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SOVIETS GAIN ON U.S. AIRPOWER LEAD

Women In Aviation Gain In Numbers

When Mrs. C. J. S. Miller finally decided to become an air traveller, she really started something. On August 11, 1906, she became the first woman in the United States to fly in an aircraft.

Since then, the ladies have invaded aviation in force. Today, there are more than 164,000 women engaged in some phase of the aviation industry in the United States.

About 122,000 of these women are engaged in the actual manufacture of aircraft. This represents about 16 per cent of all aircraft manufacture employees. Another 20,000 women, representing 10 per cent of all airline industry employees, are employed by the scheduled airlines. Thousands more (complete statistics are not available) are employed in various federal aviation agencies.

The Civil Aeronautics Administration reports that there are 11,564 active licensed women pilots, of which 14 hold helicopter ratings. The Civil Air Patrol, volunteer auxiliary of the Air Force, boasts 14,138 lady members (admitting only that they're over 18), and the Armed Forces point out with pride that nearly 10,000 girls are serving in military aviation.

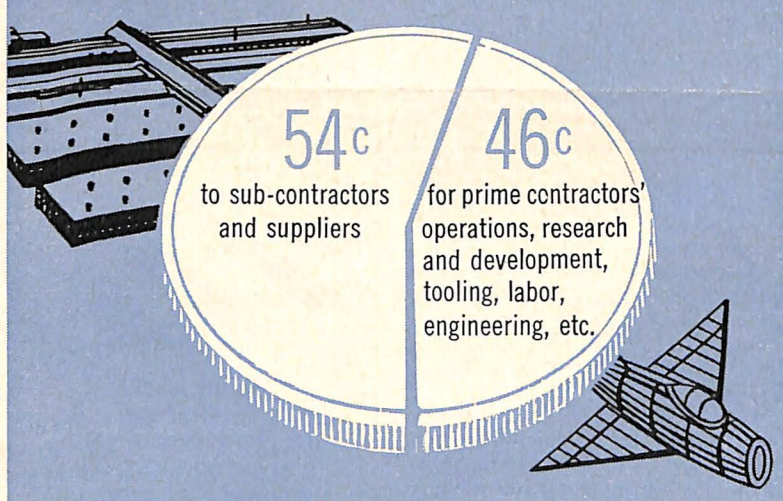
The day has arrived when women have achieved practical equality with men in aviation. Besides building aircraft, they are officials of aircraft firms; they monopolize the sales counters of the airlines; they decorate the giant airliners as stewardesses; they inhabit the nation's airports in their own planes, and even hold races in which they allow no man to compete.

If that were not enough, the National Aeronautic Association has just recently decided that all air records should be lumped into one category. No longer are there to be special records for women pilots.

But to top it all off, some scientists are predicting that it is highly probable that a woman will be the pilot of the first rocket ship to the moon because of her better physical and mental ability to withstand the special stresses and strains of such a trip.

Men have got to look to their mettle, if they expect to keep ahead of the ladies.

AIRCRAFT PRODUCTION DOLLARS



35 major U. S. aircraft manufacturers, including airframe, aircraft engine and major component manufacturers, spend 54 cents of each contracting dollar in sub-contracting and supply. These companies purchase materials directly from 50,000 business firms in every state of the union.

'PLANES'

Telephone Communication Needed To Run Largest Wing-Building Machine Tool

One of the 30,000 tools used in the manufacture of a giant new four piston-engined airliner is so big that production line employees using it have to communicate by telephone; yet its own manufacture was so precise that watchmaker's tools were used.

Looking like a huge bridge structure, the tool is called a jig, and is used to build complete one-piece aircraft wings. It cost $100,000, and thirteen other precision tools which are needed to make it a complete unit, cost another $750,000.

Wings produced on the device measure 150 feet from tip to tip and have a total area of 1,850 square feet—bigger than the floor space of most homes. Despite the mammoth size of the tool, workmen can detect and correct a thousandth-of-an-inch variation in the basic structure itself or in the wing in manufacture. For example, minute expansion or contraction of different metals, caused by temperature changes, such as occur between morning and afternoon, can be detected and compensated for.

The one-piece wing is built in a vertical position, then separated and fastened in the normal horizontal attitude to an interconnecting section of the fuselage. Before development of the new tool, wings were manufactured in six separate, time consuming and expensive operations. The new manufacturing method makes a much stronger wing.

The built-in safety of this one-piece construction is typical of the constant effort of aircraft manufacturers to insure the quality and superiority of U. S. aircraft.

World's Least Experienced Airline?

Western observers are puzzled by the fact that nothing has been heard of East German Airlines since the ceremonial departure for Moscow of its first flight on September 16, 1955.

The airline is said to be equipped with a single Russian Il-14. It is reported that the "fleet is at present stored in a hanger at Schonefeld, East Berlin.

Grim Race Begins Nation Warned

By DeWitt C. Ramsey
(Adm., USN, Ret.)
President, Aircraft Industries Association

The United States, who has long since conceded to Russia the race for quantities of aircraft, today is seriously challenged by the Soviets in the superior quality of air weapons.

Government officials and military leaders of the nation have stated their belief that the U. S. still possesses superiority in the quality of aircraft, aircraft engines and firepower, but at best the margin is narrow.

The Rusian atomic potential is growing rapidly. Their combat aircraft, as demonstrated over Moscow last May Day, are excellent. There is ample reason to believe that they have made long strides in guided missiles. They are showing signs of progress in transports and other types of aircraft.

So there is no room for boasting or for complacency. We spotted the Rusisans five years of intensive research and development and production following Warld War II, and we established qualitative superiority and narrowed the gap in quantitative strength. We have never been required under our limited program to produce as much as we could have produced in quantities of equipment.

On the military-industry team, then, has fallen the burden of keeping America ahead in this grim race. The amazing record of the U. S. aircraft industry during the last five years speaks for itself—a record of tremendous accomplishments.

Today, the U. S. has 127 Air Force wings and powerful new Navy air groups, with a large percentage well equipped with the most advanced types of aircraft, guided missiles and supporting material. It is a far cry from 1950, when the Air Force had only 47 wings, with relatively few modern aircraft and no guided missiles, and the Navy was proportionately weak in the air. Against our total of some 8,000 combat aircraft, reliable sources of information estimated that the Russians had 20,000 first-line planes, with 20,000 additional in reserve.

There was no mystery about this state of affairs, for while American citizens were getting ready to enjoy

(See AIR POWER, page 3)

PLANES

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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.

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The Dominant Factor

"Today airpower is the dominant factor in war. It may not win a war by itself, alone, but without it no major war can be won."—Admiral Arthur W. Radford, Chairman, Joint Chiefs of Staff

It is vital to the safety and security of the United States that the American public should not be confused by those individuals who argue that approach of an apparent nuclear weapons stalemate between the forces of Democracy and Communism heralds a period in which this nation can reduce its support of military aviation.

Fortunately, most of our national leaders view this possibility with alarm and a deep sense of urgency. They realize full well that the security and well-being of this nation rests squarely on the quality and superiority of its aeronautical products, and upon the capability of the United States aircraft industry to produce them quickly.

In cold appraisal of the threat of a nuclear stalemate, Air Force Secretary Donald A. Quarles has recently issued a policy statement setting out the plan by which the Air Force expects to insure that its *current* and *emergency* missions are met. It is called "Industrial Production Readiness Policy." By and large, the aircraft industry subscribes to this policy—*and has for the last decade.*

Continuous technological advancement, along with shifting international political and military power, Mr. Quarles says, has dictated radical changes in our national strategy. For the first time in modern history, our nation is faced with a continuing potential threat of devastating destruction at the outset of general war. If, in an emergency, we are to survive and minimize the devastation to our nation, the traditional concept of a prolonged industrial build-up after attack must be replaced with a "readiness" program.

Industrial readiness, Mr. Quarles declares, will accomplish four vital objectives necessary to the national security:

1. Deter war by maintaining a modern Air Force in being that can immediately defend the nation and retaliate in case of attack.
2. Make the aircraft industry capable of rapidly expanding production of aircraft, guided missiles and other appropriate weapons in case of involvement in peripheral conflicts or expansions short of a general nuclear war.
3. Improve industry's ability to maintain or rapidly restore production of critical survival and retaliation weapons systems and related support commodities in case of general war involving severe industrial damage.
4. Maintain the health of the aircraft industry as necessary to fulfill the needs of the Air Force.

Industrial readiness will be achieved only when this nation's aircraft industry can respond immediately to the vital demands placed upon it in an emergency. To achieve this state of readiness, the Air Force Secretary declares, will require a long-term Air Force-Aircraft Industry program.

The plans then, for the defense of this nation, must be inevitably geared to a healthy, vigorous aircraft industry. Both the aircraft industry and the military know that the size and impetus of aircraft research, development and production programs cannot be adjusted up or down in accordance with what the Communists may or may not be doing.

Increasing complexity in the manufacture of modern military aircraft has brought demands by the aircraft industry for components manufacture across the length and breadth of the nation. Today, more than 50,000 firms, 83 per cent of which are small business firms, are engaged in some phase of aircraft production.

But outside industry, large and small, is necessarily geared to the fortunes of the aircraft industry. In periods of emergency, when extreme demands are placed upon the aircraft manufacturers, it is normal for them to sub-contract with allied industry. When aircraft production is low, it is natural that the prime contractor does less sub-contracting. Much that would be "farmed out" in peak periods must be done by the aircraft industry primes when its heretofore widely fluctuating production assignment dips into a low production valley.

Thoughtful congressional consideration will undoubtedly be given to Secretary Quarles' Industrial Production Readiness program in lieu of the "traditional concept" that there will be time for a prolonged industrial build-up after war starts.

Plane Views

Plane 'Medics' Give Bomber Physicals

Stethoscopes are the only stock in trade of some of the employees of a major aircraft manufacturer. And although these people probably couldn't tell a lung ailment from a heart attack, they're mighty important in safeguarding the crews of the fast jet bombers who fly miles above the earth.

These men "working under pressure" as a matter of course, go about their business with the care and exactness of physicians, because lives depend upon their stethoscope readings.

Their job is to make certain that the pressurized crew compartments function properly. Their special hearing aids will detect and catch even the most minute air fizz leaking from an improperly sealed compartment joint, as quickly as they could detect a heart flutter.

These aircraft medics work inside the pressurized compartments. Leaks, however slight, must be pinpointed at their source. They know that leakage in a pressurized cabin at extreme altitude could mean trouble. Their contribution to the quality and superiority of bombers manufactured by the United States aircraft industry is to see that it doesn't happen.

Plane Facts

The U. S. Air Force is considering the use of mothballs on military airport runways near seacoasts. Protection against moths? No, says the USAF, protection against seagulls. Plane collisions with the big birds have, on occasion, caused severe damage to planes and pilots. Air Force borrowed the idea from Great Britain's RAF which has had some success with mothballs subbing as scarecrows (scaregulls?) for seagulls!

One large aircraft company engaged in research to slow fighter landing speeds, has devised a rubber covering for the leading edge of the wing. The rubber, inflated for landings, rounds the wing's sharp leading edges, smooths the airflow and cuts landing speed 23 per cent.

The testing of one integral structure of a new Air Force bomber required 14 months and the investment of 110,000 engineering man-hours and 430,000 shop man-hours before completion of tests.

Russian Aeronautical Progress Threatens To Outstrip Ours

(*Continued from page* 1)

the blessing of world peace, through large-scale demobilization, the Russians maintained a high level of both research and development and production.

Our industry-military team are doing a herculean task in their efforts to maintain at least a marginal lead in airpower superiority over the Soviets.

Unfortunately, today we cannot even be completely sure of our qualitative lead. Recently enumerated Soviet accomplishments during the past year are:

- Six new types of aircraft which imply six new types of engines, all of an advanced jet or turboprop design. These aircraft have been revealed in substantial quantities, indicative of advanced production know-how.
- Advanced radar capability implying a "vast state" of advancement in this field.
- Advancement in electronics and radiation by the Soviets was corroborated by the quality and quantity of data which they discussed at the Geneva Conference.
- Continued substantial growth in nuclear weapons capability as revealed by tests. Their most recent test in current series was in the megaton (million-ton) range.
- Development of advanced commercial aircraft, continuing enthusiasm for development of guided missiles, and a stated national policy concerning such advanced areas of technology as scientific satellites.

The sudden demands made on the American aircraft industry in 1950 came as no surprise. Historically, it has been allowed to deteriorate in peace and expected to produce miracles in emergency and war. So in 1950, when the military called upon the industry to expand its facilities, employment, production, and research and development, the response followed an old pattern. How well that job has been done in only five years, you can judge for yourselves.

In only two years, the aircraft production rate was tripled, the plant floor space was doubled, the work force was increased two and a half times and continued to increase in the two following years. This production rate was not achieved by the war expedient of freezing models and mass-producing them. Nothing was frozen. Nothing was standard. Models were improved ceaselessly. Changes were the rule; not the exception. New types were constantly being introduced as research and development quickened. Engine power was growing steadily. New equipment was being brought forward to increase the efficiency of our aircraft—to extend the vision of the pilots, to take over some of the responsibilities of control at higher altitude and ever-faster speeds, and to make planes habitable under these extreme conditions.

The combat airplane became one of the most complex mechanisms known. Engines had to produce more and more power without great increase in size or weight. Electronics and other delicate components came into such profusion that marvellous feats of miniaturization had to be performed to find space for them in their craft.

To achieve these things, the industry had to change its manpower and training practices. New skills for new and exacting standards and new machines had to be produced. Where engineers had comprised only 2.2 per cent of the typical aircraft company's total employment in World War II, the proportion of engineering employees has grown to more than 20 per cent of the total force—involving most of the classifications of the engineering profession. Presently, the aircraft industry employs over 750,000 people — the second largest industrial employment in the country.

Additionally, the industry has used more than 50,000 sub-contrators and suppliers in every state of the Union, paying them $4.7 billion in 1954, or 54 per cent of all industry disbursement. Of this, 43 per cent went to small businesses.

The results of this feverish activity have been phenomenal by any measure. At the time of the Chinese Communist attack upon Korea in 1950, most U.S. Air Force Fighter Wings and Navy carriers were equipped with 400-mile-an-hour piston-engine aircraft. Today, all Air Force and Navy fighter wings are fully equipped with jet aircraft. Several new types in operational service are supersonic and are effective at altitudes higher than 50,000 feet.

In 1950, there were no medium or heavy jet bombers in U. S. military inventory. Now, every medium bomber wing is equipped with six-engine jet aircraft, and our first jet heavy bomber wing is equipped with eight-engine jet aircraft.

Fast jet tankers, which can travel with the bomber fleets to extend their range, are in production. From this development also will come the commercial jet transports which will revolutionize air travel. Helicopter development and production has been equally spectacular, and all of the military services are using them in many ways—the Army in evacuation of wounded, deployment of troops and materials, observation and a hundred special services; the Navy in rescue, in inter-ship and ship-to-shore communication, anti-submarine and many other uses, and the Air Force in numerous ways. Lightplane output not only performs many fine services for the Army and Air Force, but the civilian fleet is regarded as an extremely valuable reserve potential for patrol, courier and disaster-relief service.

A particularly noteworthy achievement of the five years of build-up has been engine development and production. In 1950, production jet engines delivering 4,000 to 5,000 pounds of thrust were the order of the day, and models in development were in the 7,000-pound-thrust range. Now, more than 2,500 engines of more than 10,000 pounds thrust are in service, and great increases in power are known to be in prospect.

In addition to the increases in the strategic, tactical and defense power of the Air Force, the Navy has greatly enlarged its own air capabilities. Jet bombers and fighters have replaced piston-engine aircraft on the larger carriers. Development of the super-carrier has made possible even more advanced types of large and small aircraft for attack and defense. The jet flying boat, now capable of speeds over 600-miles-an-hour, has come back into its own.

Paralleling piloted aircraft and equipment development and production has ben another contribution of th eaircraft industry to the national security—guided missiles. From an almost negligible production in 1950, the industry is now delivering missiles of all types at a rate of more than $1 billion worth a year, and it is estimated in the new Federal Budget that this will be increased next year to approximately $1.2 billion. These range all the way from ground-to-ground and ground-to-air missiles which have been deployed at home and at foreign bases, to air-to-air, air-to-ground and air-to-underwater missiles. Little can be said about the guided missile program, because it is under rigid security. But its importance to both the strategic and defensive strength of our military air services is urgent.

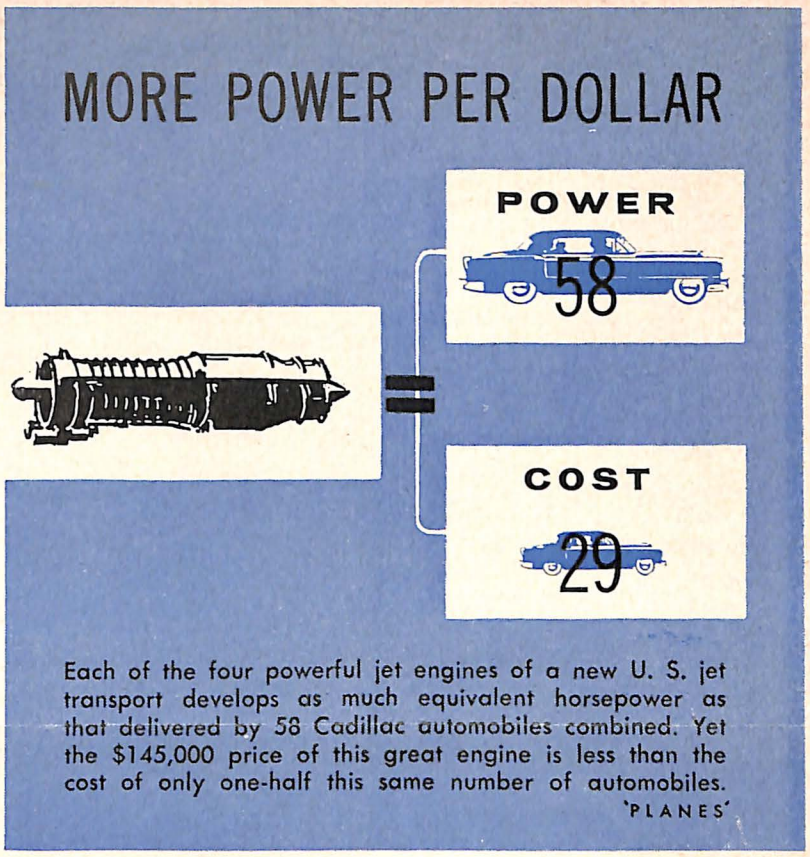
So much for the tangible results. The shape of some of the things to come is already visible in announced programs of research and development in the industry. Consider these projects, which have been disclosed only in recent months. First, the researches into the so-called "thermal barrier," where speeds multiplying the speed of sound generate heats which render present aircraft materials inefficient. Second, the man-made earth satellite for which the aircraft industry must produce the vehicle and propulsive power. Third, the intercontinental ballistics missile, sometimes called the "ultimate weapon." Fourth, atomic-powered aircraft which would have range and other capabilities hitherto unheard of.

In the nex year and a half we will reach the prescribed strength level of 137 Air Force wings and proportionate Navy air. *That is not the end, but the logical beginning of qualitative superiority.* It means only that we then will have enough numerical strength to assure adequate defense and offense to meet any challenge. But unless those wings and carrier groups have the *best* equipment at all times, they will not find satisfaction in number.

Yet today we are faced with some melancholy statistics. While our universities are graduating hardly more than 20,000 engineers a year, the Russians are known to be graduating around 53,000. That order used to be reversed in 1950. Now we learn from the Professional Engineers Society that fewer than 25 per cent of our high school students are studying algebra—the gateway to advanced mathematics, which is the basis of science and engineering. Fewer than 12 per cent are studying geometry—the gateway to drafting and many of the physical sciences. A large proportion of our secondary schools do not even have science courses of any kind.

The aircraft industry is doing all it can to recapture the lost interest of American youth in aviation through cooperation with the educators themselves, but it cannot go to the grassroots where the problem is born.

American citizens everywhere must carry this message into every school in the country—to the children, to the parents, and to the teachers. The needs of the aircraft industry are critical, but the march of science with its opportunities for youth are everywhere. This is a scientific age.



Airline Jet Plane Orders Top Billion

The nation's scheduled airline operators, backed up their belief in the superiority of American manufactured equipment with more than $1,309,600,000 worth of jet, turboprop and piston engined transport plane orders in 1955.

This unprecedented flood of firm orders placed by U. S. scheduled airlines does not include orders for hundreds more piston, turbojet and turboprop-engined airliners placed by foreign flag airlines.

It was a big year for commercial airline operations. Airline passenger travel again in 1955 soared to unprecedented heights with an estimated 42 million passengers traveling on domestic and international routes for more than 24,409,470,000 passenger miles. U. S. airline passenger travel, in 1955, topped by more than 20 per cent 1954's record year when the airlines carried some 35,000,000 pasengers more than 20 billion passenger miles.

Biggest purchases made by the scheduled airlines during 1955 were the more than $761,300,000 in firm orders for 155 turbojet airliners. Another flood of orders for 75 turboprop powered transports totaled $265,000,000. In addition, the airlines also placed orders for 55 big new piston-engined transports at a total cost of more than $137,300,000.

U.S. airline industry backlog for all types of civilian transports by year-end 1954 totaled only $270,000,000, and both U. S. aircraft manufacturers and airline operators were more than a little alarmed at the apparent inroads in airline travel being made by the British airlines. The British aircraft industry had jumped the gun on the United States in turbojet and turboprop powered commercial transport while this nation's manufacturers concluded their research, development and testing of various jet applications to airline transport.

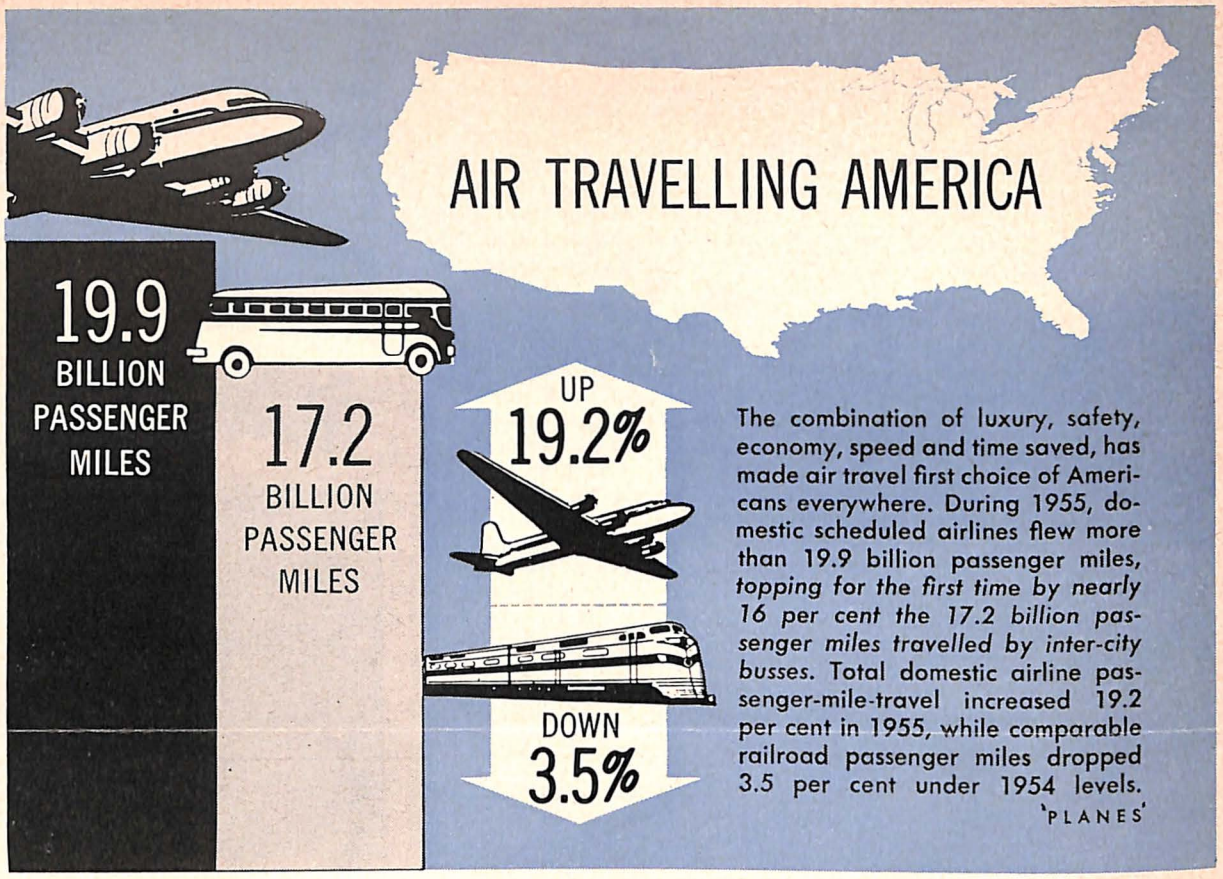
But by December 1955, the U. S. aircraft industry backlog for these luxurious jet powered giants had skyrocketed to more than $1,309,600,000, setting an all-time high in civil aircraft manufacturing history.

Thus, the nation's plane makers gained a decided lead in their race with Great Britain's aircraft industry attempt to capture world airline turbojet and turboprop transport market. It also reaffirmed the U. S. airline industry reliance on the quality and economy of U. S. manufactured aircraft and engines.

'Carrot Bags' for Radar

America's busy air terminals may soon borrow an idea from the American housewife, with a low-cost "carrot bag" type plastic covering for weatherproofing the antenna system used in instrument landings.

Designed to keep rain, moisture and snow off the sensitive antenna array which directs the pilot's approach to the runway, the "carrot bag" was first used at New York's La Guardia Airport under near-emergency conditions when, during the hurricane season, the wooden shelter housing the antenna system was badly damaged by rising water.



Textile Industry—Glass Plastics Join To Aid Plane Production

The textile industry, science and the aircraft industry teamed up recently in the unending battle for airframe weight reduction, with the development of fiberglass air storage spheres.

Hollow steel spheres used for compressed air storage reservoirs to actuate any number of pneumatic devices on U. S. fighters, bombers and transports, have long plagued aircraft designers because of their necessarily heavy weight-to-strength ratio. One of the most common models, for example, weighs 20.5 pounds.

Engineers of an aircraft components manufacturer, after an eight-year huddle, figured out a way to make the sphere inexpensively of glassfiber, which would weigh almost eight and one-half pounds less —yet be as strong as the heavy steel tank.

The first stage of the newly developed process is the manufacture of a low-melting-point metal alloy sphere—or mandril, to those who know the textile industry. The mandril is then covered with a rubber coat, soon to become the inside of the air tank.

Next, bobbins of fiberglass yarn are mounted on a creel of vertical bars on a weaving machine device. Then the ends are collected together, passed through a resin bath and secured to the metal mandril. A flip of a switch starts the weaving machine into action, and the fiberglass is spun onto the metal ball in much the same manner that an ordinary home sewing machine bobbin is loaded with thread. When the correct amount of fiberglass yarn has been wound around the mandril, the sphere is transferred to an oven for heat-hardening.

Finally steam is injected into the sphere. The metal melts and is run off, leaving only the porous-proof rubber lining. The end product is a strong air storage tank, weighing eight and one-half pounds lighter than its steel counterpart. To the aircraft designer this means a saving of approximately 82 pounds of aircraft design weight. (Each pound of equipment adds ten pounds to gross weight—heavier structure, etc., plus fuel to carry the added weight.) This one weight saving at the standard rule of thumb measure of airframe cost of $50 per pound, saved the American taxpayer $4,100 in the total manufacturing cost of the military plane using the air storage sphere.

Military Air Travel

The U. S. Military Air Transport Service, during 1955, established an all time safety record, flew farther and carried more patients, passengers and cargo for the armed forces than at any other time in its history.

The 1,500 aircraft comprising MATS, according to a year-end report, logged 1,180,000 flight hours, carried 733,400 passengers and 139,000 tons of high priority cargo during the last twelve months.

MATS officials figure that 83 military passengers and 16 tons of cargo were airlifted every hour of the year. A regularly scheduled or Special Air Missions plane of the global military transport service made an Atlantic or Pacific crossing every 32 minutes of the year.

Wire Spinning Device Out-Spins Spider

A new precision coil winder which spins strands of spider-web thin wire in loops less than one thirty-fifth of a hair's breadth apart has been developed for the aircraft industry.

The coils it manufactures are tiny electrical devices whose signals operate electronic autopilots and other automatic controls of today's sleekly lethal U. S. fighters and guided missiles.

The precision that goes into manufacture of components such as this inevitably means that aircraft production costs are far higher than plane costs of the World War II era. But the precision manufacture of these complex parts and components assures world superiority of today's U. S. supersonic jet fighters and guided missiles.

The machine, electronically controlled by a human operator, can achieve a theoretical accuracy of .00000000001, engineers say, but it is limited by microscopic flaws in the wire itself.

So delicate is the control of the machine that the winder "feels" slight changes in wire tension and automatically signals the operator to correct them. The human operator can instantly start or stop the machine, even when it is operating at 1,500 revolutions per minute, without snapping the fragile wire.

The machine, performing the first production operation of its kind, is mounted on a desk-like cabinet. Through a high-powered microscope the operator can check visually the entire winding operation.