AIA

planes

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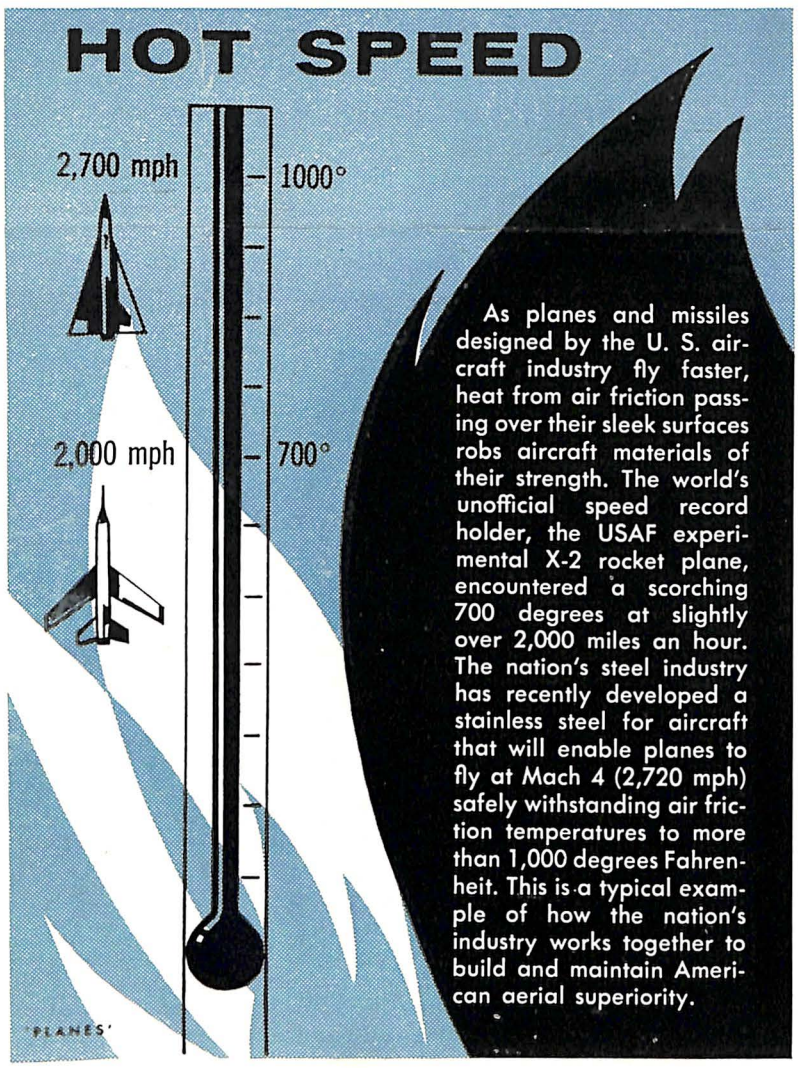
AIRCRAFT, MISSILES HEART OF NAVY POWER



Aircraft Re-equipment Program of Local Carriers Speeded by Loan Guarantee

President Eisenhower this month signed into law a bill which will provide for the re-equipment of local service, territorial and helicopter airline operators through a federal guaranty of loans for new aircraft.

The 28 carriers affected by the bill—13 local service airlines, 12 territorial carriers (Alaska, Hawaii, Carribean) and 3 helicopter lines—will be able to replace their outmoded fleets with new aircraft capable of greater earning power.

Most of the carriers today use a transport model which made its debut in 1936. This is still a safe and reliable aircraft, but the aircraft industry has made great progress in the development and manufacture of aircraft which can carry twice as many passengers in pressurized comfort. "These airliners are needed," according to Joseph P. Adams, general counsel of the Association of Local and Territorial Airlines, "to attract more traffic at lower seat-mile costs and to reduce the subsidy bill." Col. Adams, a marine flyer and former vice chairman of the Civil Aeronautics Board, was a leader in securing the equipment loan guaranty legislation.

The new law permits each carrier to borrow up to $5 million for the purchase of new planes. This means that the 458 points served in the U. S. (261 of which have no other air service) by the local carriers alone will soon be welcoming the arrival of modern aircraft capable of giving the same service now enjoyed by major traffic points.

In modern America, a community's airport may fairly be regarded as its gateway to the future.

Naval Aviation Force Third Largest Military Air Power in World

By Vice Admiral William V. Davis, Jr.
Deputy Chief of Naval Operations (Air)

The U. S. Navy's air force, with nearly 10,000 operating aircraft, today is the world's third largest military air power, exceeded only by the U. S. Air Force and Russian air forces.

This powerful force has been strengthened even further with the addition of guided missiles to the fleet. Other potent missiles and manned aircraft of very high performance, still in the development stage, will be used with atomic-powered carriers and submarines now being built which will increase the speed, range and impact of our future Navy.

Naval aviation is a basic source of sea power which has three primary objectives:

1. Exploit the sea to defeat the enemy.
2. Deny the use of sea lanes to the enemy.
3. Insure the unhampered utilization of sea lanes by our own and allied shipping.

Naval aircraft and guided missiles are the heart of our striking capability as well as our defensive capability. The integration of aviation with our surface and underwater fleets is a tribute to the men of the Navy who have developed their employment to its present peak of versatility and to the aircraft industry which has conceived and produced a succession of high performance aircraft and missiles. This partnership is paying a continuous dividend in national security.

Where does the Navy stand in an era where a crisis is always present and varies only in degree of severity? Our fleets are in position in every critical world area. The Navy striking strength, built around the air power of our carriers and air power in our anti-submarine warfare squadrons, is ready today for immediate use in any type of emergency. Navy fleets are at sea now, able to deliver an offensive blow or simply to prevent trouble by their presence. Versatility and mobility are the keystones of today's Navy.

The attack carrier striking force is the Navy's Sunday punch which is available for action every day of the week. The U. S. Navy pioneered many of the great advances in the carrier aviation system, and its development as an instrument of national defense has been pushed forward to a degree of effectiveness far beyond that of any other nation. The force is built around the carriers, but the supporting cruisers and destroyers play important parts in making this a balanced striking force.

The Navy is putting ever-increasing reliance on guided missiles and aircraft to take over the job formerly done by its guns. Missiles have added another dimension to sea-air power. Today, seven cruisers are being converted for guided missiles, and ten frigates are under construc-

(See *NAVY*, Page 7)

Bomber Flight Takes 1,199 Ground Tests

Flying a new aircraft is almost an anti-climax for the test crews of a heavy jet bomber.

Before these huge aircraft ever leave the runway on a test hop, approximately two hours is spent performing 1,199 separate and vital checks. The co-pilot is responsible for 331 items; the pilot, 290; radio navigator, 272; the gunner and navigator handle 181 and 125 items respectively.

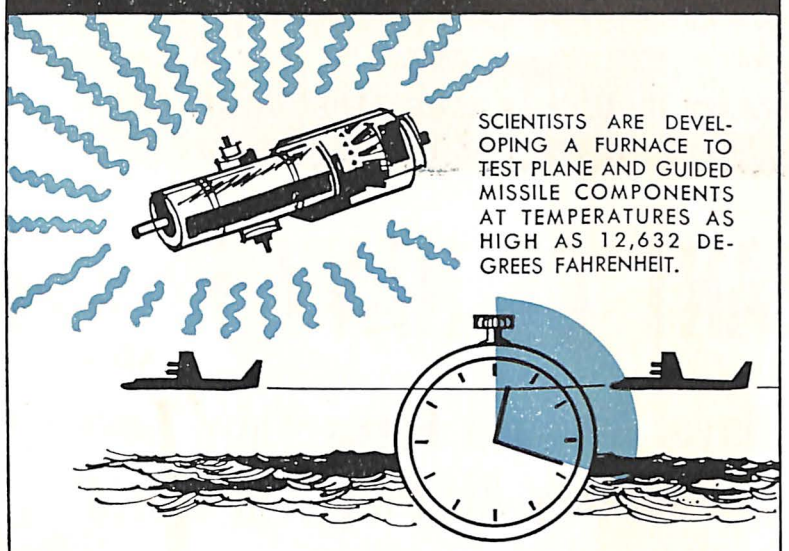
Before entering the aircraft, 141 exterior points in nine major sections are thoroughly gone over by the crew. Once inside, each man takes his appointed station, checklist in hand, and starts his run-down. Circuit breakers, oxygen controls, normal and emergency systems, ejection seats and instruments to be operated in flight are tested.

Finally, each crewman reviews his checklist and reports to the pilot.

The pilot then pushes the throttles forward for 100 per cent thrust and the plane quickly becomes airborne.

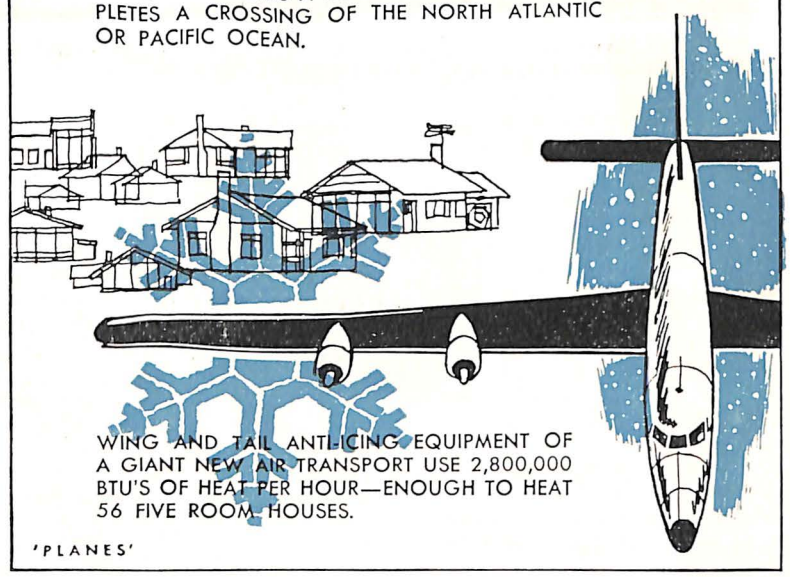
The careful attention to detail and meticulous checks made by the aircraft industry throughout the design, development, production and test flight of aircraft sets the world standard for quality.

Plane Views



SCIENTISTS ARE DEVELOPING A FURNACE TO TEST PLANE AND GUIDED MISSILE COMPONENTS AT TEMPERATURES AS HIGH AS 12,632 DEGREES FAHRENHEIT.

EVERY 18 MINUTES A SCHEDULED AIRLINER COMPLETES A CROSSING OF THE NORTH ATLANTIC OR PACIFIC OCEAN.



WING AND TAIL ANTI-ICING EQUIPMENT OF A GIANT NEW AIR TRANSPORT USE 2,800,000 BTU'S OF HEAT PER HOUR—ENOUGH TO HEAT 56 FIVE ROOM HOUSES.

'PLANES'

Tapes Telling Tales About Performance

Magnetic tapes are telling stories to engineers—up to 2,280 of them—about the performance of supersonic aircraft, speeding their development.

Tape recording systems are mounted in the aircraft and during test flights, virtually every phase of the aircraft's performance can be recorded on tape. Perfection in the aircraft is speeded up, quickly reporting data that once required weeks to obtain. The data on tape can be quickly translated into useable information by automation.

Data recorded by the tape includes pressure, altitudes, structural forces, temperatures and the pilot's comments on the flight. Values recorded include air speed, angles of attack, sideslip, positions of the rudder, stabilator, flaps and aileron, engine revolutions per minute and fuel flow rate.

Before magnetic tape became available, the most common methods of obtaining data were actual photographs of the instrument panel and recording oscillographs. The magnetic tape system is more compact and ultimately less expensive.

Engineers and scientists in the aircraft industry work constantly to reduce the cost of air power and to build superior aircraft.

AIR QUOTE

"If we had to fight a war today, it would still be fought, primarily, with manned air vehicles. The differences are that now they are jet powered, they are much faster and they pack far more punch per aircraft. Additionally, they are much more automatic, unlimited by weather, with advanced guidance systems, tracking devices, fire control equipment, and superior communications.

"Ten years from now, this pattern should be drastically altered. If we have to fight an all-out war in 1967, we should have adequate quantities of ballistic and air-breathing missiles which will effectively complement our manned bomber force and our manned fighter-interceptors.

"Further, these will be faster, higher-flying, and more lethal than anything we now have: manned aircraft in standard categories, with speeds exceeding Mach 3, and development aircraft reaching toward Mach 10. Our missiles, flying at over 300 miles at hypersonic speeds, will be greatly simplified and reduced in size, cost, and ground support requirements."—*Lt. General C. S. Irvine, Deputy Chief of Staff, Materiel, USAF, August 28, 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.

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'Serious, Not Grave'

By Maj. Gen. James F. Phillips, (USAF, Ret.)
Coordinator, Guided Missile Committee, Aircraft Industries Association

Back during the days of World War II when enemy forces were making strong penetrations, Allied communiques more often than not carried a phrase to the effect that "the situation is serious but not grave." A similar sentence might well be used to describe the Free World's ballistic missile situation.

Soviet leaders have announced they have launched a ballistic missile capable of hitting any target on earth. Based on Russian success in evolving atomic and hydrogen weapons and jet fighters and bombers, there is no valid reason for presuming that the Soviet announcement on attainment of an intercontinental ballistic missile is not factual.

It is, of course, possible that the Kremlin does not actually have an accurate ICBM and that the claim was made for purposes of ballistically blackmailing the U. S. and its Allies. But it is far more probable that the Soviet Union has truly developed at least an experimental ICBM.

Considering known previous Soviet success with nuclear weapons, this means, in all probability, that within the next few years American cities could be attacked. After launching, it would take only a half-hour for such a Soviet ICBM with a thermonuclear warhead to reach this country. This is most certainly a serious and sobering situation. Anyone who thinks otherwise is deceiving himself.

It is likely, however, that the newly announced Russian ICBM is actually only a prototype. Because of the lead time required to acquire such a weapon for the military inventory, it can be concluded that it will be many months before the Soviet missile force has enough ICBM's to attack major American cities.

Furthermore, the same deterrent force which has kept Kremlin leaders from attacking us in the past is still intact and growing stronger every day. America's aircraft industry has delivered hundreds upon hundreds of medium and long-range jet bombers to the USAF's Strategic Air Command. Each of these planes, using either the technique of in-flight refueling or overseas air bases in friendly countries, can strike deeply and effectively at the heartland of Russia with both conventional and nuclear weapons. And our Navy leaders have frequently pointed out that A- and H-bomb-carrying attack bombers built by U. S. aircraft companies can also reach targets behind the Iron Curtain from carriers at sea. And these aircraft can head for their targets from any direction on earth.

These manned aircraft are supplemented by missiles already in production in this country, many of them capable of knocking out Soviet targets with their atomic warheads. The Russians are fully aware of the lethal potentialities of the manned and unmanned aerial weapons being delivered to the Army, Navy and Air Force by this country's aircraft industry.

Even in the ballistic missile field, the U. S. is making swift progress. Airframe, engine, components and electronic companies are engaged in top-priority programs to provide the U. S. armed forces with various types of short, intermediate and intercontinental range ballistic missiles. Testing of the prototypes of these ballistic missiles is constantly under way at military missile test bases and these tests are certain to result in accurate weapons for the military inventory of the Free World far sooner than the Russians would like.

All in all, the U. S. and its Allies have received some disquieting news from Moscow Radio. It must be realized that cities like New York, Washington, Pittsburgh, Chicago and Los Angeles are already, or very soon will be, under threat of atomic attack from Soviet ICBM's. But the planes and missiles developed and produced by this country's aircraft manufacturers are continuing to provide life insurance for the residents of these cities by letting the Russians know that they can expect instant retaliation.

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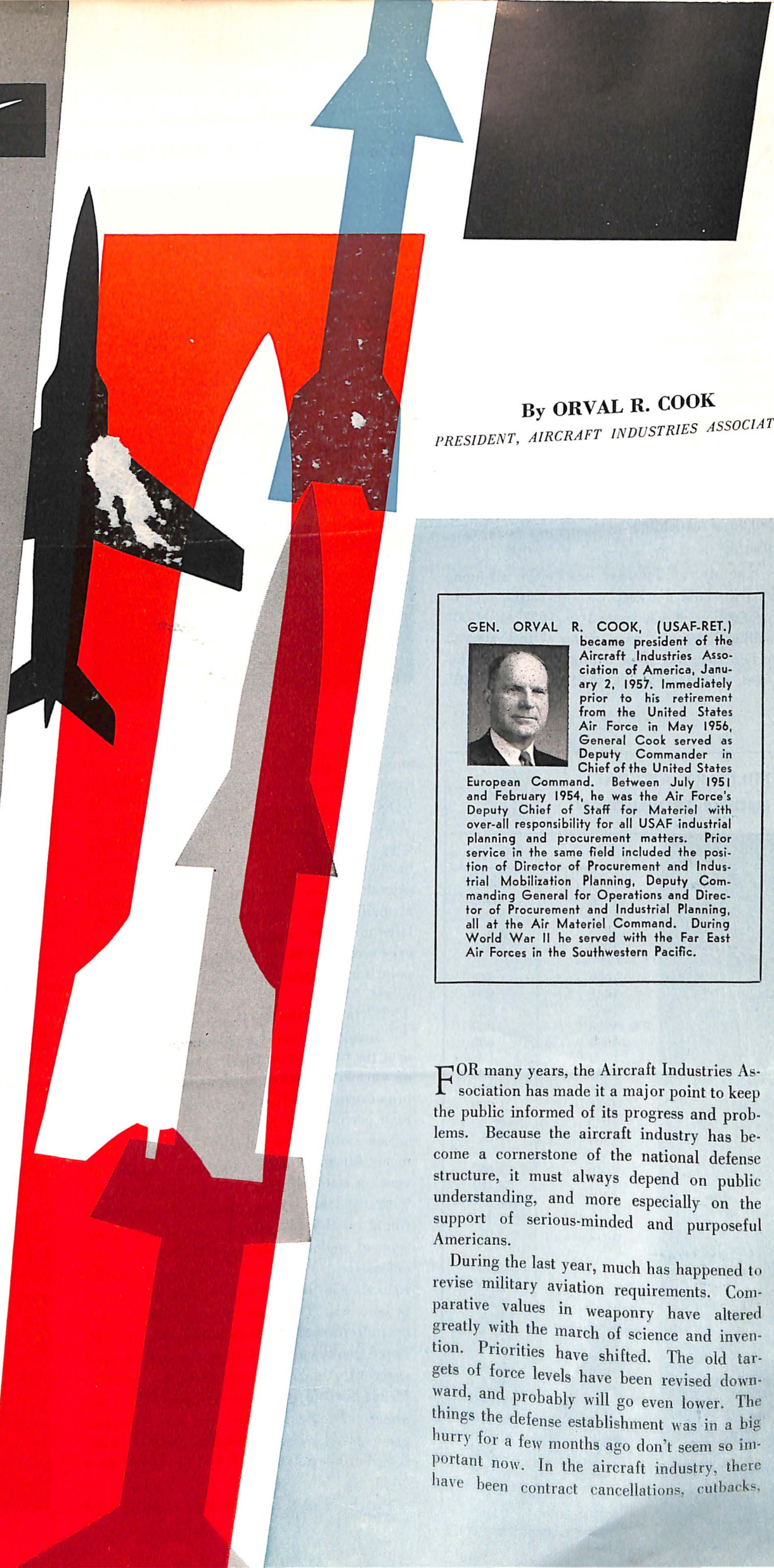
SEPTEMBER 1957
AIA

aircraft industry in transition



By ORVAL R. COOK
PRESIDENT, AIRCRAFT INDUSTRIES ASSOCIATION

GEN. ORVAL R. COOK, (USAF-RET.) became president of the Aircraft Industries Association of America, January 2, 1957. Immediately prior to his retirement from the United States Air Force in May 1956, General Cook served as Deputy Commander in Chief of the United States European Command. Between July 1951 and February 1954, he was the Air Force's Deputy Chief of Staff for Materiel with over-all responsibility for all USAF industrial planning and procurement matters. Prior service in the same field included the position of Director of Procurement and Industrial Mobilization Planning, Deputy Commanding General for Operations and Director of Procurement and Industrial Planning, all at the Air Materiel Command. During World War II he served with the Far East Air Forces in the Southwestern Pacific.

FOR many years, the Aircraft Industries Association has made it a major point to keep the public informed of its progress and problems. Because the aircraft industry has become a cornerstone of the national defense structure, it must always depend on public understanding, and more especially on the support of serious-minded and purposeful Americans.

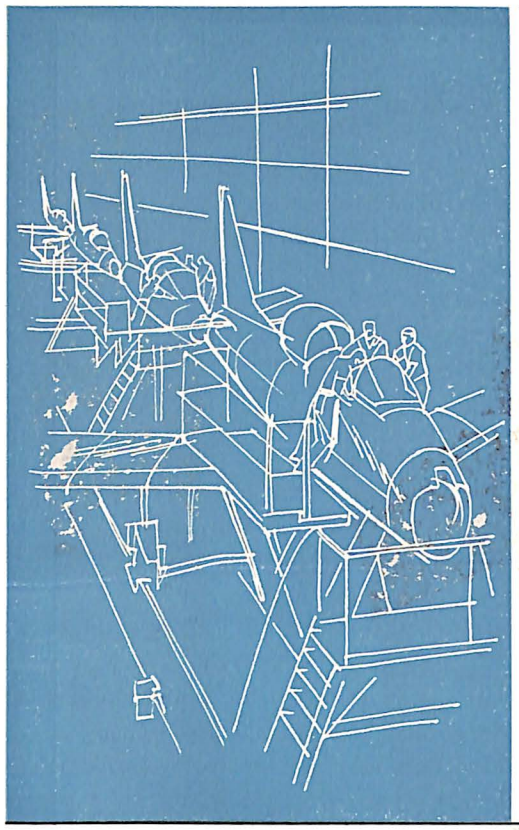
During the last year, much has happened to revise military aviation requirements. Comparative values in weaponry have altered greatly with the march of science and invention. Priorities have shifted. The old targets of force levels have been revised downward, and probably will go even lower. The things the defense establishment was in a big hurry for a few months ago don't seem so important now. In the aircraft industry, there have been contract cancellations, cutbacks,

stretch-outs, reduction in employment and facilities.

NO one can understand better than this industry the need for change in weapon requirements. As a matter of fact, it is contributing to that need by the very acceleration and momentum of research, development and invention. It has always been true that we invent new weapons and methods of offense, and then promptly invent the defenses against them. That is the history of the military arts —the teeter-totter of offense and defense. The big difference today is that science is moving at such a tremendous pace, and with such devastating potential effects, that it is hard to keep up with them. Nor can the pace of science and technology in weapon development ever let up, as long as this nation faces a formidable potential enemy bent on world domination and with the scientific and technological capability of matching us or surpassing us if we waver.

The aircraft industry has known all along that it would not keep up forever the pace of production which peaked in 1953 at 11,000 military aircraft. As a matter of fact, aircraft production has been coming down, year-by-year, ever since—9,000 in 1954, 8,000 in 1955 and 6,800 last year. Or, to put it in more accurate terms, 141 million airframe pounds in 1953, 130 million in 1954, 114 million in 1955, and 95.5 million in 1956. The industry knew that when target strength goals would have been reached, it would operate on a considerably lower plateau of production, aimed at maintaining those strength levels with the latest and best equipment. Actually, it was expected that 1961 would be the real turning point for the industry.

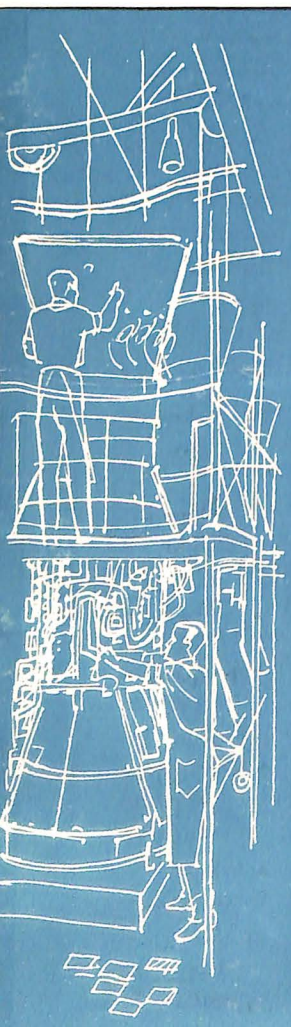
U. S. MILITARY AIRCRAFT PRODUCTION



Year	Number	Year	Number
1917	2,013	1936	1,141
1918	13,991	1937	949
		1938	1,800
1919	682		
1920	256	1939	2,195
1921	389	1940	6,019
1922	226	1941	19,433
1923	687	1942	47,836
		1943	85,898
1924	317		
1925	447	1944	96,318
1926	532	1945	47,714
1927	621	1946	1,669
1928	1,219	1947	2,100
		1948	2,284
1929	677		
1930	747	1949	2,544
1931	812	1950	3,000[E]
1932	593	1951	5,400[E]
1933	466	1952	9,000[E]
		1953	11,000[E]
		1954	9,000[E]
1934	437	1955	8,000[E]
1935	459	1956	6,800[E]

E—Estimate

MILITARY AIRCRAFT ENGINE PRODUCTION



Year	Number
1917–1919	44,453
1926	842
1927	1,397
1928	2,620
1929	1,861
1930	1,841
1931	1,800
1932	1,085
1933	860
1934	688
1935	991
1936	1,804
1937	1,989
1938	N.A.
1939	N.A.
1940	22,667
1941	58,181
1942	138,089
1943	227,116
1944	256,911
1945	109,650
1946	2,585
1947	4,808
1948	N.A.
1949	N.A.
1950	N.A.
1951	N.A.
1952	26,000[E]
1953	34,500[E]
1954	22,000[E]
1955	13,000[E]
1956	13,000[E]

N.A.—Not available
E—Estimate

BUT in May, the Air Force announced plans for an even more drastic change extending over the next several years. The great potency of nuclear weapons, with their capacity for broad-scale annihilation, together with the high performance built into our aircraft and missile systems, reduced the numerical requirements for these items. Furthermore, the advancing state of perfection of guided missiles indicated that these aeronautical weapons would be able to perform a number of functions of manned aircraft, both offensively and defensively. All of this called for a gradual reduction in manned aircraft and an increase in missiles. The final effect—a diminishing over-all production requirement by the Air Force, requiring only half of the present plant space of Air Force contractors by 1959-60. Meanwhile, no re-programming had been announced by the other two services. This program would have permitted a gradual reduction, but not until after it had peaked in early 1958.

But it turned out that this orderly readjustment was not to be. The Government ran into money troubles and this resulted in, not a gradual decline, but a sharp drop that could hardly be called orderly adjustment. In June, the industry was told by the defense establishment that the rate of expenditure by the services was exceeding industry's supply of money. In other words, the original estimate of defense expenditures for fiscal 1958 was $38 billion, but it was found that the spending rate was around $40 billion. It is not difficult to understand why: 1. industry, through a successful Government-industry cooperation in cutting lead time, was delivering equipment ahead of schedule in many cases; 2. inflation was having marked effect; 3. weapon systems had become so enormously complex that costs had risen sharply; 4. the necessity of keeping ahead of the Russians has placed top priorities on advanced weapons development, such as the ICBM and the IRBM—weapons rivalling the Manhattan Project (the atom bomb) in complexity and ultimate cost; 5. building and operating our distant early warning systems and our far-flung air bases is enormously expensive.

SOMETHING had to give—or else the national debt limit, now standing at $275 billion, would have to be raised. So the Defense Department ordered all of the military services to stay within the $38 billion expenditure limit. No longer can there be preproduction purchasing on long-lead-time items; each contract must be fully funded before any commitments can be made. The

services have had to pick and choose between promising parallel developmental and research projects in both manned aircraft and missiles. It was necessary to slow down production because of the services' inability to pay for it. For the industry, it was necessary to cut overhead. The work force had to be reduced. The most rigid economy had to be practiced.

WE have known for a long time that guided missiles would assume a growing importance in our air arsenal, even though it is generally recognized that manned aircraft will be the backbone of our combat forces for the foreseeable future. This trend was only partially, and indirectly, responsible for our peculiar fiscal situation. It would have come in any case. But it has been speeded up as a result. Partially as a consequence, development and production on some important fighter types have been cut back or stretched out. Earlier, our heavy bomber, the B-52, which enjoys a high priority, had been stretched out.

It always has been considered sound military procurement practice to bring along more than one weapon system for the same mission. The theories back of this are well known. The instinctive American spirit of competition stimulates any manufacturer and his team to turn out a better product than the other fellow. It's the will to win. Also, if combat experience shows an unsuspected weakness in one aircraft, chances are it does not exist in the other, which can carry on until a fix is made. The B-25 and B-26 bombers in World War II were designed for the same types of missions; the B-17's and B-24's worked in parallel. So did the fighters—the P-47's, P-38's, P-51's and the F-4-U and F-6-F—and so on through the troop-carrying and cargo planes.

While there has been similar development in more recent operations, especially in the fighter and missile fields, it is obvious that this practice is going to be more restricted in the future. There is a disposition now to choose between parallel developments at an earlier stage than formerly—even before production. Recently, for example, the Air Force had to cancel one intercontinental air-breathing missile project that had already cost the Government $690 million (*although the Government did get good return in missile advancement, including valuable data on guidance and ramjet and rocket power*) in the development stage in favor of a rival weapon. Ultimately, this practice of earlier selection may be followed in other parallel developments, in the intercontinental and intermediate-range ballistic missiles.

WHAT are some of the effects of all these recent moves on the aircraft industry? Well, reductions amounting to around a billion dollars have been ordered. Development of one fighter type has been cancelled outright. Six others, involving both Navy and Air Force, have been cut back or stretched out. A major contract for a large turboprop troop and cargo carrier, in an advanced stage of development, has been cancelled. The long-range missile mentioned a moment ago has been cancelled. Production on a major long-range bomber has been stretched out. One Navy bomber contract has been stretched out. Other weapon systems may be dropped through applications of priorities.

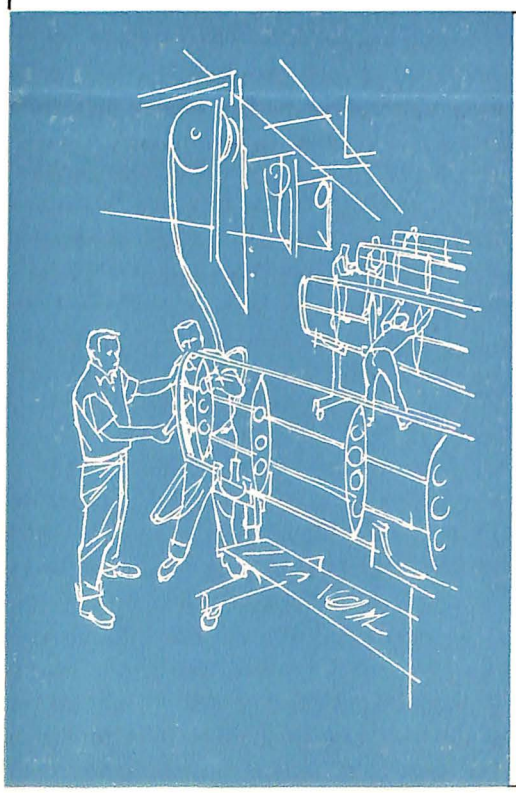
In the industry, a five per cent reduction in work force will be made by October 31. Overtime has been reduced to a bare minimum. The Defense Department has cut progress payments (in other words, incremental payments for work done) by five per cent, which will force contractors to make up the deficit in bank borrowings, even though interest on such loans is not admitted as cost of contract and must be taken out of earnings.

The industry has been told quite frankly that the services will not require facilities which cannot be used to best advantage in the reduced program. For example, there will be a sharply diminishing use for the high-bay factories the industry has employed in large-plane manufacture, since there will be few large military planes in the future.

There is no question that the effects of these changes will be selective to a large degree. Some companies and some of the nation's communities are going to feel them more than others, although austerity will be the watchword throughout the entire airframe, engine and components industry.

IT is likely that there will be somewhat less subcontracting than heretofore. When production was running high, the aircraft industry made a practice of subcontracting the work to a large extent. In the past year, subcontracts of the larger airframe companies have run from 30 per cent to as high as 60 per cent. But it is to be expected that, as the work load decreases for airframe and engine companies, there will be pull-backs, even though the armed services have said that economy and efficiency will be the determining factors. It makes little sense that a manufacturer whose facilities and work force are not fully occupied would continue to farm out work, if he can do the job better and at lower cost. Chances are he can. As Major General David Baker, until recently Director of Pro-

U. S. AIRFRAME WEIGHT PRODUCTION, 1939 TO DATE



Year	Weight in Millions of Pounds (Excluding Spares) Total	Military	Civil
1939	12.5	10.1	2.4[E]
1940	27.8	23.1	4.7[E]
1941	86.1	81.4	4.7[E]
1942	275.9	275.9	—
1943	654.7	654.7	—
1944	962.4	962.4	—
1945	542.2	540.5	1.7
1946	38.4	12.9	25.5
1947	29.3	11.4	17.9
1948	35.3	25.2	10.1
1949	36.5	29.8	6.7
1950	41.0[E]	35.0[E]	6.0
1951	55.0[E]	50.0[E]	5.0
1952	117.3[E]	108.0[E]	9.3
1953	151.4[E]	141.0[E]	10.4
1954	140.5[E]	130.0[E]	10.5
1955	124.2[E]	114.0[E]	10.2
1956	111.6[E]	95.5[E]	16.1

E—Estimate

curement and Production for the Air Materiel Command, said: "Since the products involved in this subcontracting are of the primes' own engineering and design, their manufacture is generally compatible with the primes' production capacity."

SIMILARLY, with less hardware being produced, there is likely to be some impact on the normal sources of supply items.

With the change in "mix" of our armaments, guided missile business is going to be of increasing importance to the aircraft industry to take up the slack left by airplane cancellations and cutbacks. The pilotless aircraft was developed chiefly by the aircraft industry. It has the same three vital elements as the manned aircraft—airframe, propulsion and guidance—so it is quite natural that this industry is best equipped to develop and produce it.

The techniques and know-how of aircraft production, acquired over the years, have been applied to guided missiles. Aircraft materials, electronics, systems and components also have wide application in guided missiles. It is quite natural that the industry which brought the airplane to its present advanced estate should develop and produce missiles most efficiently and at lowest over-all cost.

There has been some disposition to place missile development in Government arsenals and with universities and other tax-free institutions. The aircraft industry does not believe in that. The business of missile systems is a natural function of the aircraft industry and should replace lost business in the manned aircraft field if this industry is to maintain the state of health which has always been considered of vital importance to this nation. Also, there is an expensive loss of time and efficiency in translating the project from development by an arsenal or a university to production by industry. There are great advantages in flexibility and improvement if the design, experimental, tooling and manufacturing teams work together from the start. So there will be no misunderstanding, the aircraft industry does not advocate elimination of the arsenals and universities from either the aircraft or missiles field. They have a most important part to play in testing and in basic research.

There is one segment of the aircraft industry's operations which, of course, is not affected by military re-programming. This is the commercial business. The first of the turbine-engine transports will be delivered to the airlines next year, and thereafter the great increase in speed and comfort of air travel will have a tremendous impact on our habits and on our economy. Meanwhile, there is a growing market in business and private flying, and new aircraft, designed especially for these markets, are coming along rapidly.

BUT, despite the fact that five companies have a backlog of over two billion dollars in jet and propjet transports, it is still true that commercial business is only a small fraction of the total business of this industry—something on the order of 15 per cent.

Now, let's look at all of these developments through the eyes of the aircraft industry.

In the first place, nothing cataclysmic has happened. It will suffer shortly a sharp and sudden drop in business, but it still will have a big job to do. Because of these reductions, and because of shifting emphasis on certain air weapons, the entire aircraft industry must make some important readjustments.

IN the second place, this industry has never concerned itself with military requirements. That rests in the judgment and experience of the military services. Its job is to design, develop and produce those aircraft, missiles and systems for which the military specifies a need.

In the third place, the industry recognizes fully the need to maintain an economic balance in building our defenses. It has always applauded the national policy of building our civilian economy at the same time we were building military superiority, feeling it would be as disastrous for our country to be ruined economically as it would be militarily.

In the fourth place, the industry agrees entirely with the military services that their job is to defend America, and not to support any segment of the aircraft industrial complex. These companies have never felt that the nation owes them existence. With a change in requirements and a reduction in the production of air armaments, competition will be severe. The industry has always been competitive, and it will continue to be.

In the fifth place, this industry will in no manner slacken its efforts to devise, develop and produce the best air weapons in the world to help assure a qualitative superiority. It will try to produce them at the lowest possible cost, consistent with the complexity and degree of urgency of the military task. The aircraft industry has reason to be proud of its achievements and contributions since the nation went on full alert with the Korean outbreak seven years ago.

The urgency of national defense is no less now than it was a few months ago. Indeed, there is ample evidence that Russia is making great progress in development of advanced armaments. We must not let our guard down. We must not instill in the public mind any sense of security that is not warranted.

No matter what expediencies may be dictated by our fiscal situation, we should not lose sight of the fact that we are faced by a most formidable and implacable enemy. He has surrendered nothing at the council tables. He boasts of his advanced air armaments, and we have very little reason to doubt that he has them. He speaks as from a position of strength.

You may be sure that our military planners are weighing these considerations very carefully and that they will do everything possible to maintain the balance of power in our favor. Whatever is required of the aircraft industry will be supplied in the shortest possible time and at the lowest feasible cost. There is only one important point to remember. Once the brakes have been applied to this complex industry, acceleration is not a simple matter.

FEDERAL EXPENDITURES AND EXPENDITURES FOR MILITARY AIRCRAFT AND RELATED PROCUREMENT 1917 TO DATE (Dollar Figures in Millions)

Fiscal Year	Expenditures for Aircraft and Related Items	Fiscal Year	Expenditures for Aircraft and Related Items
1917[E]	$54	1938	$ 67
1918[E]	372	1939	68
1919[E]	18	1940	205
1920[E]	7	1941	587
1921[E]	10	1942	2,915
1922	6	1943	10,072
1923	7	1944	12,828
1924	10	1945	11,521
1925	10	1946	1,649
1926	12	1947	593
1927	14	1948	703
1928	22	1949	1,248
1929	29	1950	1,705
1930	31	1951	2,536
1931	31	1952	5,712
1932	29	1953	8,605
1933	25	1954	9,247
1934	13	1955	8,794
1935	23	1956	8,046
1936	44	1957[E]	7,861
1937	58		

E—Estimate

Navy's Versatility Prime Deterrent

(*Continued from page* 1)

tion which will mount missiles as the offensive punch.

The carrier force possesses the dual capability as a force for nuclear deterrence and an effective arm for countering local aggression. Naval striking power, coordinated with the Air Force through the Joint Chiefs of Staff, and through unified commanders in the case of nuclear weapons, supplements and enhances the striking power provided by the long-range aircraft of the U. S. Air Force.

Need Varied Forces

But there remains the danger of piecemeal conquest that in the aggregate over a period of years could spell defeat. We cannot rely on one type of retaliation; we need forces of a varied nature. The carrier force can handle either the task of nuclear deterrence or apply precisely the small force that could help smother lesser aggressions.

These versatile carrier forces can move their launching sites with bewildering speed. A modern aircraft carrier can cover 1,000 miles in a 24-hour period. The enemy can never be sure where or when a carrier striking force will be at any given moment.

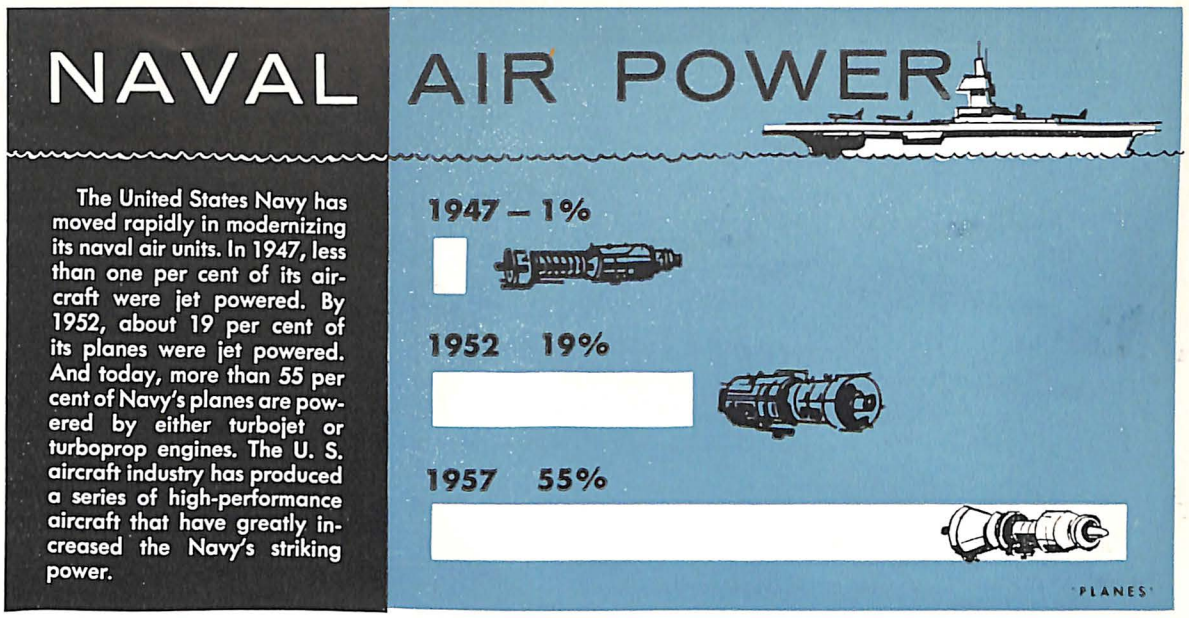
There are three principal types of combat aircraft used by the carrier force: fighters, heavy attack and light attack aircraft. The aircraft industry has provided the Navy supersonic fighters with performance characteristics unequalled by any other nation. One of these fighters today holds the transcontinental speed record from Los Angeles to New York. The mission of the fighter is to destroy enemy aircraft, and to attack shore targets.

Formidable Weapon

The heavy attack bomber is the primary means for delivering nuclear weapons over long distances. This plane can reach a target well over a thousand miles from its carrier base in all kinds of weather. This range, coupled with the mobility of its carrier, makes the heavy attack plane a formidable weapon.

The light attack bomber features close-in, accurate delivery of nuclear and conventional weapons. These aircraft specialize in the selective destruction of small targets, bridges, rail and truck convoys, troop concentrations, pill boxes, etc.

The principal Russian naval threat is its force of well over 450 submarines. Armed with missiles capable of firing from surface or even underwater positions, this fleet could ring the vital coastline areas of the United States and hurl its missiles, armed with nuclear warheads, at our most heavily populated areas. There is certainly no reason to doubt that this technique, which contains the classic elements of warfare—surprise and power—will be soon available to the Russians. The U. S., however, has a nuclear submarine in service today and others under construction. The virtually limitless range, the ability to remain submerged for long periods gives the U. S. a technical lead in underwater fleets.



Submarine Combat

Combat of submarines has many aspects. Nearly every type of aerial vehicle used by the Navy comes into play.

The detection and sinking of submarines at sea is a difficult task, and specialized planes and equipment are required. The hunter-killer force is one example. This force consists of an aircraft carrier with fixed wing and rotary aircraft, accompanied by destroyers. Propeller-driven aircraft are used in this force, which is able to search for submarines in a wide pattern around the surface vessels. Propeller aircraft are used, since speed and high altitude are not required. In fact, low speed is desirable in this type of plane. The principal function of the helicopter in the hunter-killer force is to determine the precise location of submerged submarines. The helicopter can hover and lower its submarine detection instruments into the water.

Patrol aircraft of large size and range are another weapon used against the submarines. They can carry all of the anti-submarine electronic equipment, plus the ordnance to destroy the target. The patrol plane can fly to a distant target, stay in the area in its search for a target and then attack.

Electronic Detectors

The lighter-than-air patrol anti-submarine aircraft, the blimp, has not been overlooked by the Navy. Low speed and endurance are its principal virtues. The blimp can tow submarine-detecting instruments at slow speeds. A Navy blimp recently covered, without refueling, a distance of 9,400 miles, crossing the Atlantic both ways.

The detection equipment used by the Navy represents some of the greatest advances made in electronics. This equipment, such as the sonobuoy, uses the earth's magnetic field, the diesel exhaust from the submarine and water surface phenomena in its searching techniques.

The jet seaplane will be the newest aircraft to enter Navy service. This aircraft can carry up to 15 tons of mines or bombs at very high speeds and altitudes. The seaplane together with its mobile base, the tender, offers another means of increasing the mobility of Naval air power.

Missile Program

The Navy has a comprehensive program of guided missiles in rounding out its air power. This program was established more than ten years ago . Today, there are more than a dozen guided missile projects under way, and the progress shown by the aircraft industry in meeting the Navy's unique requirements in missiles has exceeded expectations. There are four missiles in active service with our surface ships, submarines and aircraft squadrons. The Navy, because of the varied nature of its defense assignments, needs missiles of all types—air-to-air, air-to-surface, surface-to-surface, and surface-to-air and even air-to-underwater. These missiles must be capable of rapid loading and reloading on their launching systems.

There are specialized problems such as highly corrosive salt spray and missile operations in a tropical climate one week and in a polar climate the next week.

Industry Meets Challenge

Missiles will not entirely replace manned aircraft in the foreseeable future. The surface-to-air missile in the near future may take over a large part of the task now assigned to interceptor aircraft. But for many years most missiles will be used in a complementary rather than a supplanting role. Missiles can do some things more effectively than manned aircraft and in some cases are the only way to do the job. But they are limited in versatility, and, to eliminate the human being with the priceless asset of on-the-spot judgment and his ability to improvise, creates a rigidity in striking power that would leave the Navy dangerously vulnerable.

The Navy has found the aircraft industry equal to the challenge of its special requirements in aviation from the day in 1910 when the first aircraft made a take-off from a carrier. The aircraft and missiles the Navy will launch from an atomic-powered carrier force in the future will incorporate the latest ideas that have come in profusion from the design and development teams of the aircraft industry.

Blimps Play Vital Anti-Sub Role

The role of lighter-than-air airships, commonly known as blimps, has been obscured by the headline activities of supersonic aircraft and the hypersonic performance of guided missiles.

But the blimp is an important element of the complex air and sea defenses required by the United States. This airship is able to carry and operate the most diverse assembly of electronic systems for detection of enemies under the seas or in the air. and has a capability for sustained flight without refueling that is measured in days.

This combination of operational characteristics gives the airship capabilities for the dual missions of early warning and anti-submarine duties.

The performance of radar is directly related to the area of the sweep antenna. The airship is capable of carrying very large antenna within its "gas bag" without penalizing its performance.

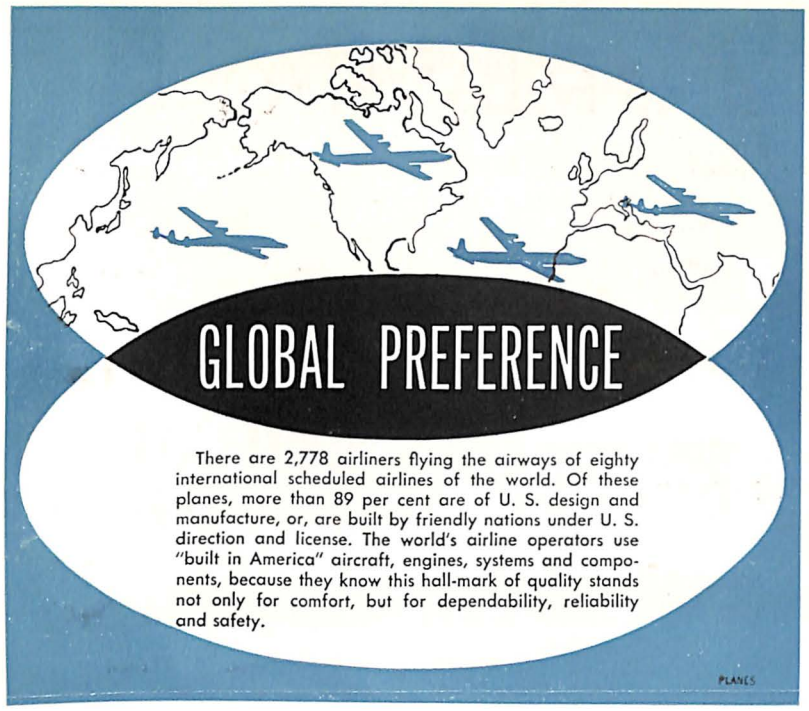
The aircraft industry is continuing its development along a broad front of aircraft and missiles to provide the versatility necessary for national defense.

Where Is Europe? Answer Top Secret

One of the U. S. Air Force's most closely guarded secrets is the exact location of Europe!

For the last four years the United States Air Force has been busily recharting the North Atlantic ocean with precise electronic navigational equipment. It was found that many commonly used maps were in error —not enough for general ocean-going shipping purposes but far too inaccurate for precise military air purposes.

The new information gained is of inestimable value to USAF, and would be of equal value—if they could get it—to enemy nations. The reason: an infinitesimal error in calculations from mapping could throw the long-range missiles, built with watch-like precision by the U. S. aircraft industry, far off course.



Quiet, Please! Men at Work in Echoless Room Building Silence into New Transport

A science-fiction-like "quiet room," technically an anechoic chamber or room without echoes, has been constructed at one aircraft manufacturing facility to guarantee that a new turboprop transport plane will be materially quieter than the best of today's luxury airliners.

The "quiet room" is lined with pie-shaped wedges of Fiberglas to absorb all resonance, and suspended by taut wires within an outer room in order to be free of vibration from outside. Instruments in this super-quiet laboratory measure sounds as low as 50 cycles per second, studying the noise output of such equipment as electric motors and pumps.

As part of its half-million-dollar "Operation Hush," the aircraft company has installed a $100,000 acoustic mockup of a 25-foot fuselage section inside the anechoic chamber. Ends of the fuselage section are tightly sealed with massively insulated double plugs so that noise can enter only through the fuselage skin.

The mockup is bombarded with recorded flight noises through a loudspeaker while delicate recording instruments pick up and analyze the sound transmitted into the passenger compartment.

The intensive noise abatement program for the new turboprop airliner began shortly after the airplane's design was completed, and every effort is being made to engineer quietness into the basic design. This is a vast improvement over earlier practices within the industry, when sound abatement was largely a hit-or-miss corrective operation after the airplane had taken shape.

"Engineers have yet to design a completely silent airplane," the sound abatement project chief says, but the new luxury airliner "will come as close as money, research, imagination and hard work can make it."

Tape Recorder Solves Seagull Menace

Because seagulls — like eagles — are protected by law, they possess a boldness seldom found among other birds, and have consequently become a hazard at airports near the seacoasts. Occasionally, they have been sucked into jet engines, or smashed into windshields. Since it is illegal to shoot the gulls, another means had to be found to keep them away from the airports. The problem was solved at Floyd Bennett Field, Long Island, in a novel way: a jeep is driven down the runway, playing a tape-recorded cry of frightened seagulls! It works every time, officials say.

Private Pilot Does Well in Business

A fascinating insight into the makeup of the private pilot comes from the Aircraft Owners and Pilots Association, which learned, after surveying its 65,000 members, that the composite (or average, or median) private pilot is:

A college man, married, and the father of children under 21 years of age; earns $10,906 a year, owns his own home, participates in community affairs, owns more than one and a half automobiles, owns an airplane or has a financial interest in one. He also prefers summer vacations to winter vacations, and he may be one of the 22 per cent of private pilots who also own a boat of some sort.

The private flier seems to do all right in the business world, too, according to the AOPA survey. Executive titles are held by almost half of those studied in the survey. Twelve per cent are presidents of business organizations, and 702 of them are board chairmen of corporations. Agewise, 66 per cent of the private pilots fall in the 31 to 50-year age bracket, 18.2 per cent are between 21 and 30, and 10.7 per cent are 51 to 60 years old.

Flight Simulator Cuts Training Costs from $350 to only $35 per Hour

An electronic flight simulator, which duplicates flying conditions aboard an Air Force cargo plane, is computed to cost about $35 an hour to operate, as compared with approximately $350 an hour to fly the aircraft itself.

The simulator reacts to the controls exactly like its flying counterpart, except for the fact that it never leaves the ground. A technician at the Air Force base where the simulator performs its training chores, said the machine can "simulate fires in either engine, runaway propellers, a 'beat note' when the engines are not in synchronization, backfiring, cargo loading and unloading, fire in the heater compartment, ignition trouble of many types, false indication on any instrument, electrical failures, gear malfunctions and icing."

The simulator weighs 32,000 pounds, is 23 feet wide, 26 feet long and 12 feet tall. It puts out enough heat in its 280 vacuum tubes to heat an average family home in the winter, uses 25,000 volt amps of power and has 450 miles of wire.

The simulator familiarizes pilots with emergency procedures under conditions which would be too dangerous to perform in the air. Occasionally, a pilot "crashes" while flying the simulator, but he can always walk away from such "crashes," resolving to do better next time. Eventually, emergency procedures become second nature to pilots trained on the simulator, saving untold amounts of time, effort and money when he flies the airplane instead of its ground-bound counterpart.

Many such simulators—built by the aircraft industry—are in use today, training both civilian and military pilots to keep safety uppermost when they graduate into the air.

Science Courses Gain in High Schools

For the first time in almost 50 years, high school students are showing an increased interest in mathematics and science courses.

A study by the U. S. Office of Education reveals that the percentage of students enrolled in these courses is up for the first time since 1910. Until last fall, the percentages had been on the decline. However, despite the previous percentage declines, the total number of students enrolled in these courses has increased steadily and is now the highest in the nation's history.

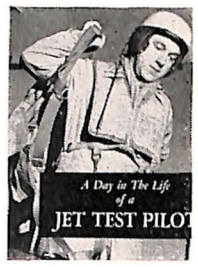
Increasingly complex military need, particularly in the design, development and production of aircraft and missiles, has created a demand for more scientific and engineering manpower. The aircraft industry has been very active in programs to enrich junior and high school curriculums and has furnished substantial aids to assist in teaching these vital courses.

The federal agency pointed out that the increase in the proportion of pupils taking courses in science and mathematics was due in part to the fact that more and more schools are offering such courses. Many schools have introduced science and mathematics courses as a direct result of student interest in these subjects.

Percentage of public high schools offering courses in chemistry or physics to 12th grade pupils increased from 77 per cent in 1954 to 82 per cent last year. Schools offering plane geometry courses to 10th grade pupils rose from 78 per cent to 81 per cent.

Booklet Tells Story of Jet Test Pilot

If, like most people, you are intrigued with one of the really courageous and dramatic figures of the air age, we recommend the booklet *A Day In The Life Of A Jet Test Pilot*. This is one of several publications put out by the National Aviation Education Council, a non-profit organization dedicated to broadening the educational horizons of American youth.



This is an authentic account of one day in the life of Pat, a "scientist of the sky," who works in an ever-changing mobile laboratory—the super-plus jet plane he tests. He is an engineer of the air who must be equipped, not only with steady courage, but many skills, much technical knowledge and experience as well. For, from the time the jet was in the planning stages, and through each step in its development, he has drawn from his vast knowledge of flying many ideas which were included in its design.

The story moves swiftly and excitingly as it describes Pat's activities. He checks the morning flight schedule assigning him to test hop two jets. He attends briefing sessions—that are not so brief. He dons elaborate protective garb, including head gear with more gadgets, than Mr. John ever devised for Madame's Easter chapeau. And finally, after hangar checks, flight line checks, cockpit checks, and last minute conferences, the reader shares his exciting takeoff. The jet engine hisses, whines, then screams as the plane streaks down the runway for a flight 40,000 feet above the earth.

A worthy addition to the library of the 12 to 18-year-old, *A Day In The Life Of A Jet Test Pilot* may be obtained by sending 50 cents to the National Aviation Education Council, 1025 Connecticut Ave., N.W., Washington 6, D. C.

In modern America, a community's airport may fairly be regarded as its gateway to the future.