America's first air patent to Muzio Muzzi on direction of balloons.

1845, Sept. 18—Rufus Porter proposes steam airship line, New York-California, to carry gold-seekers at $100 a trip. Stock sales unsatisfactory. His 1849 booklet illustrates a jet-propeller passenger rocket.

1859, July 1—World record balloon trip, 809 miles, St. Louis to Henderson, N. Y., by John Wise and three companions.

1859, Aug. 16—Airmail carried by John Wise in balloon flight from Lafayette to Crawfordsville, Ind.

1860, Aug. 21—Capt. E. B. Hunt, Corps of Engineers, U.S.A., advocates balloon telegraphy.

1860, Oct. 13—Successful aerial photos taken by William Black from a balloon, Boston, Mass.

1861, June 10—Military flight by James Allen, First Rhode Island State Militia, in balloon over Washington, D. C.

1861, June 18—Balloon telegraph demonstrated by T. S. C. Lowe. (Message to Abraham Lincoln.)

1861, June 22-24—Military reconnaissance by T. S. C. Lowe and Army officers from balloon using telegraph, over Arlington and Falls Church, Va. Military air observation continues into 1863.

1861, Aug 3—Civilian aeronaut La Mountain inaugurates aircraft carrier operations with his war balloon. Lowe follows.

1861, Sept. 24—Air artillery adjustment from Lowe's Army ballon near Washington.

1861, Nov. 7—Helicopter proposed for Union Army. After experiments, a machine is partly built before Appomattox ends the project.

1862, Mar. 9—War helicopter bomber designed and urged by William C. Powers of Mobile, Ala.

1866, May 25—Solomon Andrews' airship maneuvers over New York with 4 passengers.

1873, Oct. 7—Unsuccessful trans-Atlantic flight by W. H. Donaldson, Alfred Ford and George A. Lunt in balloon, *Graphic*, from Brooklyn, N. Y., to New Canaan, Conn.

1877—Prof. William H. Pickering, Harvard University, begins experiments with model helicopters. In 1903 a rabbit is sent aloft.

1880—Thomas A. Edison conducts helicopter experiments for James Gordon Bennett.

1883, Mar. 17—First of a series of glider flights by John Joseph Montgomery, Otay, Cal.

1885, Jan. 7—Russell Thayer, C. E., a graduate of West Point, urges on Secretary of War Robert T. Lincoln a compressed-air airship of his design. No action.

1887, Jan. 30—Thomas E. Baldwin makes his first parachute jump at San Francisco.

1886, July—W. E. Irish, publisher of *Aeronautical World*, proposes balloon radio.

1887—American altitude record made by aeronaut Moore and Prof. H. A. Hazen of U. S. Signal Service, at St. Louis; 15,400 feet, in balloon of St. Louis *Post Dispatch*.

1890, July 31—During the month, L. Gathmann, of Chicago, explodes a shell at high altitude in attempt to produce rain.

1890, Oct. 1—President Harrison approves legislation creating the Weather Bureau and re-establishing the Signal Corps which is charged with collection and transmission of information, among other duties. Military aeronautics is then considered as among such means, and Army aeronautics is revived.

1892, Oct. 10—Balloon section is being organized with each telegraph train by Chief Signal Officer, General A. W. Greely, who anticipates military airships and airplanes.

1892, Nov. 5—Wingless aerial torpedo suggested by Prof. A. F. Zahm.

1893, Aug. 1-4—International Conference on Aerial Navigation held at Chicago; Octave Chanute, Chairman; Dr. A. F. Zahm, Secretary.

1893, Oct. 9—The Chief Signal Officer, General Greely reports the purchase of a Lachambre balloon for the Signal Corps balloon section. First ascents since the war are made at the Chicago exposition from Oct. 31, 1893.

1896, Apr. 29—First American wind tunnel begins operation at M.I.T.

1896, May 6—Steam-powered airplane model flown by Samuel Langley, Washington, D. C.

1898, Apr. 29—War and Navy Departments examine Langley's work, approve, and Board of Ordnance and Fortification makes two allotments of $25,000 each to build his airplane.

1898, Dec. 22—The Secretary of War approves a Fort Myer site for barracks, officer quarters, administration building and a balloon house to concentrate Signal Corps schools at one point.

1901, Sept. 1—Simon Newcomb, Ph.D., LL.D., writes in *McClures* for September: "The first successful flyer will be the handiwork of a watchmaker and will carry nothing heavier than an insect."

In December, Rear Admiral Melville, USN says in the *North American Review*: "A calm survey . . . leads the engineer to pronounce all confident prophecies at this time for future success as wholly unwarranted, if not absurd."

1902, Sept. 15—A. Leo Stevens sails his airship *Pegasus* over Manhattan Beach in a race with Edward C. Boyce in the latter's Santos Dumont airship.

1903, Mar. 23—Orville and Wilbur Wright

apply for patent on their flying machine. (Patent issued May 22, 1906.)

1903, Dec. 8—Samuel Langley's flying machine, piloted by Charles Manly, plunges in the Potomac and is wrecked on its second test, Washington, D. C.

1903, Dec. 17—First sustained controllable flight of powered heavier-than-air machine by Orville and Wilbur Wright, Kitty Hawk, N. C.

1904, Aug. 3—Circuit flight in airship (Curtiss motor) by Capt. Thomas S. Baldwin at Oakland, Cal.

1904, Wright brothers make 104 flights, covering 20 miles. British representative visits the Wrights in November.

1905, Jan. 18—Wright brothers open negotiations with U. S. War Department for disposition of their invention. Correspondence is had through 1907.

1905, Apr. 29—Daniel Maloney begins series of glides with Montgomery glider, taking off from captive balloon. Later killed.

1905, Aug. 5—Charles K. Hamilton begins series of kite flights, towed by cars and boats.

1905, Sept. 26-Oct. 5—Wright brothers make 55 flights, the longest being 24 miles in 38 min. 3 sec. Frank S. Lahm, in France, obtains report on Wrights' flying from Ohio relative. French remain skeptical. In October the French government is negotiating along with British.

1905—Lt. Frank P. Lahm becomes first Army balloon pilot.

1906, Jan. 13-20—First indoor aero exposition, New York.

1906, Mar.—French and British visit Wright brothers at Dayton.

1906, Sept. 30—First Bennett international balloon race won by Lt. F. P. Lahm—Paris to England.

1906, Dec. 1-8—Second indoor air exhibition of Aero Club of America.

1907, June 8—Building devoted exclusively to aeronautics dedicated at Jamestown (Va.) Exposition.

1907, Aug. 1—Aeronautical Division established, Army Office of Chief Signal Officer.

1907, Sept. 2—Walter Wellman airship *America* fails in polar attempt.

1907, Sept. 30—Ornithopter of H. C. Gammeter, multigraph inventor, lifts temporarily.

1907, Oct. 1—Aerial Experiment Association formed by Dr. A. Graham Bell, F. W. Baldwin, J. A. D. McCurdy, Glenn H. Curtiss and Thomas E. Selfridge.

1907, Oct. 3—Record altitude of 23,110 feet by U. S.- Weather Bureau meterological kite.

1907, Oct. 18—Air bombing prohibition signed at second Hague conference.

1907, Oct. 21—Second Bennett international balloon race, St. Louis, won by Oscar Erbsloh of Germany. Airship races are held Oct. 22-23.

1907, Oct. 28-29—International Aeronautic Congress held in New York.

1907, Oct. 28—Admiral C. M. Chester urges anti-submarine airships and shipboard airplanes at International Aeronautic Congress.

1907, Dec. 6—Seven-minute towed flight from motor boat tug in Dr. Bell's kite, flown by Lt. T. E. Selfridge.

1907, Dec. 16—Chief Signal Officer advertises for airship bids, resulting in purchase of Baldwin airship.

1907, Dec. 23—Chief Signal Officer advertises for airplane bids, after visit of Wrights.

1908, Feb. 10—First Army plane contract signed by Signal Corps with Wright Brothers. (Other contracts signed with A. M. Herring and J. F. Scott.)

1908, Mar. 12—First Aerial Experiment Association's plane, *Red Wing*, flown by F. W. Baldwin. Later, three other machines fly.

1908, May 6-18—Wright brothers renew flying preliminary to delivery of Army airplane. Charles Furnas is first airplane passenger.

1908, May 13—Balloon radio reception demonstrated by Signal Corps.

1908, May 31—G. H. Curtiss Manufacturing Company announces planes for sale.

1908, June 10—Aeronautical Society formed in New York and Morris Park Airfield shortly obtained—first of kind in U.S.

1908, June 20—Anthony radio-controlled airship model demonstrated.

1908, July 4—*Scientific American* Trophy awarded Glenn H. Curtiss for first public flight of one kilometer circuit in his biplane, *June Bug*, Hammondsport, N. Y.

1908, July 17—First air ordinance passed by Kissimmee, Fla., with registration and regulation.

1908, Aug. 8—Demonstration flights under French syndicate control begin near LeMans, France, by Wilbur Wright, continuing through December, making a number of astounding records. Training of students follows.

1908, July 31-Aug. 8—Henri Farman of France makes first exhibition airplane flights in U.S.

1908, Aug. 22—First Army Baldwin airship accepted.

1908, Sept. 17—First plane fatality, killing Signal Corps Lt. Thomas E. Selfridge and severely injuring Orville Wright, in delivery of first Army airplane, Fort Myer, Va.

1908, Dec. 28—Matthew B. Sellers makes several flights with 7 hp quadroplane.

1909, Jan. 22—Commercial airplane, built by Glenn Curtiss, sold to Aeronautic Society of New York.

1909, April 16-28—Wilbur Wright delivers an airplane in Italy and teaches pupils.

1909, June 10—President Taft presents Aero Club of America medal to Wright brothers. Congressional medal presented at a celebration at Dayton, June 17-18.

1909, June 26—Glenn H. Curtiss demonstrates at the Aeronautical Society's meet, Morris Park, New York, the machine ordered Jan. 22. Further flights are made at the Society's meet July 5, before removal of the machine to Mineola and the instruction of member Charles F. Willard.

1909, July 17—Curtiss flies 52 mins. in longest U.S. flight except Wrights and wins *Scientific American* trophy for second time. On this success in the Mineola flights the Aero Club of America names him as America's entry in the Bennett international race.

1909, Aug. 22-29—Glenn H. Curtiss wins first Bennett international airplane race and other events of first International Flying meet, Rheims, France. Speed: 45.7 mph.

1909, Aug. 25—First Army airfield leased at College Park, Md.

1909, Aug. 28—After instruction by Glenn H. Curtiss and subsequent practice in the machine contracted by the Aeronautical Society, Charles F. Willard gives his first exhibition at

Scarsborough Beach, Toronto—America's first exhibition pilot. His exhibitions continue over several years.

1909, Sept. 7-Oct. 15—At Berlin, Orville Wright makes flights under German contract, with more records.

1909, Sept. 30—Inception of Wright-Curtiss patent litigation.

1909, Sept. 30—Emile Berliner describes a proposed guided missile.

1909, Oct. 3—At Zurich, Switzerland, E. W. Mix wins the Bennett International balloon race the second time for America.

1909, Oct. 4—Wilbur Wright makes sensational flight, Governors Island to Grant's Tomb and return. Glenn H. Curtiss makes a short flight Sept. 29 and Oct. 3.

1909, Oct. 7—Glenn H. Curtiss flies his first exhibition at St. Louis. Chicago is next. The same month, Charles K. Hamilton and Otto Brodie learn to fly, followed by others. An exhibition company is formed and Curtiss returns to his development work.

1909, Oct. 8-Nov. 5—First Army aviators taught to fly by Wilbur Wright, College Park, Md.: Lt. Frank P. Lahm, Lt. Frederic E. Humphreys, and Lt. B. D. Foulois.

1909, Nov. 27—Anti-aircraft firings begin at Sandy Hook by Ordnance Department.

1909, Nov. 22—The Wright Co. formed with $1,000,000 capital. In 1914, Orville Wright buys the company back. On Oct. 13, 1915, a syndicate buys the company and adds the Simplex Co. In 1916 it becomes the Wright-Martin Co.

1910, Jan. 10-20—First flying meet held at Los Angeles; Louis Paulhan, of France, the star performer.

1910, May 29—Record flight from Albany to New York by Glenn Curtiss, 142.50 mi. in 2 hr., 50 min.

1910, Mar. 25—Wright patent condemnation urged by William M. Page, attorney for C. F. Bishop, president, Aero Club of America.

1910, June 13—Charles K. Hamilton flies New York-Philadelphia and return for N. Y. *Times* and Philadelphia *Public Ledger* and $10,000 prize—149.5 miles in flying time 3 hr. 27 min.; elapsed time, 6 hr. 57 min.

1910, June 13-18—First show of Wright exhibition team, Indianapolis, Ind. where Walter Brookins is star and makes new records. Exhibitions by single pilots or groups continue about the country until the Wright exhibition business is discontinued in Nov. 1911.

1910, June 30—Dummy bomb demonstration made by Glenn H. Curtiss to Army and Navy officers.

1910, Aug. 4—Plane-ground radio demonstrated by E. N. Pickerill.

1910, Aug. 8—Tricycle landing gear installed by Lt. B. D. Foulois on Army Wright at San Antonio.

1910, Aug. 27—Air-land plane radio used by J. A. D. McCurdy, Sheepshead Bay, N. Y.

1910, Sept. 2—First American woman pilot solos: Blanche Stuart Scott. First exhibition at Fort Wayne, Oct. 22.

1910, Oct. 8-10—Former President Theodore Roosevelt is flown at St. Louis exhibition by Arch Hoxsey.

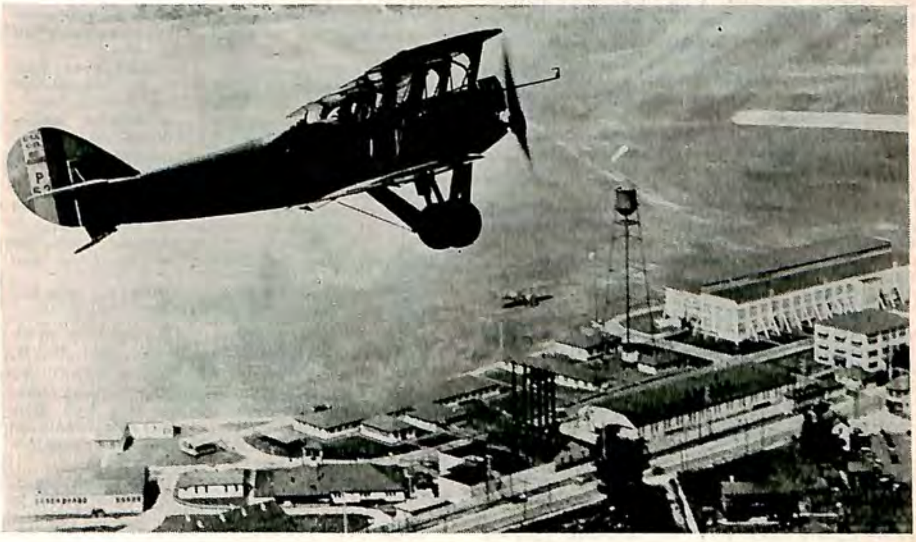
1910, Oct.14-16—Wellman airship, *America*, abandons trans-Atlantic trip after some 800 miles.

1910, Oct. 22-31—Second Bennett international airplane race won by C. G. White (Bleriot) at 61 mph during Belmont Park meet where numerous records are made.

1910, Nov. 14—First battleship takeoff by Eugene Ely from U.S.S. *Birmingham* in Hampton Roads, Va.

1910—Night flights by Walter R. Brookins

Packard Le Pere, World Altitude Flight, Dayton, Ohio, 1920



(Montgomery, Ala., Apr. 18) and Charles Hamilton (Camp Dickenson, Nashville, Tenn., June 21-26).

1911, Jan. 7—Didier Masson flies Los Angeles-San Bernardino to deliver *Times* newspapers. Mail and papers delivered Feb. 17 by Fred J. Wiseman.

1911, Jan. 7-25—Dive bombing, aerial photography, airplane radio demonstrated by Army officers in San Francisco meet.

1911, Jan. 27-28—Lieut. T. G. Ellyson, U.S.N., is first U.S. naval aviator when he takes his Curtiss off at San Diego during Curtiss exhibitions.

1911, Jan. 30—J. A. D. McCurdy attempts Key West-Havana flight but lands in water ten miles short and is rescued by Navy destroyer. In 1913 Domingo Rosillo makes the entire distance.

1911, Feb. 17—Curtiss flies tractor seaplane from North Island to cruiser *Pennsylvania*. Plane hoisted on board and return flight later made.

1911, Mar. 3—Lt. B. D. Foulois and P. O. Parmalee fly record cross-country Laredo-Eagle Pass, Tex., 106 mi. in 2 hr. 10 min. in Wright plane loaned Army by R. J. Collier. Messages dropped en route, radio received and sent.

1911, Mar. 13—Capt. W. Irving Chambers, U.S.N., is assigned the Bureau of Navigation to devote exclusive efforts to naval aeronautics.

1911, Mar. 31—About this date Missouri National Guard Signal Corps establishes air section and members taught flight and ballooning.

1911, May 8—First Navy airplane ordered, Curtiss Triad, amphibian. By July the three 1911 planes of the Navy are delivered—Curtiss A-1, A-2; Wright B-1.

1911, May 13—Lieuts. H. H. (Hap) Arnold and Thomas DeWitt (Tommy) Milling complete flying training at Wright School: 7th and 8th Army pilots.

1911, June 7—Lieut. John P. Kelley, Med. Res. Corps, assigned Army School at College Park—first U. S. air medical officer.

1911, June 8—Connecticut state air regulation is first state air law.

1911, June 21—Short-lived Aeronautical Manufacturers Assn'n. incorporated; Ernest L. Jones, president.

1911, June 30-July 11—Boston-Washington flown by Harry N. Atwood. Charles K. Hamilton flies with him most of way—longest continuous air journey to this date.

1911, July 1—Third Bennett plane race won for U. S. by Charles T. Weyman (Nieuport-Gnome 100) at 78 mph.

1911, July 31—During the month, Frank E. Boland begins flying his tailless, allegedly non-infringing airplane.

1911, Aug. 5—Lincoln Beachy wins over Eugene Ely and Hugh Robinson in New York-Philadelphia race for Gimbel $5000 purse. Elapsed time: 1 hr. 50 min. 18 sec.; one stop for fuel.

1911, Aug. 14-25—Harry N. Atwood flies St. Louis-New York, 1155 miles by route; longest cross-country flight to this date.

1911, Aug. 20—World altitude record set at 11,642 ft. by Lincoln Beachy in Curtiss biplane.

1911, Sept. 4—Earle L. Ovington (Bleriot-Gnome 70) wins over Lieut. T. D. Milling (Burgess-Wright-Wright 30) in 160-mile tri-state race during Boston meet, in 3 hr. 6 min. 22 sec.

1911, Sept. 7—Lt. T. G. Ellyson, U.S.N., demonstrates shipboard launching by taking off from aerial cable at Hammondsport, N. Y.

1911, Sept. 17-Nov. 5 — Transcontinental flight by Calbraith P. Rodgers from New York to Pasadena, Calif.—3,390 mi., 49 days.

1911, Sept. 23-30—Earle L. Ovington appointed Airmail Pilot No. 1, flying mail from Nassau Boulevard to Mineola, L. I., N. Y.

1911, Sept. 30—Lt. H. H. Arnold is "stunt man" for the lead in pioneer air movies at Nassau Boulevard meet where Army pilots compete.

1911, Oct. 9—Demonstration of Tarbox automatic pilot made before officers at College Park. Other similar inventions follow.

1911, Oct. 10—Bombsighting and dropping device demonstrated by Riley Scott, College Park, Md.

1911, Oct. 19-Feb. 12, 1912—Eastbound transcontinental flight of Robert G. Fowler (Wright B), Los Angeles-Pablo Beach, Fla., 2520 mi. in 116 days.

1911, Oct. 24—Orville Wright makes soaring record of 9 min. 45 sec. at Kitty Hawk.

1912, Feb. 12—Frank T. Coffyn takes automatic movie aerials over New York harbor.

1912, Feb. 17—First pilot physical exam published by U. S. Army.

1912, Mar. 1—Attached type parachute jump by Bert Berry from Benoist pusher plane, St. Louis.

1912, Apr. 16—First U. S. licensed woman pilot, Harriet Quimby, flies English Channel. (Killed at Boston Aviation Meet, July 1.)

1912, May 24—Paul Peck makes American duration record of 4 hr. 23 min. 5 sec. in biplane with Berliner Gyro engine.

1912, May 30—Death of Wilbur Wright by typhoid.

1912, June 7-8—Machine gun fired from Wright biplane by Capt. Charles DeForest Chandler, College Park, Md.

1912, July 2—Vaniman airchip *Akron* crashes off Atlantic City in renewed trans-Atlantic attempt.

1912, July 31—Plane launched from sea wall by catapult, Navy Lt. T. G. Ellyson in Curtiss AH-3.

1912, Aug. 12—First Army tractor plane, Burgess, received; flown by Lts. H. H. Arnold and Roy C. Kirtland from Marblehead, Mass.

1912, Oct. 6—In night flight, Lt. J. H. Towers, U.S.N., (Curtiss A-2) makes world seaplane duration record, 6 hr. 10 min. 35 sec. at Annapolis; American record for any plane.

1912, Oct. 8—First Navy physical exam for pilots published by Bureau of Medicine and Surgery.

1912, Oct. 9—First competition for Mackay Trophy won by Lt. H. H. Arnold.

1912, Nov. 5-13—First U. S. airplane artillery adjustment, Ft. Riley, Kans., Lt. H. H. Arnold and observer Lt. Follett Bradley.

1912, Nov. 6-Dec. 15—Antony Jannus (Benoist seaplane Roberts 2-cycle 100 hp) flies Omaha-New Orleans, with mail and merchandise, carrying passengers at stops en route—1835 mi., flying time: 31 hr. 43 min.

1913, Jan. 13-Mar. 31—Air parcel post flight, Boston-New York, by Harry M. Jones (Wright B).

1913, Feb. 11—James Hay bill in Congress inaugurates the project of a separate air service.

1913, Feb. 13—Langley Field Aerodynamical Laboratory project inaugurated.

1913, Apr. 27—First cross-Isthmus flight by Robert G. Fowler and cameraman R. A. Duhem. Panama-Cristobal. Publication of story and pictures results in arrest.

1913, May 10—Didier Masson and bomber Dean attack Mexican federal gunboats in Guaymas Bay. A number of other Americans fly for Villa in this and subsequent years.

1913, May 28—Lt. T. D. Milling and Lt. W. C. Sherman make 2-man duration and distance record of 4 hr. 22 min. and 220 miles (Burgess tractor-Renault 70), Texas City-San Antonio.

1913, May 30—About this date is instituted M.I.T.'s aerodynamics course under Asst. Naval Constructor Jerome C. Hunsaker.

1913, June 20—First Naval aviator killed when Ensign W. D. Billingsley is thrown from seaplane.

1913, July 19—Sky writing initiated by Milton J. Bryant over Seattle.

1913, Oct. 12—Eighth Bennett international balloon race won for U. S. for fourth time at Paris by R. H. Upson and R. A. D. Preston, landing in England.

1913, Nov. 27—First exhibition loop by Lincoln Beachy in Curtiss biplane, Coronado, Cal.

1913, Dec. 4—Tactical Air Unit, First Aero Squadron, set up as provisional organization, San Diego, Cal.

1913, Dec. 12—Wright pilot Oscar Brindley reports at San Diego as Army's first civilian instructor. Scores of others subsequently employed through 1918.

1913, Dec. 31—Orville Wright demonstrates automatic pilot; awarded Collier Trophy.

1914, Jan. 1—First scheduled airline begins operations with Benoist flying boat between St. Petersburg and Tampa, Fla.; Tony Jannus, pilot.

1914, Jan. 31—During the month first U. S. Navy air station established at Pensacola, following temporary camps at San Diego and Annapolis, 1911-1912.

1914, Feb. 17—Seaplanes and flying boats classed as "vessels" by the Department of Commerce and the license No. 1 is issued to Antony Jannus.

1914, Feb. 24—Army Board condemns all pusher type airplanes.

1914, Apr. 15—Electric self starter fitted to Anzani 200-hp engine of Collier flying boat.

1914, June 23—Curtiss' Wanamaker trans-Atlantic flying boat tested. With outbreak of World War I the project is abandoned.

1914, July 2—Lawrence Sperry wins French War Dept. prize for "stable airplane" flown by early automatic pilot over Seine River in Paris.

1914, July 18—Aviation Section of Signal Corps created by Congress, authorizing 60 officers and students and 260 enlisted men.

1914, Dec. 1-16 — Two-way plane-ground radio demonstrated by Lt. H. A. Dargue and Lt. J. O. Mauborgne, Manila, P. I.

1915, Mar. 3—National Advisory Committee for Aeronautics established by Congress.

1915, May 14—Contract let for first Navy airship D-1 to Connecticut Aircraft Co. In July is contracted a floating airship shed.

1915, June 22—Wisconsin State Forester, E. M. Griffith, flown by Jack Vilas, in first air forest patrol.

Witteman-Lewis XNBL-1, Barling Bomber, 1923

1915, Sept. 17—Joseph Dolgos of Philadelphia demonstrates air incendiary bombs.

1916, Feb. 9—Cpl. A. D. Smith (Martin S-Hall Scott 125) makes world seaplane duration record of 8 hr. 42 min.

1916, Feb. 12—Invitation for bids on airmail issued by Post Office in Massachusetts and Alaska.

1916, Mar. 15—First Aero Squadron, under command of Capt. B. D. Foulois, begins operations at Columbus, N. M., with Gen. Pershing's Punitive Expedition.

1916, Apr. 5—The Governors Island Training Corps organized by Philip A. Caroll.

1916, Apr. 14—A power-driven turret is proposed without result by Col. F. P. Cobham.

1916, June 3—National Defense Act increases strength of Aviation S. C. from 60 to 148 officers over 5-year period. President may fix increase of enlisted men from old figure of 260.

1916, June 18—U. S. aviator H. Clyde Balsley shot down. (Member of Lafayette Escadrille, flying for France.)

1916, Aug. 29—First U. S. Coast Guard Aviation Division organized.

1916, Oct. 2—Allocation airship development to Army or Navy raised by Chief Signal Officer. Rigids later assigned Navy.

1916, Nov. 2—Chicago-New York commercial airmail line asked by Glenn Muffly. Sponsored by New York *Times*, Victor Carlstrom flies mail demonstration, Nov. 2-3.

1916, Nov. 14—More than 60 civilians are to Curtiss contract school at Newport News, Va., beginning this date and before Apr. 6, 1917. Others are sent to Curtiss school at Miami. Gen. Mitchell learns to fly here at this period.

1916, Nov. 18-20—Group National Guard cross-county flight under Capt. R. C. Bolling from New York to Princeton, N. J. and return. On Dec. 30, another is made to Philadelphia.

1916, Nov. 19-20—Ruth Law flies her 1914 Curtiss pusher Chicago-New York, with 2 stops en route, for new cross-country record.

1916, Dec. 17—To this date the Aero Club of America has certified 636 airplane pilots. In addition are many other pilots who have never flown for the Aero Club certificate. On Dec. 31, the Army has graduated 122 pilots since 1909.

1916, Dec. 18—Non-exclusive licenses are offered by Wright-Martin Aircraft Corp. on royalty basis. Terms are considered prohibitory and in 1917 Congress appropriates $1,000,000 to acquire basic patents. Solution is the cross-license agreement of the Aircraft Manufacturers Association.

1917, Feb. 13—Capt. Francis T. Evans, U.S.-M.C., loops and spins a seaplane at Pensacola.

1917, Feb. 15—Aircraft Manufacturers Association completes organization.

1917, Apr. 6—U. S. declares war on Germany.

1917, Apr. 6—Official strength of the Aviation Section, S. C., is 131, including regular and reserve. Of these, 112 are airplane pilots or student pilots. Enlisted strength is given variously from 1087-1800. At armistice the figures are: total officers, 20,708 (pilots and student pilots, 12,449); enlisted, 174,315.

Airplane strength, "less than 300." Produced in U. S., Apr. 6, 1917—Nov. 1, 1919: 13,894; received from Allies, 5,229; total: 19,123.

1917, May 10—Arrangements made for eight ground schools for theoretical training Reserve officer candidates.

1917, May 16—Aircraft Production Board created. Superseded by the Aircraft Board Oct. 1. Dissolved May 19, 1919.

1917, May 23—French Premier Ribot asks U.S. to furnish 5,000 pilots, 50,000 mechanics, 4,500 planes for active service by spring 1918.

1917, May 29—Liberty engine project inaugurated. An 8-cylinder Liberty is flown in an L.W.F., July 25. The 12-cylinder production Liberty follows in December.

1917, June 1—Barlow robot bomber urged. Armistice ends project.

1917, July 13—Fiske torpedo plane tested with dummy missile. Experiments continue.

1917, July 24—First great U. S. air appropriation, $640,000,000. Act also provides for increase in organization of Aviation Section, S. C.

1917, July 27—Secretary of Navy authorizes a Naval Aircraft Factory at Philadelphia.

1917, July 27—First British DH-4 arrives to be the first American service plane put into production, with Liberty engine. First American DH-4 completed is flown Oct. 29 by civilian test pilot H. M. Rinehart.

1917, Aug. 5—Original First Aero Squadron leaves Columbus, N.M. for overseas under Maj. Ralph Royce.

1917, Aug. 13—First AEF squadron program calls for 89 wings and 508 squadrons. One wing equals six squadrons (5 airplanes, 2 balloons). A brigade comprises two or more wings.

1917, Sept. 5—Bristol fighter project started. Condemned July 20, 1918, after 27 planes are built.

1917, Sept. 22—Montgomery heirs sue Wright-Martin Aircraft Corp. for infringement. Suit withdrawn June 6, 1921. Suit of same date against U. S. is dismissed May 28, 1928.

1917, Oct. 16—Airplane to airplane radiophone conversation is demonstrated.

1917, Oct. 18—McCook Field established as Signal Corps Experimental Laboratory.

1917, Oct. 18—Aviation Medical Research Board established by Signal Corps.

1917, Nov. 15—J. Newton Williams' helicopter proposal results in recommendation of N.A.C.A. for Government prize of $20,000, not accomplished.

1917, Nov. 21, Robot bomber demonstrated to Army and Navy officers.

1917, Nov. 27—Brig. Gen. B. D. Foulois made Chief of Air Service, AEF.

1917—Gen. William Mitchell claimed as first officer to fly over enemy lines.

1918, Jan. 19—U. S. School of Aviation Medicine begins operations under Signal Corps Maj. William H. Wilmer, Hazelhurst Field, Mineola, L. I., N. Y.

1918, Feb. 28—Under President Wilson's proclamation, licenses are required for civilian pilots or owners; more than 800 are issued.

1918, Mar. 8—Maj. Edward C. Schneider and Maj. James L. Whitney, in simulated altitude flight, reach artificial altitude of 34,000 ft. in 24 min. at Signal Corps, Mineola, N. Y. laboratory.

1918, Mar. 11—First D.S.C. awarded Army air service personnel goes to Lt. Paul Baer of 103rd Squadron for his performance this date.

1918, Mar. 14—Two pilots of First Pursuit Group (95th Squadron) go on patrol.

1918, May 9—Flight Surgeons are organized at flying fields.

1918, May 11—U. S.-built DH-4 Liberty planes received by AEF.

1918, May 15—Congress establishes Air Mail Flyer's Medal of Honor. First award is to M. F. Freeburg, 1932.

1918, May 15—Regular airmail service flown by Army between New York and Washington, D. C.

1918, May 20—Army aeronautics severed from Signal Corps; two departments created: Bureau of Military Aeronautics and Bureau of Aircraft Production.

1918, June 26—A trans-Atlantic flight is urged by Gen. William L. Kenly, Director Military Aeronautics as "most necessary." On Aug. 8, Roy N. Francis is assigned to study project. Experiments continue to 1919 when Navy's NC4 makes the flight.

1918, July 4—Plan to distribute tons of propaganda by balloon over Germany this day fails attainment. Previously extended experiments had been conducted and contracts let.

1918, Aug. 2—First DH Liberty patrol by 135th Aero Squadron

1918, Aug. 17—First Martin bomber flown at Cleveland by Thomas Eric Springer.

1918, Sept. 7—First U. S. demonstration of troop transport by air.

1918, Sept. 12-13—Greatest air concentration of history at St. Mihiel under Gen. William Mitchell—1481 planes.

1918, Sept. 16—German attached type parachutes being in use at least as early as May 1, 1918, the AEF cables need and suggests Floyd Smith, test pilot, prosecute development. Smith develops tree type 'chute. Leslie L. Irving makes first free jump Apr. 28, 1919.

1918, Sept. 18—Altitude of 28,899 ft. reached by Maj. R. W. Schroeder.

1918, Sept. 25—First Congressional Medal of Honor awarded for air activity voted 1st Lt. Edward V. Rickenbacker of 94th Aero Squadron.

1918, Sept. 26—First phase of Meuse-Argonne attack.

Consolidated PT-1, first modern primary trainer, replaced "Old Jenny" in 1926

1918, Sept. 28—Pilotless airplane maneuvered from another airplane by radio, after some months of experiment. Various automatic pilots and radio controllers tried over the years.

1918, Oct. 2—First successful flights of Army's guided missile. Its prototype had been flown by H. M. Rinehart in July, substituting for the explosive load and the automatic controls.

1918, Oct. 3—Flight refueling demonstrated by Lt. Godfrey L. Cabot, U.S.N.R., continuing into 1920.

1918, Oct. 12—Use of oxygen tanks ordered all pilots over German lines.

1918, Oct. 25—Charles E. Hughes reports on his investigation of dishonesty in aircraft production.

1918, Nov. 11—Armistice signed.

1918, Dec. 4—First Army trans-continental flight made by Major Albert D. Smith's group of JN4 planes, San Diego-Jacksonville-New York-San Diego. Major Smith's plane alone completes the full round trip.

1919, Jan. 2—Maj. Gen. Charles T. Menoher becomes Director of Air Service.

1919, Jan. 21-30—Army second transcontinental flight; Major T. C. Macauley (DH-4 Liberty), Ft. Worth-San Diego-Miami-Ft. Worth. Repeated in April.

1919, Jan. 24—At Issoudun, France, 1st Lt. Temple M. Joyce (Morane) makes 300 consecutive loops.

1919, Mar. 3—U. S.-Canada airmail flown by Edward Hubbard in Boeing seaplane, Type C.

1919, Apr. 26—Lt. Comdr. H. B. Grow, U.S. N. in F5L flying boat makes non-stop endurance record: 20 hr. 10 min.

1919, Apr. 28—Leslie L. Irving makes first free type manually operated airplane parachute jump over McCook Field. (See 9/16/18).

1919, May 8-31—Trans-Atlantic crossing by Lt. Albert C. Read and crew from Rockaway Beach, N. Y., to Plymouth, England, in NC-4, 53 hr. 58 min.

1919, May 14—Navy airship C-5 makes American non-stop record of 25 hr. 50 min., Montauk Pt., L. I. to St. Johns, N.F.

1919, May 18—In first trans-Atlantic takeoff, H. C. Hawker and McKenzie Grieve alight in ocean 1200 miles and 14½ hours out with engine trouble. Rescued.

1919, May 19—First award of DFC made to M/Sgt. Ralph W. Bottriell for first jump by Army personnel with free-type 'chute.

1919, June 1—First organized and sustained forest fire patrol inaugurated at Rockwell.

1919, June 14—First non-stop Atlantic crossing by Capt. John Alcock and Lt. A. W. Brown (Vickers-2 Rolls 375) St. Johns to Clifden, Ireland: 1890 mi. in 16 hr. 12 min.

1919, June 28—Treaty of peace with Germany signed at Versailles.

1919, July 1—Aerial fish patrols inaugurated at San Diego by Comdr. E. W. Spencer, Jr., U.S.N.

1919, July 2-6—First airship ocean crossing, British R-34, E. Fortune, Scotland, to Mitchel Field, N. Y., 3270 mi. in 108 hr. 12 min.; Lt. Comdr. L. Lansdowne, U.S.N. on board. Return made July 9-12, Col. William M. Hensley, representing Air Service.

1919, Aug. 14—Airmail from Aeromarine flying boat to White Star liner, *Adriatic*.

1919, Aug. 27-29—New York-Toronto race of military and civilian pilots.

1919, Aug. 28-Sept. 19—Lawson "air liner," 26-passenger, twin Liberty biplane, makes demonstration trip Milwaukee-Washington via Chicago, New York and other cities. It returns Sept. 25-Nov. 6.

1919, Sept. 1—Dive bombing demonstrated about this date at Aberdeen Proving Ground.

1919, Sept. 16—Flood relief provided by four JN4D's from Corpus Christi to stranded inhabitants.

1919, Sept. 18—Roland Rohlfs (Curtiss triplane-K12 Curtiss 400) makes world altitude record of 31,420 ft.

1919, Oct. 8-31—Army transcontinental reliability and endurance test New York-San Francisco and return. Forty-four compete westbound; 15 eastbound. Ten planes make round trip.

1919, Oct. 30—Reversible pitch propeller tested at McCook Field, Dayton, Ohio.

1919, Nov. 12-June, 1920—Six Navy F-5L's cruise New York to West Indies and return, covering 12,731 nautical miles.

1920—Moon eclipse observed by Lts. J. H. Tilton and W. H. Cushing of Rockaway Naval air station from height of some three miles.

1920, Feb. 27—World altitude record of 33,113 feet set by Maj. R. W. Schroeder (Le Pere-Liberty).

1920, Mar. 29-Apr. 22—Marine Corps group flight Washington-San Domingo and return, 4842 miles.

1920, June 7—Lt. John H. Wilson makes unofficial world parachute jump record of 19,800 ft.

1920, June 4—Army Reorganization Bill approved, creating Air Service in Army.

1920, July 7—F-5L Navy seaplane flown by radio compass from Hampton Roads, Va., to *U.S.S. Ohio*, at sea.

1920, July 15-Oct. 20—New York-Alaska flight; Capt. St. Clair Street, 1st Lt. Clifford Nutt, 2nd Lts. Ross C. Kirkpatrick, Eric H. Nelson and C. E. Crumrine, Sgts. James Long and Joseph E. English, Capt. Howard Douglas, advance officer; Mitchel Field, N. Y., to Nome and return.

1920, Sept. 8—Transcontinental mail route, combination plane-train, New York-Chicago-San Francisco, completed.

1920, Nov. 1—U. S. international passenger service started by Aeromarine West Indies Airways between Key West, Fla., and Havana, Cuba.

1920, Nov. 25—1st Lt. C. C. Moseley (Verville-Packard 600) wins first Pulitzer race at 156.54 mph; 24 contestants finish, 13 others start but do not finish.

1920, Dec. 13-14—Navy balloon of Lts. L. A. Kleer, Walter Hinton and S. A. Farrell land beyond Moose Factory, Ont., after 25 hours, 852 miles from start at Rockaway, N. Y.

1921, Feb. 18—First U. S. airplane parachute escape by C. C. Eversole, airmail pilot.

1921, Feb 22-23—Night airmail flown by Jack Knight from North Platte, Neb., to Chicago, Ill.

1921, Feb. 24—Lt. W. D. Coney completes transcontinental flight, San Diego-Jacksonville, 2180 mi. in 22 hr. 27 min.; 57 hr. 24 min. elapsed time.

1921, Mar. 23—Lt. A. G. Hamilton drops 23,700 ft. by parachute, Chanute Field.

1921, June 21—Navy F5L planes sink German sub U-117 in demonstration.

1921, July 18-21—Sinking of captured German cruiser, *Frankfurt*, and battleship, *Ostfriesland*, by U. S. bombs proves vulnerability of naval craft to aerial attack.

1921, Aug. 10—Navy Bureau of Aeronautics formed with Rear Admiral W. A. Moffett as Chief.

1921, Sept. 28—New world altitude record of 34,508 ft. set by Lt. J. A. Macready.

1921, Nov. 5—Bert Acosta (Curtiss Navy-C12 Curtiss 400) wins Pulitzer race at 176.7 mph.

1921, Nov. 12—Refueling in air: Earl S. Daugherty transfers *Wesley May* with can of gasoline from wing of another plane.

1921, Nov. 15—Italian airship *Roma* makes initial ascent in U. S. at Langley Field.

1921, Dec. 1—Helium airship, Navy dirigible C-7, flown from Hampton Roads, Va. to Washington, D. C.

1921, Dec. 29—World endurance record of 26 hr. 18 min. 35 sec. made at Roosevelt Field by Edw. Stinson and Lloyd Bertaud (CJL6 BMW 185).

1922, Jan. 1—Underwriters Laboratories starts registration of aircraft for benefit of insurance companies.

1922, Jan. 1—Aeronautical Chamber of Commerce organized, New York, with I. M. Uppercu, president.

1922, Feb. 21—Airship *Roma* destroyed.

1922, Mar. 20—Airplane carrier *U.S.S. Langley*, commissioned at Norfolk, Va.

1922, June 16—Helicopter demonstrated by Henry Berliner, Washington, D. C.

1922, July 14—Aeromarine Airways starts Detroit-Cleveland flying boat service.

1922, Aug. 5-7—Lt. Clayton Bissell completes first model airway flight, Washington-Dayton-Washington.

1922, Aug. 16—Sperry airway light beacon demonstration, McCook Field.

1922, Sept. 4-5 — Transcontinental speed flight by Lt. James H. Doolittle, Pablo Beach. Fla.-San Francisco, Cal., in 22 hr. 35 min. elapsed time.

1922, Sept. 14-23—Transcontinental Army airship flight with Maj. H. A. Straus commanding crew of Capt. G. W. McEntire and others, from Langley Field, Va. to Arcadia, Cal.

1922, Oct. 5-6—World endurance record, 35 hr. 18 min. 30 sec., Rockwell Field, by Lts. J. A. Macready and O. G. Kelly (Fokker T2 Liberty 375).

1922, Oct. 14—Lt. R. L. Maughan wins Pulitzer race at 206 mph (Army Curtiss-D12 Curtiss 375).

1922, Oct. 18—World speed record of 222.97 mph set by Brig. Gen. William Mitchell in Curtiss racer.

1922, Oct. 23—American Propeller Co. demonstrates reversible propeller at Bolling Field.

1922, Dec. 18—Army's De Bothezat helicopter makes first successful flight, 1 min. 42 sec., Dayton, Ohio.

1923, Mar. 29—Lt. R. L. Maughan makes world speed record 236.58 mph (Curtiss R6-Curtiss 465), Dayton, Ohio.

1923, Apr. 16-17—World duration—distance records by Lts. J. A. Macready and O. G. Kelly (Fokker T2 Liberty 375), 36 hr. 4 min. 34 sec., 2516.55 miles.

1923, May 2-3—Cross-country non-stop flight by Lts. J. A. Macready and Oakley G. Kelly in Fokker T-2, from New York to San Diego, 2,520 miles in 26 hr. 50 min. 3 sec.

1923, Aug. 27-28—Lts. L. H. Smith and J. P. Richter (DH-4E Liberty 400) made world duration-distance refueled records: 3293.26 miles, 37 hr, 15 min. 14.8 sec.; Rockwell Field.

1923, Sept. 5—Smoke screen demonstrated by Thomas Buck Hine during naval bombing maneuvers, Cape Hatteras, N. C.

1923, Sept. 5—Langley Field bombers sink naval vessels *New Jersey* and *Virginia*.

1923, Oct. 6—Lt. A. S. Williams, U.S.N. wins Pulitzer race (Curtiss R2C1-D12 Curtiss 460) at 243.68 mph.

1923, Oct. 25-27—Barling bomber makes series weight-carrying records with greatest weight 3000 kg.; duration, altitude records, 1 hr. 19 min. 11.8 sec., 5,344 ft.

1923, Nov. 4—Lt. A. J. Williams, U.S.N. (Curtiss R2C1-D12A Curtiss 500) makes world speed record 266.59 mph.

1923, Dec. 18—For $100,000 the Christmas Aeroplane Co. assigns its aileron patent to U. S. Government.

1924, Jan. 16—Navy airship *Shenandoah* tears loose from mast in storm and rides it out during the night.

1924, Feb. 21—Alaskan airmail flown by Carl B. Eielson from Fairbanks to McGrath.

1924, Feb. 22—Lt. J. A. Macready (Lepere-supercharged Liberty 400) reaches 41,000 ft. indicated altitude.

1924, Apr. 6-Sept. 28—Round-the-world flight by Lts. Smith, Nelson, Arnold, and Harding, Seattle to Seattle, 26,445 miles, 175 days (368 hours flying time).

1924, June 2—Lt. James T. Neely and storm-riding meteorologist Dr. C. L. Meisinger, Weather Bureau, killed by lightning in balloon near Monticello, Ill.

1924, July 1—Through transcontinental airmail service begun by U. S. Post Office.

1924, Oct. 4—Lt. H. H. Mills wins Pulitzer trophy (Verville Sperry-Curtiss HC D12A) at 216.55 mph.

1924, Oct. 7-25—Navy airship *Shenandoah* makes record cross-country cruise over 7080 miles in 235 hr. 01 min. Air hours total of 422 hr. 23 min. includes time moored.

1924, Oct. 12-15—U. S. Navy's German airship *ZR3 (Los Angeles)* makes fourth aircraft Atlantic crossing, Friedrichshafen - Lakehurst, in delivery under reparations.

1924, Oct. 29—Fog dispersal by electrified silica and sand demonstrated at Bolling Field.

1925, Jan. 29—Eclipse pictures and astronomic data secured at high altitudes by Air Service pilots.

1925, Feb. 2—Kelly Bill signed by President Coolidge authorizing private contract air transport of mail.

1925, Apr. 7—Navy carrier *Saratoga* launched.

1925, May 21-July 6—Amundsen-Ellsworth polar flight.

1925, July 15—Dr. A. Hamilton Rice Expedition, first to employ planes in exploration, returns from Amazon; Lt. Walter Hinton, pilot, in Curtiss Seagull.

1925, Aug. 4-22—MacMillan polar expedition, with Navy assistance.

1925, Aug. 5—Seven American pilots leave Paris to fly for the French in the Riff campaign in Africa. Others follow to a total of 17 pilots, 5 observers.

1925, Aug. 31-Sept. 8—In Navy's attempted San Francisco-Honolulu flight, Commander John Rodgers and crew (PN9-2 Packard 500 flying boat) alight short of mark, making nonstop cross-country seaplane record of 1,841 miles.

1925, Sept. 3—Navy dirigible, *Shenandoah*, collapsed in storm over Ava, O., killing 14 of 43 on board.

1925, Sept. 12—Morrow Board appointed by President Coolidge. (Laid down U. S. air policy.)

1925, Oct. 12—Lt. Cyrus Bettis wins 6th Pulitzer race (Curtis R3C1-V1400 Curtiss 619) at 248.97 mph.

1925, Oct. 26—Lt. J. H. Doolittle wins 8th international Schneider Seaplane Trophy race in first contest in America (Curtiss R3C2—V1400 Curtiss 619) at 232.57 mph.

1925, Dec. 17—Gen. William Mitchell found guilty of violating 96th Article of War; had risked insubordination by demanding unrestricted use of air power. Sentenced five years suspension of rank, pay and command. Resigned.

1926, Jan. 18—A $2,500,000 air promotion fund established by Daniel Guggenheim.

1926, Jan. 29—Lt. J. A. Macready (XCO5A-Liberty 400) makes American altitude record: 38,704 ft.

1926, Feb. 11—Strip bombing tests made at Kelly Field.

1926, Apr. 16—First cotton dusting plane purchased by Department of Agriculture.

1926, Apr. 30—Capt. G. H. Wilkins and Lt. Carl B. Eielson complete third round trip Fairbanks-Pt. Barrow-Fairbanks.

1926, May 8-9—Flight over North Pole by

Loening Amphibian flown on Pan American Good-Will Tour, 1926-1927

Richard Byrd, navigator, and Floyd Bennett, pilot, in Fokker monoplane.

1925, May 21-July 6—Amundsen-Ellsworth bile airship *Norge* crosses Pole in voyage Spitzbergen-Teller, Alaska in 71 hours.

1926, May 20—Air Commerce Act (Bingham-Parker Bill) signed by President Coolidge; Aeronautics Branch, Department of Commerce, established.

1926, May 30—Bennett international balloon race, Brussels, brought to America by the win of W. T. Van Orman and W. W. Morton in Goodyear III balloon. Capt. H. C. Gray, Air Service, second.

1926, July 2—Army Air Service renamed Army Air Corps.

1926, July 2—First reforesting by airplane, Hawaii.

1926, July 14—Armstrong seadrome model demonstrated at Wilmington, Del. to Air Service.

1926, Aug. 18—Metal-clad airship contract let at not over $300,000.

1926, Aug. 25—JN training plane dropped by parachute, San Diego Naval Air Station.

1926, Dec. 7—Airway beacon erected by Aeronautics Branch, Department of Commerce, on Chicago-Dallas route.

1926, Dec. 21-May 2 ('27)—Mass amphibian good will flight from San Antonio, Tex. through Mexico, Central and South America and West Indies, under Maj. H. A. Dargue.

1927, Mar. 9—American balloon altitude record of 28,508 ft. made by Capt. H. C. Gray.

1927, Apr. 12—New American duration record of Clarence D. Chamberlin and B. B. Acosta (Bellanca-15 Wright 200) 51 hr. 11 min. 25 sec.

1927, May 4—Record balloon altitude attempt by Capt. H. C. Gray, 42,470 ft.

1927, May 15-19 — Greatest concentration since World War I (109 planes) in maneuvers under Brig. Gen. J. E. Fechet.

1927, May 20-21—Non-stop trans-Atlantic solo flight by Charles A. Lindbergh, New York-Paris, 3,610 miles, 33 hr. 30 min. (13th aircraft to make completed crossing.)

1927, May 25—Outside loop demonstrated by Lt. James H. Doolittle.

1927, June 4—First nonstop flight to Germany, Clarence D. Chamberlin and passenger (Bellanca-15 Wright 200), 3,911 miles, 43 hr. 49 min. 33 sec.

1927, July 25—World airplane altitude record by Lt. C. C. Champion, U. S. N. (Wright-P & W 425 supercharged) 38,484 ft.

1927, Aug. 16-17—A. C. Goebel and Lt. W. V. Davis, U. S. N. (Travelair-15 Wright 200) win Dole Oakland-Honolulu race One team finishes. Two teams lost.

1927, Sept. 1—Air express operations begun by American Railway Express and major airlines.

1927, Sept. 10—Bennett international balloon race, Dearborn, Mich., won by E. J. Hillard and A. G. Schlosser with 745 miles; 15 contestants.

1927, Oct. 12—Wright Field dedicated.

1928, Feb. 3-Dec. 28—Lt. H. A. Sutton conducts a series of spin tests; awarded Mackay Trophy.

1928, Mar. 1-9—Transcontinental amphibian flight by Army Lt. Burnie R. Dallas and civilian Beckwith Havens in Loening.

1928, Mar. 28-30—Edw. A. Stinson and George Holderman (Stinson-Wright 200) make endurance record of 53 hr. 36 min. 30 sec.

1928, Apr. 12-13—First non-stop westbound North Atlantic airplane crossing made by Baron G. von Huenefeld, Capt. Hermann Koehl and Maj. James Fitzmaurice (Junker-Junker 280/310 metal cabin land monoplane) from Baldonnel, Ireland to Greenly Island, N.F., 2,070 miles in 37 hours.

1928, Apr. 15-21 — First eastbound Arctic crossing made by Capt. G. H. Wilkins and Lt. C. B. Eielson (Lockheed-Wright 225) Pt. Barrow-Green Harbor, Spitzbergen, 2,200 miles, 20 hr. 20 min.

1928, May 24—Gen. Umberto's airship is over the Pole in trip from Spitzbergen. It is wrecked May 25, with loss of lives of crew and rescuers.

1928, May 31-June 8—First U. S.-Australian flight, by Capt. C. Kingsford-Smith, Capt. C. T. P. Ulm, H. W. Lyon and James Warner (F7 Fokker-3 Wright 200) Oakland-Brisbane, 7,410 miles; 83 hr. 19 min.

1928, June 11-12—Mexico-Washington flight by Capt. Emilio Carranza (Bryan-Wright 200).

1928, June 17-18—First woman to fly Atlantic, Amelia Earhart with Wilmer Stultz, pilot, from Trepassey Bay, N.F., to Burryport, England, in trimotored Fokker, 2,140 miles, 20 hr. 40 min.

1928, July 30-31—Twenty-second Bennett international balloon race, Detroit, won by Capt. W. E. Kepner and Lt. W. O. Fareckson; 460 miles, 43 hr.

1928, Sept. 19—First Diesel engine to power heavier-than-air craft; designed by I. M. Woolson, manufactured by Packard Motor Car Co.; flight-tested at Utica, Mich.

1928, Oct. 19—Parachute troop demonstration at Brooks Field.

1928, Nov. 11—First Antarctic flight made by Lt. C. B. Eielson and Sir Hubert Wilkins (Lockheed-Wright 22). Other flights subsequently.

1928, Nov. 23-Dec. 30—New York-Girardot, Colombia, flight by Capt. Benjamin Mendez, 4,600 miles.

1928, Dec. 19—Autogiro flight by Harold F. Pitcairn, Pitcairn Field, Willow Grove, Pa.

1929, Jan. 1-7—Refueling endurance record set by Maj. Carl Spaatz and Capt. Ira C. Eaker, Lt. Elwood R. Quesada, Lt. Harry A. Halverson, S/Sgt. Roy W. Hooe in 150 hr., 40 min., 51 sec.

1929, Apr. 3—Floyd Smith trap-door parachute demonstrated.

1929, Apr. 30—Jack Barstow makes duration glider record of 15 hr. 13 min. at Point Loma, Cali.

1929, June 28-29—Round transcontinental flight by Capt. Frank M. Hawks (Lockheed-P & W) in 40 hr. 4 min. 32 sec. Capt. E. G. Harper repeats the performance July 11-26.

1929, July 13-30—World endurance record of 420 hr. 17 min. by Forrest O'Brien and Dale Jackson (Curtiss Robin-Curtiss 70).

1929, July 18-20 — N. Y.-Alaska flight by Capt. Russ G. Hoyt. Return flight ends at Edmonton, after covering 6,000 miles out of 8,469 itinerary.

1929, Aug. 5-6—Group transcontinental flight of 9 Keystone bombers under Major Hugh J. Knerr.

1929, Sept. 24—Demonstration by Lt. James H. Doolittle results in Guggenheim report blind flying solution.

1929, Oct. 21—Air Ambulance Service organized by Colonial Flying Service and Scully Walton Ambulance Co., New York.

1929 — Bennett international balloon race won by W. T. Van Orman and aide, 341 miles, 9 contestants.

1930, Mar. 15—Glider, piloted by Capt. Frank Hawks, released from seaplane, Port Washington, N. Y.

1930, Apr. 6—Transcontinental glider in tow, piloted by Capt. Frank Hawks; San Diego to New York; 2,860 miles in 36 hr., 47 min.

1930, May 20—Dirigible-launched Vought observation plane, flown by Lt. Comdr. Charles A. Nicholson from *U.S.S. Los Angeles* to *U.S.S. Saratoga*, Lakehurst, N. J.

1930, June 4—New world altitude record of 38,560 ft. set by Navy Lt. Apollo Soucek, Anacostia, Md.

1930, June 11-July 4—World endurance record of 553 hr. 41 min. 30 sec. established by John and Kenneth Hunter (Stinson-Wright 200).

1930, July 21-Aug. 17—Refueling endurance record raised to 647 hr., 28 min. by Forrest O'Brien and Dale Jackson in a Curtiss Robin, St. Louis, Mo.

1930, July 22—German air mail plane catapulted 250 miles out en route to New York; 198 such ship-shore flights 1929-1938.

1930, Sept. 1 — Bennett international balloon race again won for U. S. by W. T. Van Orman and aide, 542 miles.

1931, Feb. 14-19—Lts. W. W. Lite, Clement McMullen fly New York-Buenos Aires, 6,870 miles, 5 days, 5 hours elapsed time; 52:15:00 flying.

1931, Mar. 30—Airplane-airship mail transfer at Scott Field.

1931, Apr. 10—Airship sub-cloud observation car demonstration by Lt. W. J. Paul.

1931, May 25-28—World endurance record, non-refueled, set by Walter E. Lees and F. A. Brossi, Bellanca, Packard Diesel 225 hp; 85 hr., 32 min., 38 sec., Jacksonville, Fla.

1931, May 14-28—Transcontinental autogiro flight by John M. Miller, from Philadelphia to San Diego.

1931, June 4—Rocket glider flown by William G. Swan; remained aloft for 30 min. with 10 rockets, Atlantic City, N. J.

1931, June 23-July 1—World flight by Wiley Post and Harold Gatty (Lockheed-PW 550), New York-Harbor Grace-Berlin-Moscow-Irkutsk-Khabarovsk-Solomon Beach-Fairbanks-Edmonton-Cleveland-New York, in 14 hours. 8 days 16 hours, 16,500 miles.

1931, July 25-26—Glider duration record of 16 hr. 38 min. by 2nd Lt. John C. Crain, Honolulu.

1931, Oct. 3-5—Trans-Pacific non-stop airplane flight by Clyde Pangborn and Hugh Herndon, Samushiro Beach, Japan, to Wenatchee, Wash.

1931, Oct 3-5—Herndon and Pangborn (Bellanca-PW 420) left New York July 28 on world trip and had reached Japan Aug. 6, abandoning attempt to better Post-Gatty record.

1931, Oct. 6-9—Navy bomber tests on *U.S.S. Pittsburgh* in Chesapeake Bay.

1931, Nov. 3—Dirigible, *Akron*, carried record number of 207 persons in flight over New York and Philadelphia.

1931, Dec. 17-18—Glider duration record of 21 hr. 34 min. by Lt. Wm. A. Cocke, Honolulu.

1932, May 9—First solo blind flight, by Capt. Albert F. Hegenberger, Wright Field, Dayton, O.

1932, May 20-21—Amelia Earhart soloes across Atlantic, St. Johns, New Brunswick to Londonderry, Ireland, in Wasp-powered Lockheed Vega.

1932, Aug. 25—First woman to complete non-stop transcontinental flight, Amelia Earhart, Los Angeles to Newark.

1932, Dec. 1—Teletypewriter weather map service inaugurated by Department of Commerce.

1933, Jan. 19 — Rocket guided by sound waves from enemy aircraft proposed.

1933, Jan. 23 — Steam airplane project launched by Great Lakes Aircraft and General Electric Co. Later Besley brothers fly their steam airplane.

1933, Apr. 4—Navy dirigible, *Akron*, crashes into sea, killing 73; Comdr. Herbert V. Wiley, commanding.

1933, May 3-26 — Airborne troop logistics part of West Coast maneuvers, with 283 aircraft.

1933, July 15-22—Solo round-the-world flight by Wiley Post in Lockheed Vega monoplane, *Winnie Mae*, in 7 days, 18 hr., 49 min.

1933, Sept. 4—World speed record for land planes set at 304.98 mph by James R. Wedell in Wasp-powered Wedell-Williams racer.

1933, Nov. 20-21—World balloon altitude record set at 61,237 ft. by Lt. Comdr. T. G. W. Settle and Maj. C. L. Fordney over Akron, O.

1934, Jan. 10-11—Longest non-stop over-water mass flight completed by six P2Y-1 Navy flying boats under command of Lt. Comdr. Knefler McGinnis, San Francisco to Honolulu.

1934, Feb. 9 — Postmaster General Farley cancels certain mail contracts. Air Corps flies the mail Feb. 19-Mar 10; Mar. 19-May 5.

1934, June 12—Howell commission to study airmail act and report on all phases of aviation by Feb. 1, 1935.

1934, Dec. 31—War Department announces instruction governing GHQ Air Force organization and operation.

1935, Jan. 3—Antarctic flight by Ellsworth and Kenyon (Northrop-PW 600).

1935, Feb. 12—Navy dirigible, *Macon*, crashes into sea, killing 2.

1935, June 12-Aug. 14—Washington-Alaska-Washington flight (Douglas Amphibian-2 Wasps) in test of practicability of such flight with standard equipment and as any ordinary flight. Capt. Hez McClellan and crew of two.

1935, Aug. 15—Will Rogers and Wiley Post killed in take-off crash near Point Barrow, Alaska.

1935, Nov. 11—Balloon altitude record of 72,394 ft. by Capt. O. A. Anderson and Capt. Albert Stevens.

1935, Nov. 21-Dec. 5—Antarctic flights renewed by Ellsworth and Kenyon (Northrop-PW 600).

1935, Nov. 22-29—Trans-Pacific airmail flight by Capt. Edwin C. Musick, Pan American Airways, from San Francisco to Honolulu, Midway Island, Wake Island, Guam and Manila, in Martin *China Clipper*.

1936, June 7—All-instrument transcontinental flight by Maj. Ira C. Eaker, between New York and Los Angeles.

1936, Sept. 10-Oct. 20—Regular trans-Atlantic flying boat service by Deutsche Lufthansa. (Dornier twin Diesel engine 600.) Continued in 1937 and 1938.

1936, Sept. — Trans-Atlantic round-trip flight by Henry (Dick) Merrill and Harry Richman, New York to London and return.

1937, May 6—German dirigible, *Hindenburg*, burned on mooring, killing 36, Lakehurst, N. J.

1937, May 20-July 3—Amelia Earhart Putnam and Fred Noonan lost in Pacific in round-the-world attempt.

1937, June 25—Non-stop transcontinental amphibian flight by Richard Archbold in PBY-1, Catalina, from San Diego to New York.

1937, July 3-Sept. 3—Regular trans-Atlantic service test by Pan American Airways. Imperial Airways also similarly operate July 5-Aug. 2 and continue in 1938.

1937, Aug. 12—In joint coast defense exercise, Navy patrol planes locate target ship *Utah* 300 miles off San Francisco; Air Corps planes attack.

1937, Aug. 23—Wholly automatic landings made, "first in history," at Wright Field by Capt. Carl J. Crane with 2 passengers; awarded DFC.

1938, Feb. 15-27—Miami-Buenos Aires-Miami flight of 6 bombers under Lt. Col. Robert Olds, for inauguration President Ortiz.

1938, Feb. 26—Government acquires monopoly on helium by purchasing production facilities at Dexter, Kan.

1938, Apr. 22—Capt. E. V. Rickenbacker purchases Eastern Air Lines from North American Aviation, Inc., for $3,500,000.

1938, June 23—Civil Aeronautics Authority with five members, an administrator, and a three-man Safety Board, created under Civil Aeronautics Act signed by President. This supersedes Aeronautics Branch, Department of Commerce.

1938, July 10-14—Howard Hughes and crew of four fly short northern course around world in 3 days, 19 hr., 8 min.

1938, July 17-18—Douglas (Wrong-Way) Corrigan flies from New York to Ireland in nine-year-old Curtiss Robin.

1938, Aug. 3-12—Miami-Bogota-Miami goodwill flight of 3 bombers under Major Vincent J. Meloy.

1938, Aug. 10-11 — First Berlin-New York nonstop flight by Capt. Alfred Henke and crew (Focke-Wulf Condor 200), 4,577 miles, 24 hr. 54 min.

1938, Aug. 22—Civil Aeronautics Act becomes effective.

1939, Feb. 4-6—Langley Field-Santiago Red Cross flight by Major C. V. Haynes in XB bomber with medicinal supplies.

1939, Mar. 5—Non-stop airmail system by pick-up demonstrated by Norman Rintoul and Victor Yesulantes in Stinson Reliant planes, Coatesville, Pa.

1939, Apr. 3—The National Defense Act, providing for aerial rearmament, signed by President Roosevelt.

1939, Apr. 17—Inclined runways for assisted takeoff studied by Air Corps Board.

1939, May 20—North Atlantic airmail service begun by PAA between Port Washington, L. I., the Azores, Portugal and Marseille, France.

1939, June 27—Bill authorizing Civilian Pilot Training Program signed by President.

1939, Sept. 1-3—Germany invades Poland. England and France declare war on Germany.

1940, Mar. 26—U. S. commercial airlines complete a full year of flying without a fatal accident or serious injury to a passenger or crew member.

1940, July 1—Air Safety Board abolished with its functions delegated to the Civil Aeronautics Board. Civil Aeronautics Administration transferred to Department of Commerce.

1940, Sept. 23—House committee asks $80 million for airport development, in $500 million program; $40 million voted.

1941, Mar. 17—Milwaukee renames its airport as General Mitchell Field.

1941, Apr. 15—First officially-recorded rotor helicopter flight in western hemisphere, Vought-Sikorsky VS-300A, piloted by Igor I. Sikorsky; flight time, 1 hr., 5 min., 14.5 sec., Stratford, Conn.

1941, May—Barrage balloon defense transferred from Air Corps to Coast Artillery.

1941, June 5—Ferry Command, for delivery of planes to Britain, organized by Army Air Corps.

1941, June 20—Army Air Force, comprising office of Chief of Air Corps and Air Force Combat Command, created.

1941, June—First woman to ferry bomber across Atlantic, Jacqueline Cochran, Canada to British Isles.

1941, Sept. 5—Mass trans-Pacific flight of heavy bombers completed by nine Army B-17 Flying Fortresses.

1941, Dec. 7—Pearl Harbor.

1942, Apr. 8—First flight of Ferry Command over Himalayan "Hump" made by Lt. Col. William D. Old, between Assam, India and Kunming, China.

1942, Apr. 18—First bombing attack on Japanese mainland by 16 B-25 Mitchell bombers from Navy carrier, *Hornet*; Lt. Col. James H. Doolittle commanding.

1942, May 4-9—Battle of Coral Sea.

1942, June 20—Ferry Command redesignated Air Transport Command under Maj. Gen. Harold L. George.

1942, June 3-7—Battle of Midway.

1942, June 17—AAF tow planes successfully pick up gliders in tests at Wright Field.

1942, Aug. 17—First official bombing raid of Eighth Air Force, 12 Flying Fortresses, Brig. Gen. Ira C. Eaker commanding, Rouen, France.

1942, Sept.—Fifty American Eagle squadron pilots, RAF, all Americans, transferred to Eighth Air Force. (Fourth Fighter Group.)

1942, Oct. 1—Jet plane built and flown by Robert M. Stanley; Bell Airacomet (XP-59A), Muroc Dry Lake, Cal.

1943, Mar. 1-4—Battle of Bismarck Sea.

1943, Mar. 19—Lt. Gen. Henry H. Arnold, commanding general of the AAF, advanced to full four-star general, the first in air history.

1943, June 24—World's longest parachute drop, 40,200 ft., made by Lt. Col. W. R. Lovelace at Ephrata, Wash.

1943, June 11—First ground victory by air power when Pantelleria, Italy, surrenders unconditionally to Lt. Gen. Carl Spaatz. First case in history of a well-fortified citadel being defeated without aid of ground forces.

1943, Oct.—World's longest freight line opened by Capt. J. L. Okenfus and crew of five in 28,000-mile round-trip flight, Ohio to India.

1944, June—Army Air Force reaches peak with 78,757 aircraft.

1945, May 8—War in Europe ends.

1945, Aug. 6—Atomic bomb dropped on Hiroshima from B-29, *Enola Gay*, under command of Col. Paul W. Tibbets, Jr.

1945, Aug. 14—Japan's surrender ends World War II.

1945, Sept. 28-Oct. 4—Round-the-world air service begun by Air Transport Command Douglas C-54E, Globester, 9 passengers, 23,147 miles in 149 hr., 49 min.

1946, Jan. 26—Jet-propelled P-80, flown by Col. William H. Councill, sets non-stop transcontinental record of 4 hr., 13 min., 26 sec., between Long Beach, Cal., and New York.

1946, Mar. 12—First commercial helicopter license granted by Civil Aeronautics Administration for Bell 2-place Model 47.

1946, Mar. 22—First American-built rocket to escape earth's atmosphere, reaches 50-mile height. Constructed by Douglas.

1946, July 21—The McDonnell XFH-1 Phantom is first U.S. jet to operate from carrier, *U.S.S. Franklin D. Roosevelt*.

1946, Aug. 6—Two B-17 radio-controlled bombers with stand-by crews, fly non-stop, Hilo, Hawaii, to Muroc Lake, Cal.

1947, Feb. 28—Lt. Col. Robt. E. Thacker and Lt. John M. Ard, in a North American F-82 (Rolls Royce V-1650) fly longest known flight by fighter aircraft, Honolulu to N. Y., 4,968 miles in 14 hr. 31 min. 50 sec.

1947, July 18—Air Policy Commission established by President.

1947, July 26—Army-Navy Merger Bill signed by President, making Department of Air Forces co-equal with Army and Navy, and creating Department of Defense.

1947, Oct. 17—First faster-than-sound flight by Capt. Charles E. Yeager in rocket-powered Air Force research plane, Bell XS-1, betters 760 mph. (Not announced officially until June 10, 1948.)

1948, June 18—Air parcel post system established by Congress; to begin Sept. 1.

1948, June 26—Berlin Airlift begins "Operation Vittles" with Douglas C-47's carrying 80 tons of supplies the first day. During first five months, Airlift tops cargo volume of all U.S. airlines by flying 93,000,000 ton-miles.

1948, July 1—Air Transport Command and Naval Air Transport Service consolidated as Military Air Transport Service (MATS) under command of Air Force Chief of Staff.

1948, Sept. 15—U. S. Air Force recaptures world speed record with North American F-86 jet fighter traveling 670.981 mph, flown by Maj. Richard L. Johnson.

1948—Northrop's YB-49 Flying Wing, first eight-jet bomber in the U.S. Air Force, makes longest jet-propelled flight on record of approximately 3,400 miles at average speed of 382 mph.

1949, Jan. 7—Air Force announces a new unofficial climbing speed record set by the Bell X-1 at Muroc Air Force Base with Capt. Charles E. Yeager at the controls, climbing more than 13,000 ft. per min., compared with 8-10,000 ft. per min. for jet planes.

1949, Jan. 14—Capt. William Odom, flying a specially modified Beechcraft Bonanza, sets a new lightplane distance record, crossing from Honolulu to Oakland, Ca'

1949, Feb. 7—Eastern Air Lines reports new transcontinental speed record for transport aircraft set Feb. 5 by new-type Lockheed Constellation on delivery flight from Los Angeles to La Guardia Field in 6 hr. 17 min. 39-2/5 sec.

1949, Feb. 8—Boeing XB-47 jet bomber sets cross-country speed record to Andrews Field, Washington, D. C. from Moses Lake, Wash. in 3 hr. 46 min.

1949, Mar. 2—Air Force completes the first nonstop round-the-world flight in history, as a Boeing B-50 bomber, *Lucky Lady II*, lands at Carswell AFB, Ft. Worth, Tex. at 9:30 CST, after a 94-hour trip; piloted by Capt. James Gallagher, assisted by a crew of 13, the B-50 flew a total of 23,452 miles at an average speed of 249 mph. Four refueling contacts were made with B-29 tankers.

1949, Mar. 8—New world distance record for light planes set by Capt. William Odom in a Beechcraft *Bonanza*, flying 5,273 miles from Honolulu to Teterboro, N. J., in 36 hr. 2 min.

1949, May 3—The Martin *Viking*, 45-ft. research rocket, is fired successfully at White Sands Proving Ground, Las Cruces, N. M., reaching an altitude of 51½ miles and a speed of 2,250 mph.

1949, May 6—Sikorsky S-52-1 helicopter sets new international speed record of 122.75 mph.

1949, Oct. 3—Navy jet-rocket special research plane, the Douglas D-558-II Skyrocket, reaches a top speed of slightly over 700 mph at an altitude of 25,000 ft. in test flight at Muroc, Cal.

1950, Jan. 3—Jacqueline Cochran sets new official F.A.I. 500 kilometer closed course record flying a North American F-51 (Packard-built Merlin V1650) at 444 mph.

1950, Jan. 22—Paul Mantz sets new transcontinental record flying a North American P-51 Mustang (Allison) from Burbank, Calif. to La Guardia Field, N. Y. in 4 hr. 52 min. 58 sec.

1950, Feb. 9—Navy Lockheed P2V Neptune (Wright 3350) patrol bomber completes 5,156-mile flight in 25 hr. 57 min.

1950, Mar. 31—Ana Louisa Branger, flying a Piper Cub Special powered by a Continental C-90-8F engine, sets official new lightplane international altitude record of 24,504 feet.

1950, Sept. 5—North American Aviation announces successful completion of tests at Edwards AFB in which heavy bombs were dropped for first time at speeds over 500 mph with a B-45 Tornado (GE-J47).

1950, Sept. 22—Col. David C. Schilling and Lt. Col. William D. Ritchie fly London-New York nonstop with three in-flight refuellings in two Republic F-84E (Allison J-35A-17) jet fighters. (Schilling completed flight; Ritchie bailed out over Newfoundland and was later rescued by helicopter.)

1950, Nov. 10 — A Lockheed F-80 shoots down a Russian-built MIG-15 in first jet aerial combat, Korea.

1951, Jan. 17—Convair RB-36D reconnaissance bomber makes 51 hr. 20 min. non-stop flight without refueling.

1951, Feb. 2—First successful air-to-air refueling of a U.S. jet bomber is carried out by a North American RB-45C Tornado and a Boeing KB-29P tanker at Edwards AFB, Calif.

1951, Apr. 24—Piper Super Cub, piloted by Mrs. Ana Louisa Branger, sets an international altitude record of 26,820 feet in the minus 1,103-pound category.

1951, May 15—Max Conrad sets non-stop lightplane record in Piper Pacer (125 hp Lycoming), crossing the country in 23 hr. 4 min. 31 sec.

1951, Aug. 8—Navy's Martin Viking VII sets new altitude record for single stage missiles, flying 135 miles up from White Sands Proving Ground, N. M., reaching a top speed of 4,100 mph.

1951, Aug. 18—North American F-86A Sabre jet, piloted by Col. Keith K. Compton, flies from Edwards AFB, Calif., to Detroit, Mich., in 3 hr. 27 min. 56 sec. at an average speed of 553.761 mph.

1952, Jan. 2—A Sikorsky H-19 helicopter completes 1,800-mile flight from Great Falls, Mont., to Ladd AFB, Fairbanks, Alaska, in five days—probably the longest flight ever made by rotary wing craft.

1952, Mar. 18—Two Republic F-84 Thunderjets land in Neubiberg, Germany, after a 2,800 mile flight without refueling—believed to be the longest sustained jet fighter flight in history. The jets crossed seven countries, averaged 385 mph, and were in the air 4 hr. 48 min.

1952, Apr. 30—For the first time in aviation history, air passenger-miles (10,679,281,000) in 1951 exceeded the total passenger-miles traveled in Pullman cars (10,224,714,000).

1952, May 10—Transcontinental lightplane record is set by Max Conrad in a Piper Pacer, traveling from Los Angeles to New York (2,461 mi.) non-stop in 24 hr. 54 min.

1952, Aug. 1—Two Sikorsky H-19 helicopters complete first trans-Atlantic helicopter crossing and break non-stop distance record for rotary wing aircraft.

1952, Nov. 19—New record set by North American F-86D (GE J-47 GE-17) Sabre jet, piloted by Capt. J. Slade Nash, flying at 699.92 mph. (Previous world speed record—670.981 mph.)

1953, Jan. 26—Chance Vought Aircraft completes final F4U Corsair, bringing to an end the longest production record of any airplane ever built.

1953, May 18—Jacqueline Cochran Odlum flies at record speed of 652.337 mph over a 100 km. course, in a Canadair F-86 swept-wing Sabre.

1953, Oct. 3—LCdr. James B. Verdin establishes new world speed record of 753.4 mph in Douglas XF4D-1 Skyray, Navy carrier fighter.

1953, Oct. 20—TWA Lockheed Super Constellation completes first scheduled nonstop transcontinental passenger trip from Los Angeles to New York in 8 hr. 17 min.

1953, Oct. 29—North American YF-100 Super Sabre establishes new world's speed record of 754.98 mph, piloted by Lt. Col. F. K. Everest.

1953, Dec. 12—Maj. Charles E. Yeager, USAF pilot, establishes new world speed record of more than 1600 mph in the Bell X-1A.

1954, Jan. 5—Air National Guard Col. Willard W. Millikan sets New York-Washington speed mark of 24 minutes in North American F-86F.

1954, Mar. 1—Peak is reached in number of U.S. airports: 6,760.

1954, Mar. 29—American Airlines DC-7 sets official Los Angeles-New York commercial speed record: 6 hrs. 10 mins.

1954, May 24—Martin Viking II, single stage rocket, sets altitude record soaring 158 miles high (834,240 feet) at 4300 mph. at White Sands Proving Ground, New Mexico.

1954, May 25—Goodyear ZPG-2 non-rigid airship sets new record for flight without refueling, landing at Key West, Fla., after 200 hrs. 4 mins. in the air.

1954, Aug. 27—Adm. DeWitt C. Ramsey, president of Aircraft Industries Association, reports that U.S. aircraft manufacturers are now building 900 to 1,000 military planes per month.

1955, Feb. 16—Longest non-stop flight by a jet fighter-bomber—2,390 miles—made by Republic F-84F from George AFB in California to Langley AFB, Virginia. Speed averaged 605 mph.

1955, Mar. 9—Republic's F-84F Thunderstreak sets a new official transcontinental speed record, flying 2,445 miles non-stop from Los Angeles to New York in 3 hrs. 44 mins.

1955, May 24—A North American F-86 sets two transcontinental records: (1) as first aircraft to cross the U. S. round trip in daylight and (2) by flying east-west leg in 5 hrs., 27 mins., 37 secs., breaking previous record.

1955, Aug. 1—White House announces that U. S. plans to launch a small unmanned satellite about the size of a basketball sometime after July, 1957. Satellite will circle earth at altitudes between 200 and 300 miles.

1955, Aug. 17—Republic's Thunderstreak sets a new world's non-stop jet fighter distance record of 5,118 mi. from London, England, to Texas.

1955, Aug. 20—North American F-100C sets the first supersonic world speed record of 822.135 mph, 70 miles faster than the previous record set in 1953.

1955, Oct. 15—Douglas A4D Skyhawk sets a new closed course world speed record of 695.163 mph.

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Old Windsor Rd.
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P. O. Box 468
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Helicopter Div.
Box 516
St. Louis 3, Missouri
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Sacramento, Calif.
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Missiles Div.
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Los Angeles 54, Calif.
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R. E. Lynch, Mgr.

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Wichita 1, Kans.
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Washington 25, D. C.
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Washington 25, D. C.
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OFFICIAL RECORDS

The Federation Aeronautique Internationale, Paris, France, better known as the FAI, currently composed of the national aero clubs of fifty nations, is the governing body of the world for official aircraft records and sporting aviation contests. The FAI was organized in Paris in October, 1905, by representatives from Belgium, France, Germany, Great Britain, Italy, Spain, Switzerland, and the United States. Representing the FAI in the United States is the National Aeronautic Association, organized in 1922.

The rules for all official world and international aircraft records are proposed initially by the various national aero clubs who are members of FAI. Later they are evaluated by the International Sporting Aviation Commission of FAI and then submitted, for final approval, to the delegates of the many national aero clubs who attend each annual FAI conference. Developed over a period of forty-five years, the rules are markedly complete. All attempts to establish official aircraft records must meet identical FAI standards.

NAA also rules on the best national performances and on many records of strictly national interest, such as inter-city speed times of transport aircraft.

FAI-NAA rules have these goals: (1) an equal opportunity to every competitor, (2) competent, unbiased judging, and (3) scientifically accurate recording.

The NAA Contest Board enforces FAI-NAA regulations in the United States.

OFFICIAL F.A.I. WORLD AIR RECORDS

Note: International Records are now designated World Class Records by F.A.I.

MAXIMUM SPEED OVER A STRAIGHTAWAY COURSE .... 822.266 mph.
Col. H. A. Hanes, USAF, August 20, 1955, North American F-100C Swept Wing Monoplane.

MAXIMUM SPEED IN A CLOSED CIRCUIT .... 728.114 mph.
Robert O. Rahn, Oct. 16, 1953, Douglas XF4D Delta Wing Monoplane.

DISTANCE IN A STRAIGHT LINE .... 11,235.600 mi
Comdr. Thomas D. Davies, USN.; Comdr. Eugene P. Rankin, USN.; Comdr. Walter S. Reid, USN.; Lt. Comdr. Ray A. Tabeling, USN.; United States, Sept. 29 - Oct. 1, 1946, Lockheed P2-V Neptune.

DISTANCE IN CLOSED CIRCUIT .... 8,854.308 mi.
Lt. Col O. F. Lassiter, pilot; Capt. W. J. Valentine, co-pilot and USAF crew, Tampa' Fla., Aug. 1-3, 1947, Boeing B-29 monoplane.

ALTITUDE .... 72,395 ft.
Capt. Orvil Anderson and Capt. Albert Stevens, United States, Nov. 11, 1935, free balloon, the "Explorer II."


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OFFICIAL F.A.I. INTERNATIONAL AND NATIONAL "CLASS" RECORDS

AIRPLANES—(Class C) Group II

RECIPROCATING ENGINES

DISTANCE, CLOSED CIRCUIT

World Class Record .... 8,854.308 mi.
Lt. Col. O. F. Lassiter, pilot; Capt. W. J. Valentine, co-pilot; Capt. William D. Bailey, Capt. F. O. Hinckley, 1st Lt. A. J. Orillon, 1st Lt. R. L. Lewis, M/Sgt. J. J. Blancio, T/Sgt. J. R. Sanders, S/Sgt. J. Gauthier, and M/Sgt. R. B. Corey, crew: USAAF, United States, Boeing B-29 monoplane, 44-84061, 4 Wright 3350-57A engines of 2,200 hp each, MacDill Field, Tampa, Fla., Aug. 1 - 3, 1947.

National (U.S.) Record .... Same as above.

DISTANCE IN A STRAIGHT LINE

World Class Record .... 11,235.600 mi.
Comdr. Thomas D. Davies, USN.; Comdr. Eugene P. Rankin, USN.; Comdr. Walter S. Reid, USN.; and Lt. Comdr. Ray A. Tabeling, USN; United States, Lockheed P2V-1 monoplane, 2 Wright R-3500 engines of 2,300 hp each, from Pearce Field, Perth, Australia, to Port Columbus, Columbus, O., Sept. 29 - Oct. 1, 1946.

National (U.S.) Record .... Same as above.

ALTITUDE

World Class Record .... 56,046 ft.
Mario Pezi, Italy, Caproni 161 biplane, Piaggio XI R.C. engine, Montecelio, Oct. 22, 1938.

National (U.S.) Record .... 47,910 ft.
Maj. F. F. Ross, pilot; Lt. D. M. Davis, co-pilot; Lt. C. B. Webster, Lt. L. B. Barrier, F/O Pamphille Morrissette, Sgt. W. S. George, crew; USAAF, Boeing B-29 monoplane, 4 Wright R-3350-23 A 2,000 hp engines, Harmon Field, Guam, M. I., May 15, 1946.

MAXIMUM SPEED OVER A 1.86 MI. MEASURED COURSE

World Class Record .... 469.220 mph.
Fritz Wendel, Germany, Messerschmitt B. F. 109R, Daimler Benz 601 1,000 hp engine, Augsburg, Apr. 26, 1939.

National (U.S.) Record .... 412.002 mph.
Jacqueline Cochran, North American F-51 monoplane, Packard built Rolls Royce Merlin 1,450 hp engine, Thermal, Cal., Dec. 17, 1947.

MAXIMUM SPEED AT HIGH ALTITUDE

World Class Record .... 464.374 mph.
Jacqueline Cochran, United States, North American F-51 low wing monoplane, Packard built Rolls Royce Merlin 1,450 hp engine, near Indio, Cal., Apr. 9, 1951.

National (U.S.) Record .... Same as above.

SPEED FOR 62.137 MI. WITHOUT PAYLOAD

World Class Record .... 469.549 mph.
Jacqueline Cochran, United States, North American F-51, Rolls Royce Merlin 1,450 hp engine. Coachella Valley, Calif., Dec. 10, 1947.

National (U.S.) Record .... Same as above.

SPEED FOR 310.685 MI. WITHOUT PAYLOAD

World Class Record .... 436.995 mph.
Jacqueline Cochran, United States, North American F-51, Packard Rolls Royce Merlin 1,450 hp engine, Desert Center—Mt. Wilson Course, Dec. 29, 1949.

National (U.S.) Record .... Same as above

SPEED FOR 621.369 MI. WITHOUT PAYLOAD

World Class Record .... 431.094 mph
Jacqueline Cochran, United States, North American F-51, Packard Rolls Royce Merlin 1,450 hp engine. Start and finish near Palm Springs, Cal., May 24, 1948.

National (U.S.) Record .... Same as above.

SPEED FOR 1,242.739 MI. WITHOUT PAYLOAD

World Class Record .... 447.470 mph
Jacqueline Cochran, United States, North American P-51 monoplane, Packard built Rolls Royce Merlin Engine of 1,450 hp near Pálm Springs, Cal., May 22, 1948.
National (U.S.) Record .... Same as above

SPEED FOR 3,106.849 MI. WITHOUT PAYLOAD

World Class Record .... 338.392 mph
Capt. J. E. Bauer, pilot; Capt. J. E. Cotton, co-pilot; M/Sgt. Angelo Queses, T/Sgt. Richard McDonald and Cpl. Raymon Koss, crew; USAAF, United States, Boeing B-29 monoplane, 4 Wright R-3350-23A engines of 2,200 hp each, Dayton, O., June 28, 1946.
National (U.S.) Record .... Same as above

SPEED FOR 6,213.698 MI. WITHOUT PAYLOAD

World Class Record .... 273.195 mph
Lt. Col. O. F. Lassiter, pilot; Capt. W. J. Valentine, co-pilot; Capt. William D. Bailey; Capt. F. O. Hinckley, 1st Lt. A. J. Orillon, 1st Lt. R. L. Lewis, M/Sgt. J. J. Blancio, T/Sgt. J. R. Sanders, S/Sgt. J. Gauthier, S/Sgt. R. B. Corey, crew; USAAF, United States, Boeing B-29 monoplane, 4 Wright R-3350-57A engines, 2,200 hp each, Wright Field, Dayton, O., July 29 - 30, 1947.
National (U.S.) Record .... Same as above

WITH PAYLOAD OF 2,204.622 LB.

ALTITUDE

World Class Record .... 47,910 ft
Maj. F. F. Ross, pilot; Lt. D. M. Davis, co-pilot; Lt. L. B. Barrier, Lt. C. B. Webster, F/O Pamphille Morrissette and Sgt. W. S. George, crew; USAAF, United States, Boeing B-29 monoplane, 4 Wright 2,000 hp engines, Harmon Field, Guam, M.I., May 15, 1946.
National (U.S.) Record .... Same as above.

SPEED FOR 621.369 MI.

World Class Record .... 325.713 mph.
Furio Niclot, Italy, Breda 88, 2 Piaggio XI R. C. 40B, 1,000 hp engines, Dec. 9, 1937.
National (U.S.) Record .... 259.398 mph.
Capt. C. S. Irvine and Capt. P. H. Robey, USAAC pilots; Capt. C. J. Crane and Lt. P. G. Miller, USAAC, Boeing YB-17A monoplane, 4 Wright 840 hp engines, Dayton, O., Aug. 1, 1939.

SPEED FOR 1,242.739 MI.

World Class Record .... 365.649 mph
Lt. E. M. Grabowski, pilot; Lt. J. J. Liset, co-pilot; M/Sgt. D. P. Kelly, Cpl. F. M. Polmotier, and Cpl. O. W. Lambert, crew; USAAF, United States, Boeing B-29 monoplane, 4 Wright 2,200 hp engines, Dayton, O., May 17, 1946.
National (U.S.) Record .... Same as above.

SPEED FOR 3,106.849 MI.

World Class Record .... 338.392 mph.
Capt. J. E. Bauer, pilot; Capt. J. E. Cotton, co-pilot; M/Sgt. Angelo Queses, T/Sgt. Richard McDonald and Cpl. Raymon Koss, crew; USAAF, United States, Boeing B-29 monoplane, 4 Wright R-3350-23A engines of 2,200 hp each, Dayton, O., June 28, 1946.
National (U.S.) Record .... Same as above.

WITH PAYLOAD OF 4,409.244 LB.

ALTITUDE

World Class Record .... 46,522 ft.
Col. E. D. Reynolds, pilot; Capt. B. P. Robson, co-pilot; Lt. J. G. Barnes, Lt. Theodore Madden, Lt. K. H. Morehouse, S/Sgt W. C. Flynn and Cpl. A. L. Lentowski, crew; USAAF, United States, Boeing B-29 monoplane, 4 Wright 2,000 hp engines, Harmon Field, Guam, M.I., May 13, 1946.
National (U.S.) Record .... Same as above.

SPEED FOR 621.369 MI.

World Class Record .... 369.692 mph.
Lt. E. M. Grabowski, pilot; Lt. J. J. Liset, co-pilot; M/Sgt. D. P. Kelly, Cpl. F. M. Polmotier, and Cpl. O. W. Lambert, crew; USAAF, United States, Boeing B-29 monoplane, 4 Wright 2,200 hp engines, Dayton, O., May 17, 1946.
National (U.S.) Record .... Same as above.

SPEED FOR 1,242.739 MI.

World Class Record .... 365.649 mph.
Lt. E. M. Grabowski, pilot; Lt. J. J. Liset, co-pilot; M/Sgt. D. P. Kelly, Cpl. F. M. Polmotier, and Cpl. O. W. Lambert, crew; USAAF, United States, Boeing B-29 monoplane, 4 Wright 2,200 hp engines, Dayton, O., May 17, 1946.
National (U.S.) Record .... Same as above.

SPEED FOR 3,106.849 MI.

World Class Record .... 338.392 mph.
Capt. J. E. Bauer, pilot; Capt. J. F. Cotton, co-pilot; M/Sgt. Angelo Queses, T/Sgt. Richard McDonald and Cpl. Raymon Koss, crew; USAAF, United States, Boeing B-29 monoplane, 4 Wright 2,200 hp engines, Dayton, O., June 28, 1946.
National (U.S.) Record .... Same as above.

WITH PAYLOAD OF 11,023 LB.

ALTITUDE

World Class Record .... 45,253 ft.
Lt. J. P. Tobinson, pilot; Lt. Lloyd A. Lee, co-pilot; Lt. D. B. Gleicher, Lt. A. W. Armistead, Lt. R. M. Beattie, Lt. F. J. Royce, F/O R. F. Johnson and Mario R. Genta, crew; USAAF, United States, Boeing B-29 monoplane, 4 Wright 2,000 hp engines, Harmon Field, Guam, M.I., May 14, 1946.
National (U.S.) Record .... Same as above.

SPEED FOR 621.369 MI.

World Class Record .... 369.692 mph.
Lt. E. M. Grabowski, pilot; Lt. J. J. Liset, co-pilot; M/Sgt. D. P. Kelly, Cpl. F. M. Polmotier, and Cpl. O. W. Lambert, crew; USAAF, United States, Boeing B-29 monoplane, 4 Wright 2,200 hp engines, Dayton, O., May 17, 1946.
National (U.S.) Record .... Same as above.

SPEED FOR 1,242.739 MI.

World Class Record .... 365.649 mph.
Lt. E. M. Grabowski, pilot; Lt J. J. Liset, co-pilot; M/Sgt. D. P. Kelly, Cpl. F. M. Polmotier, and Cpl. O. W. Lambert, crew; USAAF, United States, Boeing B-29 monoplane, 4 Wright 2,200 hp engines, Dayton, O., May 17, 1946.
National (U.S.) Record .... Same as above.

SPEED FOR 3,106.849 MI.

World Class Record .... 266.023 mph.
Lt. Col. R. G. Ruegg, pilot; Lt. Col. Carl P. Walter, co-pilot; 2nd Lt. J. E. Wetzel, M/Sgt. William Cunningham and M/Sgt. R. L. Hilton, crew; USAAF, United States, Boeing B-29 monoplane, 4 Wright 2,200 hp engines, Dayton, O., June 21, 1946.
National (U.S.) Record .... Same as above.

WITH PAYLOAD OF 22,046 LB.

ALTITUDE

World Class Record .... 41,562 ft.
Capt. A. A. Pearson, pilot; Lt. V. L. Dalbey, co-pilot; Lt. R. S. Strasburg, Lt. I. E. Bork, Cpl. J. T. Collins and Cpl. Joseph Friedberg, crew; USAAF, United States, Boeing B-29 monoplane, 4 Wright 2,200 hp engines, Harmon Field, Guam, M.I., May 8, 1946.
National (U.S.) Record .... Same as above.

SPEED FOR 621.369 MI.

World Class Record .... 357.731 mph
Capt. J. D. Bartlett, pilot; Lt. William Murray, co-pilot; M/Sgt C. M. Youngblood, Cpl. D. J. Shrader and Cpl. R. F. Wilden, crew; USAAF, United States, Boeing B-29 monoplane, 4 Wright 2,200 hp engines, Dayton, O., May 19, 1946.
National (U.S.) Record .... Same as above.

SPEED FOR 1,242.739 MI.
World Class Record .... 357.035 mph.
Capt. J. D. Bartlett, pilot; Lt. William Murray, co-pilot; M/Sgt. C. M. Youngblood, Cpl. D. J. Shrader and Cpl. R. F. Wilden, crew; USAAF, United States, Boeing B-29 monoplane, 4 Wright 2,200 hp engines, Dayton, O., May 19, 1946.
National (U.S.) Record .... Same as above.

SPEED FOR 3,106.849 MI.
World Class Record .... 266.023 mph.
Lt. Col. R. G. Ruegg, pilot; Lt. Col. Carl P. Walter, co-pilot; 2nd Lt. J. E. Wetzel, M/Sgt. William Cunningham and M/Sgt. R. L. Hilton, crew; USAAF, United States, Boeing B-29 monoplane, 4 Wright 2,200 hp engines, Dayton, O., June 21, 1946.
National (U.S.) Record .... Same as above.

WITH PAYLOAD OF 33,069 LB.

ALTITUDE
World Class Record .... 39,521 ft.
Col. B. H. Warren, pilot; Maj. J. R. Dale, Jr., co-pilot; Lt. W. D. Collier, M/Sgt. Gordon S. Fish, S/Sgt. V. H. Worden and Sgt. Thomas H. Hall, crew; USAAF, United States, Boeing B-29 monoplane, 4 Wright 2,200 hp engines, Harmon Field, Guam, M.I., May 11, 1946.
National (U.S.) Record .... Same as above

SPEED FOR 621.369 MI. .... No official record.
SPEED FOR 1,242.739 MI. .... No official record
SPEED FOR 3,106.849 MI. .... No official record

GREATEST PAYLOAD CARRIED TO AN ALTITUDE OF 6,561,660 FT.
World Class Record .... 33,435 lb.
Col. B. H. Warren, pilot; Maj. J. R. Dale, Jr., co-pilot; Lt. W. D. Collier, M/Sgt. Gordon S. Fish, S/Sgt. V. H. Worden and Sgt. Thomas H. Hall, crew; USAAF, United States, Boeing B-29 monoplane, 4 Wright 2,200 hp engines, Harmon Field, Guam, M.I., May 11, 1946.
National (U.S.) Record .... Same as above.
CIRCUIT OF THE WORLD .... No official record.

AIRPLANES—(Class C) Group I
JET ENGINES

DISTANCE IN A CLOSED CIRCUIT WITHOUT REFUELING
World Class Record .... 1,143.134 mi.
Miss Elisabeth Boselli, France, Mistral aircraft, Hispano-Suiza "Nene" 104 c. jet engine, Mont de Marsan-Oran-Mont de Marsan Course, February 21, 1955.
National (U.S.) Record .... None established.

DISTANCE IN A STRAIGHT LINE WITHOUT REFUELING
World Class Record .... 1,448.550 mi.
Miss Elisabeth Boselli, France, Mistral aircraft, Hispano-Suiza "Nene" 104 c. jet engine, from Creil to Agadir, March 1, 1955.
National (U.S.) Record .... None established.

ALTITUDE
World Class Record .... 63,668 ft.
Walter F. Gibb, Great Britain, English Electra Canberra B. Mark II, two Bristol "Olympus" 9,750 pounds static thrust jet engines, Bristol, May 4, 1953.
National (U.S.) Record .... 47,169 ft.
Miss Jacqueline Cochran, Canadian-built F-86E swept-wing monoplane, Orenda jet engine, Edwards, Cal., May 24, 1953.

MAXIMUM SPEED OVER A 1.8 MI. STRAIGHTAWAY COURSE
World Class Record .... 752.943 mph.
Lt. Comdr. James B. Verdin, USN, United States, Douglas XF4D delta wing aircraft, Westinghouse J-40-WE-8 jet engine, Salton Sea, Cal., Oct. 3, 1953.
National (U.S.) Record .... Same as above.

MAXIMUM SPEED OVER A 15.25 KM. STRAIGHTAWAY COURSE
World Class Record .... 822.266 mph.
Col. H. A. Hanes, USAF, United States, North American F-100C Swept Wing Monoplane, Pratt and Whitney J-57 P-21 Jet Engine, Palmdale, California, August 20, 1955.
National (U.S.) Record .... Same as above.
(Pending homologation by F.A.L.)

SPEED FOR 62.137 MI. WITHOUT PAYLOAD
World Class Record .... 728.114 mph.
Robert O. Rahn, United States, Douglas XF4D delta wing aircraft, Westinghouse J-40-WE-8 jet engine, Edwards, Cal., Oct. 16, 1953.

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National (U.S.) Record ____ **Same as above.**

SPEED FOR 310.685 MI. WITHOUT PAYLOAD

World Class Record ____ 649.46 mph.
Maj. John L. Armstrong, USAF, United States, North American F-86 H swept wing monoplane, General Electric J-73-GE-3 jet engine, Dayton, Ohio, Sept. 3, 1954. (Pending confirmation by F.A.I. as we went to press.)

National (U.S.) Record ____ Same as above.

SPEED FOR 500 KILOMETERS IN A CLOSED CIRCUIT WITHOUT PAYLOAD

World Class Record ____ 649.460 mph.
Major John L. Armstrong, USAF, Unted States, North American F-86H Swept Wing Monoplane, General Electric J-73-GE-3 Jet Engine, Vandalia, Ohio, September 3, 1954.

National (U.S.) Record ____ Same as above.

SPEED FOR 1,242.739 MI. WITHOUT PAYLOAD

World Class Record ____ 440.298 mph.
Lt. John Hancock, USAAF, United States, Lockheed P-80 monoplane, Allison J-33 jet engine, Dayton, O., May 19, 1946.

National (U.S.) Record ____ Same as above.

SPEED FOR 3,106.849 MI. WITHOUT PAYLOAD ____ No official record.

SPEED FOR 6,213.698 MI. WITHOUT PAYLOAD ____ No official record.

CLIMB TO 9,842.5 FT.

World Class Record ____ 1 min., 15.5 sec
Richard Bellingham, Great Britain, Gloster Meteor Mark 8 W.A. 820, two Armstrong Siddeley Sapphire Mark 2 jet engines, Moreton Valence airport, Gloucestershire, Aug. 31, 1951.

National (U.S.) Record ____ No official record

CLIMB TO 19,685 FT.

World Class Record ____ 1 min., 50.0 sec
Richard Bellingham, Great Britain, Gloster Meteor Mark 8 W.A. 820, two Armstrong Siddeley Sapphire Mark 2 jet engines, Moreton Valence airport, Gloucestershire, Aug. 31, 1951.

National (U.S.) Record ____ No official record

CLIMB TO 29,527.5 FT.

World Class Record ____ 2 min., 27.0 sec
Richard Bellingham, Great Britain, Gloster Meteor Mark 8 W.A. 820, two Armstrong Siddeley Sapphire Mark 2 jet engines, Moreton Valence airport, Gloucestershire, Aug. 31, 1951.

National (U.S.) Record ____ No official record.

CLIMB TO 39,370 FT.

World Class Record ____ 3 min., 09.5 sec.
Richard Bellingham, Great Britain, Gloster Meteor Mark 8 W.A. 820, two Armstrong Siddeley Sapphire Mark 2 jet engines, Moreton Valence airport, Gloucestershire, Aug. 31, 1951.

National (U.S.) Record ____ No official record.

WITH PAYLOAD OF 2,204.622 LB.

ALTITUDE ____ No official record.

SPEED FOR 621.369 MI.

World Class Record ____ 410.431 mph.
Lt. Col. T. P. Gerrity, pilot; Capt. Wm. Rickert, co-pilot, USAAF, United States, Douglas XA-26F monoplane, 2 Pratt and Whitney R-2800, 2,000 hp and 1 General Electric I-16 jet engine, Dayton, O., June 20, 1946.

National (U.S.) Record ____ Same as above.

SPEED FOR 1,242.739 MI. ____ No official record.

SPEED FOR 3,106.849 MI. ____ No official record

LIGHT AIRPLANES—(Class C-1.a)

FIRST CATEGORY (AIRCRAFT WEIGHING LESS THAN 1,102.3 LB., IN FLYING ORDER)

DISTANCE IN A CLOSED CIRCUIT, WITHOUT REFUELING

World Class Record .... 1,242.74 mi.
Albert Revillon, France, Minicab, Type G-Y 20, Continental 65 hp engine; gross weight 499.5 kilograms, Toussus-le-Noble-Tour-Bourges course, May 10, 1952.
National (U.S.) Record .... No official record.

AIRLINE DISTANCE

World Class Record .... 1,361.485 mi.
Robert C. Faris, United States, Mooney M-18-L, Lycoming 65 hp engine; gross weight 476.73 kilograms, from Wichita, Kan. to Montpelier, Vt., Aug. 9, 1952.
National (U.S.) Record .... Same as above.

ALTITUDE

World Class Record .... 27,152 ft.
Mrs. Ana L. Branger, Venezuela, Piper Super Cub, Model PA-18, Lycoming 0-290-D 125 hp engine, Hybla Valley Airport, Alexandria, Va., Apr. 10, 1951.
National (U.S.) Record .... No official record.

SPEED FOR 62.137 MI. IN A CLOSED CIRCUIT

World Class Record .... 171.097 mph.
Iginio Guagnellini, Italy, Ambrosini C-F.4 "Rondone" airplane, Continental 90 hp engine, gross weight 499.7 kilograms, Sesona-(Vergiate) Cameri-Seveso-S. Pietro course, Novmber 20, 1954.
National (U.S.) Record .... No official record.

SPEED FOR 310.685 MI. IN A CLOSED CIRCUIT

World Class Record .... 168.642 mph.
Iginio Guagnellini, Italy, Ambrosini C-F.4 "Rondone" Airplane, Continental 90 hp engine, gross weight 499.7 kilograms, Sesona-(Vergiate)-Cameri-Seveso-S. Pietro course, November 20, 1954.
National (U.S.) Record .... No official record.

SPEED FOR 621.369 MI. IN A CLOSED CIRCUIT

World Class Record .... 149.451 mph.
Nello Valzania, Italy, Ambrosini G.F.4 Rondone Airplane, Continental 90 hp engine, gross weight 499.9 kilograms, Sesona-(Vergiate)-Cameri-Seveso-S. Pietro course, December 19, 1954.
National (U.S.) Record .... No official record.

SPEED FOR 1,242.74 MI. IN A CLOSED CIRCUIT

World Class Record .... 113.979 mph
Albert Revillon, France, Minicab, Type G-Y 20, Continental 65 hp engine; gross weight 499.5 kilograms, Toussus-le-Noble-Tour-Bourges course, May 10, 1952.
National (U.S.) Record .... No official record.

LIGHT AIRPLANES—(Class C-1.b)

SECOND CATEGORY (ALL AIRCRAFT WITH A TOTAL WEIGHT, IN FLYING ORDER, BETWEEN 1,102.3 AND 2,204.6 LB.)

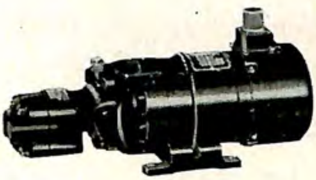
DISTANCE IN A CLOSED CIRCUIT WITHOUT REFUELING

World Class Record .... 1,936.189 mi.
Frantisek Novak, Czechoslovakia, Sokol OK-DHH arcraft, Walter Minor engine, gross weight 870.5 kilograms, Brno-Hutsopece-Letonice-Brno Course, June 23, 1955.
National (U.S.) Record .... No official record.

AIRLINE DISTANCE

World Class Record .... 2,462.330 mi
Maximillian A. Conrad, United States, Piper Pacer, Lycoming 0-290-D 125 hp engine; gross weight 998.4 kilograms, Los Angeles, Cal. to New York, N. Y., Apr. 30-May 1, 1952.
National (U.S.) Record .... Same as above.

Pesco AIRCRAFT ACCESSORIES



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ALTITUDE
World Class Record .... 37,063 ft.
William D. Thompson, Jr., United States, Cessna Turbo Prop XL-19B monoplane, Boeing 502-8 XT-50-BO-1 engine, Wichita, Kan., July 16, 1953.
National (U.S.) Record .... Same as above.

SPEED FOR 62.137 MI. IN A CLOSED CIRCUIT
World Class Record .... 192.839 mph.
R. R. Paine, Great Britain, Miles Hawk Speed Six, de Havilland Gipsy Major 205 hp engine; gross weight 1,843 lb., at Wolverhampton, June 17, 1950.
National (U.S.) Record .... No official record.

SPEED FOR 310.685 MI. IN A CLOSED CIRCUIT
World Class Record .... 164.231 mph.
Miss Marie Nicolas, France, Norecrin, Regnier engine; gross weight 2,082 lb., Montpellier-Frejorgues course, Dec. 5, 1951.
National (U.S.) Record .... No official record.

SPEED FOR 621.369 MI. IN A CLOSED CIRCUIT
World Class Record .... 163.287 mph.
Miss Marie Nicolas, France, Norecrin, Regnier engine; gross weight 2,082 lb., Montpelier-Frejorgues course, Dec. 5, 1951.
National (U.S.) Record .... No official record.

SPEED FOR 1,242.74 MI. IN A CLOSED CIRCUIT
World Class Record .... 149.650 mph.
Miss Marie Nicolas, France, Norecrin F. B.E.V.O. airplane, Regnier 4 L 00 engine Marignane-Avignon-Montpellier-Marignane Course, July 7, 1954.
National (U.S.) Record .... No official record.

LIGHT AIRPLANES—(Class C-1.c)

THIRD CATEGORY (ALL AIRCRAFT WITH A TOTAL WEIGHT, IN FLYING ORDER, BETWEEN 2,204.6 AND 3,858 LB.)

AIRLINE DISTANCE
World Class Record .... 4,957.240 mi.
William P. Odom, United States, Beech Bonanza Model 35 airplane, take-off weight 3,858 lb., Continental E-185-1 engine, from Honolulu, Hawaii to Teterboro, N. J., Mar. 7 - 8 (G.M.T.), 1949.
National (U.S.) Record .... Same as above.

DISTANCE IN A CLOSED CIRCUIT
World Class Record .... 1,245.640 mi.
Yakov Forostenko, U.S.S.R., Yak-18 airplane, M.11-FR 160 hp engine, Touchino-Bogodoukhov-Misk-Touchino course, September 25, 1954. Gross Weight: 1,283 kilograms.
National (U.S.) Record .... No official record.

ALTITUDE
World Class Record .... 20,705 ft.
Vladimir Choumilov, U.S.S.R., Yak 18 airplane, M.11 FR 160 hp engine, gross weight 1008.8 kilograms, at Klyazma, June 18, 1954.
National (U.S.) Record .... No official record.

SPEED FOR 62.137 MI. IN A CLOSED CIRCUIT
World Class Record .... 260.654 mph.
Guido Ferrari, Italy, Super S.7 Ambrosini airplane, Gipsy Queen 330 hp engine, Punto X-Faro di Fiumicino-Faro di Anzio Torre Vaianica Punto X course, Dec. 5, 1953.
National (U.S.) Record .... No official record.

SPEED FOR 310.685 MI. IN A CLOSED CIRCUIT
World Class Record .... 255.819 mph.
Guido Ferrari, Italy, Super S-7 Ambrosini airplane, Gipsy Queen 330 hp engine, Monte Cavo-Villa Odesccalchi-Osservatorio Vesuvio-Monte Cavo course, Dec. 5, 1953.
National (U.S.) Record .... No official record.

SPEED FOR 621.369 MI. IN A CLOSED CIRCUIT
World Class Record .... 216.114 mph
Leonardo Bonzi, Italy, SAI.7 Ambrosini, deHavilland Gipsy Queen 240 hp engine, gross weight, 3,197 lb., Fiumicino-Chiesa Antignano-Tauerna Pagliavone Course, Dec. 21, 1951.
National (U.S.) Record .... No official record.

SPEED FOR 1,242.739 MI. IN A CLOSED CIRCUIT
World Class Record .... 158.932 mph.
Paul Burniat, Belgium, Beechcraft Bonanza, Continental 185 hp engine, gross weight 3,586 lb., Keerbergen-Ostende-Gosselies-Bierset Course, June 8, 1952.
National (U.S.) Record .... No official record.

LIGHT AIRPLANES—(Class C-1.d)

FOURTH CATEGORY (ALL AIRCRAFT WITH A TOTAL WEIGHT, IN FLYING ORDER, BETWEEN 3,858.1 AND 6,613.9 LB.)

AIRLINE DISTANCE

World Class Record .... 1,236.640 mi.

Ivan Tchernov, U.S.S.R., Yak-II airplane, ACH 21 650 hp engine, from Touchino Airport, Moscow to Peropavlovsk, September 11, 1954. Gross Weight: 2,382.273 kilograms.

National (U.S.) Record .... No official record.

ALTITUDE .... No official record.

SPEED FOR 62.137 MI. IN A CLOSED CIRCUIT

World Class Record .... 322.789 mph.

Miss R. M. Sharpe. Great Britain, Vickers Supermarine Spitfire 5B, gross weight 5,626 lb., Rolls Royce Merlin 55 M 1,280 hp engine, Wolverhampton, June 17, 1950.

National (U.S.) Record .... No official record

SPEED FOR 310.685 MI. IN A CLOSED CIRCUIT

World Class Record .... 292.881 mph.

Y. D. Forostenco, U.S.S.R., YAK II, A.C.H. 650 hp engine, gross weight 4,916 lb., Touchino-Skhodnia course, July 12, 1951.

National (U.S.) Record .... No official record.

SPEED FOR 621.369 MI. IN A CLOSED CIRCUIT

World Class Record .... 274.825 mph.

Nicolay Golovanov, U.S.S.R., YAK II, ACH-21 engine, gross weight 5,251 lb., Skhodnia-Kourgane-Orel-Skhodnia course, Aug. 26, 1951.

National (U.S.) Record .... No official record

SPEED FOR 1242.739 MI. IN A CLOSED CIRCUIT

World Class Record .... 223.713 mph.

Petre Zakhoudanine, USSR, YAK II Monoplane, ACH-21, 650 hp engine, Touchino-Kalouga-Viazma-Touchino course, Oct. 31, 1953

National (U.S.) Record .... No official record.

SEAPLANES—(Class C-2)

DISTANCE, CLOSED CIRCUIT

World Class Record .... 3,231.123 mi.

Mario Stoppani and Carlo Tonini, Italy, Cant Z I-LERO seaplane, 3 Alfa Romeo 126 RC.34 750 hp engines, May 27-28, 1937.

National (U.S.) Record .... 1,569 mi.

Lts. B. J. Connell and H. C. Rodd, Pn-10, 2 Packard 600 hp each, San Diego, Cal., Aug. 15 - 16, 1927.

AIRLINE DISTANCE

World Class Record .... 5,997.462 mi

Capt. D. C. T. Bennett and First Officer L. Harvey, pilots; Great Britain, Short-Mayo Mercury seaplane, 4 Napier Rapiers J.I. 370 hp engines, from Dundee, Scotland to near Fort-Nolloth, S. Africa, Oct. 6-8, 1938.

National (U.S.) Record .... 3,281.402 mi

Lt. Comdr. Knefler McGinnis, USN, Lt. J. K. Averill, USN, NAP T. P. Wilkinson, USN, Pilots; C. S. Bolka, A. E. J. Dionne and E. V. Sizer, crew; Navy XP3Y-1 seaplane, 2 Pratt and Whitney 825 hp engines, from Cristobal Harbor, C. Z. to San Francisco Bay, Alameda, Cal., Oct. 14-15, 1935.

ALTITUDE

World Class Record .... 44,429 ft

Col. Nicola Di Mauro, Italy, Caproni 161 seaplane, (biplane), Piaggio XI RC 100 engine, at Vigna di Valle, Sept. 25, 1939.

National (U.S.) Record .... 38,560 ft

Lt. Appollo Soucek, USN, Apache, Pratt and Whitney 425 hp engine, supercharged, at Washington, D. C., June 4, 1929.

MAXIMUM SPEED

World Class Record .... 440.681 mph

Francesco Agello, Italy, M.C. 72 seaplane, Fiat A.S. 6 engine at Lake Garda, Italy, Oct. 23, 1934.

National (U.S.) Record .... 245.713 mph.

Lt. James H. Doolittle, USAF, Curtiss R3C-2, Curtiss V-1400, 600 hp engine, Bay Shore, Baltimore, Md., Oct. 27, 1925.

SPEED FOR 62.137 MI. WITHOUT PAYLOAD

World Class Record .... 391.072 mph

Guglielmo Cassinelli, Italy, Macchi C. 72 seaplane, 2,400 hp Fiat AS 6 engine, Falconara-Pesaro permanent course, Oct. 8, 1933.

National (U.S.) Record .... 241.679 mph

Lt. G. T. Cuddihy, USN, Curtiss R3C-2, Curtiss V-1500, 700 hp at Norfolk, Va., Nov. 13, 1926.

SPEED FOR 310.685 MI. WITHOUT PAYLOAD .... No official record

SPEED FOR 621.369 MI. WITHOUT PAYLOAD

World Class Record .... 250.676 mph.

M. Stoppani and G. Gorini, pilots; Ing. Luzzatto and E. Accomolli, passengers; Italy, Cant Z 509 seaplane, 3 Fiat A80 RC 41 1,000 hp engines, Mar. 30, 1938.

National (U.S.) Record .... 165.040 mph

Maj. Gen. Frank M. Andrews, pilot; J. G. Moran and H. O. Johnson, crew; Martin BO12-A seaplane, 2 Pratt and Whitney 700 hp Hornet engines, Aug. 24, 1935.

SPEED FOR 1,242.739 MI. WITHOUT PAYLOAD

World Class Record .... 246.351 mph.

M. Stoppani and G. Gorini, pilots; Ing. Luzzatto and E. Accomolli, passengers; Italy, Cant Z 509 seaplane, 3 Fiat A80 RC 41 1,000 hp engines, Mar. 30, 1938.

National (U.S.) Record .... 157.319 mph.

Edwin Musick, Boris Sergievsky and Charles A. Lindbergh, Sikorsky S-42 Seaplane, 4 Pratt and Whitney 670 hp Hornet enines, Aug. 1, 1934.

SPEED FOR 3,106.849 MI. WITHOUT PAYLOAD

World Class Record .... 191.534 mph.

Mario Stoppani and Carlo Tonini, Italy, Cant Z I-LERO seaplane, 3 Alfa Romeo 126 RC.34 750 hp engines, May 27-28, 1937.

National (U.S.) Record .... No official record.

SPEED FOR 6,213.698 MI. WITHOUT PAYLOAD .... No official record

WITH PAYLOAD OF 2,204.622 LB.

ALTITUDE

World Class Record .... 34,085 ft.

Nicola di Mauro and Mario Stoppani, Italy. Cant Z. 506 B. seaplane, 3 Alfa Romeo RC.55 700 hp engines, at Monfalcone, Nov. 12, 1937.

National (U.S.) Record .... 26,929 ft.

Boris Sergievsky, Sikorsky S-48 seaplane, 2 Pratt and Whitney Hornet, 575 hp each, at Bridgeport, Conn., July 21, 1930.

SPEED FOR 621.369 MI.

World Class Record .... 250.676 mph.

M. Stoppani, and G. Gorini, pilots; Ing. Luzzatto and E. Accomolli, passengers; Italy, Cant Z 509 seaplane, 3 Fiat A80 RC 41 1,000 hp engines, Mar. 30, 1938.

National (U.S.) Record .... 165.040 mph.

Maj. Gen. F. M. Andrews, pilot; J. G. Moran and H. C. Johnson, crew; Martin B-12-A seaplane, 2 Pratt and Whitney 700 hp Hornet, engines, Aug. 24, 1935.

SPEED FOR 1,242.739 MI.

World Class Record .... 246.351 mph.
M. Stoppani and G. Gorini, pilots; Ing. Luzzatto and E. Accomolli, passengers; Italy Cant Z 509 seaplane, 3 Fiat A80 RC 41, 1,000 hp engines, Mar. 30, 1938.

National (U.S.) Record .... 157.319 mph.
Edwin Musick, Boris Sergievsky and Charles A. Lindbergh, Sikorsky S-42 seaplane, 4 Pratt and Whitney 670 hp Hornet engines, Aug. 1, 1934.

SPEED FOR 3,106.849 MI.

World Class Record .... 191.534 mph.
Mario Stoppani and Niccola di Mauro, Italy, Cant Z 506-B seaplane, 3 Alfa Romeo 126 RC.34 750 hp engines, May 27-28, 1937.

National (U.S.) Record .... No official record.

WITH PAYLOAD OF 4,409.244 LB.

ALTITUDE

World Class Record .... 29,367 ft.
Mario Stoppani and Nicola di Mauro, Italy, Cant Z 506-B seaplane, 3 Alfa Romeo 700 hp engines, at Monfalcone, Nov. 3, 1937.

National (U.S.) Record .... 19,709 ft.
Boris Sergievsky, S-38 seaplane, 2 Pratt and Whitney 424 hp Wasp, engines, at Stratford, Conn., Aug. 11, 1930.

SPEED FOR 621.369 MI.

World Class Record .... 250.676 mph.
M. Stoppani and G. Gorini, pilots; Ing. Luzzatto and E. Accomolli, passengers; Italy, Cant Z 509 seaplane, 3 Fiat A80 RC 41 1,000 hp engines, Mar. 30, 1938.

National (U.S.) Record .... 157.580 mph.
Edwin Musick, Boris Sergievsky and Charles A. Lindbergh, Sikorsky S-42 seaplane, 4 Pratt and Whitney 670 hp Hornet engines, Aug. 1, 1934.

SPEED FOR 1,242.739 MI.

World Class Record .... 246.351 mph.
M. Stoppani and G. Gorini, pilots; Ing. Luzzatto and E. Accomolli, passengers; Italy, Cant Z 509 seaplane, 3 Fiat A80 RC 41 1,000 hp engines, Mar. 30, 1938.

National (U.S.) Record .... 157.319 mph.
Edwin Musick, Boris Sergievsky and Charles A. Lindbergh, Sikorsky S-42 seaplane, 4 Pratt and Whitney 670 hp Hornet engines, Aug. 1, 1934.

SPEED FOR 3,106.849 MI. .... No official record

WITH PAYLOAD OF 11,023.11 LB.

ALTITUDE

World Class Record .... 24,311 ft.
Mario Stoppani and Nicola di Mauro, pilots; Forlivesi, mechanic; Italy, Cant Z 506-B seaplane, 3 Alfa Romeo 700 hp engines, at Monfalcone, Nov. 7, 1947.

National (U.S.) Record .... 20,406 ft.
Boris Sergievsky and Raymond B. Quick, Sikorsky S-42 seaplane, 4 Pratt and Whitney 670 hp Hornet engines, Bridgeport, Conn., May 17, 1934.

SPEED FOR 621.369 MI.

World Class Record .... 156.516 mph.
Mario Stoppani and Ing. Antonio Maiorana, pilots; A. Spinelli, S. Forlivesi and R. T. Suriano, crew; Italy, Cant Z, 508 seaplane, 3 Isotta-Fraschini Asso 11 R.C. 836 hp engines, Grado-Faro Ancona-Faro di Rimini temporary course, May 1, 1937.

National (U.S.) Record .... No official record.

SPEED FOR 1,242.739 MI.

World Class Record .... 154.356 mph.
Mario Stoppani and Ing. Antonio Maiorana, pilots; A. Spinelli, S. Forltvesi and R. T. Suriano, crew; Italy, Cant Z, 508 seaplane, 3 Isotta-Fraschini Asso 11 RC 836 hp engines, Grado-Faro Ancona-Faro di Rimini temporary course, May 1, 1937.
National (U.S.) Record .... No official record.

SPEED FOR 3,106.849 MI. .... No official record.

WITH PAYLOAD OF 22,046.22 LB.

ALTITUDE

World Class Record .... 15,955 ft.
Mario Stoppani, pilot; G. Divari and A. Spinètti, passengers; Italy, Cant Z 508 seaplane, 3 Isotta Fraschini Asso 11 R.C. 836 hp engines, Monfalcone, Apr. 13, 1937.
National (U.S.) Record .... No official record.

SPEED FOR 621.369 MI.

World Class Record .... 131.110 mph.
Guillaumet, Leclaire, Comet, Le Duff, Le Morvan and Chapaton, France, Latecoere 521 seaplane, *Lt. de Vaisseau Paris*, 6 Hispano-Suiza 650 hp engines, Lucon-Aureilhan base, Dec. 27, 1937.
National (U.S.) Record .... No official record.

SPEED FOR 1,242.739 MI. .... No official record

SPEED FOR 3,106.849 MI. .... No official record.

WITH PAYLOAD OF 33,069.33 LB.

ALTITUDE

World Class Record .... 13,509 ft.
Guillaumet, Leclaire, Comet, Le Duff, Le Morvan and Chapaton, France, Latecoere 521 seaplane, *Lt. de Vaisseau Paris*, 6 Hispano-Suiza 650 hp engines, at Biscarosse, Dec. 30, 1927.
National (U.S.) Record .... No official record.

SPEED FOR 621.369 MI.

World Class Record .... 117.899 mph.
Guillaumet, Leclaire, Comet, Le Duff, Le Morvan and Chapaton, France, Latecoere 521 seaplane, *Lt. de Vaisseau Paris*, 6 Hispano-Suiza 650 hp engines, Lucon-Aureilhan course, Dec. 29, 1937.
National (U.S.) Record .... No official record.

SPEED FOR 1,242.739 MI. .... No official record.

SPEED FOR 3,106.849 MI. .... No official record.

GREATEST PAYLOAD CARRIED TO AN ALTITUDE OF 6,561.660 FT.

World Class Record .... 39,771 lb.
Guillaumet, Leclaire, Comet, Le Duff, Le Morvan and Chapaton, France, Latecoere 521 seaplane, *Lt. de Vaisseau Paris*, 6 Hispano-Suiza 650 hp engines, at Biscarosse, Dec. 30, 1937.
National (U.S.) Record .... 16,608 lb.
Boris Sergievsky, Sikorsky S-42 seaplane, 4 Pratt and Whitney Hornet 650 hp engines, Bridgeport, Conn., Apr. 26, 1934.

LIGHT SEAPLANES—(Class C-2.a)

FIRST CATEGORY (LIGHT SEAPLANES WEIGHING LESS THAN 1,322.8 LBS.)

ALTITUDE

World Class Record .... 24,498 ft.
Charles L. Davis, United States, Piper Super Cub PA-18, Lycoming 125 hp engine, gross weight 1,295 lb., Detroit, Mich., June 18, 1952.
National (U.S.) Record .... Same as above.

DISTANCE IN A STRAIGHT LINE .... No official record.

SPEED FOR 62.137 MI. IN A CLOSED CIRCUIT

World Class Record .... 108.806 mph.
Charles L. Davis, United States, Piper Super Cub PA-18, Lyooming 125 hp engine, gross weight 1,321 lb., Grosse Point, Mich. Yacht Club, Aug. 29, 1952.
National (U.S.) Record .... Same as above.

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SPEED FOR 310.137 MI. IN A CLOSED CIRCUIT
World Class Record .... 105.354 mph.
Charles L. Davis, United States, Piper Super Cub PA-18, Lycoming 125 hp engine, gross weight 1,321 lb., Grosse Point, Mich. Yacht Club, Aug. 29, 1952.
National (U.S.) Record .... Same as above.

SPEED FOR 621.359 MI. IN A CLOSED CIRCUIT .... No official record.
SPEED FOR 1,242.739 MI. IN A CLOSED CIRCUIT .... No official record.

LIGHT SEAPLANES—(Class C-2.b)

SECOND CATEGORY (LIGHT SEAPLANES WITH A TOTAL WEIGHT, IN FLYING ORDER, BETWEEN 1,322.8 AND 2,645.6 LB.)

ALTITUDE
World Class Record .... 26,266 ft.
Charles L. Davis, United States, Piper Super Cub Seaplane, N1997A, Lycoming 125 hp engine, Detroit Seaplane Base, Mich., Oct. 18, 1952.
National (U.S.) Record .... Same as above.

AIRLINE DISTANCE
World Class Record .... 946.732 mi.
Harold E. Mistele, United States, Cessna 170, Continental 145 hp engine, gross weight 1,117 kilograms, from near Brownsville, Tex. to near Rosiclair, Ill., June 12, 1952.
National (U.S.) Record .... Same as above.

SPEED FOR 62.137 MI. IN A CLOSED CIRCUIT
World Class Record .... 109.081 mph.
Harold E. Mistele, United States, Cessna 170, Continental 145 hp engine, gross weight 1,986.5 lb., Grosse Pointe, Mich., Yacht Club, Aug. 25, 1952.
National (U.S.) Record .... Same as above.

SPEED FOR 310.685 MI. IN A CLOSED CIRCUIT
World Class Record .... 102.274 mph.
Harold E. Mistele, United States, Cessna 170, Continental 145 hp engine, gross weight 1,986.5 lb., Grosse Pointe, Mich., Yacht Club, Aug. 25, 1952.
National (U.S.) Record .... Same as above.

SPEED FOR 621.369 MI. IN A CLOSED CIRCUIT .... No official reocrd.
SPEED FOR 1,242.739 MI. IN A CLOSED CIRCUIT .... No official record.

LIGHT SEAPLANES—(Class C-2.c)

THIRD CATEGORY (LIGHT SEAPLANES WITH A TOTAL WEIGHT, IN FLYING ORDER, BETWEEN 2,645.6 AND 4,629.7 LB.)

AIRLINE DISTANCE .... No official record.
ALTITUDE
World Class Record .... 20,523 ft.
Harold E. Mistele, United States, Cessna 180 seaplane, Continental 225 hp engine, Aug. 18, 1954. (Pending confirmation by F. A. I. as we went to press.)
National (U.S.) Record .... Same as above.
SPEED FOR 62.137 MI.
World Class Record .... 131.307 mph.
Harold E. Mistele, United States, Cessna 180 seaplane, Continental 225 hp engine, Aug. 18, 1954.
National (U.S.) Record .... Same as above.
SPEED FOR 310.685 MI. IN A CLOSED CIRCUIT .... No official record.
SPEED FOR 621.369 MI. .... No official record.
SPEED FOR 1,242.739 MI. .... No official record.

LIGHT SEAPLANES—(Class C-2.d)

FOURTH CATEGORY (LIGHT SEAPLANES WITH A TOTAL WEIGHT, IN FLYING ORDER, BETWEEN 4,629.7 AND 7,495.7 LB.)

AIRLINE DISTANCE .... No official record.
ALTITUDE .... No official record.
SPEED FOR 62.137 MI. .... No official record.
SPEED FOR 310.685 MI. IN A CLOSED CIRCUIT .... No official record.
SPEED FOR 621.369 MI. .... No official record.
SPEED FOR 1,242.739 MI. .... No official record.


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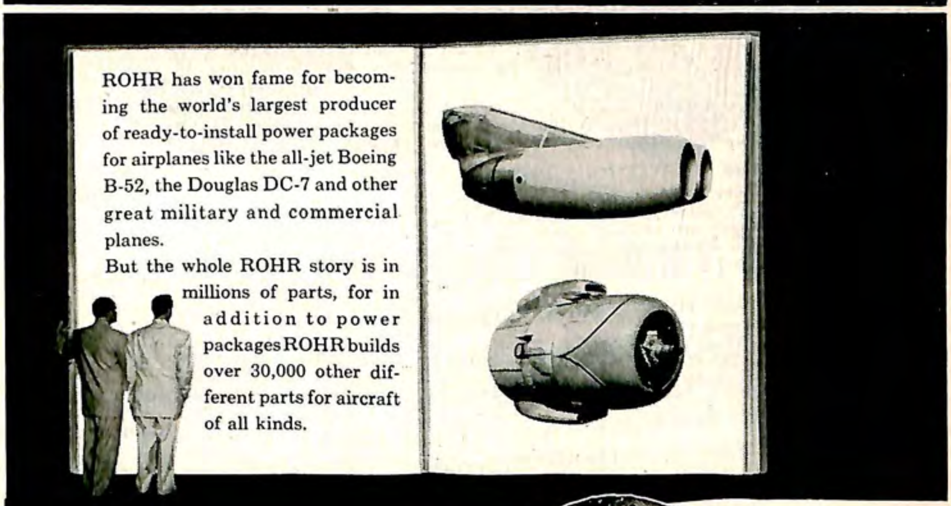
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AMPHIBIANS—(CLASS C3)

AIRLINE DISTANCE

World Class Record .... 1,855.610 mi.
Marquise Carina Negrone and Sign. Ada Marchelli, Italy, Piaggio P. 136 L airplane, 2 Lycoming Go 435 C2 240 hp. engines, from Ghedi (Brescia) to Luxor, Egypt, June 18, 1954.

National (U.S.) Record .... 1,429.685 mi.
Maj. Gen. F. M. Andrews, pilot; Maj. John Whiteley, co-pilot; and crew, United States, Douglas YOA5 Amphibian, 2 Wright Cyclone 800 hp engines, from San Juan, Puerto Rico, to Langley Field, Va., June 29, 1936.

ALTITUDE

World Class Record .... 24,951 ft.
Boris Sergievsky, United States, Sikorsky S-43 amphibian, 2 Pratt and Whitney 750 hp Hornet engines, Stratford, Conn., Apr. 14, 1936.

National (U.S.) Record .... Same as above.

MAXIMUM SPEED

World Class Record .... 230.413 mph.
Maj. Alexander P. de Seversky, United States, Seversky Amphibian, Wright Cyclone 710 hp engine, Detroit, Mich., Sept. 15, 1935.

National (U.S.) Record .... Same as above.

SPEED FOR 62.137 MI. WITHOUT PAYLOAD

World Class Record .... 241.883 mph.
R. R. Colquhoun, Great Britain, Vicker's Supermarine Seagull I, Rolls Royce Griffin Mark 29 1380 hp engine, Marston Moor, July 22, 1950.

National (U.S.) Record .... 209.451 mph.
Major A. P. deSeversky, United States, Seversky Amphibian, Wright "Cyclone" 1,000 hp engine, Miami, Fla., Dec. 19, 1936.

SPEED FOR 621.369 MI. WITHOUT PAYLOAD

World Class Record .... 186.076 mph.
Capt. W. P. Sloan and Capt. B. L. Boatner, USA AC, pilots; United States, Grumman YOA-9 amphibian, 2 Pratt and Whitney engines, 400 hp each, Dayton, O., July 31, 1939.

National (U.S.) Record .... Same as above.

SPEED FOR 1,242.739 MI. WITHOUT PAYLOAD

World Class Record .... 154,701 mph.
Giuseppe Burei and Enrico Rossaldi, pilots; Gino Velati, passenger; Italy, Macchi C-94 I.-NEP I amphibian, 2 Wright Cyclone 750 hp engines, Rovine Ansedonia-Faro Fiumicino Antignano temporary course, May 6, 1937.

National (U.S.) Record .... No official record.

SPEED FOR 3,106.849 MI. WITHOUT PAYLOAD .... No official record.

SPEED FOR 6,213.689 MI. WITHOUT PAYLOAD .... No official record.

WITH PAYLOAD OF 2,204.622 LB.

ALTITUDE

World Class Record .... 23,405 ft.
Ivan Soukhomline, USSR, Tsagui 44 D Amphibian, 4 M-87 840 hp engines, Katcha, near Sebastopol, June 17, 1940.

National (U.S.) Record .... 19,626 ft.
Boris Sergievsky, Sikorsky S-43, 2 Pratt and Whitney 750 hp Hornet engines, Stratford, Conn., Apr. 25, 1936.

SPEED FOR 621.369 MI.

World Class Record .... 172.409 mph.
Ivan Soukhomline, USSR, Tsagui 44 D Amphibian, 4 M-85, 750 hp engines, Katcha-Kersoness-Taganrog course, Sept. 28, 1940.

National (U.S.) Record .... No official record.

SPEED FOR 1,242.739 MI. .... No official record.

SPEED FOR 3,106.849 MI. .... No official record.


LIBERTY
IN GOD WE TRVST
1924

WITH PAYLOAD OF 4,409.244 LB.

ALTITUDE

World Class Record .... 20,617 ft.
Ivan Soukhomline, USSR, Tsagui 44 D Amphibian, 4 M-87 840 hp engines, Katcha, near Sebastopol, June 19, 1940.

National (U.S.) Record .... 19,625 ft.
Boris Sergievsky, United States, Sikorsky S-43 Amphibian, 2 Pratt and Whitney, 750 hp engines, Stratford, Conn., Apr 25, 1936.

SPEED FOR 621.369 MI.

World Class Record .... 149.694 mph.
Ivan Soukhomline, USSR, Tsagui 44 D Amphibian 4 M-85 750 hp engines, Katcha-Kersoness-Taganrog course, Oct. 7, 1940.

National (U.S.) Record .... No official record

SPEED FOR 1,242.739 MI. .... No official record
SPEED FOR 3,106.849 MI. .... No official record

WITH PAYLOAD OF 11,023.11 LB.

ALTITUDE

World Class Record .... 17,123 ft.
Ivan Soukhomline, USSR, Tsagui 44 D Amphibian, 4 M-87 840 hp engines, Katcha, near Sebastopol, June 19, 1940.

National (U.S.) Record .... No official record.

SPEED FOR 621.369 MI. .... No official record.
SPEED FOR 1,242.739 MI. .... No official record
SPEED FOR 3,106.849 MI. .... No official record.

WITH PAYLOAD OF 22,046.22 LB.

ALTITUDE .... No official record.
SPEED FOR 621.369 MI. .... No official record.
SPEED FOR 1,242.739 MI. .... No official record.
SPEED FOR 3,106.849 MI. .... No official record.
GREATEST PAYLOAD CARRIED TO AN ALTITUDE OF 6,561.660 FT.

World Class Record .... 11,023 lb.
Ivan Soukhomline, USSR, Tsagui 44 D Amphibian, 4 M-87 840 hp engines, at Katcha, near Sebastopol, June 19, 1940.

National (U.S.) Record. .... No official record.

LIGHT AMPHIBIANS

FIRST CATEGORY, CLASS C-3.a (less than 1,322.7 lb.)
SECOND CATEGORY, CLASS C-3.b (1,322.8 to 2,645.4 lb.)
THIRD CATEGORY, CLASS C-3.c (2,645.6 to 4,629.7 lb.)
FOURTH CATEGORY, CLASS C-3.d (4,629.7 to 7,495.7 lb.)

AIRLINE DISTANCE .... No official record.
ALTITUDE .... No official record.
SPEED FOR 62.137 MI. IN A CLOSED CIRCUIT .... No official record.
SPEED FOR 310.685 MI. IN A CLOSED CIRCUIT .... No official record.
SPEED FOR 621.369 MI. IN A CLOSED CIRCUIT .... No official record
SPEED FOR 1,242.739 MI. IN A CLOSED CIRCUIT .... No official record.

ROTORPLANES—(Class E)

DISTANCE IN A STRAIGHT LINE WITHOUT PAYLOAD

World Class Record .... 1,217.137 mi
Elton J. Smith, United States, Bell 47D1 Helicopter, Franklin 200 hp engine, from Hurst, Ft. Worth, Tex., to Niagara Falls, N. Y. Sept. 17, 1952.

National (U.S.) Record .... Same as above.

DISTANCE CLOSED CIRCUIT WITHOUT PAYLOAD

World Class Record .... 778.311 mi.
Jean Boulet, France, S.E.3 120 Helicopter, Salmson 9 NH 200 hp engine, Buc-Etampes-Rambouillet Course, July 2, 1953.

National (U.S. Record) .... 621.369 mi.
Maj. D. H. Jenson and Maj. W. C. Dodds; USAAF; U.S.; Sikorsky R-5A Helicopter, Pratt and Whitney 450 hp engine, Dayton, O., Nov. 14, 1946.

ALTITUDE, WITHOUT PAYLOAD
World Class Record .... 26,931 ft.
Jean Boulet, France, SE "Alouette" Helicopter, Turbomeca Artouste II 400 hp engine, Buc Airport, June 6, 1955.
National (U.S.) Record .... (7,474 meters) 24,521 ft.
W/O Billy I. Wester, USA, United States, Sikorsky XH-39 Helicopter, Turbomeca Artouste II 425 hp engine, Bridgeport, Connecticut, October 17, 1954.
National (U.S.) Record .... Same as above.

MAXIMUM SPEED WITHOUT PAYLOAD
World Class Record .... 156.006 mph.
W/O Billy I. Wester, USA, United States, Sikorsky XH-39 Helicopter, Turbomeca Artouste II 425 hp engine, Windsor Locks, Conn., Aug. 26, 1954. (Pending F.A.I. confirmation as we went to press.)
National (U.S.) Record .... Same as above.

SPEED FOR 62.137 MI. IN A CLOSED CIRCUIT, WITHOUT PAYLOAD
World Class Record .... 122.749 mph.
Harold E. Thompson, United States, Sikorsky S-52-1 Helicopter, Franklin 0-425-1 engine, 245 hp, Milford, Conn., May 6, 1949.
National (U.S.) Record .... Same as above.

SPEED FOR 310.685 MI. IN A CLOSED CIRCUIT, WITHOUT PAYLOAD
World Class Record .... 66.607 mph.
Jean Boulet, France, S.E.3. 120 Helicopter, Salmson 9 NH 200 hp engine, Buc-Etampes-Rambouillet course, July 2, 1952.
National (U.S.) Record .... No official record.

SPEED FOR 621.369 MI. IN A CLOSED CIRCUIT, WITHOUT PAYLOAD
World Record Class .... 66.642 mph.
Maj. D. H. Jenson & Maj. W. C. Dodds, USAAF, Sikorsky R-5A Helicopter, Pratt and Whitney 450 hp engine, Dayton, O., Nov. 14, 1946.
National (U.S.) Record .... Same as above.

SPEED FOR 1,242.739 MI. IN A CLOSED CIRCUIT, WITHOUT PAYLOAD—No official record.

SPEED FOR 3,106.849 MI. IN A CLOSED CIRCUIT, WITHOUT PAYLOAD—No official record.

AIRSHIPS—(CLASS B)

AIRLINE DISTANCE
World Class Record .... **3,967.137** mi.
Dr. Hugo Eckener, Germany, L. Z. 127, *Graf Zeppelin* 5 Maybach 450-550 hp engines, from Lakehurst, N. J., to Friedrichshafen, Germany, Oct. 29, 30, 31, and Nov. 1, 1928.
National (U.S.) Record .... No official record

GLIDERS—(CLASS D)

(Single-Place)

DISTANCE IN A STRAIGHT LINE
World Class Record .... 535.169 mi.
Richard H. Johnson, U.S. Ross-Johnson sailplane, N-3722C, from Odessa, Tex. to Salina, Kan., Aug. 5, 1951.
National (U.S.) Record .... Same as above.

DISTANCE TO A PREDETERMINED POINT WITH RETURN TO POINT OF DEPARTURE
World Class Record .... 310.7 mi.
Lyle A. Maxey, United States, Kerns Sailplane, from El Mirage to Independence, Calif., and return, September 4, 1955.
National (U.S.) Record .... Same as above.

DISTANCE TO A PREDETERMINED DESTINATION
World Class Record .... 395.736 mi.
V. I. F. Efimenko, USSR, A-9 Sailplane, from Grabtsevo (Kalouga) to Melovoe (Vorochilovograd), June 6, 1952.
National (U.S.) Record .... 332.903 mi.
Wallace R. Wiberg, Laister-Kaufmann 10A Sailplane, N 57826, from Odessa, Tex. to Guymon, Okla., Aug. 5, 1951.

ALTITUDE GAINED
World Class Record .... 30,100 ft.
William S. Ivans, Jr., U.S., Schweizer SGS 1-23 sailplane, N-91876, Bishop, Cal., Dec. 30, 1950.
National (U.S.) Record .... Same as above.

ALTITUDE ABOVE SEA LEVEL
World Class Record .... 42,100 ft.
William S. Ivans, Jr., U.S., Schweizer SGS 1-23 sailplane, N-91876, Bishop, Cal., Dec. 30, 1950.
National (U.S.) Record .... 309.678 mi

F-100 WORLD AIR SPEED RECORD MARKS U.S. SUPERSONIC SUPREMACY

The world's first official supersonic speed record—set by Colonel H. A. Hanes in an Air Force North American F-100C SUPER SABRE*—is a faster-than-sound 822.135 m.p.h.

These record holding F-100s are being delivered in quantity to the Air Force, and are now flying from U.S. Air Bases, at home and in Europe, in America's first Supersonic Squadrons. They defend the skies as day fighters, fighter-bombers and in other specialized tactical missions.

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*Reg. U. S. Pat. Off.

SPEED FOR 62.137 MI. OVER A TRIANGULAR COURSE
World Class Record .... 59.475 mph.
Jersy Wojnar, Poland, Jaskolka SP 1325 Sailplane, Leszno-Rawicz-Gostyn-Leszno course, May 15, 1954.
National (U.S.) Record .... 52.766 mph.
Richard H. Johnson, Ross-Johnson 5 Sailplane, Grand Prairie-Russell-Don's Airpark-Grand Prairie, Tex. Course, Aug. 28, 1952.

(Multi-Place)

DISTANCE IN A STRAIGHT LINE
World Class Record .... 515.626 mi.
Victor Iltchenko, pilot; Grigory Petchnikov, passenger; USSR; A-10 Sailplane, from Kountsevo (Moseow) to Ilovlia (Stalingrad), May 26, 1933.
National (U.S.) Record .... 309.678 mi.
Richard H. Johnson, pilot; R. A. Sparling, passenger; Schweizer TG-2 glider, NC-479903, from Prescott, Ariz. municipal Airport to the Ackerman Ranch approximately 11 miles west of Governador, N. M., Sept. 8, 1946.

DISTANCE TO A PREDETERMINED POINT WITH RETURN TO POINT OF DEPARTURE
World Class Record .... 270.917 mi.
Evert Dommisse, pilot; Samuel J. Barker, passenger; South Africa, Kranich II ZS-G Sailplane, from Keetmanshoop to Mariental and return, Feb. 9, 1952.
National (U.S.) Record .... 153.930 mi.
Ted Nelson and Harry N. Perl, Hummingbird auxiliary powered sailplane, N 68959, from Grand Prairie, Tex. to Bowie, Tex. and return, Aug. 20, 1952.

DISTANCE TO A PREDETERMINED DESTINATION
World Class Record .... 336.348 mi.
Jerzy Popiel, pilot; Adolf Siemaszkiewicz, passenger; Poland; Zuraw II S.P.-1211 Sailplane, from Lublin to Hrubieszow, July 20, 1953.
National (U.S.) Record .... 223.138 mi.
David C. Johnson, pilot; Robert Fronius, passenger; Schweizer TG-2 from Adelanto, Cal. to Overton, Nev. July 3, 1950.

ALTITUDE GAINED
World Class Record .... 34,426 ft.
Laurence E. Edgar, pilot; Harold E. Klieforth, passenger, United States, Pratt-Read PR-G1 Sailplane, Bishop, Cal., Mar. 19, 1952.
National (U.S.) Record .... Same as above.

ALTITUDE ABOVE SEA LEVEL
World Class Record .... 44,255 ft.
Laurence E. Edgar, pilot; Harold E. Klieforth, passenger, United States, Pratt-Read PR-G1 Sailplane, Bishop, Cal., Mar. 19, 1952.
National (U.S.) Record .... Same as above.

SPEED FOR 62.137 MI. OVER A TRIANGULAR COURSE
World Class Record .... 49.920 mph.
Ernst-Gunter Haase, pilot; Reinaldo Picchio, passenger, Germany; Condor IV Sailplane, at Klippeneck, Aug. 13, 1952.
National (U.S.) Record .... 27.873 mph.
William G. Briegleb, pilot; Jack LaMare, passenger; Briegleb BG-8 glider, N-33636, Adelanto, Cal., Aug. 12, 1949.

BALLOONS (CLASS A)

FIRST CATEGORY—(8,328.6 CU. FT. OF LESS)

DURATION
Neither World Class nor National (U.S.) Record has been established.

DISTANCE
Neither World Class nor National (U.S.) Record has been established.

ALTITUDE
Neither World Class nor National (U.S.) Record has been established.

SECOND CATEGORY—(8,828.7 TO 14,125.7 CU. FT.)

DURATION
World Class Record .... 4 hours, 00 minutes
Audouin Dollfus, France, "Zodiac" F.AIJA Balloon of 375 cubic meters volume, from Senlis to Cheverny, May 3, 1953.
National (U.S.) Record .... No official record

DISTANCE
World Class Record .... (208.622 kilometers) 129.631 mi.
Audouin Dollfus, France, "Zodiac" F.AIJ Balloon of 375 cubic meters volume, from Senlis to Cheverny, May 3, 1953.
National (U.S.) Record .... No official record.

ALTITUDE
Neither World Class ncr National (U.S.) Record has been established.

THIRD CATEGORY—(14,125.8 CU. FT.)

DURATION
World Class Record ..... 46 hr. 10 min.
Serge Sinoveev, USSR, VR 80 Balloon, 21,082.458 cu. ft., take-off near Dolgoproudnaia, Mar. 30, 1941.
National (U.S.) Record ..... No official record.

DISTANCE
World Class Record ..... 499.69 mi.
Georges Cormier, France, July 1, 1922.
National (U.S.) Record ..... No official record

ALTITUDE
World Class Record ..... 23,286 ft.
Boris Nevernov, USSR, VR-80 Balloon, 13,984.344 cu. ft., at Dolgoproudnaia, Aug. 31, 1940.
National (U.S.) Record ..... No official record.

FOURTH CATEGORY—(21,224 - 31,783 CU. FT.)

DURATION
World Class Record ..... 61 hr. 30 min.
F. Bourlouzki and A. Aliochine, USSR, from Moscow to Charaboulski, Apr. 3-6, 1939.
National (U.S.) Record ..... 19 hr. 00 min.
W. C. Naylor and K. W. Warren, *Skylark*, Little Rock, Ark., to Crawford, Tenn., Apr. 29-30, 1926.

DISTANCE
World Class Record ..... 1,056.950 mi.
F. Bourlouzki and A. Aliochine, USSR, from Moscow to Charaboulski, region of Koustanai, Apr. 3-6, 1939.
National (U.S.) Record ..... 410.104 mi.
W. C. Naylor and K. W. Warren, *Skylark*, Little Rock, Ark., to Crawford, Tenn., Apr. 29-30, 1926.

ALTITUDE
World Class Record ..... 27,718 ft.
Alexei Rostine, USSR, VR-70 Balloon of 29,451.876 cu. ft. at Dolgoproudnaia, Oct. 4, 1940.
National (U.S.) Record ..... No official record.

FIFTH CATEGORY—(31,818 - 42,376.8 CU. FT.)

DURATION
World Class Record ..... 61 hr. 30 min.
F. Bourlouzki and A. Aliochine, USSR, from Moscow to Charaboulski, Apr. 3-6, 1939.
National (U.S.) Record ..... 26 hr. 48 min.
E. J. Hill and A. G. Schlosser, Ford Airport to Montale, Va., July 4-5, 1927.

DISTANCE
World Class Record ..... 1,056.950 mi.
F. Bourlouzki and A. Aliochine, USSR, from Moscow to Charaboulski, region of Koustanai, Apr. 3-6, 1939.
National (U.S.) Record ..... 571.877 mi.
S. A. U. Rasmussen, Ford Airport to Hookerton, N. C., July 4-5, 1927.

ALTITUDE
World Class Record ..... 27,718 ft.
Alexei Rostine, USSR, VR-70 Balloon, 29,451.876 cu. ft., at Dolgoproudnaia, Oct. 4, 1940.
National (U.S.) Record ..... No official record

SIXTH CATEGORY—(42,411.8 - 56,502.4 CU. FT.)

DURATION
World Class Record ..... 69 hr. 20 min.
Boris Nevernov and Semion Gaiguerov, USSR, VR-73 Balloon, 50,357.764 cu. ft., from Dolgoproudnaia to Novosibirsk, Mar. 13-16, 1941.
National (U.S.) Record ..... 26 hr. 46 min.
E. J. Hill and A. G. Schlosser, Ford Airport to Montvale, Va., July 4-5, 1927.

DISTANCE
World Class Record ..... 1,719.215 mi.
Boris Nevernov and Semion Gaiguerov, USSR, VR-73 Balloon, 50,357.764 cu. ft., from Dolgoproudnaia to Novosibirsk, Mar. 13-16, 1941.
National (U.S.) Record ..... 571.877 mi.
S. A. U. Rasmussen, Ford Airport to Hookerton, N. C., July 4-5, 1927.

ALTITUDE
World Class Record ..... 27,718 ft.
Alexei Rostine, USSR, VR-70 Balloon, 29,451.876 cu. ft., at Dolgoproudnaia, Oct. 4, 1940.
National (U.S.) Record ..... No official record

SEVENTH CATEGORY—(56,537.7 - 77,690.8 CU. FT.)

DURATION

World Class Record .... 69 hr. 20 min.
Boris Nevernov and Semion Gaiguerov, USSR, VR-73 Balloon, 50,357.764 cu. ft., from Dolgoproudnaia to Novosibirsk, Mar. 13-16, 1941.

National (U.S.) Record .... 51 hr. 00 min
T. G. W. Settle and C. H. Kendall, Gordon-Bennett Balloon Race, Chicago, Ill., Sept. 2-4, 1933.

DISTANCE

World Class Record .... 1,719.215 mi.
Boris Nevernov and Semion Gaiguerov, USSR, VR-73 Balloon, 50,357.764 cu. ft., from Dolgoproudnaia to Novosibirsk, Mar. 13-16, 1941.

National (U.S.) Record .... 963.123 mi.
T. G. W. Settle and Wilfred Bushnell, from Basle, Switzerland to Daugieliski, Poland, Sept. 25-27, 1932.

ALTITUDE

World Class Record .... 30,755 ft.
Josef Emmer, Austria, *OE-Marek Emmer II* Balloon, Vienna-Lac de Nuesiedl, Sept. 25-27, 1937.

National (U.S.) Record .... No official record

EIGHTH CATEGORY—(77,706 - 150,942 CU. FT.)

DURATION

World Class Record .... 69 hr. 20 min.
Boris Nevernov and Semion Gaiguerov, USSR, VR-73 Balloon, 50,357.764 cu. ft., from Dolgoproudnaia to Novosibirsk. Mar. 13-16, 1941.

National (U.S.) Record .... 51 hr. 00 min.
T. G. W. Settle and C. H. Kendall, Gordon-Bennett Balloon Race, Chicago, Ill., Sept. 2-4, 1933.

DISTANCE

World Class Record .... 1,719.215 mi.
Boris Nevernov and Semion Gaiguerov, USSR, VR-73 Balloon, 50,357.764 cu. ft., from Dolgoproudnaia to Novosibirsk, Mar. 13-16, 1941.

National (U.S.) Record .... 963.123 mi.
T. G. W. Settle and Wilfred Bushnell, from Basle, Switzerland to Daugieliski, Poland, Sept. 25-27, 1932.

ALTITUDE

World Class Record .... 30,755 ft.
Josef Emmer, Austria, *OE-Marek Emmer II* Balloon, Vienna-Lac de Neusiedl, Sept. 25-27, 1937.

National (U.S.) Record .... 28,508 ft.
Capt. Hawthorne C. Gray, Scott Field, Belleville, Ill., Mar. 9, 1927.

NINTH CATEGORY—(105,977 - 141,256 CU. FT.)

DURATION

World Class Record .... 69 hr. 20 min.
Boris Nevernov and Semion Gaiguerov, USSR, VR-73 Balloon, 50,357.764 cu. ft., from Dolgoproudnaia to Novosibirsk, Mar. 13-16, 1941.

National (U.S.) Record .... 51 hr. 00 min.
T. G. W. Settle and C. H. Kendall, Gordon-Bennett Balloon Race, Chicago, Ill., Sept. 2-4, 1933.

DISTANCE

World Class Record .... 1,719.215 mi.
Boris Nevernov and Semion Gaiguerov, USSR, VR-73 Balloon, 50,357.764 cu. ft., from Dolgoproudnaia to Novosibirsk, Mar. 13-16, 1941.

National (U.S.) Record .... 963.123 mi.
T. G. W. Settle and Wilfred Bushnell, from Basle, Switzerland to Daugieliski, Poland, Sept. 25-27, 1932.

ALTITUDE

World Class Record .... 32,811 ft.
Z. J. Burzynski, Poland, at Legjonowo, Mar. 29, 1936.

National (U.S.) Record .... 28,508 ft.
Capt. Hawthorne C. Gray, at Scott Field, Belleville, Ill., Sept. 2-4, 1933.

TENTH CATEGORY—(141,291.3 CU. FT. OR OVER)

DURATION

World Class Record .... 87 hr. 00 min.
H. Kaulen, Germany, Dec. 13-17, 1913.

National (U.S.) Record .... 51 hr. 00 min.
Lt. Comdr. T. G. W. Settle and Lt. Charles H. Kendall, Gordon-Bennett Balloon Race, Chicago, Ill., Sept. 2-4, 1933.

DISTANCE

World Class Record .... 1,896.856 mi.
Berliner, Germany, Feb. 8-10, 1914.

National (U.S.) Record .... 1,172.898 mi.
A. R. Hawley, St. Louis, Mo. to Lake Tschotogama, Canada, Oct. 17-19, 1910.

ALTITUDE

World Class Record .... 72,395 ft.
Capt. Orvil Anderson and Capt. Albert Stevens, United States, *Explorer II*, take-off approximately 11 miles southwest of Rapid City, S. D., landing on school reserve land approximately 12 miles south of White Lake, S. D., Nov. 11, 1935.

National (U.S.) Record .... Same as above.

FEMININE RECORDS

GLIDERS—(CLASS D)

(Single-Place)

DISTANCE IN A STRAIGHT LINE

World Class Record .... 465.532 mi.
O. Klepikova, USSR, Rot-Front 7 glider from Moscow to Otradnoie, region of Stalingrad, July 6, 1939.

National (U.S.) Record .... 201.450 mi.
Miss Betsy Woodward, Briegleb BG-7 Sailplane, from Grand Prairie, Tex. to Sweetwater, Tex., Aug. 22, 1952.

ALTITUDE GAINED

World Class Record .... 27,994.4 ft.
Miss Betsy Woodward, United Sttaes, Pratt-Read Sailplane, N 63195, Bishop, California, April 14, 1955.

National (U.S.) Record .... Same as above.

ALTITUDE ABOVE SEA LEVEL

World Class Record .... 39,994 ft.
Miss Betsy Woodward, United Sttaes, Pratt-Read Sailplane, N 63195, Bishop, California, April 14, 1955.

National (U.S.) Record .... Same as above.

DISTANCE TO A PREDETERMINED DESTINATION

World Class Record .... 315.067 mi.
Mrs. M. Choisnet-Gohard, France, Air-100 Sailplane No. 14, from Beynes-Thiverval to Bordeaux-Leognan, Apr. 17, 1954.

National (U.S.) Record .... 76.752 mi.
Miss Betsy Woodward, Briegleb BG-7 Sailplane, from Grand Prairie, Tex. to Stephenville, Tex., Aug. 29, 1952.

DISTANCE TO A PREDETERMINED POINT WITH RETURN TO POINT OF DEPARTURE

World Class Record .... 203.934 mi.
Maksymiliana Czmielowna, Poland, "Jaskolka" Sailplane, from Miroslawice (Wrolaw) to Kobylnica (Poznan) and return, June 18, 1955.

National (U.S.) Record .... 120.452 mi.
Miss Betsy Woodward, Briegleb BG-7 Sailplane N 1741 B, from Grand Prarie to Mineral Wells, Texas, and return, August 21, 1952.

SPEED FOR 62.137 MI. OVER A TRIANGULAR COURSE

World Class Record .... 46.953 mph.
Wanda Szemplinska, Poland, Jaskolka SP-1311 Sailplane, Leszno-Rawicz-Gostyn-Leszno Course, May 15, 1954.

National (U.S.) Record .... 28.635 mph.
Miss Betsy Woodward, Briegleb BG-7 Sailplane, Grand Prairie-Russell-Don's Air Park-Grand Prairie, Tex. Course, Aug. 28, 1952.

GLIDERS—(CLASS D)

(Multi-Place)

DISTANCE IN A STRAIGHT LINE

World Class Record .... 275.711 mi.
O. Klepikova and V. Bardina, USSR, Stakanovetz glider, from Toula to Konotop, June 19, 1940.

Combines For the First Time

Pantobase *and* BLC

(All Bases) (Boundary Layer Control)

It is with pride that Stroukoff Aircraft is producing for the United States Air Force the most efficient advanced assault air transport in the history of military aviation.

This development combines slow landing speeds through means of the Boundary Layer Control system, and includes the Pantobase installation, both designed by Stroukoff Aircraft Corporation.

The MS-8-1 is able to land and takeoff from unprepared surfaces such as rough terrain, sand, snow, ice, ordinary runways and to operate from water as well. It will do so at low speeds never before possible with aircraft of its weight; and in half the area needed by its prototypes.

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WEST TRENTON NEW JERSEY

ALTITUDE ABOVE SEA LEVEL

World Class Record .... 23,104 ft

Mrs. M. Choisnet-Gohard, pilot; Miss J. Queyrel, passenger; France, Castel Mauboussin CM glider No. 02, St. Auban sur Durance, Jan. 18, 1951.

National (U.S.) Record .... No official record.

ALTITUDE GAINED

World Class Record .... 19,921 ft.

Mrs. M. Choisnet-Gohard, pilot; Miss J. Queyrel, passenger; France, Castel Mauboussin CM glider No. 02, St. Auban sur Durance, Jan. 18, 1951.

National (U.S.) Record .... 10,797 ft.

Betsy Woodward, pilot; Vera Gere, passenger; Schweizer TG-3 glider, N-67871, El Mirage Field, Adelanto, Cal., Apr. 7, 1950.

DISTANCE TO A PREDETERMINED DESTINATION

World Class Record .... 235.942 mi.

Miss Francine Abadie and Miss Jacqueline Trubert, France, Castel 25 Bi-place Sailplane, from La Ferte-Alais to Cognac, April 16, 1955.

National (U.S.) Record .... 170.316 mi.

Miss Betsy Woodward, pilot Anna Saudek, passenger, Pratt Read Sailplane N63189, Adelanto, Calif., to Las Vegas, Nevada, July 11, 1952.

DISTANCE TO A PREDETERMINED POINT WITH RETURN TO POINT OF DEPARTURE

World Class Record .... 155.598 mi.

Mrs. Francine Abadie and Mrs. Josiane Charpentier, France, Castel 25 S 138 Sailplane, La Ferte Alais-Blois-LaFerte Alais Course, May 30, 1954.

National (U.S.) Record .... No official record.

SPEED FOR 62.137 MI. OVER A TRIANGULAR COURSE

World Class Record .... 39.945 mph.

Anna Samocadova, pilot; A. V. Neventchannaya, passenger; U.S.S.R., A-10 glider No. 1, Grabtsevo Makarova-Peremychl course, July 30, 1952.

National (U.S.) Record .... No official record.

BALLOONS—(CLASS A)

FOURTH CATEGORY—(14,126-21,188.4 CU. FT.)

DURATION

World Class Record .... 22 hr. 40 min.

A. Kondratyeva, USSR, SSSR BP-31 Balloon, Moscow to Loukino Polie, May 14-15, 1939.

National (U.S.) Record .... No official record.

DISTANCE

World Class Record .... 318.128 mi.

Mrs. Paulette Weber, France, F-AMAQ Balloon of the Roubaix (Nord) at Villers, May 8-9, 1953.

National (U.S.) Record .... No official record.

ALTITUDE .... No official record.

SIXTH CATEGORY (10,629.514 - 56,502.4 CU. FT.)

DURATION

World Class Record .... 34 hr. 21 min. 36 sec.

Miss L. Ivanova and Miss S. Tonkova, USSR, take-off near the Central Aerology Observatory at Dolgoproudnaia, landing at Barachevo, Apr. 22-24, 1948.

National (U.S.) Record .... No official record.

DISTANCE .... No official record.

ALTITUDE .... No official record.

SEVENTH CATEGORY (56,537.714 - 77,690.8 CU. FT.)

DURATION

World Class Record .... 34 hr. 21 min. 36 sec.

Miss L. Ivanova and Miss S. Tonkova, USSR, take-off near the Central Aerology Observatory at Dolgoproudnaia, landing at Barachevo, Apr. 22-24, 1948.

National (U.S.) Record .... No official record.

DISTANCE .... No official record.

ALTITUDE .... No official record.

EIGHTH CATEGORY (77,726.114 - 105,942 CU. FT.)

DURATION

World Class Record .... 34 hr. 21 min. 36 sec.

Miss L. Ivanova and Miss S. Tonkova, USSR, take-off near the Central Aerology Observatory at Dolgoproudnaia, landing at Barachevo, Apr. 22-24, 1948.

National (U.S.) Record .... No official record.

DISTANCE .... No official record.

ALTITUDE .... No official record.

NINTH CATEGORY (105,977.314 - 141,256 CU. FT.)

DURATION
World Class Record .... 34 hr. 21 min. 36 sec.
Miss L. Ivanova and Miss S. Tonkova, USSR, take-off near the Central Aerology Observatory at Dolgoproudnaia, landing at Barachevo, Apr. 22-24, 1948.
National (U.S.) Record .... No official record.

DISTANCE .... No official record.

ALTITUDE .... No official record.

TENTH CATEGORY (141,291.314 CU. FT. OR OVER)

DURATION
World Class Record .... 34 hr. 21 min. 36 sec.
Miss L. Ivanova and Miss S. Tonkova, USSR, take-off near the Central Aerology Observatory at Dolgoproudnaia, landing at Barachevo, Apr. 22-24, 1948.
National (U.S.) Record .... No official record.

DISTANCE .... No official record.

ALTITUDE .... No official record.

ROTORPLANES—(Class E)

DISTANCE AIRLINE
World Class Record .... 67.713 mi.
Miss Hanna Reitsch, Germany, FW. 61. V2, D-EKRA helicopter, from Stendal airport to Tempelhof airport, Oct. 25, 1937.
National (U.S.) Record .... No official record.

DISTANCE, CLOSED CIRCUIT .... No official record.

ALTITUDE .... No official record.

SPEED FOR 12.43 MI. .... No official record.

F.A.I. COURSE RECORDS

LOS ANGELES TO NEW YORK, N. Y.
World Class Record .... 652.522 mph.
Lt. Col. Robert Scott, USAF, United States, Republic F-84F Thunderstreak, Wright J-65B3 jet engine, from Los Angeles International Airport to Floyd Bennett Field, Brooklyn, March 9, 1955. Distance (Center to Center): 2,445.90 statute miles. Elapsed time (Center to Center): 3 hrs., 44 min., 53.88 sec.
National (U.S.) Record .... Same as above.

NEW YORK, N. Y., TO LOS ANGELES, CALIFORNIA
World Class Record .... 554.949 mph.
Lt. John M. Conroy, USANG, United States, North American F-86 A Sabre Jet, General Electric J-47-13 jet engine, May 21-22, 1955 (GMT). Distance: (Center to Center): 2,445.9 statute miles. Elapsed time: 4 hrs., 24 min., 26.64 sec.
National (U.S.) Record .... Same as above.

LOS ANGELES-NEW YORK-LOS ANGELES
World Class Record .... 432.616 mph.
Lt. John M. Conroy, USANG, United States, North American F-86 A Sabre Jet, General Electric J-47-13 jet engine, May 21-22, 1955 (GMT). Distance, (Twice Center to Center): 4,891.8 statute miles; elapsed time: 11 hrs., 18 min., 27.0 sec.
National (U.S.) Record .... Same as above.

WASHINGTON, D. C. TO HAVANA, CUBA
World Class Record .... 314.070 mph.
Woodrow W. Edmondson, United States, North American P-51 monoplane, Packard Rolls Royce 1,450 hp engine, from Washington National Airport to Rancho Boyeros Airport, Nov. 25, 1947. Elapsed Time; 3 hr. 37 min. 28.6 sec.
National (U.S.) Record .... Same as above

HAVANA, CUBA TO WASHINGTON, D. C.
World Class Record .... 350.328 mph.
Woodrow W. Edmondson, United States, North American P-51 monoplane, Packard Rolls Royce 1,450 hp engine, from Rancho Boyeros Airport to Washington National Airport, Nov. 27, 1947. Elapsed Time: 3 hr. 15 min. 13 sec.
National (U.S.) Record .... Same as above

CAPETOWN, AFRICA TO LONDON, ENGLAND
World Class Record — 452.760 mph.
W/C A. H. Humphrey, pilot; Sqdn. Ldr. D. Bower and Sqdn. Ldr. R. F. B. Powell, navigators; Great Britain, English Electric Canberra B. MK II WH 699 aircraft, 2 Rolls Royce Avon R.A.3 jet engines. Dec. 19, 1953. Elapsed time: 13 hr., 16 min., 25.2 sec.
National (U.S.) Record — No official record.

LONDON, ENGLAND TO ROME, ITALY
World Class Record — 447.219 mph.
John Cunningham and P. O. Bugge, Great Britain, de Havilland Comet DH-106 Mark I, 4 de Havilland Ghost Mark I jet engines, Mar. 16, 1950. Elapsed Time: 1 hr. 58 min. 37 sec.
National (U.S.) Record — No official record

ROME, ITALY TO LONDON, ENGLAND
World Class Record — 453.308 mph.
John Cunningham and P. O. Bugge, Great Britain, de Havilland Comet DH-106 Mark I, 4 de Havilland Ghost Mark I jet engines, Mar. 16, 1950. Elapsed Time: 1 hr. 58 min. 04 sec.
National (U.S.) Record — No official record

PARIS, FRANCE TO SAIGON, FRENCH INDO-CHINA
World Class Record — 67.926 mph.
Miss Maryse Hilsz, France, Caudron Simoun C. 635 airplane, Renault engine, from Le Bourget Airport to Tan Son Nhut Airport, Dec. 19-23, 1937. Elapsed Time: 96 hr. 36 min. 15 sec.
National (U.S.) Record — No official record.

PARIS, FRANCE TO HANOI, FRENCH INDO-CHINA
World Class Record — 111.976 mph.
Andre Japy, France, Caudron Simoun airplane, Renault 6Q01, number 71 motor, from Le Bourget, Paris to Gia Lam Airport, Hanoi, Nov. 15-18, 1936. Elapsed Time: 50 hr. 59 min. 49 sec.
National (U.S.) Record — No official record.

NEW YORK CITY, U.S.A. TO LONDON, ENGLAND
World Class Record — 169.227 mph.
Henry T. Merrill and John S. Lambe, pilots, United States, Lockheed Electra monoplane, Pratt and Whitney SHI engine, May 9-10, 1937. Elapsed Time: 20 hr. 29 min. 45 sec.
National (U.S.) Record — Same as above

LONDON, ENGLAND TO MELBOURNE, AUSTRALIA
World Class Record — 293.608 mph.
Capt. W. Baillie, pilot; Great Britain, BEA Vickers Viscount 700 G-AMAV airplane, 4 Rolls Royce Dart 503 RDA3 engines, Oct. 8-10, 1953. Elapsed time: 35 hrs., 46 min., 47.6 sec.
National (U.S.) Record — 121.267 mph
Roscoe Turner and Clyde Pangborn, Boeing 247-D monoplane, 2 Pratt and Whitney supercharged 550 hp engines, Oct. 20-24, 1934.

LONDON, ENGLAND TO SYDNEY, AUSTRALIA
World Class Record — 130.309 mph.
F/O A. E. Clouston and Victor Ricketts, Great Britain, de Havilland Comet monoplane, 2 D. H. Gipsy VI engines, Mar. 21-26, 1938. Elapsed Time: 80 hr. 56 min.
National (U.S.) Record — No official record.

SYDNEY, AUSTRALIA TO LONDON, ENGLAND
World Class Record — 81.261 mph.
F/O A. E. Clouston and Victor Ricketts, Great Britain, de Havilland *Comet* monoplane, 2 D. H. Gipsy VI engines, Mar. 21-26, 1938. Elapsed Time: 130 hr. 3 min.
National (U.S.) Record — No official record.

LONDON, ENGLAND TO WELLINGTON, NEW ZEALAND
World Class Record — 194.657 mph.
Air Commodore N. H. d'Aeth, Squadron Leader J. S. Aldridge, Flight Lt. D. D. Hurditch, and crew, Great Britain, Modified Avro Lancaster Aries, 4 Rolls Royce Merlin engines of 1,200 hp each, Aug. 21-24, 1946. Elapsed Time: 59 hr. 50 min.
National (U.S.) Record — No official record.

WELLINGTON, NEW ZEALAND TO LONDON, ENGLAND
World Class Record — 83.454 mph.
A. F. Clouston and Victor Ricketts, Great Britain; D. H. Comet airplane, 2 D. H. Gypsy VI engines, Mar. 20-26, 1938. Elapsed Time: 140 hr. 12 min.
National (U.S.) Record — No official record.

LONDON, ENGLAND TO CAPETOWN, AFRICA
World Class Record — 486.581 mph.
W/C G. G. Petty, pilot; Sqdn. Ldr. T. P. MacGarry and Sqdn. Ldr. J. McDonald Craig, navigators; English Electric Canberra B. MK II, WH 699 aircraft, 2 Rolls Royce Avon R.A.3 jet engines, Dec. 17, 1953. Elapsed time; 12 hr., 21 min., 3.8 sec.
National (U.S.) Record — No official record.

LONDON, ENGLAND TO KARACHI, INDIA
World Class Record .... 256.110 mph.
S/Ldr. Neville Duke, Great Britain, Hawker Fury K.857, Bristol Centaurus XVIII 2,500 hp engine, May 12, 1949 Elapsed time: 15 hr., 18 min., 36 sec.
National (U.S.) Record .... No official record.

LONDON, ENGLAND TO DARWIN, AUSTRALIA
World Class Record .... 189.523 mph.
Air Commodore N. H. d'Aeth, Squadron Leader J. S. Aldridge, Flight Lt. D. D. Hurditch, and crew, Great Britain, Modified Avro Lancaster *Aries*, 4 Rolls Royce Merlin engines, 1,200 hp each, Aug. 21-22, 1946. Elapsed Time: 45 hr. 35 min.
National (U.S.) Record .... No official record.

PARIS, FRANCE TO TANANARIVO, MADAGASCAR
World Class Record .... 94.391 mph.
Genin and Robert, France, Caudron Simoun airplane, Renault 180 hp engine, from Le Bourget airport to Ivato airport, Dec. 18-21, 1935. Elapsed Time: 57 hr. 35 min. 21 sec.
National (U.S.) Record .... No official record

TOKYO, JAPAN TO LONDON, ENGLAND
World Class Record .... 101.193 mph.
Masaaki Linuma and Kenji Tsukaloshi, Japan, Kamikase monoplane, type *Karigane*, Mitsubishi *Nakajima* 550 hp engine, Apr. 6-9, 1937. Elapsed Time: 94 hr. 17 min. 56 sec.
National (U.S.) Record .... No official record.

ROME, ITALY TO RIO DE JANEIRO, BRAZIL
World Class Record .... 137.923 mph.
Attileo Biseo, Magg. Amedeo Paradisi, S. Ten. Giovanni Vitalini Sacconi, pilots; Ubaldo Ardu, mechanic; Giovanni Cubeddu, radio operator; Italy, S.79 I-Bise airplane, 3 Alfa Romeo 126 RC.34 750 hp engines, Jan. 24-25, 1938. Elapsed Time: 41 hr. 32 min.
National (U.S.) Record .... No official record

ROME, ITALY TO ADDIS ABABA, ETHIOPA
World Class Record .... 242.938 mph.
M. Lualdi, G. Mazzotti and E. Valente, pilots; S. Pinna, radio telegrapher and G. Guerrini, mechanic; Italy; Fiat BR. 20 L airplane, 2 Fiat Asso 80 1,000 hp motors, Mar. 6-7, 1939. Elapsed Time: 11 hr. 25 min.
National (U.S.) Record .... No official record.

BERLIN, GERMANY TO NEW YORK CITY, N. Y., U.S.A.
World Class Record .... 158.759 mph.
Alfred Henke and Rudolf Freiherr von Moreau, pilots; Paul Dierberg, radiomecanicien and Walter Kober, radiotelegraphiste; Germany, Focke-Wulf FW 200 Condor airplane, 4 BMW 132 L motors, 750 hp each, Aug. 10-11, 1938. Elapsed Time: 24 hr. 56 min. 12 sec.
National (U.S.) Record .... No official record

NEW YORK, N. Y., U.S.A., TO BERLIN, GERMANY
World Class Record .... 199.409 mph.
Alfred Henke and Rudolf Freiherr von Moreau, pilots; Paul Dierberg, radiomecanicien, and Walter Kober, radiotelegraphiste; Germany; Focke-Wulf FW 200 Condor airplane, 4 BMW 132 L motors, 750 hp each, Aug. 13-14, 1938. Elapsed Time: 19 hr. 55 min. 1 sec.
National (U.S.) Record .... No official record.

BERLIN, GERMANY TO TOKYO, JAPAN
World Class Record .... 119.494 mph.
Alfred Henke and H. R. Freiherr von Moreau, pilots; P. Dierberg, radiomecanicien; W. Kober, radiotelegraphiste, and G. Kohne, mechanic; Germany, Focke-Wulf FW 200 Condor airplane; 4 BMW 132 L motors, 750 hp each, from Tempelhof to Tachikawa, Nov. 28-30, 1938. Elapsed Time: 46 hr. 18 min. 19 sec.
National (U.S.) Record .... No official record

BERLIN, GERMANY TO HANOI, FRENCH INDO-CHINA
World Class Record .... 151 mph.
Alfred Henke and H. R. Freiherr von Moreau, pilots; P. Dierberg, radiomecanicien; W. Kober, radiotelegraphiste, and G. Kohne, mechanic; Germany, Focke-Wulf FW 200 Condor airplane; 4 BMW 132 L motors, 750 hp each, from Tempelhof to Gia Lam, Nov. 28-30, 1938. Elapsed Time: 34 hr. 17 min. 27 sec.
National (U.S.) Record .... No official record.

LONDON, ENGLAND TO PARIS, FRANCE
World Class Record .... 669.475 mph.
Lt. Comdr. M. J. Lithgow, Great Britain; Vickers-Armstrong Supermarine Swift Mark IV, WK.198 aircraft, Rolls Royce Avon RA.7 jet engine, July 5, 1953.
National (U.S.) Record .... No official record

PARIS, FRANCE TO LONDON, ENGLAND
World Class Record .... 664.425mph.
Lt. Comdr. M. J. Lithgow, Great Britain, Vickers-Armstrong Supermarine Swift Mark IV, WK.198 aircraft, Rolls Royce RA.7 jet engine, July 5, 1953.

National (U.S.) Record .... No official record.

LONDON, ENGLAND TO CAIRO, EGYPT

World Class Record .... 426.607 mph.

John Cunningham, D.S.O., D.F.C., Great Britain, de Havilland DH-106 Mark I Comet, 4 Ghost D. Gt. 3 jet engines, Apr. 24, 1950. Elapsed Time: 5 hr. 6 min. 58.3 sec.

National (U.S.) Record .... No official record

CAIRO, EGYPT TO LONDON, ENGLAND

World Class Record .... 385.887 mhp.

John Cunningham, D.S.O., D.F.C., Great Britain, de Havilland DH 106 Mark I Comet, 4 Ghost D. Gt. 3 jet engines, May 11, 1950. Elapsed Time: 5 hr. 39 min. 21.7 sec.

National (U.S.) Record .... No official record.

LONDON, ENGLAND TO COPENHAGEN, DENMARK

World Class Record .... 541.417 mph.

Janusz Zurakowski, Great Britain, Gloster Meteor Mk. F8 V2468, 2 Rolls Royce Derwent V jet engines, Apr. 4, 1950. Elapsed Time: 1 hr. 5 min. 5 sec.

National (U.S.) Record .... No official record

COPENHAGEN, DENMARK TO LONDON, ENGLAND

World Class Record .... 500.670 mph.

Janusz Zurakowski, Great Britain, Gloster Meteor Mk. F8, 2 Rolls Royce Derwent V jet engines, Apr. 4, 1950. Elapsed Time; 1 hr. 11 min. 17 sec.

National (U.S.) Record .... No official record

GIBRALTAR TO LONDON, ENGLAND

World Class Record .... 435.886 mph.

Group Capt. A. C. P. Carner, Great Britain, de Havilland Hornet F Mark III, 2 Rolls Royce Merlin 130, 2,030 hp engines, Sept. 19, 1949. Elapsed Time: 2 hr. 30 min. 21 sec.

National (U.S.) Record .... No official record.

LONDON, ENGLAND TO LA VALETTE, FRANCE

World Class Record .... 387.896 mph.

Lt. Commander W. R. MacWhirter, Lt. P. C. S. Chilton, Lt. D. A. Hook and Lt. D. W. Morgan, Great Britain, Hawker XI Sea Fury, Bristol Centaurus XVIII 2,560 hp engine, July 19, 1949. Elapsed time: 3 hr. 20 min. 49 sec.

National (U.S.) Record .... No official record.

LONDON, ENGLAND TO KHARTOUM, EGYPT

World Class Record .... 481.126 mph.

Grp. Capt. John Cunningham, Great Britain, de Havilland Comet, Series 2, G-AMXA, 4 Rolls Royce Avon 503 engines, Jan. 22, 1954. Elapsed time: 6 hr., 22 min., 7.2 sec.

National (U.S.) Record .... No official record.

BELFAST, IRELAND TO GANDER, NEWFOUNDLAND

World Class Record .... 481.099 mph.

Roland P. Beamont, pilot; D. A. Watson, navigator; R. Rylands, radio operator, Great Britain, English Electric Canberra B. Mark 2, WD 940 aircraft, two Rolls Royce Avon RA 3 jet engines, Aug. 31, 1951. Distance: 2,071.7 mi.; Duration: 4 hr. 18 min. 24.4 sec.

National (U.S.) Record .... No official record.

LONDON, ENGLAND TO BRUSSELS, BELGIUM

World Class Record .... 665.890 mph.

David W. Morgan, Great Britain, Vickers Armstrong Supermarine Swift, Rolls Royce Avon R.A.7 jet engine, July 10, 1952. Elapsed time: 18 min., 3.3 sec.

National (U.S.) Record .... No official record.

LONDON, ENGLAND TO TRIPOLI, LYBIA

World Class Record .... 538.119 mph.

Squad. Ldr. L. C. E. De Vigne, pilot; Flt. Lt. P. A. Hunt, navigator; Great Britain, English Electric Canberra, BMK2, 2 Rolls Royce Avon MK.1 jet engines, from London Airport to Castel Benito Airport, Feb. 18, 1952. Elapsed time: 2 hr., 41 min., 49.5 sec.

GANDER, NEWFOUNDLAND TO BELFAST, IRELAND

World Class Record .... 605.527 mph.

Wing Comm. R. P. Beamont, pilot; P. Hillwood, co-pilot; D. A. Watson, navigator, Great Britain, English Electric Canberra VX 185, two Rolls Royce Avon engines, Aug. 26, 1952.

BELFAST-GANDER-BELFAST

World Class Record .... 411.992 mph.

Wing Comm. R. P. Beamont, pilot; P. Hillwood, co-pilot; D. A. Watson, navigator, Great Britain, English Electric Canberra VX 185, two Rolls Royce Avon engines, Aug. 26, 1952.

LONDON, ENGLAND, TO CHRISTCHURCH, NEW ZEALAND
World Class Record .... 493.540 mph.
Flt. Lt. R. L. E. Burton, pilot; Flt. Lt. D. H. Gannon, navigator; Great Britain, English Electric Canberra P.R. MK III WE 139 airplane, 2 Rolls Royce Avon R.A. 3 jet engines, Oct. 8-9, 1953. Elapsed time: 23 hr., 50 min., 42 sec.
National (U.S.) Record .... No official record.

LOS ANGELES, CALIFORNIA, TO PARIS, FRANCE
World Class Record .... 276.311 mph.
Capt. Charles Billet, pilot; Philippe Wertheimer, co-pilot; Robert Girard, radio operator; Pierre Lemaitre, mechanic, France; Douglas DC-6, Pratt & Whitney R-2800 engine on May 28-29,, 1953. Elapsed time: 20 hr., 26 min.
National (U.S.) Record .... No official record.

LONDON, ENGLAND, TO BASRA, IRAQ
World Class Record .... 544.327 mph.
Flight Lieut. R. L. E. Burton, pilot; Flight Lieut. D. H. Gannon, Navigator; Great Britain; English Electric Canberra P.R. MK III aircraft, 2 Rolls Royce Avon R.A. 3 jet engines, Oct. 8, 1953. Elapsed time: 5 hr., 11 min., 5.6 sec.
National (U.S.) Record .... No official record.

LONDON, ENGLAND, TO COLOMBO, CEYLON
World Class Record .... 519.468 mph.
Wing Comdr. L. M. Hodges, pilot; Sqdn. Ldr. R. Currie, Navigator, Great Britain; English Electric Canberra P.R. MK VII, 2 Rolls Royce Avon R.A. 7 jet engines, Oct. 8-9, 1953. Elapsed time: 10 hr., 25 min., 21.5 sec.
National (U.S.) Record .... No official record.

LONDON, ENGLAND, TO AMSTERDAM, HOLLAND
World Class Record .... 571.511 mph.
Lt. J. R. S. Overbury, RN, pilot; Great Britain, Hawker Sea Hawk F.B. 3 airplane, Rolls Royce Nene Mark 101 jet engine, from Bovington Airport to Schipol Airport, July 29, 1954. Elapsed time: 23 min., 30.9 sec.
National (U.S.) Record .... No official record.

HAVANA, CUBA, TO MADRID, SPAIN (COMMERCIAL TRANSPORT)
World Class Record .... 303.936 mph.
Ramon de la Pena Moulie, pilot; Sres Pena, Imaz, Martinez, German, G. Usera, Balaguer y San Salvador, crew; Spain, Iberian Airlines Lockheed Super Constellation, L-1049E, 4 Wright Turbo Compound engines, October 23-24, 1954. Elapsed time; 15 hr., 20 min.
National (U.S.) Record .... No official record.

NEW YORK, NEW YORK, TO MADRID, SPAIN (COMMERCIAL TRANSPORT)
World Class Record .... 378.973 mph.
Cecilio Imaz Batida, pilot; Bengoa, Rein Loring, G. Usera, Vega S. Salvador and Vicente y Triguero, crew; Spain, Iberian Airlines Lockheed Super Constellation, L-1049E, 4 Wright Turbo Compound engines, November 26-27, 1954. Elapsed time: 9 hr., 26 min.
National (U.S.) Record .... No official record.

PARIS, FRANCE, TO NICE, FRANCE
World Class Record .... 610.454 mph.
Gerard Muselli, pilot; E. Corniglion-Molinier, navigator; France, Mystere IV N, "Avon" turbojet, with afterburner, June 18, 1955. Elapsed time: 41 min., 55.8 sec.
National (U.S.) Record .... No official record.

OTTAWA, CANADA, TO LONDON, ENGLAND
World Class Record .... 496.824 mph.
Sqd. Ldr. I. G. Broom, pilot; Sqd. Ldr. D. Bower and Sqd. Ldr. R. A. Seymour, navigators; Great Britain, English Electric Canberra "Aries IV," 2 Rolls Royce "Avon" Mark I jet engines, June 27-28, 1955. Elapsed time: 6 hr., 42 min., 12 sec.
National (U.S.) Record .... No official record.

OFFICIAL NATIONAL TRANSCONTINENTAL AND INTER-CITY RECORDS

WEST TO EAST TRANSCONTINENTAL (JET PROPELLED)

Lt. Col. Robert R. Scott, USAF, United States, Republic F-84F Thunderstreak, Wright J-65B3 jet engine, from International Airport, Los Angeles, Calif., to Floyd Bennett Field. Brooklyn, N. Y., March 9, 1955. Distance (Center to Center): 2,445.90 statute miles; Elapsed time (Center to Center): 3 hours, 44 minutes, 53.88 seconds. Average Speed: 652.522 mph.

WEST TO EAST TRANSCONTINENTAL (MULTI-ENGINE MILITARY AIRCRAFT)
Col. C. S. Irvine, pilot; Lt. Col. G. R. Stanley, co-pilot; Lt. Col. F. J. Shannon, Maj. K. L Royer, Capt. W. J. Bennett, Capt. R. A. Saltzman, M/Sgt. D. E. West, T/Sgt. J. F. Broughton, crew; USAAF; Boeing B-29 monoplane, 4 Wright R-3350-23A engines; from Burbank, Cal. to Floyd Bennett Field, Brooklyn, Dec. 11, 1945. Distance: 2,457 mi. Elapsed Time: 5 hr. 27 min. 19.2 sec. Average Speed: 450.385 mph.

LOS ANGELES, CAL. TO MEXICO CITY, D. F.
A. Paul Mantz, North American F-51 monoplane, NX-1204, Packard built Rolls Royce Merlin 1,450 hp engine, from Lockheed Air Terminal, Burbank to Mexico City Airport, Mar. 8, 1950. Distance: 1,560.767 mi. Elapsed Time: 3 hr. 34 min. 45 sec. Average Speed: 436.070 mph.

WEST TO EAST TRANSCONTINENTAL (SINGLE RECIPROCATING ENGINE-SOLO)
Joe DeBona, North American F-51C, N 5528 N, Packard Merlin 1650 engine, from Los Angeles International Airport to Idlewild Airport, Mar. 31, 1954. Distance: 2,469.92 mi. Elapsed time: 4 hr., 24 min., 17 sec. Average speed: 560.744 mph.

WEST TO EAST TRANSCONTINENTAL (COMMERCIAL TRANSPORT AIRCRAFT)
Capt. Joseph B. Glass, pilot; J. W. Hayes, 1st officer; H. W. Hornbach, flight engineer; and 39 passengers; American Airlines' Douglas DC-7, 4 Wright Turbo Compound 3,250 hp. engines, from Los Angeles International Airport to Idlewild, N. Y., Mar. 29, 1954. Distance: 2,469,92 mi. Elapsed time: 5 hr., 10 min. Average speed: 400.528 mph.

EAST TO WEST TRANSCONTINENTAL (SINGLE RECIPROCATING ENGINE-SOLO)
A. Paul Mantz, North American P-51 monoplane, NX-1202, Packard Merlin 1,650 engine, 1,450 hp, from La Guardia Airport, Jackson Heights, L. I., N. Y., to Lockheed Air Terminal, Burbank, Cal., Sept. 3, 1947. Distance: 2,453.805 mi. Elapsed Time: 7 hr. 00 min. 4 sec. Average Speed: 350.488 mph.

EAST TO WEST TRANSCONTINENTAL (MULTI-ENGINE MILITARY AIRCRAFT)
Capt. Boyd L. Grubaugh, pilot; Capt. J. L. England, co-pilot; and M/Sgt. R. R. Pierron, M/Sgt. D. H. Atkins, M/Sgt. T. L. Wolfe, T/Sgt. D. B. Smith, crew; USAAF, Boeing B-29 monoplane, 4 Wright R-3350-23A engines, from La Guardia Airport, L. I., N. Y., to Lockheed Air Terminal, Burbank, Cal., Aug. 1, 1946. Distance: 2,453.805 mi. Elapsed Time: 7 hr. 28 min. 3 sec. Average Speed: 328.598 mph.

LOS ANGELES, CAL. TO WASHINGTON, D. C.
Lt. Col. H. F. Warden, pilot; Capt. G. W. Edwards, co-pilot; Douglas XB-42 monoplane, 2 Allison V-1710-129 engines, 1,820 hp each, from Long Beach Municipal Airport to Bolling Field, Anacostia, D. C., Dec. 8, 1945. Elapsed Time: 5 hr. 17 min. 34 sec. Distance: 2,295 mi. Average Speed: 433.610 mph.

LOS ANGELES, CAL. TO MIAMI, FLA. (TRANSPORT AIRCRAFT)
Capt. David P. Gannon, pilot; Capt. L. J. Royal, co-pilot; National Airlines, Douglas DC-7, N 82054, 4 Wright Turbo Compound 3250 hp engines, from Clover Field, Santa Monica, to Miami International Airport, Nov. 21, 1953. Elapsed time: 5 hr., 50 min., 12 sec. Distance: 2,341.32 mi. Average speed: 401.140 mph.

LOS ANGELES, CAL. TO JACKSONVILLE, FLA. (TRANSPORT AIRCRAFT)
Capt. Thomas P. Ball and W. Lee McBride, III, pilots; crew of three; Delta-C&S Air Lines, Douglas DC-7, 4 Wright Turbo Compound 3,250 hp engines, from Clover Field, Santa Monica, to Jacksonville Municipal Airport, Mar. 18, 1954. Elapsed time: 5 hr., 29 min., 33 sec. Distance: 2,154.448 mi. Average speed: 392.252 mph.

LOS ANGELES, CAL. TO TAMPA, FLA. (TRANSPORT AIRCRAFT)
G. T. Baker, pilot; J. Bailey, co-pilot; and 17 passengers; Northwest Airlines' Douglas DC-6, NC-90891, 4 Pratt and Whitney 2,100 hp engines, from Clover Field, Santa Monica to Drew Field, June 3, 1947. Elapsed Time: 6 hr. 5 min. 10 sec. Distance: 2,157 mi. Average Speed: 354.413 mph.

LOS ANGELES, CAL. TO ATLANTA, GA.
Capt. Charles H. Dolson and R. W. Tiller, Delta C&S Air Lines' Douglas DC-7, 4 Wright 3,250 hp Turbo Compound engines, from Clover Field, Santa Monica, to Atlanta Municipal Airport, Apr. 9, 1954. Elapsed time: 5 hr., 15 min., 26 sec. Distance: 1,944.01 mi. Average speed: 369.174 mph.

LOS ANGELES, CAL. TO CHARLESTON, S. C. (TRANSPORT AIRCRAFT)
Capt. T. P. Ball and Capt. John Van Buren, pilots, six passengers; Delta Airlines' Douglas DC-6, 4 Pratt and Whitney R-2800-CA-15 1,800 hp engines, from Clover Field, Santa Monica to Charleston Municipal Airport, Nov. 6, 1948. Elapsed Time: 6 hr. 24 min. 32 sec. Distance: 2,203 mi. Average Speed: 344.192 mph.

ATLANTA, GA., TO NEW YORK, N. Y. (TRANSPORT AIRCRAFT)
H. T. Merrill and Clifford Zieger, pilots; Eastern Airlines' Lockheed Constellation, NC-108A, 4 Wright 3350 engines, 2,500 hp each, from Atlanta Municipal Airport to La Guardia Airport, Aug. 5, 1947. Elapsed Time: 2 hr. 36 min. 20 sec. Distance: 759.707 mi. Average Speed: 291.572 mph.

NEW YORK, N. Y. TO HAVANA, CUBA
Col. A. P. de Seversky, Modified Seversky P-35 monoplane, powered with a Pratt and Whitney 1830-9 850 hp engine, from Floyd Bennett Field to Camp Columbia, Havana, Dec. 3, 1937 Elapsed Time: 5 hr. 3 min. 5.4 sec. Distance: 1,307 mi. Average Speed: 258.735 mph.

NEW YORK, N. Y., TO HOUSTON, TEX.
Henry T. Merrill, pilot, J. D. Scott, co-pilot; Eastern Airlines' Lockheed Constellation, NC-102A, 4 Wright 2,100 hp engines from La Guardia Airport, Jackson Heights, L. I. to Houston Municipal, June 6, 1947. Elapsed Time: 4 hr. 39 min. 3 sec. Distance: 1,425.5 mi. Average Speed: 306.504 mph.

HOUSTON, TEX. TO NEW YORK, N. Y. (TRANSPORT AIRCRAFT)
Henry T. Merrill, pilot, J. D. Scott, co-pilot; Eastern Airlines' Lockheed Constellation, NC-102A, 4 Wright 2,100 hp engines, from Houston Municipal to La Guardia Airport, June 6, 1947. Elapsed Time: 4 hr. 41 min. 35 sec. Distance: 1,425.5 mi. Average Speed: 303.746 mph.

NEW YORK, N. Y. TO MIAMI, FLA. (TRANSPORT AIRCRAFT)
E. R. Brown, pilot; E. H. Parker, co-pilot; Eastern Airlines' Lockheed Constellation, 4 Wright engines, 2,100 hp each, from La Guardia Airport to 36th Street Airport, May 28, 1947. Elapsed Time: 3 hr. 58 min. 41.2 sec. Distance: 1,096.427 mi. Average Speed: 275.615 mph.

MIAMI, FLA. TO NEW YORK, N Y. (TRANSPORT AIRCRAFT)
E. R. Brown, pilot; E. H. Parker, co-pilot; Eastern Airlines' Lockheed Constellation, NC-102A, 4 Wright engines, 1,200 hp each, from 36th Street Airport to La Guardia Airport, May 28, 1947. Elapsed Time: 3 hr. 29 min. 11.4 sec. Distance: 1,096.427 mil. Average Speed: 314.477 mph.

NEW YORK, N. Y. TO NEW ORLEANS, LA. (TRANSPORT AIRCRAFT)
H. T. Merrill and E. R. Brown, pilots; Eastern Airlines' Lockheed Constellation, NC-108A, 4 Wright 3350 engines, 2,500 hp each, from La Guardia Airport, L. I., to Moisant International Airport, July 23, 1947. Elapsed Time: 3 hr. 52 min. 29.8 sec. Distance: 1,182.466 mi. Average Speed: 305.157 mph.

NEW ORLEANS, LA. TO NEW YORK, N. Y. (TRANSPORT AIRCRAFT)
H. T. Merrill and E. R. Brown, pilots; Eastern Airlines' Lockheed Constellation, NC-108A, 4 Wright 3350 engines, 2,500 hp each, from Moisant International Airport to La Guardia Airport, L. I., July 23, 1947. Elapsed Time: 3 hr. 35 min. 10.8 sec. Distance: 1,182.466 mi. Average Speed: 329.714 mph.

NEW YORK, N. Y. TO WASHINGTON, D. C.
Capt. Martin L. Smith, USAF, Lockheed P-80 jet-propelled monoplane, Allison J-33-11 engine, from La Guardia Airport, Jackson Heights, L. I. to Washington National Airport, Apr. 21, 1946. Elapsed Time: 29 min. 15 sec. Distance: 214 mi. Average Speed: 438.974 mph.

MEXICO CITY, D. F. TO NEW YORK, N. Y.
Francisco Sarabia, Gee Bee monoplane, X-BAKE, Pratt and Whitney Hornet 980 hp engine, from the Military Airport, Mexico City to Floyd Bennett Field, May 24, 1939. Elapsed Time: 10 hr. 47 min. 46.8 sec. Distance: 2,087.5 mi. Average Speed: 193.353 mph.

HONOLULU, HAWAII TO NEW YORK, N. Y.
Lt. Col. Robert E. Thacker, pilot; 1st Lt. John M. Ard, co-pilot; North American P-82 monoplane, 2 Rolls Royce V-1650 engines, 2,250 hp each, from Hickam Field, Honolulu to La Guardia Airport, Jackson Heights, L. I., Feb. 28, 1947. Elapsed Time: 14 hr. 31 min. 50 sec. Distance: 4,968.852 mi. Average Speed; 341.959 mph.

CHICAGO, ILL. TO ATLANTA, GA. (TRANSPORT AIRCRAFT)
H. T. Merrill and S. A. Bell, pilots; Eastern Airlines' Lockheed Constellation, NC-108A, 4 Wright 3350 engines, 2,500 hp each, from Chicago Municipal Airport, to Atlanta Municipal Airport, Aug. 5, 1947. Elapsed Time: 1 hr. 48 min. 20 sec. Distance: 590.281 mi. Average Speed: 326.925 mph.

ATLANTA, GA. TO CHICAGO, ILL. (TRANSPORT AIRCRAFT)
H. T. Merrill and S. A. Bell, pilots; Eastern Airlines' Lockheed Constellation, NC-108A, 4 Wright 3350 engines, 2,500 hp each, from Atlanta Municipal Airport to Chicago Municipal Airport, Aug. 5, 1947. Elapsed Time: 2 hr. 1 min. 55 sec. Distance: 590.281 mi. Average Speed: 290.501 mph.

CHICAGO, ILL. TO LOS ANGELES, CAL.
Howard R. Hughes, Northrop Gamma monoplane, NR-13761, Wright Cyclone engine, from Chicago Municipal Airport to Grand Central Air Terminal, Glendale, Cal., May 14, 1936. Elapsed Time: 8 hr. 10 min. 29.8 sec. Distance: 1,734.5 mi. Average Speed: 212.172 mph.

CHICAGO, ILL. TO MIAMI, FLA. (COMMERCIAL TRANSPORT)
Capt. N. U. D. Buice and Flight Officer L. F. Woodruff, pilots; F. C. Stevens, Jr., Flight Engineer; two stewardesses and 23 passengers; Delta-C & S Air Lines' DC-7 monoplane, N-4876 C, 4 Wright Turbo Compound 3,250 hp engines, from Midway Airport to Miami International Airport, January 13, 1955. Elapsed Time: 2 hr., 43 min., 00 sec. Distance, 1,183.368 statute miles. Average speed: 435.259 mph.

CHICAGO, ILL. TO WASHINGTON, D. C. (TRANSPORT AIRCRAFT)
Jack Frye, TWA, Northrop Gamma 2-D monoplane, NR-13758, Wright Cyclone 710 hp engine, from Chicago Municipal Airport to Washington-Hoover Airport, S. Washington, Feb. 18, 1936. Elapsed Time: 2 hr. 22 min. Distance: 599 mi. Average Speed: 253.098 mph.

VANCOUVER, B. C., CANADA TO AGUA CALIENTE, MEXICO
Frank W. Fuller, Jr., Seversky monoplane, NX-70Y, Pratt and Whitney Twin Row Wasp 1,100 hp engine, from Vancouver Airport to Agua Caliente Airport, Nov. 4, 1937. Elapsed Time: 4 hr. 54 min. Average Speed: 244 mph.

MIAMI, FLA. TO CHICAGO, ILL. (TRANSPORT AIRCRAFT)
Henry T. Merrill and P. L. Foster, pilots; Eastern Airlines' Lockheed Constellation, NC-105A, 4 Wright 3350 engines, 2,500 hp each, from 36th Street Airport to Chicago Municipal Airport, July 16, 1947. Elapsed Time: 3 hr. 56 min. 22 sec. Distance: 1,183.368 mi. Average Speed: 300.390 mph.

VANCOUVER, B. C., CANADA TO OAKLAND, CAL.
Frank W. Fuller, Jr., Seversky monoplane, NX-70Y, Pratt and Whitney Twin Row Wasp 1,100 engine, from Vancouver Airport to Oakland Airport, May 28, 1938. Elapsed Time: 3 hr. 8 min. 43 sec. Distance: 792.5 mi. Average Speed: 251.965 mph.

MARCH FIELD, CAL. TO MITCHEL FIELD, N. Y.
Lt. Ben S. Kelsey, USAF, Lockheed XP-38 airplane, 2 Allison liquid cooled 1,000 hp engines, Feb. 11, 1939. Elapsed Time: 7 hr. 45 min. 36 sec. Distance: 2,425 mi. Average Speed: 312.5 mph.

RIVERSIDE, CALIFORNIA, TO PHILADELPHIA, PA.
Maj. L. J. Stevens, Aircraft Commander; Maj. F. J. Weedman, pilot; Capt. G. L. Fornes, Observer; Boeing B-47 Stratojet, 6 General Electric J-47 engines of 5970 hp each, from March AFB, Riverside, Calif, to Philadelphia International Airport, Philadelphia, Pa., September 4, 1955. Elapsed time: 3 hrs., 57 min., 59.2 sec. Distance: 2,337.4 statute miles. Average speed: 589.294 mph.

WICHITA, KAN. TO LOS ANGELES, CAL.
Paul Mantz, Lockheed Orion NR-12222, from Wichita Airport to Union Air Terminal, July 4, 1938. Elapsed Time: 7 hr. 11 min. 5 sec. Distance: 1,201 mi. Average Speed: 167.160 mph.

DETROIT, MICH. TO AKRON, O.
Louise Thaden, Beechcraft biplane, NC-15835, from Detroit City Airport to Akron Municipal Airport, Jan. 21, 1937. Elapsed Time: 40 min. 43 sec. Distance: 123.5 mi. Average Speed: 181.989 mph.

DETROIT, MICH. TO MIAMI, FLA. (TRANSPORT AIRCRAFT)
H. T. Merrill and F. Bennett, pilots; Eastern Airlines' Lockheed Constellation, NC-113A, 4 Wright 3350 engines, 2,500 hp each, from Willow Run Airport to 36th Street Airport, Aug. 7, 1947. Elapsed Time: 3 hr. 36 min. 29 sec. Distance: 1,150.455 mi. Average Speed: 318.857 mph

TAMPA, FLA. TO MIAMI, FLA. (TRANSPORT AIRCRAFT)
G. T. Baker, pilot; J. Bailey, co-pilot; and passengers; National Airlines' Douglas DC-6, NC-90891, 4 Pratt and Whitney 2,100 hp engines, from Drew Field to 36th Street Airport, June 3, 1947. Elapsed Time: 39 min. 13 sec. Distance: 204.429 mi. Average Speed: 312.769 mph.

LOS ANGELES, CALIFORNIA, TO MEXICO CITY, D. F. (TRANSPORT AIRCRAFT)
Capt. Roberto Pini, pilot; Guillermo S. Prieto, co-pilot; Cia. Mexicana de Aviaçion Douglas DC-6, 4 Pratt and Whitney R-2800 engines, from Los Angeles International Airport to Mexico City Airport, Dec. 3, 1950. Elapsed time: 4 hr., 11 min., 50 sec. Distance: 1,551.941 mi. Average speed: 369.754 mph.

MEXICO CITY, D. F., TO LOS ANGELES, CAL.
A. L. Rodriques, North American P-51-D, NX-33699, Rolls Royce Merlin 68 engine, from Mexico City (Balbuena) Airport to Clover Field, Santa Monica, Cal., Dec. 17, 1946. Elapsed time; 4 hr., 24 min., 30 sec. Distance: 1,557.5 mi. Average speed: 353.308 mph.

LOS ANGELES, CALIFORNIA, TO DENVER, COLO.
Miss Dianna C. Cyrus, Douglas A-26, 2 Pratt and Whitney R-2800 engines, 2000 hp each, from Lockheed Air Terminal, Burbank, to Stapleton Airport, Denver, June 20, 1947. Elapsed time: 2 hr., 18 min., 58 sec. Distance: 836 mi. Average speed: 360.949 mph.

SAN FRANCISCO, CAL., TO LOS ANGELES, CAL.
Capt. R. D. Creighton, USAF, North American F-86-A, General Electric J-47-A jet engine, from San Francisco International Airport to Los Angeles International Airport, May 20, 1950. Elapsed time: 32 min. 56 sec. Distance: 339.121 miles. Average speed: 617.932 mph.

SAN FRANCISCO, CAL., TO SALT LAKE CITY, UTAH
Frank W. Fuller, Jr., Seversky monoplane, NX-70-Y, Pratt and Whitney Twin Row Wasp 1200 hp engine, from San Francisco Airport to Salt Lake Municipal Airport, Apr. 20, 1939. Elapsed time: 2 hr., 9 min., 44 sec. Distance: 598.5 mi. Average speed: 276.799 mph.

SAN FRANCISCO, CAL., TO SEATTLE, WASH.
Frank W. Fuller, Jr., Seversky NR-70-Y, Pratt and Whitney Twin Row Wasp 1,100 hp engine, from San Francisco Airport to Boeing Field, May 25, 1938. Elapsed time, 2 hr., 31 min., 41 sec. Distance: 684.5 mi. Average speed: 270.261 mph.

SAN FRANCISCO, CAL., TO SAN DIEGO, CAL.
Earl Ortman, Marcoux-Bromberg Special, Pratt and Whitney Wasp. Jr. 1195 hp engine, from Oakland Airport to Lindbergh Field, June 1, 1938. Elapsed time: 1 hr., 48 min., 1 sec. Distance: 447 mi. Average speed: 248.295 mph.

SAN FRANCISCO, CAL., TO PORTLAND, ORE.
Frank W. Fuller, Jr., Seversky NR-70-Y, Pratt and Whitney Twin Row Wasp engine, from San Francisco Airport to Pearson Field, Jan. 16, 1938. Elapsed time: 2 hr., 13 min., 53 sec. Distance: 553 mi. Average speed: 247.828 mph.

SAN FRANCISCO, CAL., TO PHOENIX, ARIZ.
Frank W. Fuller, Jr., Seversky monoplane, NR-70-Y, Pratt and Whitney Twin Row Wasp engine, from San Francisco Airport to Sky Harbor Airport, Jan. 16, 1939. Elapsed time: 2 hr., 11 min., 58 sec. Distance: 650.5 mi. Average speed: 295.757 mph.

SAN FRANCISCO, CAL., TO BOISE, IDA.
Frank W. Fuller, Jr., Seversky monoplane, NX-70-Y, Pratt and Whitney Twin Row Wasp 1,200 hp engine, from San Francisco Airport to Boise Municipal Airport, May 4, 1939. Elapsed time: 1 hr., 47 min., 26 sec. Distance: 525.5 mi. Average speed: 293.484 mph.

SAN FRANCISCO, CAL., TO DENVER, COLO.
Frank W. Fuller, Jr., Seversky monoplane, NX-70-Y, Pratt and Whitney Twin Row Wasp 1,200 hp engine, from San Francisco Airport to Denver Municipal Airport, June 7, 1939. Elapsed time; 3 hr., 22 min., 26.8 sec. Distance: 954 mi. Average speed: 282.741 mph.

SAN FRANCISCO, CAL., TO WASHINGTON, D. C. (TRANSPORT AIRCRAFT)
Capt Scott Flower, pilot; 1st Officer R. E. McDonald, co-pilot; crew of seven and nine passengers; Pan American Airways Boeing B-377 Stratocruiser, 4 Pratt and Whitney Wasp Major 4360 engines, from San Francisco Airport to Washington National Airport, Mar. 3. 1949. Elapsed time: 6 hr., 22 min., 25.4 sec. Distance: 2,436.917 miles. Average speed: 382.338 mph.

NEW YORK, N. Y., TO ATLANTA, GA. (TRANSPORT AIRCRAFT)
H. T. Merrill and Clifford Zieger, pilots; Eastern Airlines' Lockheed Constellation, 4 Wright 3350 engines, 2,500 hp each from La Guardia Airport to Atlanta Municipal Airport, Aug. 5, 1947. Elapsed time: 2 hr., 18 min., 06 sec. Distance: 759.707 mi. Average speed: 330.068 mph.

EDWARDS, CAL., TO VANDALIA, OHIO—NONSTOP—(Multi-Jet Engine Aircraft)
John J. Farley, pilot; Sherman Pruitt, Jr., navigator; Northrop F-89A 49-2448, two Allison J-35-A-21B jet engines, Edwards Air Force Base to Cox Municipal Airport, Sept. 7, 1953. Elapsed time; 3 hr., 45 min., 12.5 sec. Distance: 1,868.48 miles. Average speed: 497.800 mph.

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