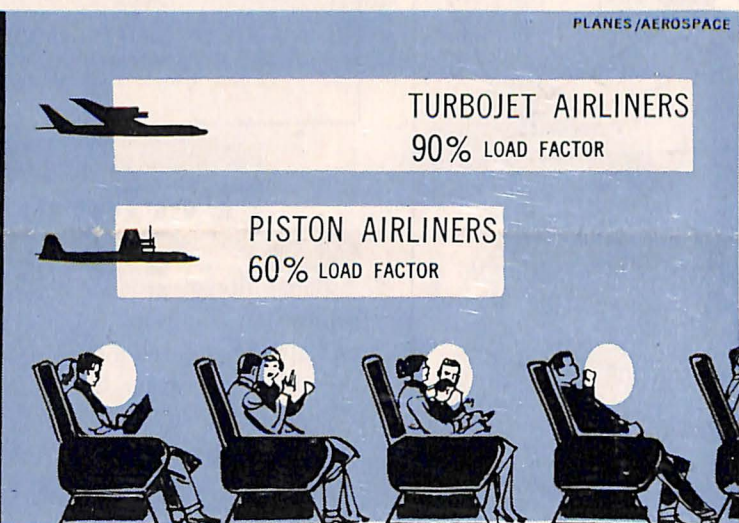


UNIQUE SPACE PLANS CHALLENGE INDUSTRY

Jet Travel Leads

The travelling public has entered the Civil Jet Age—in droves. During the first quarter of 1959, the load factor (number of passengers compared to number of seats available) of the scheduled airlines operating turbojet planes was 90 per cent, an unprecedented acceptance of a new mode of air travel. At the same time, the load factor for piston aircraft continued at 60 per cent, the average factor for all scheduled trunk carriers in 1958.



New Terms Give Look at Future

The fantastic space and missile projects under way in the aerospace industry are so unorthodox that unusual descriptive terms, which provide a glimpse of the future in space exploration and weaponry, are being created almost daily.

The Defense Department's Advanced Research Projects Agency recently listed their current contracts which range from "Electronically Steerable Array Radar" to a study of "Missile Phenomenology."

The bulk of the ARPA contracts have been assigned to the aerospace industry through participating military services. This agency which was established in February 1958, has as its assignment the direction and performance of certain advanced research and development projects. When a project assigned to ARPA has reached the development stage, the Secretary of Defense assigns its production and operational control to one or more of the military departments.

Work on such exotic problems as an "active repeater communication satellite," a "plasma electron study" and an "artificial electron clouds study" is reported by ARPA.

Here are some of the major projects being handled, to a large extent, by the aerospace industry:

Project Defender is the designation for the entire effort in the field of ballistic missile defense, and its goal is a feasible system for ballistic missile defense covering a period extending to about 1980. Included in this project is "GLIPAR"—Guide Line Identification Program for Anti-Missile Research. This element of the program is specifically aimed at encouraging highly imaginative, unorthodox ideas and plans which could pay off with systems to defend against present and future methods of delivering nuclear weapons on U. S. targets.

Project Midas is set up to develop an early warning system against ballistic missiles attacks, based on the use of satellites. The project will investigate the use of infra-red sensing devices to detect enemy missiles at the time they leave the launching pad.

Project Transit will explore the plan to use satellites for navigational purposes. This technique will provide an instantaneous, all weather

(See *ROCKET*, Page 7)

New Logistics Plan Proposed For Services

A comprehensive report, proposing a system to improve the interchange of logistics information between the military services and industry contractors, has been completed by a government-industry team.

Logistics experts estimate that several million dollars can be saved annually by using electronic data processing equipment to maintain accurate, up-to-the-minute records of the thousands of parts and design changes involved in today's weapon systems.

Ten months of intensive research and testing were required to prepare the report which will be submitted to the Department of Defense next month.

Here are some of the advantages the new system offers:

1. Data transmission speed and accuracy will be substantially increased.
2. Data interchange can be expanded to include several manufacturers involved in the same contract.
3. Variations in current methods of data interchange will be eliminated.

A study of the details of this proposal provides a high degree of compliance with both the intent and detailed provisions of the military services supply documents.

The project was first started more than two years ago when the Air Materiel Command requested the Aerospace Industries Association to participate in planning the utilization of mechanized data equipment in logistics.

A Logistics Study Group was formed, composed of Air Force members and representatives from several aircraft and missile companies. Later the group was expanded to include representatives from the Army, Navy and Department of Defense and other industrial associations.

Policies set by this group served to guide a task force known as the Military/Industry Logistics Data Development Unit (MILDDU). This group visited the military offices responsible for logistics, and manufacturing companies. Studies of available equipment and techniques were made.

Utilizing the pertinent data sys-

Air Traffic Reaches New High in 1958

Air traffic at airports and along the airways reached an all-time high during 1958, the Federal Aviation Agency reports.

Landings and takeoffs at the 213 traffic control towers operated by the FAA totaled 26,599,719 for the year—a six per cent increase over the previous year. General aviation operations were up 16 per cent, while military operations were down six per cent and air carrier operations, because of interrupted service due to airline strikes, were down two per cent.

Chicago (Midway) Airport continued to be the busiest airport in the country in both total operations and itinerant operations.

tem information gained from contact with various military and industry organizations, it was found that a single data exchange system could be designed using a standardized punched card record length as the base for development. The use of punched card, magnetic and punched paper tape and hard copy (manual) transmissions has been taken into consideration in the design of this system. Consideration has also been given in the design of formats to permit immediate use of the data flow system by both military and industry organizations.

This proposal has as its primary distinguishing characteristic, the provisions for interchange of logistics support data in two-way transmission between the military activity and the industry contractor, and to provide for its universal application to the several levels of data processing capability which can exist at the two terminals of the "transmission line."

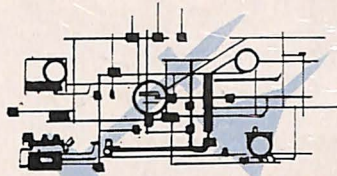
The system features flexibility and applicability through the standardization of data elements, and also provides for expansion of the system to other fields through its coding and control structure.

Future plans for this proposal after its expected acceptance by the Department of Defense includes service testing in the field under various "capability-combinations." This is to be followed by extensive implementation with both military and industry organizations. Later it is expected that the principles and techniques presented in this proposal will be extended to other functions.

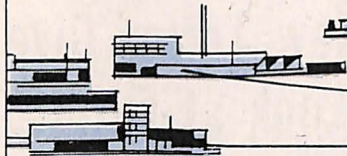
Plane Views

8000 PARTS
PER CUBIC FOOT

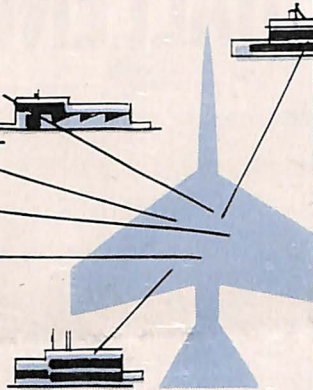
TODAY'S TV SET CONTAINS 8,000 PARTS PER CUBIC FOOT. GOAL OF THE AEROSPACE INDUSTRY IN MINIALIZATION IS 600,000 PARTS PER CUBIC FOOT.



600,000 PARTS
PER CUBIC FOOT



A NEW BOMBER AND FIGHTER NOW UNDER DEVELOPMENT WILL REQUIRE APPROXIMATELY 20,000 SUPPLIERS.



2,000,000
ENGINEERING HOURS
87,323

A SUPERSONIC FIGHTER-BOMBER REQUIRED ABOUT 2,000,000 ENGINEERING HOURS FROM DESIGN TO FIRST FLIGHT COMPARED WITH 87,323 FOR A WORLD WAR II MODEL.



PLANES/AEROSPACE

Aerospace Quote

"With the great responsibility we have to defend the United States we cannot discard our tried and proved manned aircraft weapon systems until we find something that we positively know is better. We know that the manned systems we have in the Air Force today are dependable and can do the job.

"Regardless of the progress we have made in missiles the manned aircraft of the Strategic and Tactical Air Commands today are the greatest deterrent we have in the world against aggression.

"While missiles are being and will be integrated into the Air Force inventory as fast as they are ready to effectively perform their mission we will continue in the future to have a mixed force of manned aircraft and missiles.

"I cannot foresee the day when man will ever be completely replaced by a robot equipped with electronic brains. Electronic black boxes will never be able to think, exercise judgment or make spot decisions like the human brain."—Lt. Gen. Roscoe C. Wilson, Deputy Chief of Staff, Development, USAF, May 15, 1959.

Spacecraft Controls Are Simulated

Scientists in an aerospace company are investigating methods of controlling future spacecraft in an open framework machine that looks like something from a carnival midway.

Called a reaction control simulator, the odd-looking machine is one more step in the company's drive to provide the tools with which to explore the universe.

Since there is no air beyond the earth's atmosphere, ordinary aerodynamic controls such as rudders, elevators or ailerons acting on an air stream would be useless.

In current experiments with the simulator compressed air is being used for control. Blasts of compressed air released from various nozzles on the craft cause it to change direction.

Other methods of control will be tried. Flywheels and large gyroscopes are among these. Forces resulting from accelerating a flywheel or gyroscope will cause the vehicle to move in the opposite direction.

The simulator can be adapted to represent a whole range of spacecraft of different sizes. This is done by varying the position and size of metal weights.

PLANES-AEROSPACE

Planes-Aerospace is an official publication of the Aerospace Industries Association of America, Inc., the national trade association of the designers, developers and manufacturers of aircraft, missiles, spacecraft, their propulsion, navigation and guidance systems and other aeronautical systems and their components.

The purpose of *Planes-Aerospace* is to:

Foster public understanding of the role of the aerospace industry in insuring our national security through development and production of advanced weapon systems for our military services and allies;

Foster public understanding of commercial and general aviation as prime factors in domestic and international travel and trade.

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Editor: Gerald J. McAllister

Art Director: James J. Fisher

Performance Pay-Off

Reliability of product has long been the distinguishing design and production tradition of the aircraft and engine industry. Its engines and airframes carry service guaranties that are unequalled by any other industry. For example, a transport aircraft first produced more than 25 years ago, and still in service, continues to receive the services of technical representatives of the engine and airframe manufacturers.

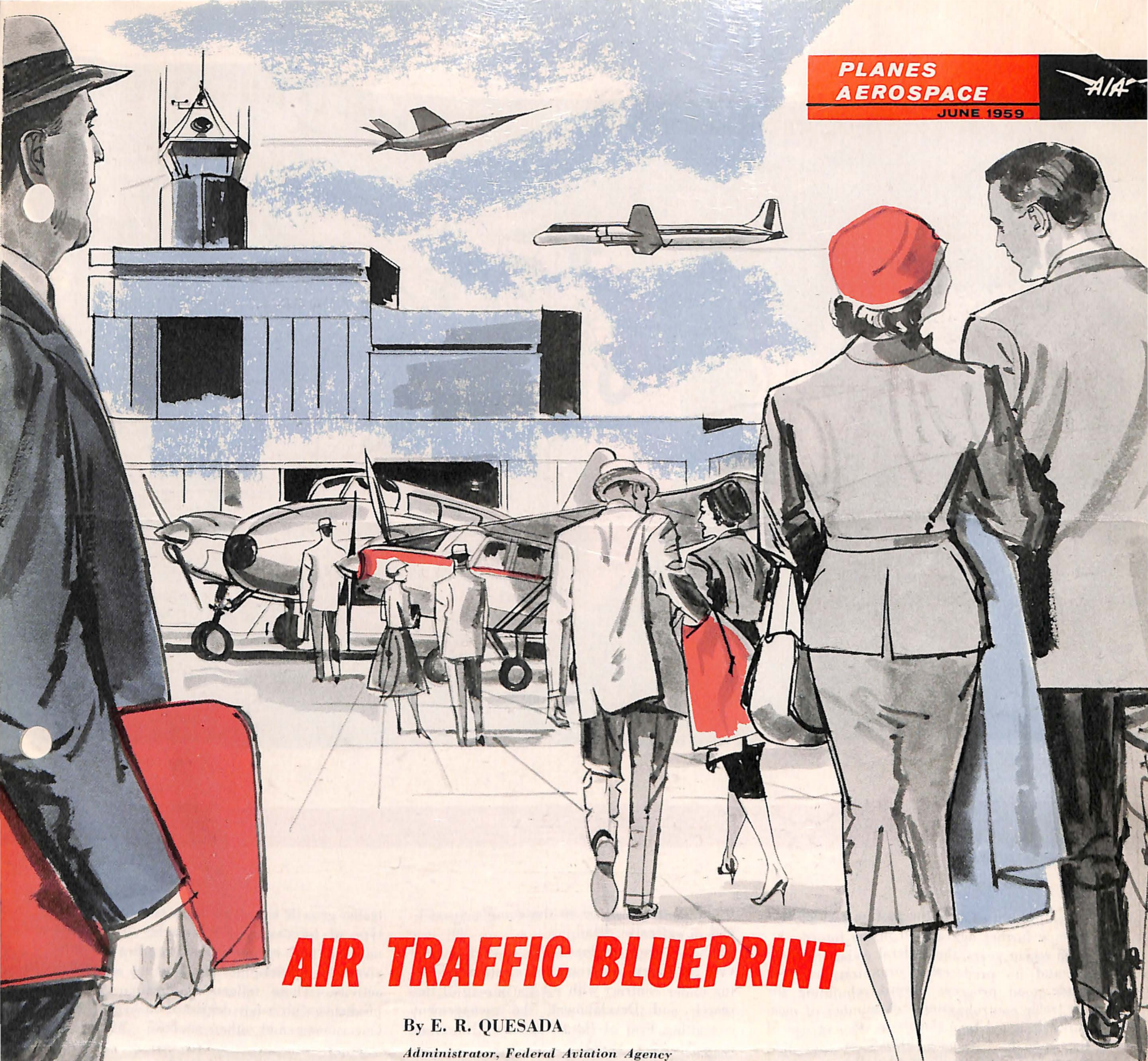
However, reliability in the missile and space vehicles produced by the aerospace industry has acquired a finely honed definition. The goal, of course, is perfection in every part, subsystem and system of the missile or spacecraft. But absolute perfection in each of the thousands of individual parts that go into a missile is an elusive and immeasurably difficult goal. The stakes are enormous, because without the unrelenting search for reliability our vital weapons system would fail to function.

A chart on page 8 of this issue of *Planes-Aerospace* graphically illustrates the problem. Theoretically, if a component part is 99 per cent reliable, this means it will function as intended 99 times out of a hundred. If ten of these critical components are assembled into a single unit, the reliability factor of the unit, by mathematics, is only 90.4 per cent, or ten out of every one hundred units would fail. The failure rate soars fantastically as additional parts of only 99 per cent reliability are added to the unit. In the case of a guided missile with one thousand parts, each of which is 99 per cent reliable, the reliability of the complete missile shrinks to less than 1 per cent which means that theoretically only one out of every hundred missiles would function. Even the momentary blinking of some tubes, a minor thing that would only mean the temporary fading of the picture in a television set, is enough to make a missile miss its target by a wide margin.

The aerospace industry is abundantly aware of this critical factor, and has developed and continues to develop unique quality controls. Reliability starts at the design engineer's drawing board and continues throughout to the final installation in a complete weapon system. In fact, reliability has become a separate branch of engineering in the aerospace industry. Each engineering change is aimed at more than increased performance. Of equal importance is that each change in design must boost the reliability factor of the component.

The chief engineer for an aerospace company recently estimated that if comparable quality control and reliability techniques used in the industry were applied to the automobile and household appliance industries, one of the "low-priced" three cars would cost about \$25,000, and a vacuum cleaner would cost several hundred dollars.

The aerospace industry is responsive to the reliability requirement, and must lead the way in this vital area in the design and production of air and space vehicles.



AIR TRAFFIC BLUEPRINT

By E. R. QUESADA

Administrator, Federal Aviation Agency

E. R. (Pete) Quesada is the first Administrator of the new and comprehensive Federal Aviation Agency. He is responsible for modernizing the federal airways system, directing air traffic control of civil and military aircraft, controlling the allocation of air space, and



both issuing and enforcing air safety regulations. Mr. Quesada, was born in Washington, D. C., and attended the University of Maryland and Georgetown University. In 1924 he enlisted in the Army and rose from private to Second Lieutenant to Lieutenant General. During World War II he served as Commanding General of the 9th Fighter Command, and directed the American air effort prior to and during the invasion of Normandy.

ONE of the most important tasks confronting the aviation world today is the development of a modern, efficient system for controlling the greatly increased air traffic over the domestic United States.

Over the last two decades, air traffic has grown at a phenomenal rate. Aircraft have increased nearly fourfold in numbers and, at the same time, their hourly utilizations have gone up sharply and their speeds have increased considerably.

During this period of growth, the nation's air traffic control system was unable to keep pace with the traffic rise. It became badly outmoded and constituted a bottleneck to development of air commerce. Moreover, the advent of the jet in military operations, which is also now becoming an increasing factor in airline operations, brought about a great disparity in the relative speed of air space users,



A

Survey is designed for high precision in areas of great activity.



B

From July 9 through August 2 more than 100,000 flight interviews will be conducted at 700 civil and 340 military airfields.

which did not exist in the past and which will become further aggravated in the future.

In recent years, the Federal Aviation Agency and its predecessor organizations have made good progress toward rebuilding the air traffic control system. A number of measures designed to make more efficient use of the available airspace have been put into effect, and many millions of dollars worth of new equipment has been ordered and installed, and there is under way an energetic research and development program designed to bring forth better equipment for control purposes.

THE problem, however, is not merely to catch up. Air traffic has by no means reached its peak; it will continue to grow. The task, then, is to develop the best possible system for immediate use, and, at the same time, work toward an even more modern system with a high degree of automation to handle the heavier air traffic of the future.

In planning for this system of tomorrow, one of the prime requirements is accurate knowledge of what can be expected in the way of air traffic growth and usage of the airway system. Crystal ball "guesstimates" are not good enough. In order to program air traffic control procedures, routes, equipment and other related factors, the FAA must know as closely as possible what the air

traffic density will be in the coming years—and in extensive detail.

There is now under way a project to provide that very important information. Working under contract with FAA's Bureau of Research and Development, the management consulting firm of Booz-Allen and Hamilton is conducting a nation-wide survey of air traffic which they will use as a basis for predicting future growth over the next 20 years.

The first phase of this survey was conducted during January of this year. A second and more comprehensive phase will take place during July and August.

The January survey provided information on air activity at its lowest seasonal point. The second phase will cover the seasonal peak of air traffic. The data from both surveys will be combined to form an integrated picture of year-round flight activity.

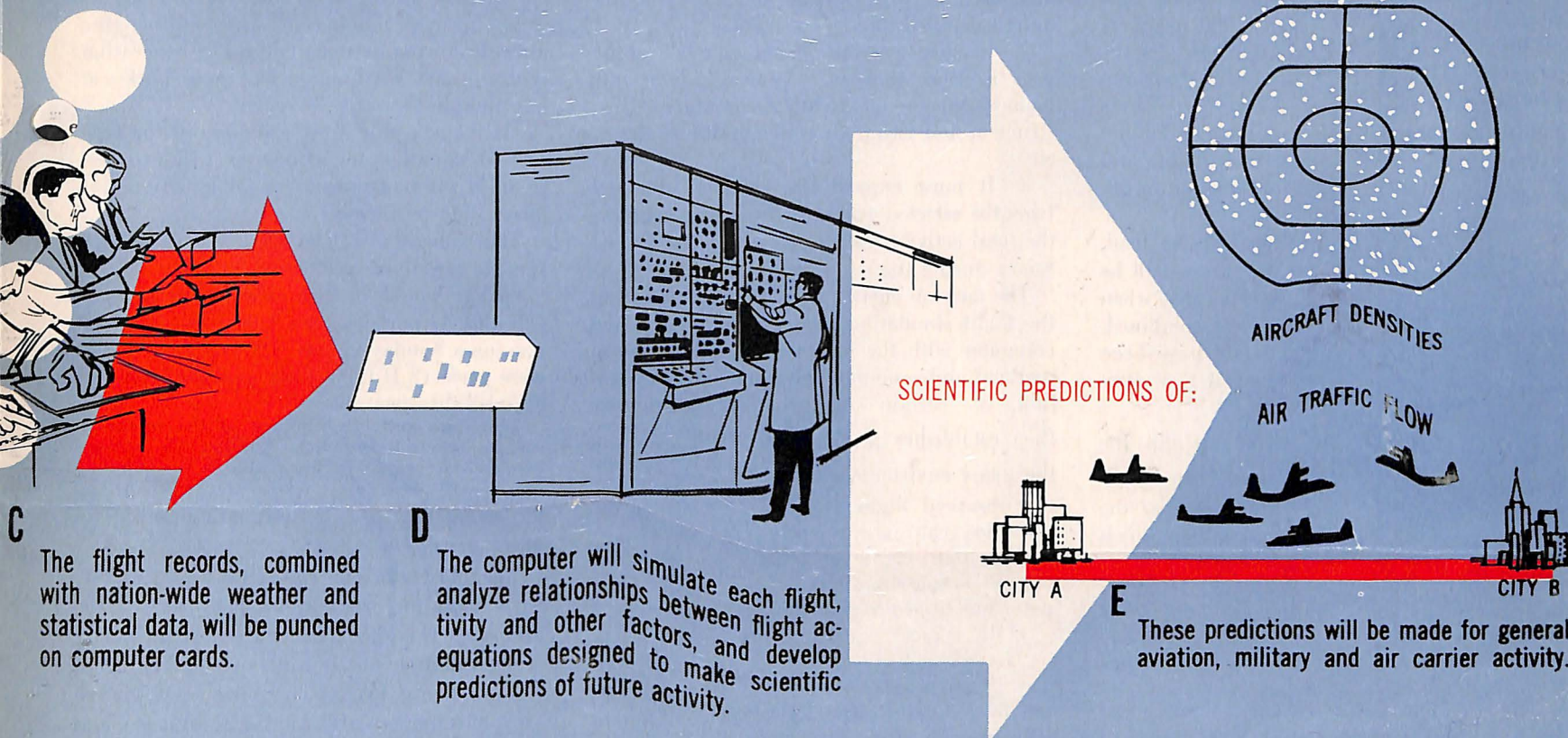
This picture will be compared with a set of influencing factors prevalent during the period of the survey; for instance, the numbers and locations of general aviation based aircraft, numbers and locations of airfields, air carrier service available, plus economic factors such as civilian and military populations, per capita income levels, etc.

The theory behind this survey is that an arbitrary assumption of a given percentage of

traffic growth is not accurate enough for the type of forecasting FAA needs. The aeronautical and economic environment at any given time determines the amount of traffic activity. These influencing factors can be predicted with a fair degree of accuracy from Government and other sources. Thus, by starting with an accurate measurement of traffic density today and the known aeronautical and economic environment today, more accurate projections of future traffic flow can be made.

The many factors which comprise this "aeronautical and economic environment" and which bear a direct relationship to general aviation, air carrier and military flight activity are being developed for 1959, 1964, 1969 and 1980. The end result will be the development of a number of equations, each capable of forecasting accurately some specific phase of aviation activity for the next 20 years.

FOR purposes of the survey, the contractor is concentrating on general aviation, that is, all flying which is not military or airline. General aviation is the major segment of air activity. In this category there are some 65,000 aircraft ranging from light single-engine planes to four-engine transport types used for business purposes; last year they flew an estimated total of 11,500,000 hours.



C The flight records, combined with nation-wide weather and statistical data, will be punched on computer cards.

D The computer will simulate each flight, analyze relationships between flight activity and other factors, and develop predictions of future activity.

SCIENTIFIC PREDICTIONS OF:

E These predictions will be made for general aviation, military and air carrier activity.

Military and airline flying is not being neglected in the survey, however. The military services will keep their own records of flight activity during the survey period and make them available. For airline operations, the contractor has available records of all scheduled flights; a very accurate measurement can be made by comparing available reports on the number of schedules actually completed.

The survey is a cooperative project involving the contractor, state and local aviation officials, airport managers, the military services and the Civil Air Patrol. The Utility Airplane Council of Aerospace Industries Association is also providing assistance, along with other general aviation interests.

THE survey technique involves personal interviews on the part of Civil Air Patrol cadets and other voluntary personnel with pilots of aircraft at a selected number of airfields. Each pilot is asked some 30 questions pertaining to the nature and purpose of his flight, type of aircraft, where he came from or is going, altitude, speed, flight time, etc.

It is obviously not practicable to attempt to survey every air traffic movement in the United States during the data collection period. For this reason, the contractor has broken the country down into 920 "cells," each measuring one degree of latitude by one degree

of longitude. The cells are then categorized according to the anticipated volume of traffic in each of them and a certain number selected for the interview procedure using scientific sampling techniques.

During the summer season survey, which starts on July 9 and continues for four weeks, interview teams will cover more than 90 per cent of the movements in 67 of the cells. They will tally all activity within the selected cells, and by expanding the sample obtained, measure cross-country activity in the 920 cells.

During the summer, or second phase of the survey, interview teams will work on Thursdays, Fridays, Saturdays and Sundays for the four-week period. These days have been determined most useful because it has been found that military traffic peaks on Thursday; general aviation business traffic and airline traffic on Friday, and private or pleasure flying on Saturdays and Sundays.

Flight activity will be tallied by 16 different time periods within each survey day. The interview teams will cover most airports from 7 a.m. to 8 p.m. local standard time, though selected fields will be subject to round-the-clock checks.

In order to fulfill FAA's ultimate information needs, the sample of activity has been designed to provide information about:

- Variations due to aircraft and pilot characteristics.
- Variations due to time of day and day of week.
- Variations resulting from seasonal traffic.
- Terrain effects on flight activity; altitudes and aircraft usage.
- Effect of economic conditions in various parts of the United States.

ANOTHER very important factor is the variation in traffic density due to weather conditions. Throughout the summer survey period, detailed weather data will be collected from several hundred Weather Bureau stations throughout the country. It will reflect ceiling, visibility, wind and other conditions that might affect flight activity. Weather variation in each of the 920 one-degree cells will be incorporated in later analyses of the data. This procedure was also followed during the winter survey completed earlier.

The data gathered in the course of the combined surveys will cover:

- About 900 of the nation's civil airfields.
- 52% of the 65,000 general aviation aircraft in the United States.
- 100% of the airline aircraft.
- 100% of the military air bases and aircraft.

- 44 of the 50 states, including data from Hawaii and Alaska.

During the January-February winter survey, 21 wings and more than 4,000 members of the Civil Air Patrol participated in the program. That portion of the survey covered 196 general aviation fields, 340 military bases and all air carrier traffic. It involved 24,000 military flights, 43,000 air carrier flights and a sample of general aviation amounting to 16,000 flights.

BECAUSE of the greater peak traffic load, the summer portion of the survey will be more comprehensive. It is expected that when the results of the two phases are combined, about 200,000 flight segments will have been sampled (a single flight landing at two cities provides two flight segments).

Collection of this mass of data is only the first step in the survey. It must then be digested and analyzed. For this purpose, the survey operators will use a computer which can make 10,000 arithmetic computations per second and store over 200,000,000 pieces of information. The programming and computational phase of the task is being handled by the Corporation for Economic and Industrial Research.

The computer has three very complex and important assignments:

1. It must simulate, or recreate, the 200,000 reported flights (the brainy computer can

recreate in one-tenth of a second a flight that might have taken several hours). Simultaneously, it will classify and tally the required detailed data.

2. It must perform "side counts" to be used in later analyses. Typical side counts include purpose of flight, the mixture of instrument and visual air traffic, altitudes flown, etc.

3. It must expand the samples obtained from the selected cells and from them estimate the total activity taking place over the United States during the survey period.

The data on current activity, obtained from the flight simulation phase, is merged in the computer with the data on the current aeronautical and economic environment. Application of certain mathematical techniques then establishes sound relationships between the many environmental factors involved and the observed flight activity, and these relationships can be projected into the future with a high degree of accuracy through development of equations for which the computer has been programmed.

SOME typical equations would permit the forecasting of:

- The peak number of landings and take-offs by general aviation light-twin aircraft that will probably occur at a given airport during a given period of activity.
- The peak number of single-engine Air

Force jets that might be expected in the airspace over any one or all of the 920 cells in the country during a specified period.

- The peak number of large multi-engine aircraft flowing between two traffic generating centers—say, Washington and New York—at any time in the next 20 years.

THESE are only three examples of the type of equation the computer will provide. In all, it will make available 150 equations for forecasting purposes.

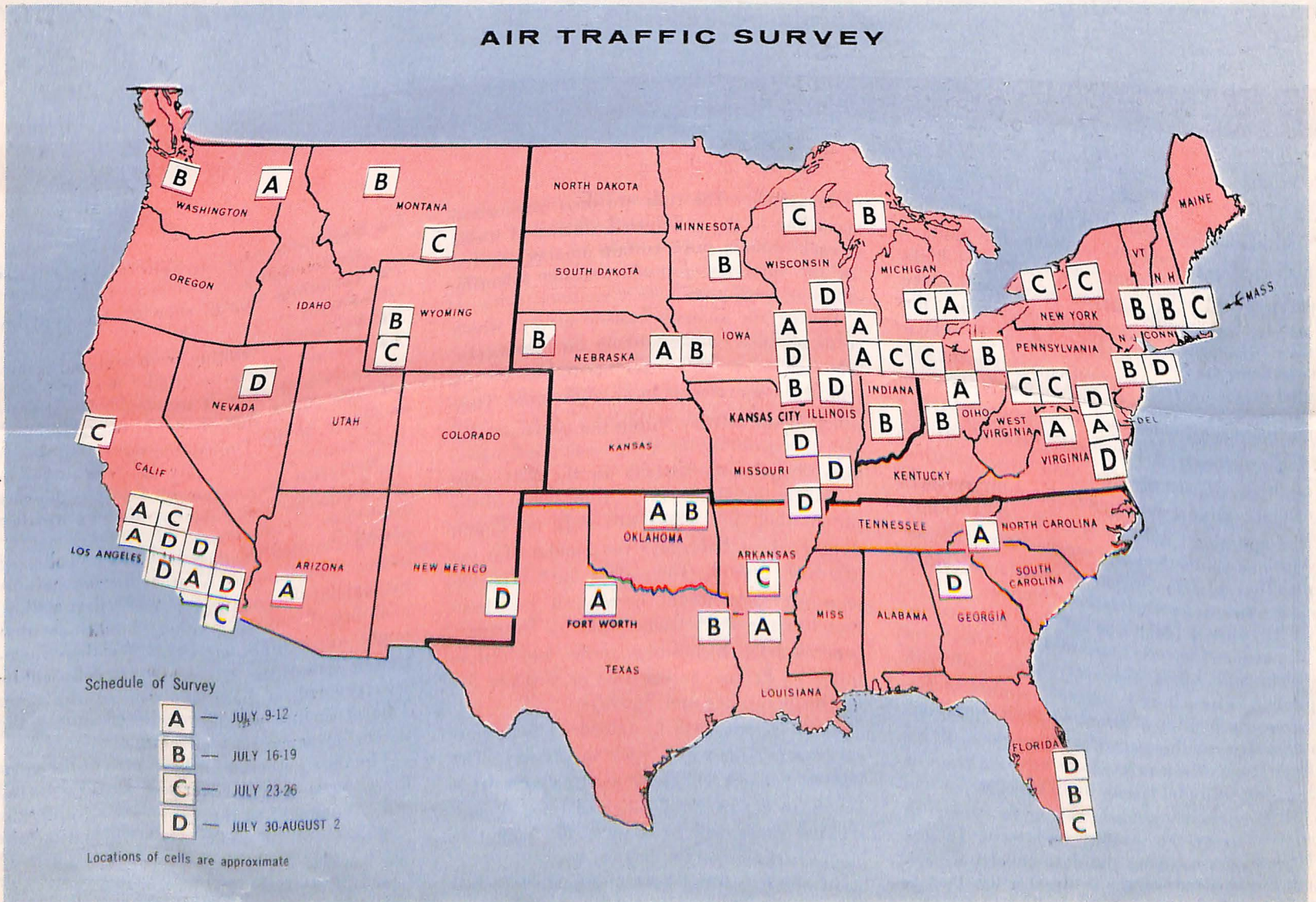
The computer will be able to answer such specific questions as these:

"What would be the expected activity at Idlewild Airport between 4:00 p.m. and 5:00 p.m. on a Sunday in July, 1964, if the weather were perfect? If the ceiling were 800 feet and the visibility two miles?"

The data collection phase of the program will be concluded in early August. The survey report is expected to be available on October 31. It will provide air traffic planners with an important new tool for estimating future requirements.

For most efficient conduct of the survey, FAA needs the cooperation of all users of the airspace. The pilot interview will require only a few minutes, but it will be time well spent by any flyer. FAA is working hard toward most effective use of the national airspace, and this traffic forecasting project is an important step in that direction.

AIR TRAFFIC SURVEY



Rocket Firings Under Way Now Yield Knowledge for New Space Vehicles

(Continued from Page 1)

er system for determining the position of a ship or aircraft at any point on the globe. A ship would listen to a signal transmitted by the satellite and with precise knowledge of the navigation satellite's orbit be able to quickly calculate its position within 4/10 of a mile. First launching of the satellite is scheduled to take place this year or early 1960.

Project Courier is the initial phase for the development of a communications satellite which will greatly increase capacity, reliability and speed of service. *Project Score* in December, 1958 successfully demonstrated the capability of putting communications equipment into orbit that could receive, store and retransmit messages. *Project Courier* is an extension of this development and is scheduled to have a capacity equal to 20 one-hundred-words-per-minute teletype channels available at ground stations located around the world. The communication satellites will be placed in 300 to 500-mile orbits. The schedule for *Courier* calls for first tests in the latter part of this year.

Project Saturn is designed to provide a new space booster engine made up of a cluster of eight liquid propellant rocket engines which will have a combined thrust of approximately 1,500,000 pounds. This thrust is approximately four times as great as the most powerful cluster of engines already flight tested. This will permit the lifting of multi-ton loads of instrumentation into space when used with appropriate upper stages. Static tests will start this fall and

'Value Analysis' Saves Taxpayers' Money

A dollar's worth of value for every dollar spent is the objective of a formal program of savings inaugurated by an aerospace company some 18 months ago.

The "Value Analysis" program to date has saved \$1,844,982. It is being used in the areas of purchased and plant-built materiel which a special staff constantly studies, with a view towards cutting costs.

Where do savings come from—here are a few examples:

Certain tapered wing skin sections formerly were cut from rectangular sheets. The Value Analysis staff came up with the workable idea of buying skin metal in sheets shaped roughly like the wing section, thus eliminating much scrap. The company saved \$68,000.

Value analysis of a seat-belt assembly resulted in different fabrication technique and procurement from a specialty vendor. It resulted in a 77 per cent decrease in cost and a \$20,500 savings.

the system is expected to enter flight status late next year.

Project Discoverer is a research program for the development of advanced space vehicles and systems. In the first phase about 12 flights will be made to perfect systems for satellite orbit control, capsule ejection from outer space and subsequent recovery. Bio-medical specimens will be carried in some of the vehicles to determine reaction to space environment. Two launches have been made and these will continue at the rate of about one a month during 1959. The information obtained during the bio-medical experiments will be utilized in *Project Mercury*, the effort by the National Aeronautics and Space Administration to place man into orbital flight and return to earth.

Project "Mrs. V" is a program involving the planning, research and systems development for a maneuverable, recoverable space vehicle.

Project Orion is a study of the feasibility of a rocket powered by controlled nuclear explosions.

A series of contracts has been let for solid propellant research which would have application in nearly every missile and space project.

In the fields of ballistic missile defense, military space technology and solid propellant research, ARPA for Fiscal Year 1959 has obligated an estimated \$425 million. The civil applications of one or two of these projects, if successful, could easily be worth billions of dollars.

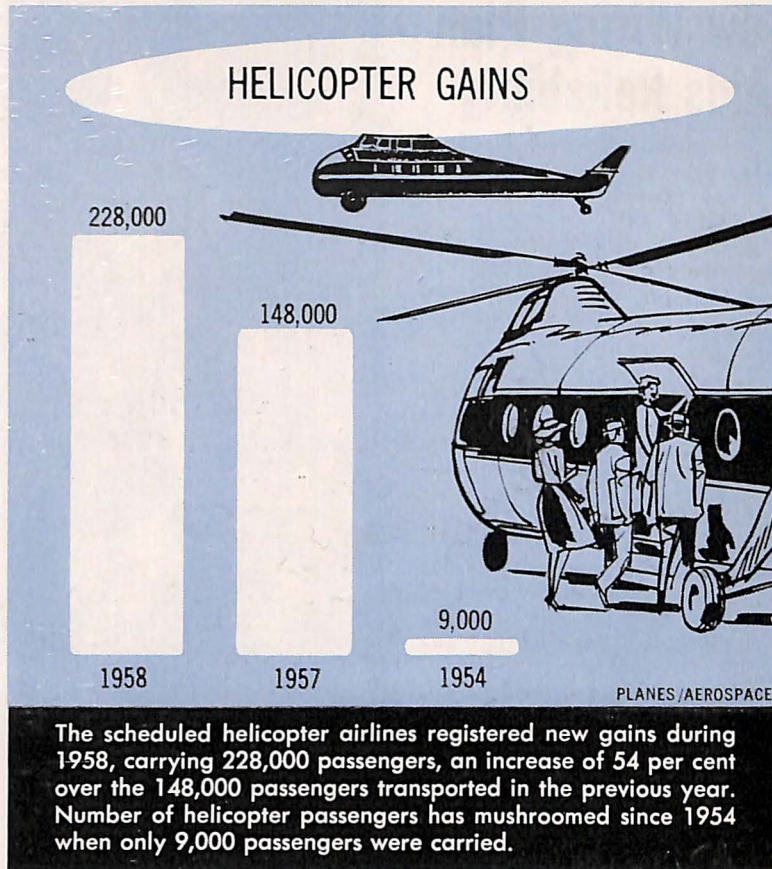
Firms Find Aerial 'Taxis' Productive Tool

In a major U. S. chemical company, aerial taxis have become such a productive tool to operations that the planes fly 16 or 17 days every month, logging an average of 50 hours of air time per month.

This company, like nearly 8,000 other U. S. firms, has its own aircraft. The pilots who fly them make regular visits to a score or more plant towns.

The company claims that fast travel linking plants to markets and headquarters adds hours of productive time to the work week. Their production executives can spend hours more at distant plants getting a first-hand look at problems and needs.

The company's five twin-engined airplanes are a small segment of more than 10,000 which industry and business operates to keep in touch with distant activities. Principal purpose of all these planes is to move production, sales and research people rapidly between communities that are not served by commercial airliners or by planes at hours which fit their needs. On the average, company planes save U. S. businessmen 30 per cent or more in travel time.



Audio Frequencies Adapted By Aerospace Firm To Test Vibration Effect on Missiles

A laboratory of "shaker pots" created by an aerospace company insures the ability of missiles to withstand vibration. The shaker pots are a complex array of electronic and mechanical equipment similar to an oversized high-fidelity sound system.

The component being tested rests on a table which is supported by a floating "voice coil" surrounded by an electromagnetic field. Various audio frequencies applied to the

"voice coil" cause the component to vibrate at the imposed frequency or combination of frequencies. The violence of the shaking depends on the power of the audio signal.

The missile environmental test laboratory has six shaker pots and associated equipment. One is capable of exerting a vibratory force of 25,000 pounds, three exert 5,000 pounds each, and two exert 1,750 pounds each. The biggest is controlled by 200 kilowatts of audio power—this is a lot of "hi-fi" energy.

A wide range of frequencies is impressed on the shaker pot in a random pattern to truly approach conditions which the missile would encounter in flight.

A vital part of the testing program was first to determine the vibration frequencies of a missile under actual flight. In early stages of the missile program, instrumented missiles were test fired and vibration data was transmitted to a ground receiver station. The telemetered data was analyzed, averaged and a safety factor added. From this information was derived the laboratory testing requirements.

'Sniffer' Finds Elusive Leaks in Fuel Tanks

Engineers at an aerospace company are using a remarkable device to locate elusive fuel leaks during the sealing of integral wing tanks on a jet aircraft.

Called a "sniffer," the device can detect the source of leaks inside a wing fuel tank in a matter of minutes, as compared to the many hours or days formerly required.

Surface Table Insures Extreme Accuracy

Ultra-accurate alignment of aircraft assembly tools is being achieved by an aerospace company with the installation of a new surface table flat enough to make a piece of paper look like a hump.

Known as a "multi-unit surface plate," the table is made up of three slabs of black granite, spaced two feet apart, and mounted on two gray granite bases. The total usable working surface of the installation is 10 by 19 feet.

Horizontal accuracy of the table, from diagonal to diagonal, is held to within five ten-thousandths of an inch. An ordinary piece of writing paper is six times thicker than this.

Need for this kind of accuracy has been brought about through the more demanding tooling requirements of high performance weapons systems.

The multi-surface plate costs 57 per cent less than a single unit surface of comparable size, in addition to reducing handling and floor loading problems.

New Wiring Plan Aids Reliability

A new method of wiring has been developed by an aerospace company to increase reliability of today's electronic-packed air-space vehicles.

Wires are completely encased in a rigid fiberglass covering which can be molded into any shape and formed to follow structural contours inside any aircraft or machine. Tough and heat resistant, the new wiring harness can also be streamlined onto the outside surface of aircraft, missiles or space vehicles.

Wires encased in the molded harness are capable of carrying higher voltages, withstanding much higher temperatures and electrical overloads, and of tolerating vibration far better than conventionally-harnessed wires. In addition, the fiberglass covering requires less than half the space of conventional harnesses and its weight is far lower.

The new system requires minimum maintenance, is abrasive-resistant and resists accidental damage by ground crews.

Bomber Needs Mobile Air Conditioner

A vital part of the ground support equipment of a supersonic bomber are mobile 50-ton air conditioners valued at \$24,000 apiece.

Subsystems of the aircraft must be kept at stable temperatures while being operated on the ground for tests or checkouts.

Importance of cool air being carried into the right areas whenever a system is in operation, was recently demonstrated when an expensive part was lost because an air conditioning duct was accidentally sealed off.

The air conditioners have a control board type operation panel which is covered with such instruments as high and low temperature pressure gauges, supply air flow and pressure meters.

Fool-Proof Tool Strips Cable Insulation

A lot of ingenuity and very little cost have practically eliminated rejects of electric cables used in aircraft.

For years the only way to get an inch or two of insulation off large electric cables for terminals was with a knife. Too frequently the knife blade cut into the strands of wire in the cable. Each damaged wire had to be rejected.

Two aircraft company employees came up with a fool-proof gadget to solve the problem. An electric wire is attached to an ordinary hand pipe-cutter, and another wire is attached to the cable. By turning the little cutter, a buzzer sounds the moment it nears the cable. At this depth the operator twists the cutter and off comes the insulation. Twice as fast and no rejects. Cost of cutter: \$3.



99.99996%

**RELIABILITY
KEY TO PERFORMANCE**

Reliability of components in missiles and space vehicles is one of the toughest problems facing the aerospace industry. Nothing less than 99.99996 per cent reliability is permissible. For example, if a missile has 1,000 critical parts, each of which had a reliability factor of 99 per cent, the missile itself would have a reliability of less than 1 per cent—i.e., the missile would fail 99 times out of a 100. The aerospace industry, in order to meet the challenge of reliability, has revolutionized its manufacturing, testing and quality controls techniques to an extent unequalled by any other manufacturing industry.

PLANES/AEROSPACE

New Technique Cools Alloys Quickly

A revolutionary new die quenching process used in the rapid forming of tough heat-resistant alloys has cut cooling cycle time from 10 minutes to less than one minute.

Developed by an aerospace company, the new process keeps the die in which the metal is chilled at a low temperature, permitting its constant use. Formerly, the cooling process would have to be stopped frequently, since the die would absorb heat from the red hot metal until the die had lost its ability to quench the metal.

Die is cast with a three-inch iron pipe running longitudinally through its center. Pipe is attached to tubing, which is connected to a portable cooling tank filled with dry ice and alcohol.

First the die and its companion punch are cold soaked until both parts are 40 degrees F. or lower. During operation, frigid air from the cooling tank blasts through the die, keeping it cold. As the air escapes through holes drilled into the face of the die, it chills the part to the desired temperature nearly ten times as fast as the previous method.

The cooling cycle is required in many of the alloys used in high-performance aircraft.

Expert Says Jet Operations Do Not Harm Home Values in Airport Areas

Jet planes will not adversely affect the value of real estate in the vicinity of airfields they use, H. O. Walther, a past president of the American Institute of Real Estate Appraisers, reports.

Addressing the American Society of Real Estate Counselors, Mr. Walther said that six factual studies made of property surrounding airports in Chicago, Los Angeles, Denver, Dallas, Newark, and New York City bore out his statement.

The studies disclosed that:

1. More than 30,000 buildings (nearly all homes) had been built within a mile of the six airports in a 12-year period from 1940.

2. Over 800 double transactions revealed that the market behavior is about the same in airport areas as in areas not in the airport environment.

3. The number of properties for sale in the airport areas was in most cases less, and in a few very slightly more, than in comparable areas.

4. There appeared to be no appreciable difference in market behavior in areas in the path of flight from the other areas.

5. Airport areas which included homes were in good condition with better than average maintenance.

6. Trade opinion of real estate brokers active in the areas showed without exception that airports had not influenced the value of homes adversely. Trade opinion of appraisers and mortgage lenders was divided. Some thought that the noise, interference with television, and anxiety produced sales resistance; other did not.

Although these studies reveal the

Stress Engineers Have 'Colorful' Job

Engineers measuring stress in aircraft components have a very colorful job.

A new process called photostress testing, which uses known principles of polarized light to measure stress, gives a "technicolor" view of the part being tested.

It works this way: The component to be stress tested is covered with a special photostress soft plastic which can be formed to cover any type of regular or irregular surface.

After application, the plastic hardens and is glued to the surface of the component. Load is then applied to induce stress, while an engineer looks through a special polaroid appliance called a field meter.

The polarizers in the field meter enable him to see a rainbow of colors the plastic takes on under differing amounts of stress, which is measured according to the colors which develop.

Areas which are put under the greatest strain can be pinpointed and are subsequently made strong enough to stand up.

existence of some noise and interference, Walther said, they suggest that either their effect is small or there are other amenities which offset the difficulties. Among the logical amenities cited was the fact that thousands of new employees at the airport strengthen the demand for housing, and in many places new industry built near the airport brings in more job opportunities.

New Air-Space Books off The Press

Latest volumes in aero-spacepower literature published in connection with the U. S. Air Force Book Program include:

Man In Space: The United States Air Force Program For Developing The Spacecraft Crew, edited by Lt. Col. Kenneth F. Gantz, USAF (Duell, Sloan and Pearce, \$4.00). A comprehensive story of Air Force research, development and test in aero-space medicine and human factors. Topics range from a history of space medicine through space vehicles, weightlessness and escape and survival during space operations. Contributors are top Air Force experts in space-medicine and space flight.

Spaceport U.S.A. The Story Of Cape Canaveral And The Air Force Missile Test Center, Martin Caidin (E. P. Dutton, \$4.95). Illustrated account of the Air Force Missile Test Center and Cape Canaveral, the history, operations, and the men. Includes description of the vast Atlantic Test Range and the significant space operations conducted from there.

Red Alert, Peter Bryant (Ace, paperback edition, 35 cents). A gripping novel about the men of SAC and the combat crews on their deadly missions during the first two hours of a mythical war.

Portable Spare Parts Kit Keeps Transport Flying

A portable flying spare parts kit has been developed by an aircraft plant and the Air Force for a global turboprop transport plane. The chest of emergency items could spell the difference between the plane's being on the ground or in the air.

Each "treasure chest" contains some 1500 low cost small parts, and is valued at approximately \$11,000. "Quite an insurance policy," a company executive says. But a one dollar part conceivably could keep a multi-million dollar plane down when possibly it is needed most, he adds.

Designed to fit into the aircraft's spacious cargo compartment, the treasure chest includes such items as special screws, gaskets, fuses, etc., which might not be available at remote bases. The kit will serve a squadron of 16 planes for 90 days.