



June 28, 1957

Vol. 13, No. 6

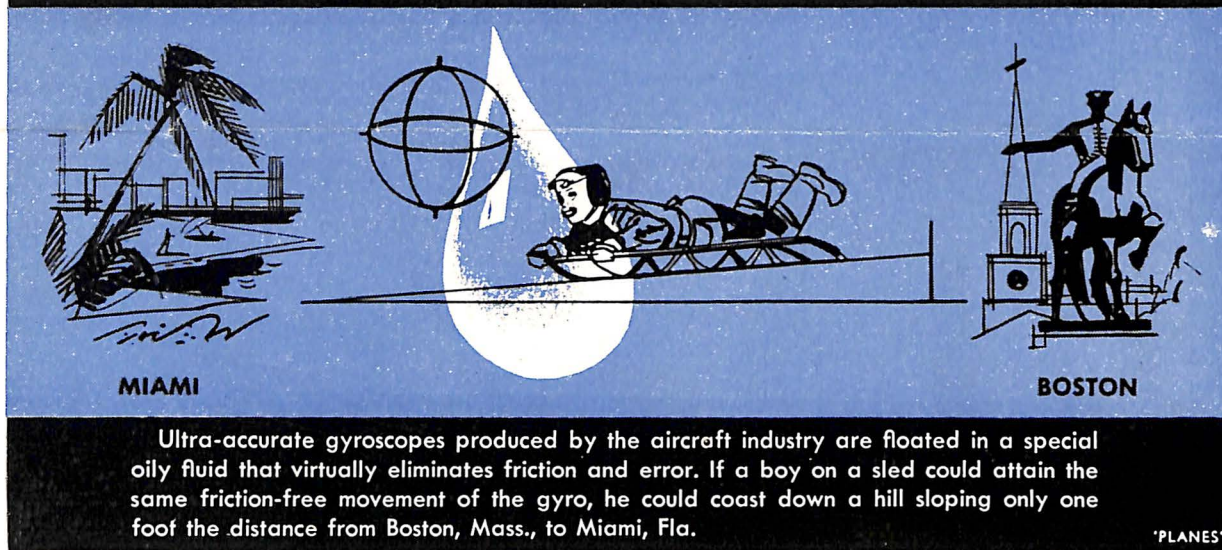
planes

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KNOW-HOW: INDUSTRY'S MOST VALUED ASSET

ELIMINATING FRICTION



Ultra-accurate gyroscopes produced by the aircraft industry are floated in a special oily fluid that virtually eliminates friction and error. If a boy on a sled could attain the same friction-free movement of the gyro, he could coast down a hill sloping only one foot the distance from Boston, Mass., to Miami, Fla.

'PLANES'

Valuable Data Faces Threat

By George Hannaum
Director of Industry Planning Service
Aircraft Industries Association

Technical complexity, particularly in the development and manufacture of modern aircraft and missiles, has graphically pointed up the absolute necessity for know-how which encompasses creative design and closely guarded manufacturing processes and techniques.

Know-how is the keystone in the design and production of today's aircraft and missiles, the most complicated equipment produced by man. Essentially, know-how is a precise blending of every scientific and administrative advance into a reliable operational weapon. It acts as a catalyst that transforms real goods—such as materials—and the ideas of men into a weapon that can guide itself from a launching point on the ground to a point in outer space and then strike a target 5,000 miles away.

Know-how, which is the ability to produce a successful product of any kind, is the most valuable asset of any company, far exceeding any figure that may appear on the balance sheet.

The national security depends completely on the know-how of the hundreds of companies engaged in an international technological race to create new weapons from the ideas turned up by research.

This property of defense industry is threatened by government policies which require industry to forfeit know-how through technical and manufacturing data requirement clauses in its procurement contracts.

The rules that govern technical and manufacturing data under government contracts today virtually give the government the right to furnish all other firms the know-how laboriously acquired by a competitive company. In times of national emergency, this may be necessary. Supplementary sources may be required to produce, in a short time, a large number of aircraft or missiles designed by one firm. This means that several companies, once competitive, may be producing the same plane or missile. The companies that make up the aircraft industry complex have never objected to this procedure.

(Continued on page 7)

2,000 Airliners Valued at \$2 Billion Produced in U.S. Since World War II

America's airliner manufacturers have produced more than 2,000 commercial transports for use by U. S. and world airlines since the end of World War II, an Aircraft Industries Association survey discloses. The planes, not counting spare engines and parts, cost about \$2 billion.

Included in the totals are more than 700 two-engine transports and a minimum of 1300 aircraft powered by four engines each. The first truly postwar commercial planes cruised at speeds of about 290 miles per hour but models currently being delivered and operated cruise at better than 360 miles an hour and have top speeds approaching 420 miles per hour.

These 2,000 commercial transports, because of their greater speed, efficiency and productivity, have enabled U. S. and other air carriers to maintain fares at about the levels charged before World War II. And the advent of these money-making airliners simultaneously served to get practically every major U. S. carrier off government subsidies for the first time.

In addition to economic advantages for the airline purchasers, the 2,000 transports are also available to support military airlift needs of the U. S. and its Allies in case of

mobilization. Virtually all of the aircraft have been delivered to either U. S. airlines or to airlines of countries friendly to the U. S. and could therefore be called up for military use if necessary. U. S. carriers have already volunteered to furnish more than 300 of their four-engine transports to the Military Air Transport Service within 48 hours of M-Day.

All the 2,000 aircraft already delivered by U. S. companies were powered by reciprocating engines, and another 400 planes of the same type are still on order. But this world-wide preference for American-built airliners is only partially evident in past deliveries. Orders on U. S. manufacturers' books indicate that the preference will continue long into the future.

Beginning in 1958, air carriers in this country and abroad will start taking delivery of the faster and quieter turboprop and turbojet airliners already in various stages of production. American manufacturers currently hold firm orders for a minimum of 200 turboprop (or propjet) airliners and for at least 320 pure jet transports. These planes will carry air travelers to their destinations at speeds up to 600 miles per hour in vibrationless comfort.

New Painting Technique Cuts Time from 1 Hour to Only 3½ Minutes

The aircraft industry's never-ending search for better, faster and more efficient aircraft is matched in the aircraft factories by the ingenuity of workers who conceive and design better, faster and more efficient methods of doing their jobs.

A case in point took place recently in a Western aircraft plant, involving the painting of small parts such as washers, clips and spacers. This used to be a time-consuming job. The parts had to be spread out on a screen and arranged so that no two parts touched one another. Then they were spray-painted.

This method required a full hour's work by three men for each batch of small parts that would fit on a screen. By using a new machine developed by aircraft workers, one man can do the same job in exactly three and a half minutes.

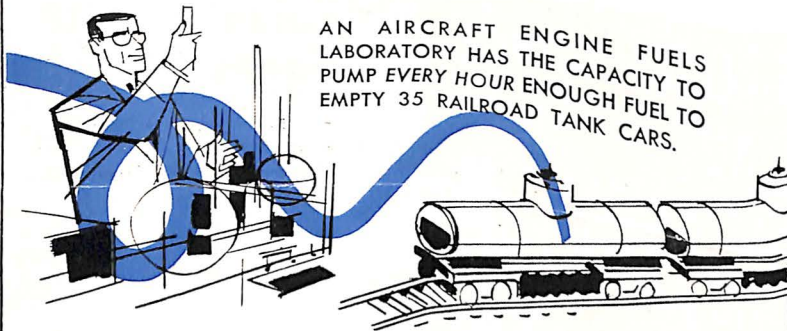
The new device is a wire-cage drum which revolves, somewhat in the manner of a cement mixer. A batch of small parts is dumped into the drum, which begins to revolve. A point spray gun is aimed into the drum, and the parts are coated evenly with an extremely fast-drying paint. A blast of air is shot into the drum while the parts are being painted, which prevents them from sticking together.

Plane Views

MORE THAN 400 SUBCONTRACTORS ARE INVOLVED IN SUPPLYING THE FLIGHT CONTROL SYSTEMS ALONE FOR A MODERN JET BOMBER.



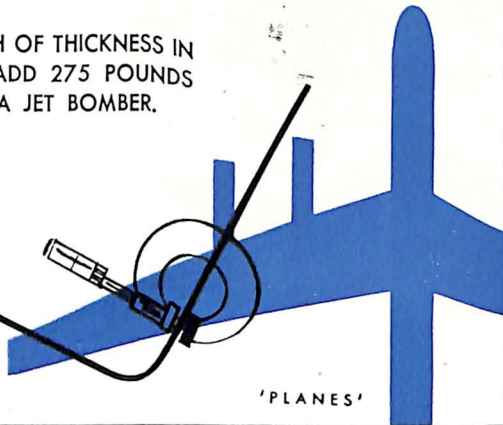
AN AIRCRAFT ENGINE FUELS LABORATORY HAS THE CAPACITY TO PUMP EVERY HOUR ENOUGH FUEL TO EMPTY 35 RAILROAD TANK CARS.



DEVIATION OF .005 INCH OF THICKNESS IN A WING SKIN COULD ADD 275 POUNDS OF EXTRA WEIGHT TO A JET BOMBER.

.005" =

+ 275 lbs.



'PLANES'

PLANE FACTS

- An airport surveillance radar unit used in air traffic control has 707 tubes, 230 fuses, and weighs about 15,500 pounds. Its range is approximately 30 miles from the airport.

- Some 12,955 miles of leased telephone line circuits were put into operation in one month by the Civil Aeronautics Administration to interconnect its air route traffic control centers. The additional mileage will be used to implement the high altitude control of air traffic.

- Some airports are so large that tower operators cannot see across them in bad weather. Occasionally, airplanes are "lost" on such airports, causing severe disruption of traffic control. The Civil Aeronautics Administration is planning to use radar and/or television in control towers to spot these "missing" aircraft, and direct them to loading ramps.

- Aircraft engineers now predict that inhabited space craft will fly at speeds up to 80,000 miles per hour and will take from several months to several years to complete round trips to nearby planets.

AIR QUOTE

"We have now entered an era of aeronautical progress which poses problems radically different and immeasurably more complex than any problems that have ever challenged human ingenuity. Today, we expect to operate—and to operate effectively—under conditions far beyond anything in the history of human progress.

"Our experimental aircraft have already reached speeds at which the seemingly well established laws of aerodynamics no longer apply. Advanced aircraft of the not too distant future will be subjected to aerodynamic heating which none of the structural materials or methods known today can withstand.

"Never before experienced extremes in heat are matched by commensurate extremes in cold; the problems created by extremely high gravitational forces are compounded by those of extremely low air densities. All these extremes must be challenged again and again by the airplane—its structure, its powerplant, its components, and, if manned, its human operator—if progress is to continue."—General Thomas S. Power, USAF, May 23, 1957.

PLANES

Planes is published by the Aircraft Industries Association of America, Inc., the national trade association of the manufacturers of military, transport, and personal aircraft, helicopters, flying missiles and their accessories, instruments and components.

The purpose of *Planes* is to:

Foster a better public understanding of Air Power and the requirements essential to preservation of American leadership in the air;
Illustrate and explain the special problems of the aircraft industry and its vital role in our national security.

Publication Office: 610 Shoreham Building, Washington 5, D. C.

New York Office: 150 East 42nd Street, New York 17, New York.

Los Angeles Office: 7660 Beverly Boulevard, Los Angeles 36, California.

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Trading For Peace

By Irving H. Taylor

Director, Export Service, Aircraft Industries Association

The goal of this nation's foreign policy can be simply stated: Insure a peaceful existence and constantly improve the living conditions of the whole community of nations.

The simplicity of stating the goal does not mean the accomplishment is any the less complex. There are many avenues that must be explored, then exploited or abandoned, to achieve this elusive prize.

One of the bedrock approaches to carrying out our foreign policy is through international trade—the commercial export and import of finished products and raw materials. The American aircraft industry is a substantial contributor to this vital flow of international trade.

The reliability and performance of American-built aircraft and other aviation products set the standard for the world. Today 85 per cent of the aircraft used by the world's airlines bear the "Built in America" plate. The high degree of acceptability of American aviation products is underlined by the fact that the leading overseas market for this equipment was the British Commonwealth which is the largest producer of aircraft outside the United States and Russia.

The total exports of aviation products by the United States in 1956 reached \$1,059,300,000, an increase of 45 per cent over the previous year. This is the highest rate of export for aviation products ever registered in a peacetime year. Over-all, the foreign trade of the United States this year will amount to more than \$30 billion, representing one-sixth of the international trade of all nations.

The aircraft industry knows that the potential of the aviation market abroad has barely been tapped. The new nations of the world today, and older nations seeking to improve their economy, are leap-frogging the age of surface transportation and moving directly into the air age as the primary means of transporting its people and its products within their own borders.

The general manager of an airline in Costa Rica explains it with this example: "We have jumped from the ox-cart to the airplane much faster than we could convert to super highways and fabulous bridges. For example, in Costa Rica, a country about the size of Massachusetts, we have over 115 airfields and over 26 airports connected by regular airline service. Some of our airports are only five minutes apart by air and 24 hours apart by surface means. Within this tiny system we carry about 9,000 passengers and over one million pounds of freight each month. We were born of necessity and we survive and prosper by serving."

Trade is based on free enterprise. The foreign aid program of the U. S. government has done much to build up countries which had lagged in economic development. But the role of the private businesses out-strips the total of all government programs both in the sums of money involved and the results attained.

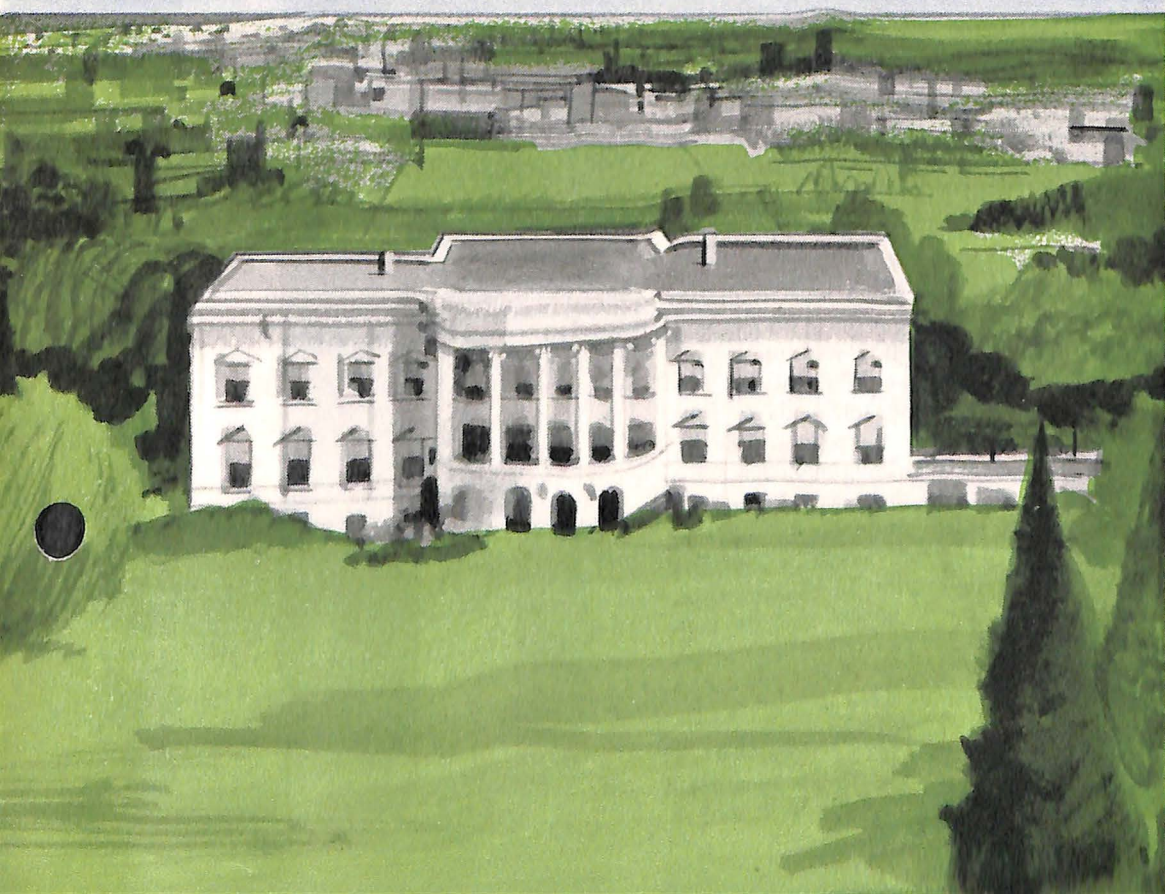
The single greatest barrier to the free flow of trade consists of artificial restrictions contrived by man. The spirit of international teamwork necessary to stimulate trade is too often grudgingly given or vitiated by complicated rules governing trade among nations.

There is no worthier goal that the community of nations can work toward than the erasure of these artificial lines that bind their efforts to promote the free give and take of international trade.



If we are to ride in

copters...



planes



B. L. WHELAN, Chairman of the Helicopter Council of the Aircraft Industries Association, is one of the world's first 250 pilots, holding Federation Aeronautique Internationale License No. 247. He was taught to fly by Wilbur and Orville Wright, paying the Wright Brothers a



dollar a minute in tuition. His name is inscribed as an early student of the Wright Brothers on a bronze tablet on Wright Brothers Hill, in Dayton, Ohio, and on another plaque at the Wright Memorial, Kitty Hawk, N. C. When World War I broke out, he became a civilian instructor for the Army, and trained scores of pilots for overseas service. He has flown thousands of hours without ever having a flying accident. As General Manager of Sikorsky Aircraft, Mr. Whelan saw the helicopter evolve from an aeronautical curiosity to an aeronautical necessity. He is now a Vice President of United Aircraft Corporation.

By B. L. Whelan

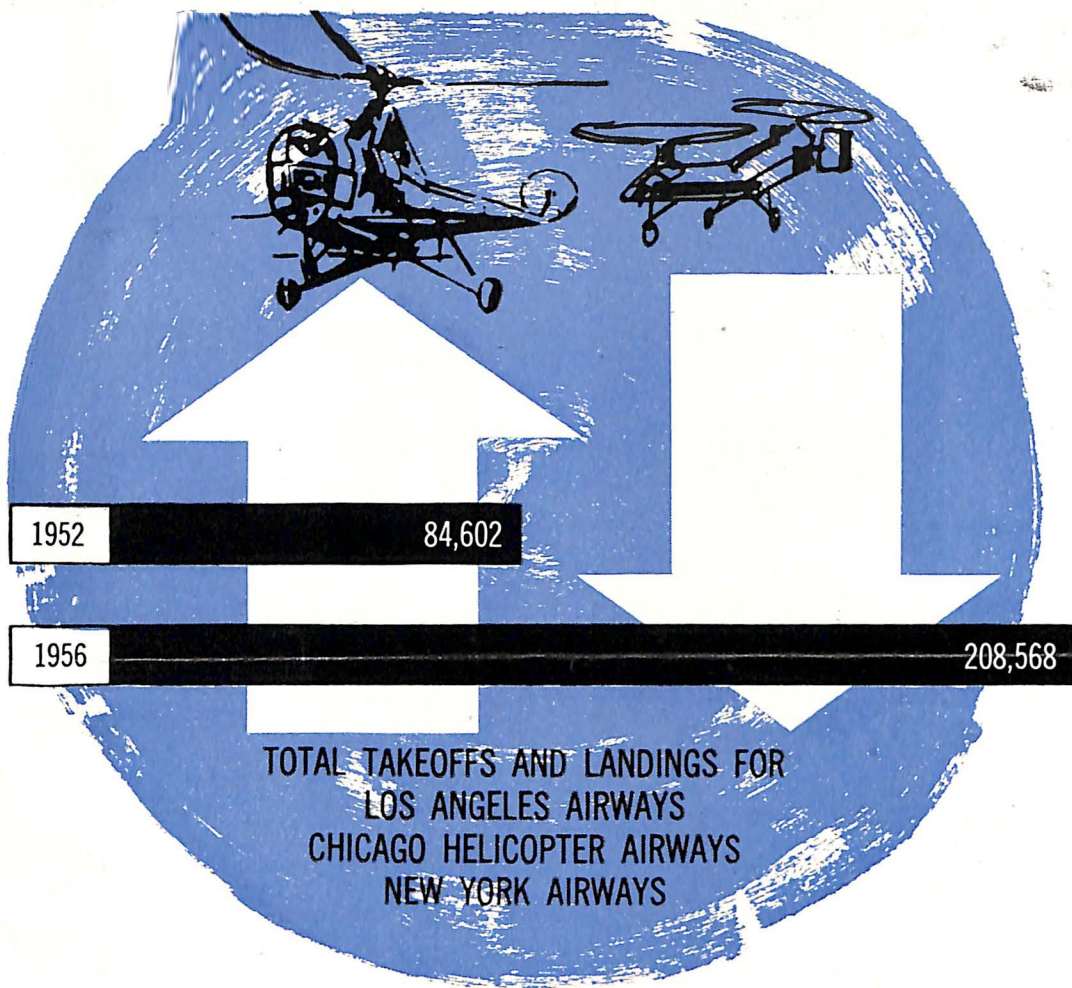
Chairman, Helicopter Council,
Aircraft Industries Association

WHEN the White House announced that two helicopters had been purchased for President Eisenhower's use, an enormous boost was given to the future personal safety, not only of Mr. Eisenhower, but of future Presidents as well.

For the Presidential helicopters are to be used between the White House south lawn and Washington's National Airport, across the Potomac, thereby overflying some of the heaviest ground traffic in the world.

The fact that those responsible for the President's safety now permit him to fly in a single engined helicopter vividly demonstrates how safe the operating characteristics of the helicopter have become. Until quite recently, the President was restricted to four-engined aircraft. It naturally follows that a single engined helicopter—even in the event of a power failure—is considered to be as safe today as was a four-engined airplane some years ago.

The truism that "flying will never be safe until they eliminate the ride to the airport," probably coined by an aviation enthusiast shortly after the Wright Brothers' Kitty Hawk



triumph, can now be retired to the archives along with other antiquated sayings. For the helicopter has virtually eliminated the "ride to the airport"—at least as far as President Eisenhower is concerned.

THE question which remains is: when can the public at large expect to have the ride to the airport eliminated?

The answer, unfortunately, is that a great deal of inertia, indifference and inexperience on the part of state and municipal governments will have to be overcome before the great day arrives when helicopter service is widely available. We must have modern laws, and we must have downtown heliports.

That it will indeed be a great day is doubted by no one, since the helicopter has already become, in its short life history, one of the most admired aircraft types ever devised. Its ability to take off and land vertically, its ability to hover in mid air like a hummingbird, and its unmatched ability to lift and tow hitherto immovable objects has endeared the helicopter to a wide range of present and potential users.

Outstanding chores performed by the helicopter in rescue work have perhaps created the impression that this is its main task. In actuality nothing could be further from the truth.

Not as well known is the helicopter's more plebeian, around-the-clock chore of serving as a draft horse for supplies and equipment, nor the many other tasks it is performing for industry, both in this country and abroad.

The majority of these chores are carried out by more than 80 commercial helicopter charter operators in the U. S. and Canada, who maintain nearly 400 of them in their

combined fleet.

In the petroleum industry, for example, 'copters patrol pipelines, service offshore oil rigs in the Gulf Coast area (making sure that supplies and crews reach these isolated water-based drilling platforms in time, and flying the men home at night), conduct gravity meter and seismograph surveys, and speed up geological mapping.

Construction companies are using helicopters to transport men and materials to hard-to-reach sites. Firms engaged in bridge and dam building have found they can save many dollars and man-hours by carrying construction materials and work crews by helicopter to the ordinarily inaccessible sites from which such projects are begun, instead of the former method of first building a costly road, then using a fleet of trucks.

In the electrical power business, 'copters are employed in patrolling thousands of miles of powerlines, many of them located in the wilderness, thereby doing away with the old-fashioned method of sending walking inspectors on trips of several weeks' duration. The helicopter can do the same job in days. Furthermore, it is far easier for a powerline inspector to look down from a helicopter for trouble spots on a line than it is for a man on the ground to patrol while constantly looking up at the wires. One electric power firm which bought a helicopter for patrol work reported (with tongue in cheek) that the helicopter saved its purchase price in liniment for stiff necks alone.

ELECTRIC companies have also used helicopters to rush emergency crews to distress areas for immediate repair work, to survey routes for new powerlines, to lay wire, and to

deliver portable towers to remote, inaccessible sites.

OIL companies have transported complete oil drill rigs into jungle territory, completing in three months a project that would otherwise have required 18 months by road alone.

The Forest Rangers had a problem—placement of watchtowers in mountainous areas of the West. It was imperative that each watchtower be located at the exact spot where a Ranger could look out over the biggest area of forest possible, in order to spot forest fires before they got out of hand.

In an area of total wilderness, the mere job of site selection, let alone getting the materials to build the towers up to the site, seemed to be a Herculean task if performed from the ground.

Helicopters solved the problem handily. Carrying a Ranger seated next to the pilot, they hovered over likely spots until the Ranger calculated, from the air, that this was the best possible place to build a tower. The 'copter executed a slow, 360-degree turn while the Ranger figured exactly how many acres of timber he could watch from this spot, at this altitude. Then it was simply a question of dropping a plumbline to earth from the hovering 'copter and measuring the rope. However long the rope was, that was how high a tower was built. The towers were built in sections, flown to the marked sites by helicopters, and assembled on the spot. Saved? Thousands of dollars, and thousands of acres of virgin timber.

In agriculture, it is next to impossible to calculate the monetary savings the use of



helicopters has brought about. 'Copters are used here for dusting, spraying, seeding, frost control (the rotating wings of the helicopters force the warm ground air, which normally rises, into a downdraft, thus keeping frost from destroying delicate crops, such as citrus fruits), weed eradication and defoliation. It has been found, for instance, that helicopters do a remarkable job of blowing pecan nuts off trees when they ripen. One 'copter can do the job instead of many men who formerly harvested pecan crops by hand.

IN the field of municipal and state government services, the helicopter is used in fighting forest fires, reseeding burned-off and cut-over timber areas, aiding police work in harbor and traffic patrol, directing Civil Defense activities, and, of course, in rescue work.

The mining industry uses them for geological work, prospecting, and the actual staking of claims is often performed from a helicopter. They have also made a place for themselves in ranching, performing such cowboy chores as riding fence and herding cattle. The aerial cowboy can more easily round up "critters" hiding in the mesquite than his counterpart on horseback—and at lower cost.

The 500,000-acre Waggoner Ranch in Texas estimates that its one helicopter can perform the work of 15 to 20 cowboys over any given period of time.

Military uses of the helicopter are almost endless in variety. Besides rescue work, which the 'copters so ably performed in Korea, they are now in use with every branch of the armed services. They can swiftly deliver ammunition to forward area troops, carry wounded back to hospitals, tow mired trucks, tanks—even beached Navy vessels as large as an LST (Landing Ship, Tank) have been successfully towed into the water by helicopters serving as aerial tugboats.

With the Navy, they hop from ship to ship and ship to shore, carrying mail, materials and messages—and even the Chaplain for Sunday services! And the ubiquitous 'copter is always hovering aft of carriers when flight operations are being conducted, ready to retrieve any luckless pilot who might miscue.

For reconnaissance, the plastic bubble canopy of a helicopter now serves as the "crystal ball" so many field commanders have often expressed a wish for, seeing behind enemy lines, reporting enemy disposition of forces, and acting as an artillery spotter. Military applications include a "drone" helicopter which can be radio-controlled from the ground, and which can simultaneously be used as an aerial television platform, bringing a graphic picture of forward operations to command posts far removed from the battle zone. 'Copters have added immeasurably to the armed forces' strategic concept of "vertical envelopment."

The greatest potential for the future growth of the rotorcraft, however, lies in the field of executive transportation, air carriers and aerial taxis. A good example of this potential is the scheduled helicopter passenger service now offered in three metropolitan areas—New York, Chicago and Los Angeles.

The fact that the public desperately wants and needs helicopter service is graphically

demonstrated by a few facts and figures.

Item: Los Angeles Airways reported in January that it carried a total of 20,560 passengers in 1956, as against only 4,788 in 1955—a growth factor in a single year of over 400 per cent.

Item: New York Airways in 1953 had only 1,513 revenue passengers, no express poundage, and 141,116 freight pounds. By the end of 1956—just three short years later—the helicopter airline recorded 43,205 revenue passengers, 1,907,373 express pounds, and 607,023 freight pounds.

ture of the future for helicopters, but there are several thorny problems which must first be solved if the helicopter industry is to reach its expected growth potential.

In the first place, many more downtown heliports are needed. As the nation's airlines switch to turboprop and turbojet equipment over the next few years, more airports will have to be built, and runways at some existing airports will have to be extended.

The tremendous savings in time accruing to airline passengers flying the new jet and prop-jet airliners can be well nigh wiped out



New York City's West 30th Street Heliport, conveniently located in midtown Manhattan, represents an ideal site location—right in the heart of town, yet offering easy over-water aerial access, no interference with ground traffic.

Item: The newest intra-city helicopter passenger carrier, Chicago Helicopter Airways, has inaugurated 22 daily flights between Midway Airport and downtown Meigs Field, and an equal number of flights between the downtown lakefront heliport and O'Hare International Airport. While new to the business of carrying passengers, the firm's rotorcraft have been carrying mail between airports, the roof of Chicago's main Post Office building and 55 suburban communities since 1949, and have compiled the enviable record of nearly 1,500,000 accident-free miles. On June 6, Chicago Helicopter Airways set a new daily record, carrying 226 passengers.

Item: Port of New York Authority officials have predicted that "by 1965, there will be close to 3,000,000 passengers annually using helicopter services within a 75-mile radius of New York City."

Item: Aviation consultant Grahame H. Aldrich has reported to Edward P. Curtis, President Eisenhower's special assistant for Aviation Facilities Planning, that by 1965, there will be about 2,800 helicopters in operation, generating a minimum of 8,700,000 trips, or 17,400,000 landings and takeoffs.

Admittedly, this appears to be a rosy pic-

ture if these passengers are forced to disembark at airports far removed from their actual destination and then fight their way through dense ground traffic to get there.

The answer, of course, is to transfer to a helicopter, and overfly the ground traffic, landing at a heliport located right in the heart of the city.

HOWEVER, it is of primary importance to see to it that the heliports are built. And to do this, forward-looking legislation is required by municipalities and state governments. Zoning laws must be updated, land acquisition must be facilitated, air space for helicopters must be separately regulated, and airports—which are expected to generate much of the helicopter traffic—must set aside areas for helicopter operations, maintenance and parking.

It is important to remember that while both the helicopter and the fixed wing airplane use the same air space, they are not at all birds of a feather. They differ vastly in operating characteristics and the uses to which each may be put.

Nevertheless—and unfortunately—the helicopter and the fixed wing aircraft are often still categorized, and worse yet, regulated, by

many state and local laws, as if they were the same type of machine.

Years ago, when state aeronautical statutes were being drafted, legislatures used the definition of the word "aircraft" then used in federal laws—a definition which was designed to compensate for the small amount of aeronautical knowledge then in existence. It was broad enough to include "any contrivance now known or hereafter invented, used or designed for navigation of or flight in the air."

WHEN this language was adopted, there were no helicopters. Yet today, when the helicopters are coming into their own, they are forced to operate in many jurisdictions under fixed wing rules and regulations pertaining to permissible altitudes over congested areas, minimum visibility limitations, and other limiting factors.

Such rules are generally far too restrictive and thus retard development of the safe, low altitude, point-to-point operations possible only with the helicopter.

Similar unfortunate problems exist with respect to the statutory and regulatory treatment of heliports as compared with conventional airports. The Civil Aeronautics Board and the Civil Aeronautics Administration have taken concrete action in these areas, separately defining the helicopter and affording helicopter operators relief in many instances where fixed wing rules would be inappropriate.

A few states have also taken steps in this direction, some by regulation, others by amending their aeronautical statutes. But many other states, and even more local jurisdictions, such as cities, counties, townships and the like still have done nothing.

Granted, the inertia of our legal processes is difficult to overcome, but overcome it must be if the public is to reap the benefits waiting for them in increased helicopter operations.

In one large U. S. city, the city health officer is empowered to deny permission for the establishment of a heliport. City health officers by and large perform their tasks ably, but it is obvious that they have no more qualification to rule on location of heliports than a pilot has to perform surgery.

In some instances, legal terminology requires that helicopters land at "airports," since the helicopters themselves are included in the definition of "aircraft." In those states where minimum airport dimensions are fixed by law, the result is to eliminate even the possibility of landing or takeoffs from heliports, which do not measure up to the legal definition of "airports." Such a legal tangle, obviously, could prevent heliport building.

Heliports themselves need not be nearly so elaborate or costly as airports. Helicopters need only a small touchdown pad, parking and refueling areas, and a modest terminal building to carry out their functions at down-town locations. In many cases, such secondary heliports can be built near or at waterfront locations, which simplifies land acquisition over water, rather than adding to land areas. For basic maintenance and fueling, helicopters should be handled from facilities at major airports, at which most traffic originates.

THOMAS M. Sullivan, Chief of the Aviation Planning Division of the Port of New York Authority, recently outlined ten basic points for selecting metropolitan heliport sites:

1. Proximity to traffic generating sites.
2. Vehicular accessibility and availability of public transportation.
3. Proximity to Post Office facilities.
4. Sufficient size and proper elevation.
5. No interference with other helicopter or fixed wing operations in the area.
6. Obstruction clearance and protection of approaches.

7. Availability of emergency landing areas.
8. Cost of site development.
9. Consideration of possible effect of noise and rotor downwash on neighboring properties.
10. Provision of refueling facilities.

Such factors as these are a "must" in heliport site selection, but a re-reading of the list discloses that each of the ten points requires some sort of legal action, and the closest cooperation from municipal, county and state government officials.

MANY localities are not as fortunate as the New York metropolitan area in having a forward-looking planning and operational organization like the Port of New York Authority.

Yet these cities and towns can enjoy the benefits of helicopter service if they will amend their horse-and-buggy laws and ordinances. Too often, city government officials are elected to office for only a few years, and are necessarily busy with immediate short-range needs. These officials often put off thinking about heliport planning. Those who are in a position to help, who have a real desire to do so, are bogged down in a morass of antiquated laws and rules predicated on the theory that helicopters will never be invented.

It is a well-known fact, however, that elected government officials on every level—from federal to village—are responsive to the will of the people. In many cases, progress has been hampered only because there has been no crystallization of public opinion. Once public opinion makes itself known, the sometimes cumbersome machinery of government can swing quickly into high gear.

Civic, fraternal and social organizations can do much to bring about modernization of restrictive and outdated laws and regulations, once they realize that there can be no adequate helicopter operations unless there are modern and adequate laws specifically tailored to the age of vertical flight.

The aircraft industry already has designed and is test flying radically new Vertical Take-off and Landing aircraft. Some of the more promising developments include tilt-wing convertiplanes, which will take off and land vertically, a la helicopter, but which will also make a transition in flight into the level attitude of conventional airplanes. These have not gone beyond the development stage. Several types of one-man helicopters have been built, including the ducted fan flying platform, and a shoulder harness helicopter which can be flown after only rudimentary instruction. At the other end of the scale, large multi-passenger helicopters have recently been given the green light by the CAA. New forms of propulsion for helicopters are being tested. A "tail-sitting" jet plane, capable of vertical takeoff, quick transition into level flight, hovering and vertical landing, was recently demonstrated.

The age of the helicopter has just begun. If enough citizens are willing to help rewrite our outmoded aviation laws, it won't be long before the vast potentialities of vertical flight are a reality.



Know-How Is Competitive Strength Of Many Small Business Firms

(Continued from page 1)

For example, an engine company today has furnished a supplementary source with the complete designs and manufacturing data for an engine used in several new planes. The supplementary source actually produces more of these engines than the primary or designing company. The designing company does not collect one cent of royalty on the production of its engines. The profit belongs to the supplementary source, and the national security purchased by having two sources of supply for this engine belongs to all of us.

However, to extend this policy and cover all products of defense industries without compensation to the developing company can only stifle initiative—the fountainhead of know-how.

It would be comparable to giving a class a problem in geometry with the understanding that the student producing the correct solution must furnish it to the rest of the class—with everyone receiving the same grade.

This drying up of the source of fresh, productive ideas can only work against the goal of our national defense program—superior aircraft at lower cost.

Manufacturing data should not be sought by the government unless there is a real need for the information by someone other than the proprietary owner, and when it is needed, these rules should apply:

1. The use should be limited to reproduction for governmental purposes only with no surrender by the originating company of proprietary rights in other fields.

2. The government should pay compensation just as it would for a similar acquisition of any other property, and as a practical matter the most efficient means of transmitting data is directly from the owner to the second source. Contractor-to-contractor should be the primary method used in securing second-source production.

The one vital segment that is most affected by any regulation giving the government indiscriminate rights to hard-won proprietary data is small business.

The competitive strength of small business lies largely in its design and manufacturing know-how. In many cases, this constitutes their principal asset in a competitive sense. The loss of the know-how or its dissipation through sharing with another company has been responsible for the failure of many small firms.

The argument is advanced that since the government buys a specific article it is entitled to all of the data surrounding its development and production. This argument possesses roughly the same validity of an automobile owner demanding from the automobile factory every piece of knowledge involved in its manufacture.

The recognition and protection of know-how as private property is essential to a growing economy. Our industrial strength is based on opportunity and incentive. Any rule that restricts or punishes these qualities can only work against a sound national defense program.

'U. S. Aviation Today' Now Off the Press

The 1957 edition of *U. S. Aviation Today*, a comprehensive, pictorial account of aviation achievements during 1956, is now off the press.

Published by the National Aviation Education Council and prepared in cooperation with the Aircraft Industries Association, the 94-page booklet with a bright three-color cover contains photographs and three-view drawings of all aircraft produced in the United States during the past year, together with specifications and performance data of each.

In addition there is a section devoted to aircraft, aircraft engines, systems and components scheduled for future production, as well as significant developments in the missile field. The booklet also records pictorially significant aviation awards made during 1956.

Ideal for school and college classrooms and libraries, *U. S. Aviation Today* is one of several booklets published by the National Aviation Education Council, a non-profit organization comprised of the nation's leading educators. NAEC booklets are designed to enrich the curriculum of our schools and stimulate the interest of American youth in aviation careers.

U. S. Aviation Today may be obtained by writing to the National Aviation Education Council, 1025 Connecticut Avenue, N. W., Washington 6, D. C. Price is 35 cents per copy. For orders of 100 copies or more, cost is 20 cents per copy.

Mighty Midget

A gas turbine engine weighing only 50 pounds—the smallest ever—is being built by one aircraft company. Only 20 inches high, with a maximum diameter of 15.5 inches, the tiny turboshaft engine will produce 55 shaft horsepower plus 12 pounds of jet thrust.

The mighty midget engine is designed to power a one-man helicopter being developed under contract to the Navy and the Army.

ELECTRONIC ECONOMY

Electronic computers have become irreplaceable tools in the design of modern aircraft. Mathematical analysis of a new transport would have cost \$112,125,000 without computers, but the electronic "brains" held this cost to \$238,400. The aircraft industry utilizes the most modern equipment to reduce the cost of aircraft and speed their development.



Batter Up!

Baker Takes to Air to Solve South Pole Problem of Sagging Cakes (and Morale)

Morale at the South Pole was sagging. It seems that every time the cooks attached to "Operation Deepfreeze" baked a cake, it came out of the oven a flattened and soggy mess. A short wave call for help was relayed by the American Red Cross to a Minneapolis flour mill. Within hours, scientists at the flour mill discovered why the polar cake bake was such a fiasco—altitude. The men at the South Pole were trying to bake ordinary cake mix at 8,000 feet.

The scientists worked out an adjustment (add five tablespoons of flour and one and two-thirds cups of milk, bake at 400 degrees). To test the theory, the flour mill sent its home service director aloft in the company's twin engine executive aircraft, armed with a portable kitchen.

When the plane reached 8,000 feet, she began baking.

Using the standard, sea-level cake mix, which had fared so disastrously at Little America, she popped a cake into the oven. Sure enough, it came out looking as though it had been stepped on. Next, she tried the new formula, which had been radioed to the Polar expedition. The cake emerged golden brown, light as a feather, and delicious enough to lick any morale problem—Antarctic or tropical.

A day later, a jubilant short wave message was sent from the South Pole to the flour mill: "We now have some mighty fine cakes. Thanks to you and your staff for finding the solution."

Not only was the problem solved, but another aviation first was racked up—the first cakes ever to be baked aboard an airplane at 8,000 feet.

Air Traffic Controller Must Envy Easy Life of One-Armed Paperhanger

As a symbol of industriousness, the one-armed paperhanger will have to move over. He has now been replaced by the Civil Aeronautics Administration's ground controller.

An airport expert recently said this: "If you think the famous one-armed paperhanger was busy, you should watch the men in either the Chicago or the La Guardia tower during a busy period, when they are likely to handle something between 60 and 72 movements per hour. Just to give you an idea of their workload, I might mention that each aircraft movement necessitates from 12 to 15 radio transmissions to and from the tower if the pilot knows what he

is doing and doesn't ask for special instructions or repeats. That means 800 to 1,000 radio transmissions in an hour, or over 15 a minute, if everything runs perfectly smoothly."

The fact that he is so busy can be traced directly to the aircraft industry, which keeps building bigger and better airplanes, which makes flying the quickest and most efficient method of travel. While this in turn creates more traffic for the CAA controller to handle, work is simultaneously going forward in developing new traffic control systems to keep pace with our burgeoning air traffic.


POWER FOR PERFORMANCE

To achieve a speed of 450 miles per hour a World War II fighter required 2,200 horsepower. Today 14,300 horsepower is required to enable a jet fighter to fly 800 miles per hour and 25,450 horsepower is required to fly a plane at 1,000 miles per hour. Continuous research and development conducted by U. S. aircraft engine manufacturers has consistently provided the increases in horsepower required to maintain American aerial supremacy.


450 MPH
2,200 HP



800 MPH
14,300 HP



1,000 MPH
25,450 HP



PLANES

Tanker Shower Bath Tests Windshields

An unusual experiment conducted by one U. S. aircraft manufacturer recently kept a jet pilot in an aerial shower bath for several days.

The pilot flew a supersonic fighter plane in and out of giant showers created by an Air Force tanker plane which released 3,000 gallons of water at the fighter through a trailing hose and perforated cone.

Purpose of the dousing was to test the aircraft's windshield rain removal system in an effort to find a way to improve pilot visibility.

Flying about 100 feet behind the tanker, the fighter pilot ducked in and out of the airborne shower bath while noting the effect of the rain on his windshield. The tanker's shower varied from a drizzle to a downpour.

From these tests and additional studies on the ground and in the laboratory, the aircraft company expects to perfect improved rain-removal equipment for use on aircraft windshields.

Jet Fighter Fires 114-Rocket Salvo

The Air Research and Development Command recently fired 114 rockets at a ground target from a "Century Series" fighter plane in a firepower test believed to encompass the greatest number of rockets ever fired from a jet aircraft at one time.

Six rocket launchers, each carrying nineteen deadly 2.75-inch folding fin aircraft rockets, were slung beneath the wings of the fighter plane in the test. When the pilot sighted a tank, the target for the firepower demonstration, all 114 rockets were simultaneously launched.

The new rocket launcher, developed by the aircraft industry in its constant search for better ways of arming combat aircraft for the defense of America, is now undergoing evaluation tests at ARDC's Air Force Armament Center before going into the Air Force inventory.

High Reinvestment Rate Shown By Cost Of New Lathe To Aircraft Firm

In 1942, when an aircraft components firm went into business, it bought a saddle-type turret lathe for one of its divisions engaged in aircraft work. The lathe then cost \$12,000.

Federal tax laws permitted the firm to lay aside the original cost of \$12,000 as depreciation over a 14-year period, so presumably there would be money available to replace the lathe when it wore out.

In 1956, the lathe became obsolete. It had a resale value of \$1,000, and the company had \$12,000 to add to that with which to buy a replacement.

But the replacement cost in 1956 was \$35,000 for a lathe which would perform the same functions as the old model, or \$67,000 for a new one with attachments to meet today's more exacting needs.

In other words, this company had only \$13,000 to do a \$67,000 job. The difference of \$54,000 had to come out of profits, and in order to get that amount in 1956, the company had to earn a profit of more than \$112,500 before taxes, because \$54,000 was all that remained after the government took its corporate profit tax of 52 per cent.

To earn the \$112,500 profit, the company had to sell more than a million and a quarter dollars worth of products to customers. *It took more than \$1,250,000 of sales to buy just one machine!*

Thus, while \$112,500 sounds like a generous profit, we find, in this case, the stockholders got none of it. The government took more than half, and the rest went to replace a machine so three employees—one per shift—could continue working.

This is why only a relatively small amount of profit is paid to stockholders in dividends, and why a large portion must be retained to finance expansion and replacement, so that aircraft companies can continue to produce, and their employees can continue to work.

Pilot in Air Equals 25 Men on Ground

A study by a major aircraft and missile producer has graphically demonstrated the superiority of man over the machine. The study found that by replacing one man in the air—the pilot—with electronic equipment, as many as 25 men are needed on the ground to do the same tasks.

Explaining this 25-to-1 ratio, a leading engineer put it this way: "In remotely human-controlled missiles you lose the pilot's kinesthetic feedbacks ('feel'), the visual cues, the auditory patterns—all the data for which no really effective substitute has yet been found."

In other words, the pilot still has more brains than a missile system.

No matter how fantastic the airplanes of the future may seem in terms of speed, range and altitude, it's a good bet they will still have a human being inside them, to "mind the store."

Army July 4 TV Film Shows Air Power Gains

The U. S. Army and the American Broadcasting Company television network on July 4 will present "Higher and Faster," a half-hour program devoted to fifty years of military aviation.

Part of the Army's "Big Picture" series, the film pays tribute to the United States Air Force and stresses the dominant role of air power in the American defense program. The film gives credit to the aircraft industry for the tremendous advances it has made in providing superior air weapons to our armed forces.

The narrator, in the closing scene, states: "Americans everywhere look up to the men who are providing our nation with a vast shield of power . . . for they know that if American democracy is to be protected, supersonic jet aircraft, capable of carrying atomic bombs anywhere in the world, are America's first line of defense."

New Designs Note 'Human Factors'

Because of the relative slowness of human reflexes and the fantastic speeds at which tomorrow's aircraft will travel, the aircraft industry has found it necessary to emphasize a comparatively new phase of engineering—"human factors" engineering.

Future production airplanes will travel so fast and so high that aircraft manufacturers have found it necessary to take a brand new look at design, from an operational viewpoint. New engineering teams, called human factors groups, will be doing the looking.

An immediate problem facing the human factors group is to develop a system of mechanical "vision" for aircraft of the future. This system will practically eliminate the possibility of in-flight collisions and will have many other advantages as well.

The principal mechanism presently in use to prevent aircraft from colliding in mid-air is the eyesight of the pilot. These eyes are doing a fine job, even though some military aircraft in production today attain speeds as fast as a .45 calibre bullet.

When two jet fighters, each traveling at a lazy 525 miles per hour, are on a head-on collision course, each is moving one mile in seven seconds. If the two pilots see each other at a distance of eight miles, their combined closing speed will allow them slightly more than 40 seconds to alter course, which is time enough.

It is not at all easy, however, to see an airplane at a distance of eight miles. Often it is merely a speck on the windshield. And its course and speed are extremely hard to judge with accuracy.

Consider this problem in the light of one of our latest experimental interceptor fighters which can travel at 1,640 miles per hour. If two such planes were flying on a collision course, pilots relying only on their eyesight would have approximately ten seconds to alter course after spotting each other at a distance of ten miles. That is not safe, and it is one of the reasons why the aircraft industry's human factors groups are interested in developing mechanical eyes which can see for great distances.

The human factors groups will be aided in their research by the finest digital and analog computers ever built. These mechanical devices can solve fantastically difficult problems with a mere ripple of flickering blue lights in their electronic tubes. Similar equipment will probably be put to work to help fly tomorrow's planes.

The essential ingredient, however, is man—still the most reliable of all machines and the only one that can think.

The pilots of tomorrow's airplanes, hurtling through the skies at unbelievable speeds and altitudes, can thank the resourcefulness of the aircraft industry and its human factors groups for designing and developing new standards of safety into their airplanes.