

# TURBINE PLANES SPUR AIR FREIGHT INCREASE



## Orbiting Atomic Clock To Be Used To Check Einstein's Theory of Relativity

An atomic clock described as so accurate it will neither gain nor lose a second in a thousand years is being developed by an aerospace company for the National Aeronautics and Space Administration.

The clock will be used in an orbiting satellite to check Einstein's general theory of relativity. Basically, the Einstein theory states that a clock running in a different gravitational field above the Earth would apparently run fast relative to a clock on the ground.

The atomic clock bears no resemblance to the common electric wall clock. It will look like a foot-long electron tube and will house a stream of ammonia molecules. It will weigh about 30 pounds.

Before being launched in a satellite, the atomic clock would be synchronized with another atomic clock on the ground. The satellite would then orbit, for example, at 8,000 miles up traveling at a speed of about 18,000 miles per hour.

The orbiting clock would generate a highly stable current with a frequency of 24 billion cycles (or "ticks") per second. Electronic circuitry would reduce these rapid oscillations to a slower rate convenient for making precise laboratory measurements. The time "ticks" would be transmitted by radio to compare with the time of the clock on Earth.

Expected time difference between the clock orbiting in the satellite and the one on Earth is 1 second every 60 years.

## Space Chamber 'Takes' Man Into Ionosphere

A space-environment chamber, capable of taking a man 150 miles above Earth into a simulated ionosphere, is being constructed for an aerospace company's research and development laboratories.

The space chamber will be 14 feet in diameter and 30 feet long, and will weigh about 30 tons. Special pumps will produce the very low pressures found in outer space.

An engineer for the aerospace company said the highest altitude man has attained in simulating chambers is about 38 miles. Another chamber is capable of testing components at altitudes of 85 miles.

This important research tool will be used in solving problems on manned flight into space.

## Rates Could Be Reduced One Half with Turbine-Powered Transports

Development of commercial turbine-powered transports specifically designed for carrying cargo is pointing the way to a tremendous expansion in the use of air freight.

Previously, cargo aircraft were modified piston-powered passenger transports. The Federal Aviation Agency confidently predicts that introduction of the turbine cargo planes will quickly result in a six-fold increase over present air tonnage.

### Models Aid Solution to Design Problems

Animated models of nuclear power plants, solar systems and solar generators are being used by an aerospace company to solve intricate design problems and aid in graphic presentations of space project proposals.

One model of the solar system is used to study the motion of the planets to aid in planning missile trajectories and mission analysis of space vehicles.

Because of the tremendous size differential in the planets and the sun, and the great difference in their distances from the sun, three scales had to be used in constructing the system model.

The planets are gear and chain driven, and power is transmitted to driving discs at the "sun's" equator, moving individual arms on which the planets are mounted. Speeds of the various planets are extremely accurate in relationship to the speed of the Earth.

Another model which helped immensely in explaining operational concepts was a solar generator which could be used in a reconnaissance satellite. The model shows a unique collector and tracking mechanism. A collector-mirror, which gathers in the sun's rays, is driven by a gearing device at the top of the model. Solar heat, which is collected by the mirror, is used to boil mercury. Mercury vapor then in turn provides power to drive a turbo-generator which provides electrical power for the satellite.

Use of these precise models is typical of the imaginative effort of aerospace companies to provide an accurate idea of new engineering concepts. They can save drafting expense, design time and material. And, most important, it results in a better system.

Principal reason is the dramatic reduction in air freight rates possible with turbine-powered equipment. The present rate averages about 26 cents per ton-mile. FAA believes this could be reduced to about 10 to 12 cents a ton-mile with jet equipment.

The growth potential in the near future following introduction of turbine cargo planes, according to FAA, follows:

	Ton-Miles in Billions	
	Today	Near Future
Commercial	0.8	7.0
Defense	0.8	0.8
Postal	0.2	3.0
TOTAL	1.8	10.8

Another reason is the increasing rate at which the public has been buying the services of air freight. In 1954, the airlines collectively hauled about 2¼ million air-freight shipments, for a gross of approximately \$47½ million. Based on the first six months for 1959, it looks as though the airlines will have handled more than 4½ million shipments of freight by the end of the year, for an increase of more than 100 per cent. Dollarwise, this represents almost a 104 per cent gain—to approximately \$97 million.

This marked expansion in the use of air freight is symptomatic of what industry refers to as a "distribution revolution."

Enthusiastic airline officials say that air freight is changing the concept of commerce. They expand on how "wings for things" has set up a new relationship between buyer and seller, has reduced costs, opened up new markets and expanded old ones.

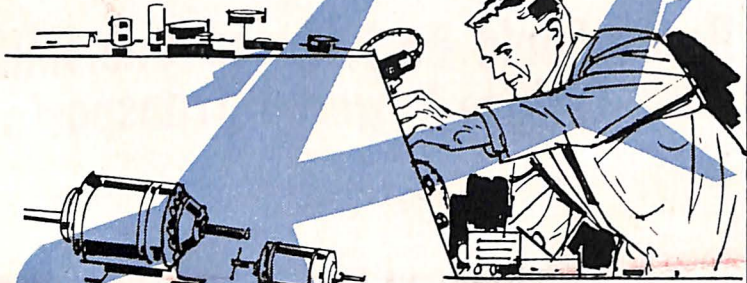
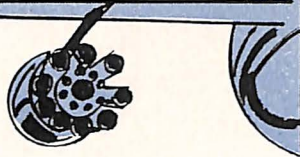
This distribution concept has been promoted by the airlines for years. The turbine cargo carrier now makes the idea completely practical.

(See AIR CARGO, Page 7)



## Plane Views

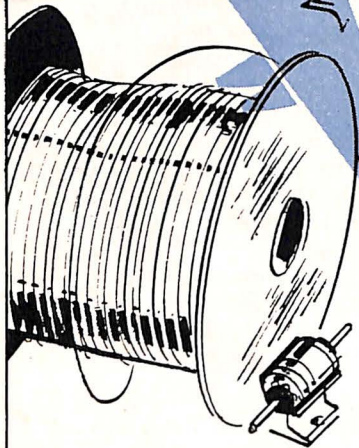
WING TANKS OF JET AIRLINERS CARRY AS MUCH FUEL AS FIVE FULLY-LOADED TANK-TRUCKS.



MORE THAN 27,000 NEW TOOLS WERE REQUIRED TO PRODUCE AN IMPROVED VERSION OF A LONG-RANGE JET BOMBER.

60 MILES

A MODERN BOMBER USES 125 ELECTRIC MOTORS AND SIXTY MILES OF WIRING.



PLANES/AEROSPACE

### Aerospace Quote

"All of us know that, modern general war being what it is, we may not be able to build a striking power after we are attacked. We have to have the force now, and it must be ready to use.

"We have it, and it is ready.

"But we have already declared to the world that we will never use it for aggression. This national policy is priceless as an expression of our moral leadership toward lasting peace for the world. However, from a cold military standpoint, it does concede the initiative to any potential enemy, and with the initiative the enemy would gain the advantage of surprise.

"This is not necessarily as bad as it sounds. It only means that we must plan our operations in such a way as to blunt the enemy's first move and to counter it with a hail of destruction such that he could not survive."—Lt. General D. C. Strother, Deputy Chief of Staff, Operations, USAF.

### Unit Duplicates Missile Firing Conditions

A test chamber at an aerospace company can accurately create the sub-zero cold or tropical heat present during actual missile firings.

The chamber can hold an entire intercontinental ballistic missile and its handling trailer. The test unit can be turned into a giant "refrigerator" with an interior temperature of minus 65 degrees. It can become an "oven" with up to 165 degrees of heat and 95 per cent relative humidity. A sprinkler system can produce high humidity or icy conditions as required, or it can produce "rain" at the rate of 5 inches an hour.

Closed circuit television makes observation of special areas possible, while peep holes from the control room add to visibility of what is happening to the missile. However, most large tests require entering the chamber. Special cold weather gear or asbestos suits are worn by test personnel.

To provide a heat source, more than 1,800 heat lamps, arranged in banks, are placed a few inches from the section being tested. This duplicates the heat present in actual firings as the missile builds itself to full speed after blast-off.

## PLANES-AEROSPACE

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—MATS OF CHARTS—PRODUCED IN UNITS OF STANDARD NEWS-

PAPER COLUMN WIDTHS—ARE AVAILABLE FREE UPON REQUEST

Editor: Gerald J. McAllister

Art Director: James J. Fisher

## Expedited Mail

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However, of the 3 billion ton-miles of non-local mail handled by the U. S. Post Office Department in Fiscal Year 1958, only about 2 per cent of it was carried by air. In addition, there has been a steady deterioration of mail-carrying passenger train service. The Postmaster General recently stated that "the Post Office is confronted with a serious mail transportation problem resulting from the rapidly changing pattern of our national transportation system." He explained that thousands of mail-carrying passenger trains have been discontinued and services to an equal number of communities entirely eliminated. Thirty years ago about 10,000 trains were used for the movement of mail; today there are only 2,200. For example, during 1958 one train a working day was removed from service.

The Post Office sums up the seriousness of this trend as follows: "Every time the railroads take off a passenger train, they pull the rug from under us on some mail service. Furthermore, remaining schedules are designed primarily to suit passenger convenience, so the value of railway service for mail transportation has substantially diminished."

In contrast, the scheduled airline fleet at the beginning of 1958 numbered 1,924 multi-engined transports. Turbojet transports, capable of spanning the continent in little more than 4 hours, have been entering the fleet in increasing numbers. Transport manufacturers during the balance of 1959 will be delivering an average of 25 turbine-powered transports to U. S. scheduled airlines each month. By the end of 1960, the airlines will be operating nearly 500 turbine aircraft.

The potential for improved mail service is available to the public whenever the Government wants to use it.

Historically, the U. S. Government has always used the fastest form of transportation to carry the mail. Over the years, the stagecoach gave way to the Conestoga wagon; the Conestoga to the canal barge; and the canal line of transport evolution.

On an experimental basis, the airlines have been proving their capability of carrying first-class mail by air for the past five years. For example, under this experiment, the airlines have handled virtually all the first-class mail between New York and Chicago. New York-Chicago mail traffic is probably the heaviest in the country. Another example is found on the West Coast, where airlifting the mail has advanced delivery as much as 48 hours.

The United States does not require a precedent in order to pass on the benefits of advanced technology to the public, but it is interesting to note that other countries—some 42, in fact—are far ahead of us where mail service is concerned.

In Belgium, for example, an "expedited" program has been operating since 1950. The basic policy governing mail movement is speed. Estimates are that 70 per cent of all letter mail moves by air.

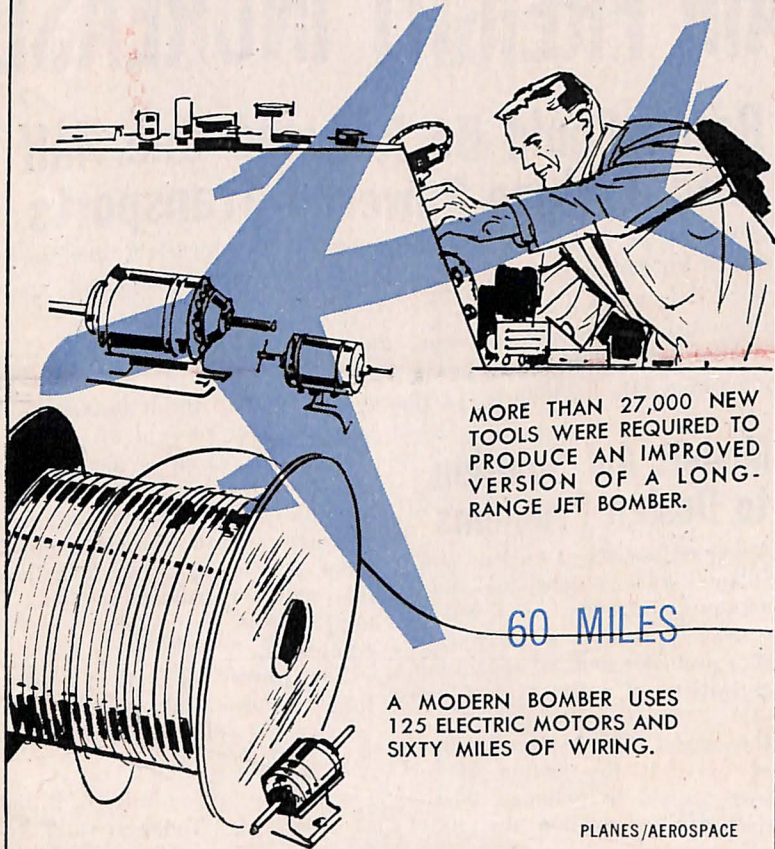
France has two postal rates, but all letter mail is given "absolute priority." Estimates are that less than 1 per cent of British mail destined for European countries moves by surface means. Sweden has a policy of "earliest distribution at destination." On this continent, Canada has "all-up" mail service.

Meanwhile, there is ample capacity in the airline fleet *right now* to give the public the quality of air-mail service it is entitled to.



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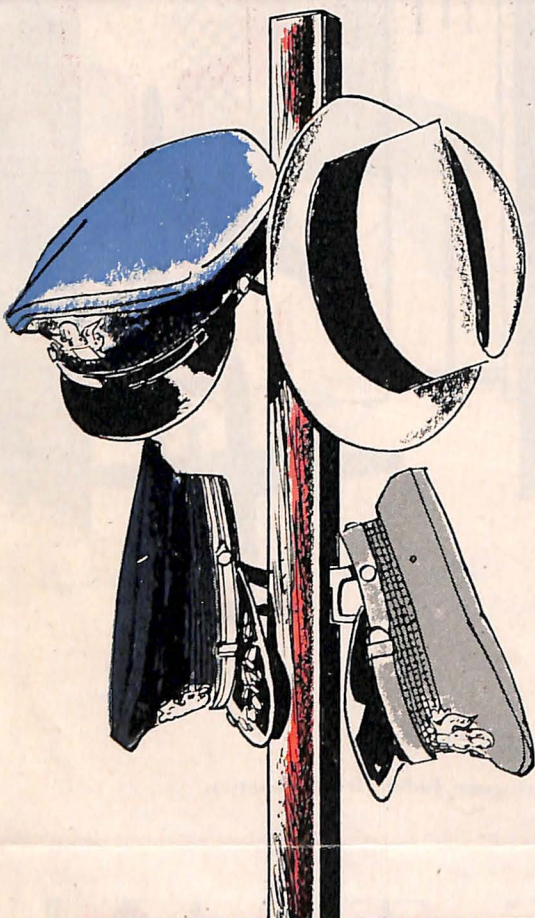
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was faced with a problem which hindered aircraft production: the threat of court action for patent infringement. The Manufacturers Aircraft Association, formed to solve the problem, helped the War and Navy Departments draw up an acceptable cross-licensing agreement under which everybody could use all patents, the first of a long succession of contributions to efficiency in defense programming.

In 1919, this trade association was incorporated as the Aeronautical Chamber of Commerce and, with two name changes, it has continued to date as the representative agency of aircraft manufacturers.

The value of industry experience and advice in defense programming was highlighted during World War II, when the Aircraft War Production Councils were formed to provide more efficient interchange of Government-industry information on aircraft production.

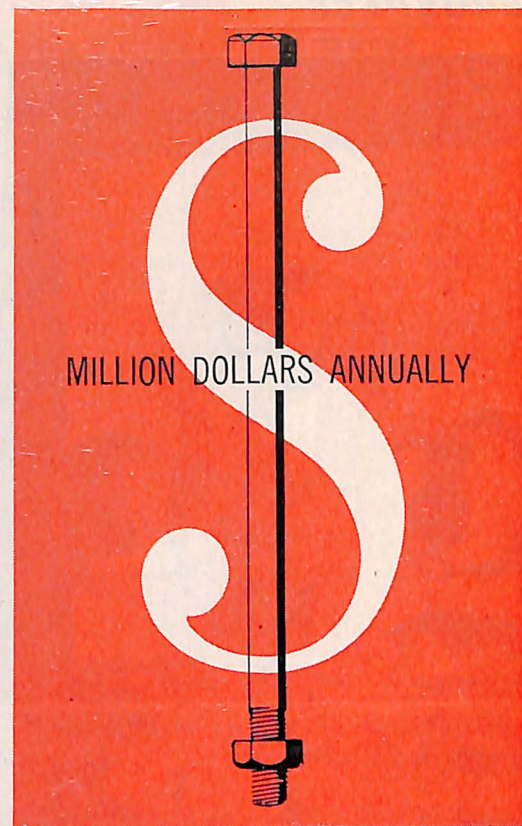


Through the AWPC's, manufacturers pooled all known information to speed the war effort. They combined their collective knowledge on engineering, design, tooling, manufacturing methods and patents, and they even exchanged materials and parts, tools and test facilities to overcome threatened bottlenecks. To cite only one of the many examples, one company provided a competitor with the results of a \$2 million research program it had conducted on flutter control.

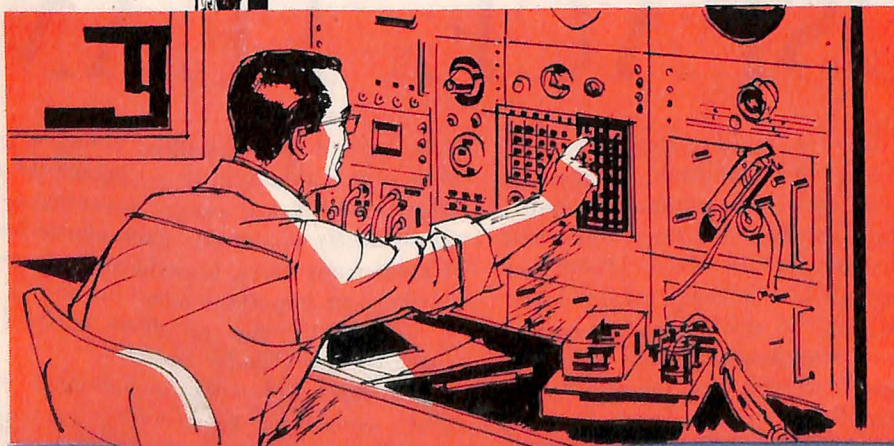
The Councils, formed as wartime emergency measures, were disbanded at the end of the war. In 1945, the Aeronautical Chamber of Commerce changed its name to Aircraft Industries Association and, earlier this year, the name was again changed to *Aerospace Industries Association*, a title which its members felt reflected the industry's expanding interests and responsibilities, since the member companies had fallen heir to new assignments in the missile and space fields by virtue of their broad experience in the closely related field of aircraft manufacture.

Today, AIA represents 79 manufacturers, both large and small. It acts as the communications link between Government and industry in arriving at cooperative solutions to problems arising in the fields of aeronautical and astronautical research, development, production and logistic support, and it is of interest that 21 major projects on which AIA worked in 1958 were initiated at the request of Government agencies. AIA is so organized that it can immediately assume the functions of the World War II Aircraft War Production Councils, should the need ever arise.

Policy direction of the Association is handled by a Board of Governors composed of the chief executives of various member companies. AIA's activities are carried out by 42 committees and councils representing every aspect of aircraft, missiles, space vehicles, propulsion systems, components and accessories production and their industry management. Each committee consists of a number of high-level company representatives thoroughly qualified in their particular fields, in all a pool of 1900 key specialists working



The National Aircraft Standards Committee of the Aerospace Industries Association, working closely with government agencies, has assisted in the development of more than 1,200 aircraft manufacturing standards. For example, more than a million dollars was saved in a year through standardization of a single bolt and nut.



A joint industry-government effort, sparked by the Spare Parts Committee of the Aerospace Industries Association, has produced a plan for the exchange of logistics information between the military services and manufacturers which will save several million dollars each year.

diligently to further the development of better products at less cost. These committees, whose work rarely comes before the public view, have contributed materially to the national defense program in terms of new methods and procedures and dollar savings.

Among the more important recent projects in which AIA's technical groups made major contributions are these:

- The development of a new system for machining complex aircraft and missile parts which offers savings in skilled man-hours of 80 to 95 per cent. This system, called APT for Automatically Programmed Tool, employs a technique similar to the paper roll in a player piano. A high-speed digital computer calculates the data necessary to program the motions of a numerically controlled machine tool in cutting metal components. An example of the time and money savings made possible by this system is evident in the programming task for a wing rib shape, which required 200 hours to program manually and only five hours by the APT method.

APT was developed as a joint effort of the USAF Air Materiel Command, Massachusetts Institute of Technology and technical representatives of 19 AIA member companies. It is now being refined for even greater productive efficiency under the management of



the APT Project Coordinating Group of AIA's Numerical Control Panel.

- Preparation of an annual five to 10-year forecast of engineering and manufacturing trends and requirements, a document which represents the combined thinking of industry's top specialists in design, production and materials. This important book serves as a guide to Government agencies in determining whether certain projects are feasible within a given time period, and it indicates to the Government, the aerospace industry and its allied industries, problem areas which will require increased attention and effort and future requirements for tools, equipment and materials. This forecast is a joint effort on the part of several AIA committees and sub-committees.

- Preparation of another document entitled "The MILDDU Proposal," which, despite its unwieldy title, is an important contribution to the increasingly complex problem of logistic support. MILDDU is a program which would provide a universal standard for military-industry support data interchange, increase the accuracy of spare parts accounting, reduce over-purchase of spares and improve the speed and efficiency of providing needed spares at the right time.

The above are just a few major examples of how AIA's work promotes more efficient defense programming and production. Daily, the 1900 members of the 42 AIA committees are studying present and anticipated problems in hundreds of areas. The data assembled by these committees is available to the Department of Defense, the Army, Navy and Air Force, the National Aeronautics and Space Administration, the Federal Aviation Agency and other interested governmental agencies. Collectively, the results of this unheralded "pick-and-shovel" work produces a fount of knowledge of inestimable value to the Nation's aerospace programs.

The activities of the 42 AIA committees are so broad that it is difficult to explain in general terms how important a contribution they make. Some indication of the type of work in which they engage may be gathered from the titles of a selected few of the committees:

*Quality Control Committee*, which develops policies, procedures and recommendations to insure continuing improvement in product performance and reliability.

*Manufacturing Committee*, which seeks to obtain more efficient manufacturing methods, equipment, processes and techniques.

*Spare Parts Committee*, which is concerned with reducing spare parts requirements and streamlining logistic support.

*Guided Missile Council*, concerned with research, design, development and construction of missiles, with special emphasis on reliability.

*Aircraft Research and Testing Committee*, which deals with applied research and testing of new structures, materials and processes and exchange of information in these areas.

Turning to the specific to better indicate just how these committees contribute to defense efficiency and cost reduction, the Spare Parts Committee has a membership of 125

managers and assistant managers of spare parts departments representing all segments of the industry. For the past 15 years, the committee has worked closely with the military services, coordinating and making recommendations in the development of procedures for provisioning spare parts, special tools, test and ground handling equipment and training aids. Recently, the Air Force reported that weapon support has increased considerably and that there has been a reduction in spares from 43 per cent of the aircraft program in 1952 to 23.5 per cent in 1959. The committee was commended for its contributions to this result.

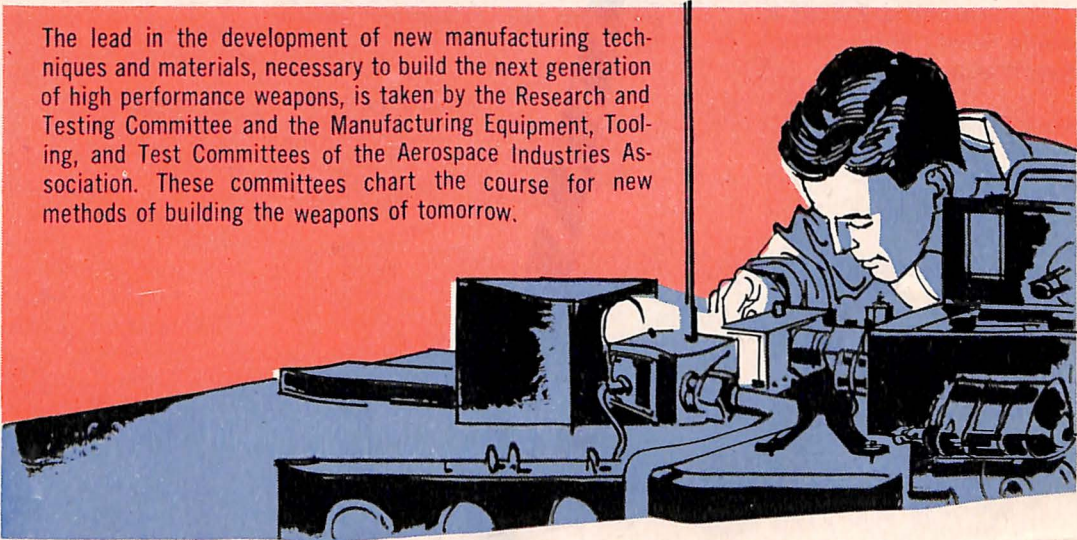
The Quality Control Committee worked five years on a long and tedious review of quality control system requirements, serving as an assistant group to the Department of Defense. This work contributed to the publication, earlier this year, of a new Department of Defense standard quality control system specification, an important advance in DOD's Standardization Program. The committee was cited for its "generosity, wise counsel and long experience" by Assistant Secretary of Defense (Supply and Logistics) Perkins McGuire, who added, "You can be sure that

your work has strengthened substantially the industry-defense production team."

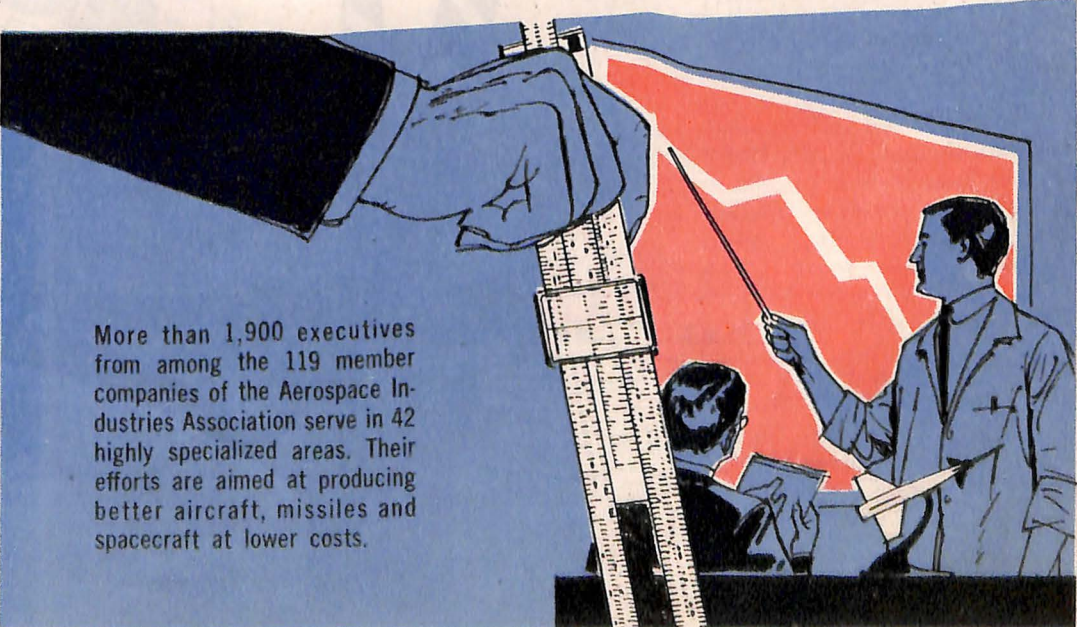
The Traffic Committee has been able to save the Government considerable sums in the shipment of aircraft and missile parts and components. For instance, builders of guided weapons have been shipping parts in large quantities to missile sites by truck. This large-volume shipping is expensive, but recently a "watchdog" group of the Traffic Committee decided that trucking costs for the missile shipments were disproportionately high. At a conference with trucking officials, a protest backed by strong arguments was made. The truckers conceded that a lower rate was in order.

Due to the size of such shipments, even a small reduction in the truckload rate brings large savings. One company estimated that the rate drop in this case brought savings of over \$100,000 for parts shipments to seven missile sites over a six-month period. Future shipments will increase the savings figure, and, of course, there are a great number of other missiles and other sites, compounding the cost reduction.

In another instance where the Traffic Committee has been active in reducing costs, a



The lead in the development of new manufacturing techniques and materials, necessary to build the next generation of high performance weapons, is taken by the Research and Testing Committee and the Manufacturing Equipment, Tooling, and Test Committees of the Aerospace Industries Association. These committees chart the course for new methods of building the weapons of tomorrow.



More than 1,900 executives from among the 119 member companies of the Aerospace Industries Association serve in 42 highly specialized areas. Their efforts are aimed at producing better aircraft, missiles and spacecraft at lower costs.



program was initiated whereby manufacturers consolidated small shipments for savings. Because the rates on less-than-a-carload shipments from points in the eastern United States to the Pacific Coast are so much higher than carload rates, aircraft plants on the West Coast were able to effect substantial savings by pooling their less-than-carload shipments to take advantage of carload rates. This simple operation saved a single company \$100,000 annually. The savings are reflected in the overall cost of the equipment to the Government.

Another illustration of the type of service provided by the AIA committees lies in the work of the Aircraft Research and Testing Committee on Project 4-58, a cooperative investigation of the properties and engineering characteristics of a promising new alloy. This material had received widespread recognition as presenting a number of advantages in higher temperature aluminum structures. ARTC sponsored a specialists meeting, during which it was estimated that the investigation and the compilation of the necessary engineering data would require approximately 7,000 man-hours of testing, data reduction

and report writing, conservatively estimated at \$10 per hour. ARTC brought about a cooperative program whereby 16 AIA member companies are contributing about 450 man-hours each for the task.

The committees make another important contribution in the matter of forecasting future industry requirements in specific areas. The pace of product development and the rapid change in engineering characteristics make it imperative that the changing needs of the industry be promptly communicated to those groups serving the aerospace industry—suppliers, vendors, subcontractors, etc.—who can then channel their own development programs into appropriate lines. For instance, Report ARTC-14 stated distinct new needs in 4340 steels. At the time the report was published, the requirements could not be met by any of the steel mills. Six months later, as a result of wide dissemination of the report to the steel industry, at least a half-dozen warehouses were stocking 4340 products meeting the new requirements.

The AIA equipment committee initiated a series of performance and basic design standards for a complete family of metal re-

moval machinery, tailored specifically to the requirements of the aircraft and missile industry. This continuing program embraces a plan of close coordination with all affected elements of industry as well as Government agencies responsible for lot purchases of Government facilities. Substantial reduction of delivered product costs have accrued to the Government through the availability of machinery and equipment designed to accomplish a specific fabricating task as opposed to modifying standard equipment initially designed for automotive and heavy industry.

The foregoing represent just a view of the hundreds of examples of how the AIA staff, which serves as a secretariat for the committees, and the membership of the various committees, are contributing to a more efficient defense program.

The function of Aerospace Industries Association as a communications link between Government and industry fills an important need in efficient defense management, and, as a defense official once stated, if such an organization did not exist, it would have to be created.



The Traffic Service of the Aerospace Industries Association represents member companies in proceedings before the Interstate Commerce Commission. In one case, arguments presented by AIA's Traffic Service resulted in annual savings of more than \$3 million in freight charges to the Government.



# Air Cargo Boom Will Enable Business To Serve Distant Markets

(Continued from Page 1)

Speaking before the Air Freight Cartage Conference, Civil Aeronautics Board Member, Louis J. Hector, sums up this concept as follows: "Now, what have you got to offer the businessman? Something far more important than speed. For many lines of business, you can offer nation-wide distribution from a single plant facility. You can show a manufacturer how he can penetrate new and distant markets without building costly new warehouses and tying up cash in large regional inventories. In a very real sense, you are selling the businessman a scheme of operations whereby he can do a greater volume of business without the increase in capital which he would require if he had to rely on conventional modes of transportation and conventional systems of distribution."

## Airline Orders

It is anticipated that by late 1960 aircraft manufacturers will begin turning out turbine-powered all-cargo planes. Four airlines have already ordered 37 giant turboprop air freighters. One type will be able to cross the Atlantic non-stop in either direction with a payload of 35 tons. By 1964 they should be effectively penetrating the freight market.

Laudable efforts are being undertaken by the Federal Government to shorten the length of the bridge passage. Of significance is the leadership taken by Federal Aviation Agency Administrator, Elwood Quesada, in sparking a program for the purchase of newly developed air cargo planes.

Another form of Government assistance being discussed is the underwriting of development contracts to produce a prototype cargo plane, much in the same way as the Navy and the Air Force promote design contests and development programs for weapons.

## Huge Market

The multiplicity of interest in producing the right cargo plane is readily understood in light of the magnitude of the total freight market which is worth billions of dollars annually. What this means may be conveyed by noting that the amount spent by the public on passenger travel is less than 5 per cent of the sum spent on the movement of freight.

For example, if air freight captured as little as 1 per cent of the total freight market, it would mean an increase of about 3,600 per cent over the volume of freight presently carried by air.

With such potential, it is not surprising that an air-cargo study re-

cently prepared by a major university is reported to predict that by 1975 U. S. domestic and international air-cargo (mail and freight) revenues will amount to \$4 billion. This compares with \$150 million from air-cargo operations in 1958.

The study also predicted that by 1957 cargo ton-miles (excluding mail) will jump from last year's less-than-one-billion to between 30 and 40 billion.

Finally, the study predicts that by 1975 orders will have gone forward for some 1,000 turbine-powered all-cargo planes. Pausing at the year 1966, the study sees between 300 and 400 new and converted planes operating all-cargo service around the world.

In the past, it is true that air-freight predictions suffered from over-exuberance. However, today's outlook seems to be a product of the necessary elements of reality.

## IATA Marks 40th Anniversary, Cites Air Travel Growth

The International Air Transport Association this month marks its fortieth anniversary.

Starting from six companies which were organized in 1919, IATA today is made up of 90 airlines from all parts of the globe.

The 1919 airliner was a crude transport. It could fly at 85 miles an hour over a 300-mile range and carry 800 pounds of payload.

Today the IATA member fleets number more than 3,200 aircraft of all sizes, including the new turbojets which can cruise at about 600 miles per hour, carry a payload of 40,000 pounds over ranges of 4,500 miles, and put in more than 3,000 hours of flying each year.

An idea of the growth of world air transport can be obtained from the fact that the smallest inter-city helicopter operator among the IATA membership today carries ten times as many passengers as all the members of IATA did in 1920.

## TV Video Tapes Used To Cut Bomber Tests

The aerospace industry has borrowed from the television networks to reduce the number of expensive tests on a supersonic bomber.

Video tape recorders, the same as those used by national TV networks, are being adapted to record test data on electronic countermeasures systems on the bomber.

The tapes can be played back immediately by engineers to study the results thoroughly on a screen. This cuts down the number of test runs the bomber must make.



The U. S. today has about 3,200 public airports, but less than 200 of this number have runways of 7,000 feet and over, according to Aviation Facts and Figures, an official publication of the Aerospace Industries Association. More than 40 per cent of all airports have runways of less than 3,000 feet. A concerted effort by national and local governments is required to expand our airport capabilities to meet the surge of commercial and private air travel.

PLANES/AEROSPACE

## 'Good Teacher' Is Prime Reason for Increase in High School Science Enrollments

A survey by Columbia University's Teachers College among 1,000 alumni shows these reasons are most frequently mentioned for increasing enrollments in high school science courses:

1. Good teacher.
2. Advice from well-staffed and prepared guidance department.
3. Encouragement from administrative sources within the school.
4. Home background conducive to study of science.
5. National publicity on the need for scientifically trained personnel.
6. Good opportunities apparent in industry.

Most frequently mentioned reasons for declining high school science enrollments:

1. Poorly prepared or uninteresting teacher.

## 'Tranquilizers' Keep Missiles on Course

The missile-space age is creating new jargon among Air Force missile men.

Here are some samples:

A "greenhouse" is a check station where simulated flights are conducted.

A "doghouse" is a protrusion that houses instruments on the rocket's otherwise smooth skin.

"Elephant ears" are thick plates that reinforce hatches and holes in the missile's body.

"Tranquilizers" are the instruments used to stabilize the missile's guidance system.

2. Subject is too difficult, takes too much time, yields poor grades, conflicts with extracurricular preferences.
3. Students have a poor elementary school background for science.
4. Inadequate guidance procedures in the school.
5. Poor physical facilities.

## USAF Book Program Lists New Titles

The USAF Book Program, established to spur the writing and publication of literature of aviation, air and space power and related subjects, this month lists the following books which were published in cooperation with the program.

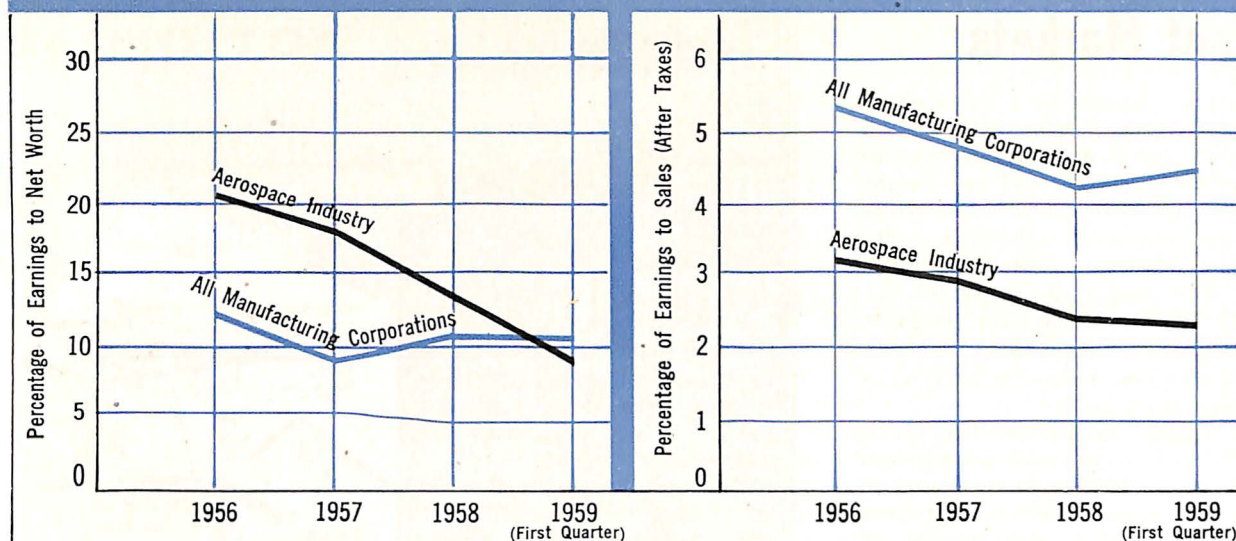
U. S. AIR FORCE ACADEMY: THE LIFE OF A CADET, Jack Engman (Lothrop, Lee and Shepard, \$3.50). A revised edition of the picture story of the USAF Academy and its new quarters at Colorado Springs. More than 250 photos.

THE BIG X, Hank Searls (Harper, \$3.50). A vivid novel about the scientists, engineers and pilots who design, build and test the experimental rocket planes designed to fly at Mach 8 and 200 miles altitude.

TARGET FOR TOMORROW, Dr. I. M. Levitt (Fleet Publishing Corp., \$4.95). A popular study of the development of rockets, missiles, and artificial satellites. Discusses the universe, space travel, the conquest of the moon, life on other planets, man-made space stations and satellite weather bureaus. The author is Director of the Fels Planetarium of Franklin Institute.



## EARNINGS COMPARISON



The earnings rate of aerospace companies comprising the aircraft and parts industry—measured against both net worth and sales—continued to decline in the first quarter of 1959, following the trend of the previous three years. The rate of earnings on net worth has dropped from 20.3 per cent in 1956 to 8.8 per cent in the first quarter of 1959, well below the average for all manufacturing corporations. These companies show only a slight change from 12.6 per cent in 1956 to 10.6 per cent in the first 3 months in 1959. The ratio of earnings to sales of aerospace companies has dropped steadily from 3.1 per cent in 1956 to 2.3 per cent in 1959. All other manufacturing changed from 5.2 per cent in 1956 to 4.5 per cent in the first quarter of this year.

Source: Federal Trade Commission  
Securities and Exchange Commission  
PLANES/AEROSPACE

### Pre-Loaded Containers To Speed Handling Of Baggage on Jets

A transport manufacturer and an airline together have developed a preloaded container which makes it possible to remove baggage from jet aircraft in less than three minutes—about one-fifth the time required by ordinary manual methods.

Made of light-weight fiberglass, the tub-shaped containers match the contour of cargo compartments in the underside of the jet transport. The "tubs" are lifted in and out by an electric hoist. Inside the compartment they fit into place on a track like beads on a string. Carts transport the baggage containers to the aircraft.

Engineers estimate that the baggage containers can be removed from the plane faster than most of the 100-plus passengers can deplane.

### Value Analysis Reduces Manufacturing Costs

Value analysis is proving to be one of the aerospace industry's most important tools in cutting costs.

For example, a part used in the manufacture of communications equipment was originally calculated to cost about \$240. The manufacturing engineers first went over the plans before construction started and reduced the cost of each part to \$115. Then a team of value analysis engineers did an even more thorough job, contacting the various departments concerned to see if further economies could be made.

The study showed that a side panel of the component, previously made of four pieces, could be made in two pieces. An aluminum extrusion was used in place of an expensive casting. A locking mechanism was made by a stamping process rather than machining. A machine bolt costing \$3.80 was replaced by a standard bolt costing 25 cents.

Final cost of the part, after value analysis: \$50.

### Tropical Fish May Be On Menu for Space Travelers

A tropical fish, the *Tilapia*, is sharing the space flight spotlight along with such exotic items as inertial guidance systems and high-thrust rocket engines at an aerospace company.

Space medicine scientists believe the fish could prove an excellent source of food for space travelers.

One basic problem of space flight is the enormous power required to lift a pound of anything into space. This means that food and water must weigh as little as possible. Most space planning contemplates

### NAEC Offers Pictorial Account of Aviation

It's back to school in September, and teachers will find that student interest can be greatly increased through the use of teaching aids available through the National Aviation Education Council.

One of the best aids is *U. S. Aircraft, Missiles and Spacecraft, 1959*, a comprehensive, pictorial account of aeronautic and astronautic achievements during 1958.

*U. S. Aircraft, Missiles and Spacecraft* contains photographs and three-view drawings of all aircraft and helicopters produced in the United States during the past year, together with specifications and performance data.

In addition, the booklet contains a special chapter on achievements in the field of space flight and records of U. S. satellite progress in 1958.

An expanded missile section depicts all U. S. missiles in development, production, or operation, with specifications and performance data.

The 152-page booklet with three-color cover, may be obtained by writing to the National Aviation Education Council, 1025 Connecticut Avenue, N. W., Washington 6, D. C. Price is \$1.00 per copy.

trips lasting months or even years, and each man will require about five pounds of water and about one and a half pounds of oxygen daily.

A solution is sought in a system in which water, oxygen and food-stuffs can complete, in a closed space and fairly fast time, the whole natural cycle: water and human wastes going to fertilize plants, which release oxygen into the vehicle, eventually are eaten by the men—who also convert the oxygen, through breathing, into carbon dioxide which the plants can use—or are fed to some animal life which will be eaten by the men, who produce the wastes to start the cycle all over again.

*Tilapia* looks like a good prospect for the animal life. The big-mouthed, white-fleshed fish has spread rapidly in the last twenty years. It lives in almost any quiet, warm water, reproduces when only eight weeks old, grows fast and can exist entirely on algae. It will also bite on an angle worm, the scientists note.

Experiments are now being directed at producing algae in various combinations of purified wastes. By photosynthesis, the algae thrive on the solution and carbon dioxide from the air and part of the algae is siphoned daily into another jar of water where the *Tilapia* waits with open mouth.

Experiments also involve various plants, such as the fast-growing mushroom. Some day space travelers may sit down to a meal of *Tilapia* and mushroom soup.

### Metal Breakthrough

A major breakthrough in using beryllium, a metal offering great advantages in aircraft, missile and spacecraft manufacture, has been reported by an aerospace company. For the first time, the company states, structurally sound beryllium sheet material has been used to build a structural part.

### Fiberglas Pads Insure Quiet Jet Flights

Padded planes scheduled for transport service next year will provide passengers with "hushabye quiet" during speedy jet flights.

Over 1,000 pieces of fiberglass, of all shapes and sizes, are being tucked into the interior of each jet transport to protect passengers from noise generated by engines and other operating systems of the plane.

The sound-proofing material is installed in each major section of the plane—the forward nose fuselage, tail, overwing barrel—as it is being built.

More than 600 different shapes of fiberglass pads wrapped and stitched into plastic fabric covers are clipped to the plane's frames and laced in with nylon cording. The pieces range in thickness from one to four inches, and in size from six inches square to the large 14-ft. long by 20-in. wide pieces that are shaped to fit around each of the 88 windows.

Fiberglass pads are placed between the skin and any installations to go into the plane before the structural tie-ins are made. For instance, in the forward fuselage, specially-shaped pads are laced into locations to serve as backings for the radio rack, electric rack, flight engineer's panel and underneath the cargo floor.

### 'Library' Technique Used For Materials

A new material handling facility at an aircraft plant will permit personnel to obtain needed items "as easily as picking a book off a library shelf."

The "books" in this case are skid loads of sheet stock which have been placed on 26,240 square feet of racks.

Material is now available a skid at a time, eliminating the former method of digging through stacks and rotating material until the required skid was uncovered.

Side-loading fork lift trucks now scoot up the aisles and pick off the skid which is available on its own shelf.