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REP. HESS URGES RENEGOTIATION STUDY

Investment Plans Are Jeopardized By 4-Year Delay in Determinations

By William E. Hess,
Member of Congress

The prime task facing the second session of the 85th Congress when it convenes in January will be a vigorous, thorough examination of our defense requirements and policies.

There is no question that we must move swiftly to overcome any barriers to our goal: military supremacy that will deter any attack against our nation.

There are thousands of facets to a successful defense program, ranging from scientific concepts to administrative procedures. A productive meshing of these facets requires careful attention.

The most advanced weapon system idea could be delayed or dissipated by unnecessary administrative handicaps to the development and production of the weapon.

There are two overriding factors in the conception, design and production of the weapons we need to achieve adequate national defense: competition and incentive. These two factors are as basic to our economic system as free elections are to our political system. Anything that chips away or tends to negate incentive or competition can irreparably damage the very system that has placed our nation in its present position of world leadership.

Russia has modified a terroristic "do it or else" system in seeking weapon supremacy by borrowing the technique of incentive from us, and is using it successfully to develop weapons which today pose a solemn threat to our nation. Their aircraft and missile designers are paid substantial cash bonuses for successful defense projects. Captive foreign scientists working for Russia are offered the dual bonus of freedom and cash rewards if they meet goals.

Of course, incentive can be carried to extremes where defense contractors are permitted to earn profits that are excessive—profits that are beyond a reasonable return for products and services. The Congress has recognized that it is necessary to have legislation that will protect the government against payment of these unreasonable profits. For more than two decades the Vinson-Trammell Act has, among other things, served as a safeguard to prevent payment of more than a reasonable profit to defense contractors.

However, at the beginning of World War II, the Congress passed the Price Readjustment Act, the forerunner of the present Renegotiation Act, which permitted the Government to review prices paid in individual defense contracts after contract completion. This was necessary so that a price fair to both the Government and the contractor was paid.

The Government, during World War II, was making capacity purchases from industry, buying materiel for the war effort ranging from bombers to lemon powder. Procurement techniques to accomplish sound purchasing on this vast scale simply were not available. The orders were to buy in great urgency and to settle the final price during a readjustment session. Work was started on contracts involving millions of dollars with no more formality than the simple statement, "We need it."

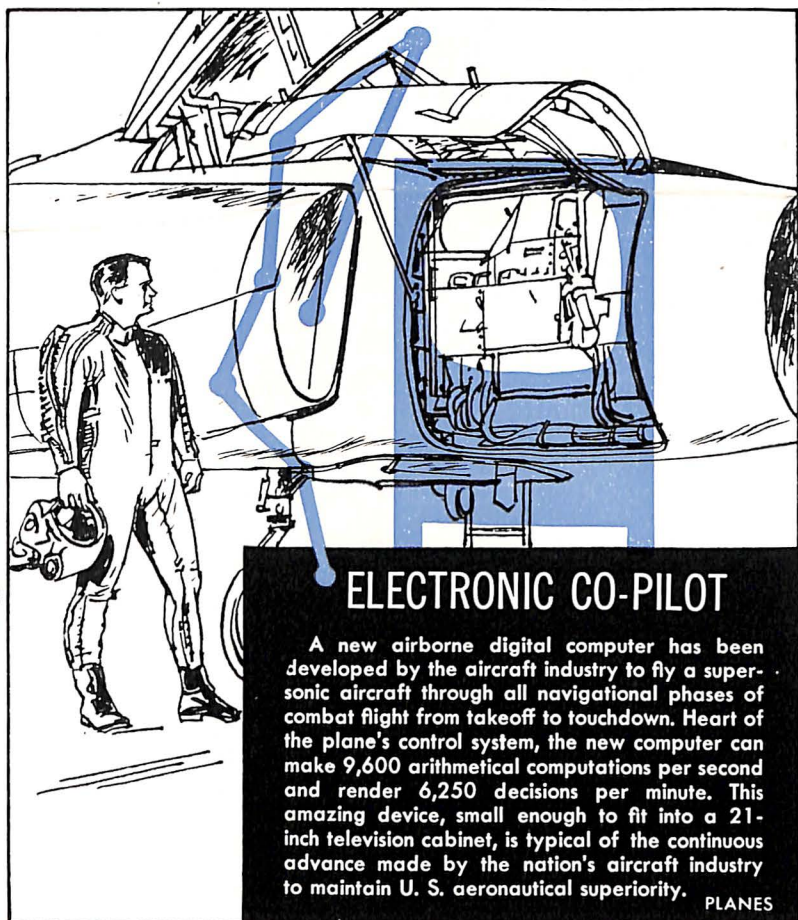
This procurement of materiel in large quantities during World War II and the Korean War enabled purchasing officers in the armed services (See *RENEGOTIATION*, Page 8)

Rep. William E. Hess is the senior



minority member of the House Armed Services Committee. He is a member of the Armed Services Subcommittee for

Special Investigations which, last year, completed hearings on the airframe industry and which is scheduled to continue hearings on the aircraft engine and component industries. He served as chairman of this Subcommittee from 1953 to 1954. Mr. Hess has been elected a representative of Ohio's Second District 13 times. He was born in Cincinnati, educated at the University of Cincinnati and Cincinnati Law School, and served as Member at Large of the Cincinnati City Council from 1922 to 1926. He has travelled extensively and has inspected military installations in the U. S., Europe and the Far East. Rep. Hess is a Commander in the U. S. Naval Reserve.



ELECTRONIC CO-PILOT

A new airborne digital computer has been developed by the aircraft industry to fly a supersonic aircraft through all navigational phases of combat flight from takeoff to touchdown. Heart of the plane's control system, the new computer can make 9,600 arithmetical computations per second and render 6,250 decisions per minute. This amazing device, small enough to fit into a 21-inch television cabinet, is typical of the continuous advance made by the nation's aircraft industry to maintain U. S. aeronautical superiority.

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Versatile Helicopter Proves Its Worth As Fire Fighter

There's apparently no limit to the versatility of helicopters. A recent test proved its value in "beating down" a gasoline spill fire by the blast from its rotors.

This technique would be of great use in helping to rescue people involved in sudden gasoline fires since it allows fire fighters on foot to get up close and use dry chemicals with a minimum of protective equipment.

In the demonstration, a gasoline fire was ignited and billowing clouds of smoke with accompanying heat and fumes rose high above the spot. The helicopter moved alongside the blaze, directed the air blast from its rotors at the blaze, dispersing the fumes and smoke in seconds and flattening the flames to about 18 inches.

Fire fighting experts pointed out that personnel caught in such a blaze could run through the low blaze without waiting for arrival of ground fighters and equipment.

State Uses 'High Road' To Make Low Road

The State of Maryland has a new highway notably different from other highways in the State.

The road is unusual because every phase of it was planned and engineered from aerial photographs. According to Maryland State Roads Commission engineers, all engineering maps, drainage surveys and even geological reports on soils were made by an aerial mapping service.

The Highway Commission said that the speed and expertness with which the plans were made were so successful that aerial planning and engineering are to be adopted permanently by the Commission.

Quick Change

Engine changes on a new turbojet airliner will require only 30 minutes—about the same time required for a lubrication job and oil change for the family automobile.

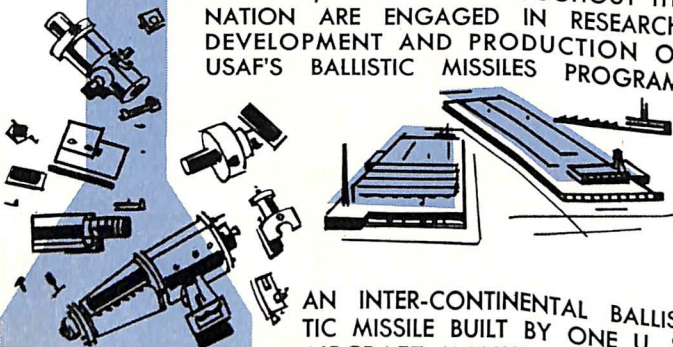
Plane Views



—452 DEGREES FAHRENHEIT—
THE COLDEST TEMPERATURE CRE-
ATED BY MAN—IS PRODUCED BY
ONE U. S. AIRCRAFT COMPANY
FOR GUIDED MISSILES RESEARCH.



SOME 80,000 PEOPLE THROUGHOUT THE
NATION ARE ENGAGED IN RESEARCH,
DEVELOPMENT AND PRODUCTION OF
USAF'S BALLISTIC MISSILES PROGRAM.



AN INTER-CONTINENTAL BALLIS-
TIC MISSILE BUILT BY ONE U. S.
AIRCRAFT MANUFACTURER IS
COMPRISED OF 300,000 SEPA-
RATE PRECISION-MADE PARTS.

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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.

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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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Progress Or Paralysis

Russia during the last six months has sharply accelerated its campaign to challenge the United States in military and economic leadership. The headline grabbing of Sputniks I and II and their far-reaching military implications have partially obscured the significant progress being made by *Aeroflot*, the state-owned Russian airline, in commercial transportation. This carrier today is flying advanced transports in regular service and extending their route system.

The military value of a sound commercial air structure is obvious: Commercial aircraft today can quickly be converted to airlift for troops and cargo. The appearance of the Red Star on Russian transports landing in foreign countries has incalculable economic and propaganda worth. In fact, our airlines serving international routes are known as flag carriers.

While Russia's *Aeroflot* is demonstrating great progress, the U. S. scheduled airlines are facing the greatest crisis to their continued growth since they became regulated carriers under the Civil Aeronautics Act in 1938.

The harsh fact is that our airlines are trapped by a paradox of increasing business and declining profits. Airline fares are actually less today than in 1938. The price per passenger mile then was 5.32 cents compared with 5.28 cents today. But the cost of doing business has climbed—wages, parts, fuel and cost of aircraft.

However, other regulated carriers have been granted substantial fare and rate increases: First class rail fares have increased 50 per cent, rail coach fares 33 per cent and bus fares 27 per cent during the same period. And airline service has been improved to a far greater degree than these other carriers, including the addition of much larger, faster and more comfortable transport aircraft to airline fleets.

The scheduled airlines today are moving into the jet age of commercial transportation, an age that will see coast-to-coast flights in four hours. A glimpse of the meaning of the jet age to the traveling public was possible when Air Force Gen. Curtis LeMay flew non-stop from Buenos Aires to Washington—a distance of 5,024 miles in 11 hours and 5 minutes. His plane, although a military transport, is basically the same as the jet transports slated to enter the nation's airline fleets next year. U. S. domestic airlines have ordered more than 350 turbojet and turbopropeller-powered airliners costing nearly \$2 billion.

The Civil Aeronautics Board last month opened the General Passenger Fare Investigation. This may be the most significant hearing ever held by this agency. The purpose is to determine if a fare increase is necessary and, if so, how much. The Board of Governors of the Aircraft Industries Association has expressed its interest and concern to the Chairman of the CAB for a suitable and equitable fare increase. The economics are simple: 1938 fares will not pay for complex 1958 airline operations.

At stake is the future of a vital, dynamic industry. The airlines need a positive policy from the Government, a policy that will permit them to grow in a healthy economic climate, to provide the public with more and better service and to serve national defense.

The alternative is a creeping paralysis of one of our most important national assets.

Air Quote

"... I stated the concept that whoever has the capability to control the air is in a position to exert control over the land and seas beneath. I feel that in the future whoever has the capability to control space will likewise possess the capability to exert control of the surface of the earth.

"We airmen who have fought to assure that the United States has the capability to control the air are determined that the United States must win the capability to control space.

"In speaking of the control of air and the control of space, I want to stress that there is no division, per se, between air and space. Air and space are an indivisible field of operations.

"Ninety-nine per cent of the earth's atmosphere lies within 20 miles of the surface of the earth. It is quite obvious that we cannot control the air up to 20 miles above the earth's surface and relinquish control of space above that altitude... and still survive."—General Thomas D. White, Chief of Staff, U. S. Air Force, November 29, 1957.

Electronic Combine Speeds Testing

Aircraft industry engineers have "wedded" electronic and data processing equipment made by four manufacturers into a single system that speeds the testing of rocket engines and components.

The new combined unit gathers information during a test, translates it into mathematical language, and presents it in consolidated form immediately at the end of the test.

Formerly, it was necessary to use individual strip charts to record performance characteristics of various test measurements. The combined unit eliminates the time lag of 6 to 24 hours required to consolidate data and, in addition, eliminates the factor of human error in copying and compiling data from many charts.

The system can record a simultaneous "readout" of 46 test measurements 30 times a second. The key to the high-speed system is a synchro-printer which resembles a teletypewriter. This machine can type numbers onto a sheet of paper at the rate of 30 lines of 120 numbers every second.

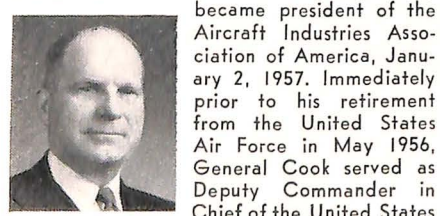
This new tool for testing means that better rocket engines can be tested and developed in a shorter time with less manpower.

Air Power Arithmetic

Management + Money = Missiles

Aircraft Industry $\left\{ \begin{array}{l} \text{spent } \underline{1 \text{ Billion dollars}} \text{ } 1946-1957 \\ \text{plan to spend } \underline{1 \text{ Billion dollars}} \\ \text{next 5 years} \end{array} \right.$

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.

By ORVAL R. COOK

PRESIDENT, AIRCRAFT INDUSTRIES ASSOCIATION

MISSILES have evolved as a logical supplement to conventional air power—bombers, fighters and transports—to create a revolution in arms as profound as the mechanization of our forces which started before World War I.

Today there are 43 announced missile projects under way, divided into four categories: Air-to-air (7 projects), air-to-surface (7 projects), surface-to-air (10 projects), and surface-to-surface (19 projects). They range in size from the air-to-air missiles which can be handled by one man to the intercontinental missiles which require huge, multi-story gantry rigs to position them for launching. The aircraft industry is the prime contractor for

most of the 43 weapons now under development and in production; and in every missile, the aircraft industry supplies the airframe, propulsion, guidance system, or a major component.

The burgeoning importance of guided missiles in today's defense planning is reflected in the figures shown in the chart accompanying this article. In 1952, only 4 cents of the Air Force's "aircraft and related procurement" dollar was spent for guided missiles and two years later it was 10 cents. By 1956 it had increased to 12 cents and it is estimated that in fiscal 1958, 50 cents of each dollar will be obligated for missiles. The climb in missile expenditures is expected to

continue, reaching about \$4 billion in 1961, and exceeding the amount expended for manned aircraft.

The design, development and production of missiles draw upon the same reservoir of scientific and technical knowledge that brought manned aircraft to their present advanced state. Basically, a guided missile is made up of the same systems as an airplane: airframe, guidance system and powerplant. The principle differences are in operational capabilities and characteristics.

THE fire control, bombing-navigation systems and electronic counter-measures of today's interceptors and bombers are in the same sophisticated class as the systems used to guide missiles. They are just as complex, perform tasks just as phenomenal as the guidance units for missiles. For example, an airborne digital computer developed and produced by the aircraft industry can take an interceptor through all phases of supersonic combat, from takeoff to landing, while the pilot makes only tactical decisions. Weighing only 120 pounds, the computer simultaneously puts out 61 different types of information while performing 30 types by combining the types. While this is being performed, the instrument performs or monitors 16 separate navigation and flight control functions every 1.3 seconds, all at least once and some of them several times. These operations include controlling the pitch and roll of the plane, commanding the pilot to increase or decrease speed, checking on fuel and the distance the plane can fly, the target range, direction, altitude and speed the pilot should fly in order to intercept the target. And then the computer automatically fires the armament at the target.

The same laws of aerodynamics that govern the flight of aircraft, apply to missile flight. The aircraft industry has laboriously accumulated a storehouse of technical knowledge on aerodynamics that is being utilized today in

its missile program. The wind tunnels used to test aircraft designs are proving missile configurations.

Powerplants used in missiles range from the turbojet types used in aircraft to ramjets and rockets. The rocket engine is generally associated in the public's mind with missiles since it is used to power the intercontinental and intermediate range ballistic missiles. Its advantages are tremendous bursts of power and its ability to operate outside the atmosphere since it carries its own oxidizer. The fact that we have high-thrust rocket engines available today is due to the close cooperation between the aircraft industry and the Air Force.

An Air Force officer, closely associated with the missile program, recently stated: "It was the conviction of the Army Air Forces, which became the U. S. Air Force in 1947, that the rocket development program should be handled in a manner like that of other engine development programs. Traditionally industry had always been regarded as a partner in these ventures. It was felt that a continuation of this policy would make available the most competent organizations and best brains for rapid exploitation of rocket art. The former Air Corps' engine development programs, dating back to the days of the Hispano-Suiza and Liberty engines of World War I, had attempted to harness available sources of industry to development and production programs. The Air Force feels today that this was a wise decision. The fact that the only successful large liquid-rocket engine programs in the United States have been Air Force programs is in no small measure due to this manner of operation. This policy has greatly eased transition from applied research to development to production and has minimized scientific stagnation."

A SUCCESSFUL missile program demands much more than technical competence. The keystone is the ability to bring together

the infinitely complicated systems so that the end result is a weapon that can not only accomplish a pre-determined task but also can be economically produced. This is system management.

THE aircraft industry has pioneered and perfected the technique of managing complicated systems. An airframe manufacturer does not usually build the engines, produce the materials, make the communications equipment, the landing gear or many of the hundreds of major components involved in an aircraft. Yet he does manufacture the plane. This is not a simple task of assembly. The highest degree of management and technical skills are required to make all of these intricate elements work together to accomplish its specific task.

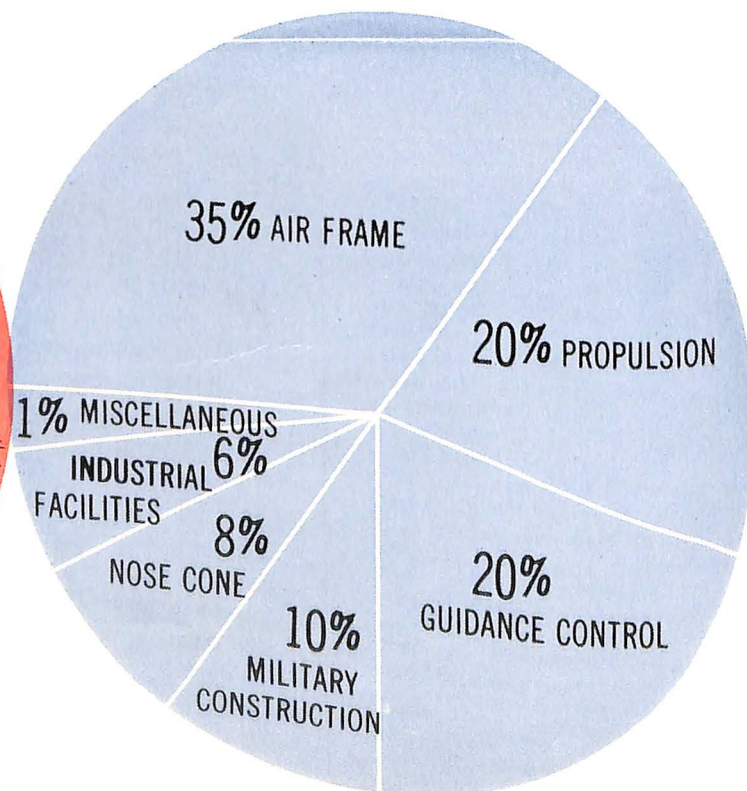
The same managerial qualities are required for missile manufacture. Unity of purpose from idea to hardware is a prerequisite. There are four major phases in any missile program:

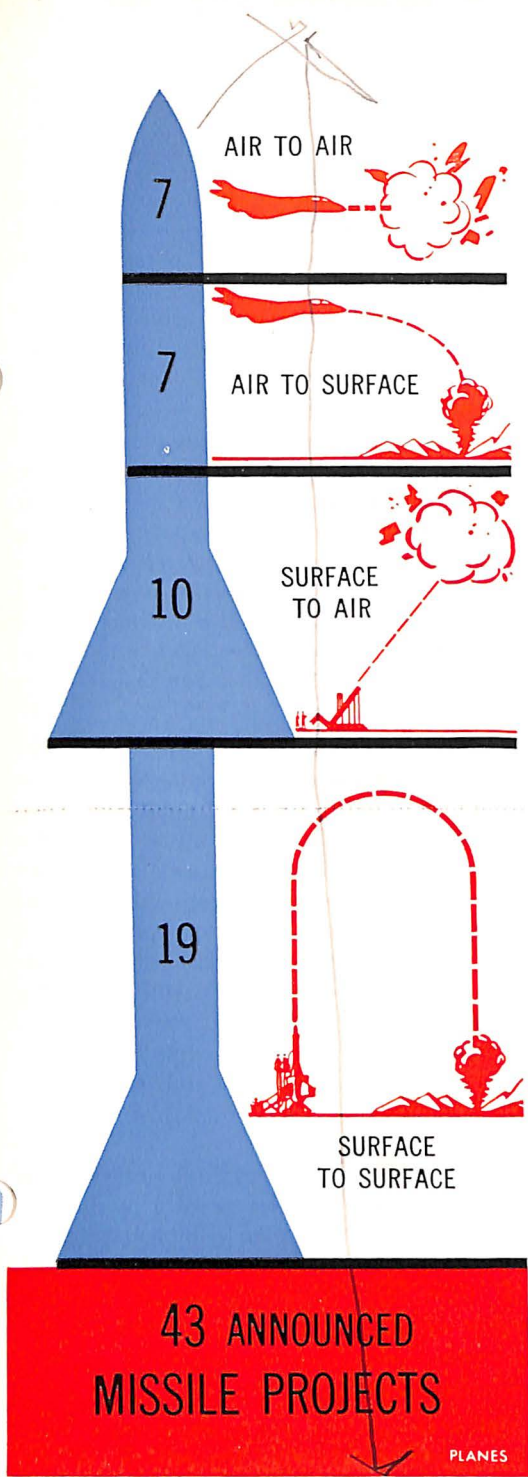
1. *Requirement:* The purpose of the weapon—its operational objective—is laid down by the military. Drawing upon the latest basic research, military and industry teams roughly determine speeds, altitude, operating temperatures, payloads and other basic features, and a timetable is set.

2. *Design:* The requirement is translated into a design. To meet the requirement, designers may call for materials of strength-weight ratios and thermal resistant properties that are just emerging from basic research. At this point, tooling engineers must start to invent machinery that can work the new materials.

3. *Development:* The drawings are translated into prototypes—working models of the weapon that are tested to prove the calculated performance.

4. *Production:* The weapon is produced from tooling, which permits a volume output at the lowest possible cost.





The aircraft industry is prime contractor for many of these 43 missile projects, and in every one builds either the air-frame, guidance system or powerplant.

These phases do not operate in individual vacuums with neat check-points marking the beginning and end of each phase. All work together throughout the life of the weapon project with only the emphasis shifting at appropriate times. Production engineers work alongside design engineers to insure that the designs can be produced. It would be of no value to conceive and design an advanced weapons system, then present it to the production engineers only to find that the design is too far ahead of the production state-of-the-art.

The missile is regarded in the broad light of a total weapon, including ground equipment, maintenance, logistics support and operational suitability—designing the weapon so that it can be used by personnel of limited technical skills.

It is comparatively easy to design and hand-build a few prototypes of a missile which will prove its feasibility simply as an isolated piece of military hardware with limited regard to the total system. Design and development engineers with limited production knowledge cannot fully appreciate the problems of producibility. This means that when the shift is made from one organization responsible for the development phase to another organization responsible for the production phase, there are, inevitably, numerous snags requiring major modifications, substitutions and possibly a re-design of the entire missile. This adds up to a delay of months, or even years, in making the changes that will allow producibility.

Missile projects managed under the aircraft industry's concept of the total weapon insures a smooth transition that telescopes time as emphasis shifts from design to development to production. There is no question that the development prototypes can be produced. Producibility is designed into the missile from the first line drawn for blueprints. The military services are delivered a complete weapon system—in quantity and on time.

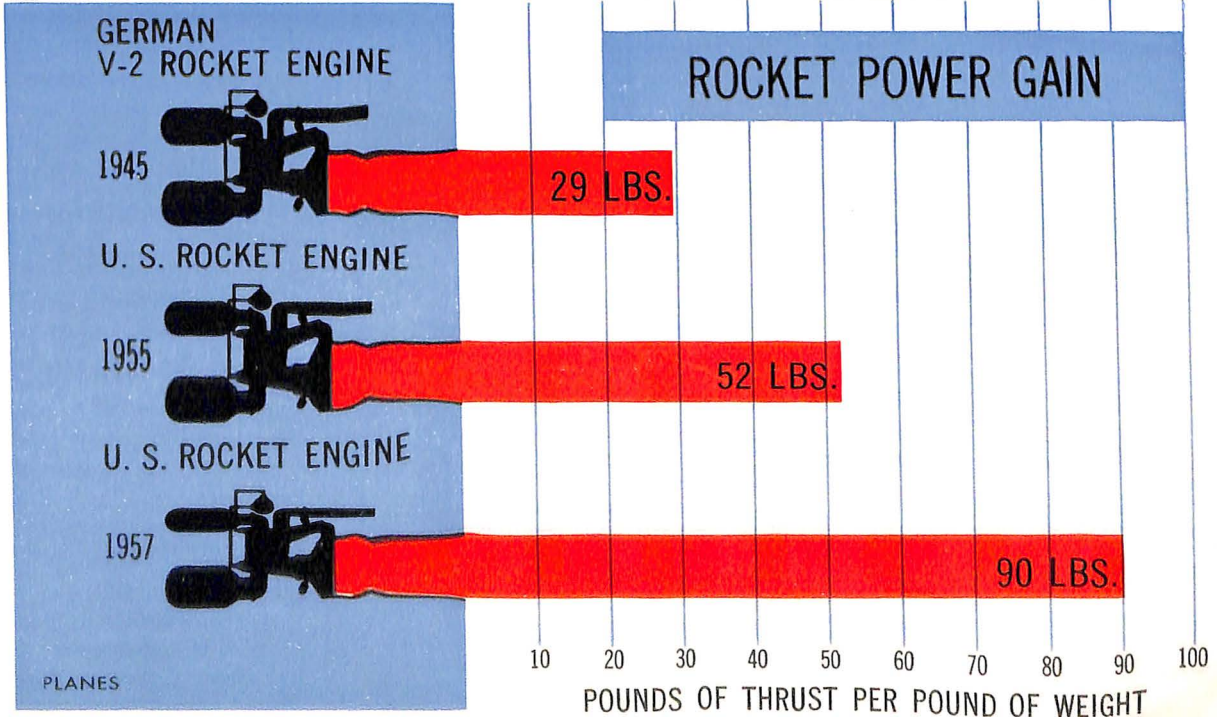
In the ICBM program handled by the aircraft industry, the components and sub-assemblies

in the test vehicles are made on production tooling in the plants that will produce the combat missile for operational units. The philosophy of hand-fabricating test vehicles, making a change here and a fix there until something that works is finally ready, and then handing it over to industry to produce in quantity is an outmoded, time-consuming, wasteful approach. This is the so-called arsenal system of weapon development and production that is not adaptable to modern weapon programs which should have design flexibility coupled with the ability to move swiftly into production.

ANOTHER prime advantage, so obvious that it is usually overlooked, is the stimulant of competition. There may be several aircraft companies working on weapon projects, each fully aware that only one is going to obtain a production contract. It means that only the best of several good ideas is finally bought, and this is a matter of corporate life or death. Arsenals, operated by public funds, are not subjected to this goal of competition.

Aircraft companies must maintain their competitive status through the investment of earnings in facilities and research. They have the highest re-investment rate (approximately 60 per cent) of earnings of any major manufacturing industry. In the ballistic missile program alone, the aircraft industry has invested more than \$100,000,000 for industrial facilities. Over-all, the aircraft industry in the years since World War II has spent \$1,000,000,000 on research and test facilities and plans to spend another \$1,000,000,000 in the next five years.

The aircraft industry is governed by an explosive technology that dictates a necessity for rapid change. No other major industry has been so affected by new scientific and technical discoveries. No design is ever final for an aircraft or missile. Modifications are made continuously during the production process as new ideas are developed and proven. Design is never frozen. The design engineers work



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with the project from the first prototype to the last production model.

The problems of high speeds, high altitudes and high operating temperatures have been with the aircraft industry for many years. They are a daily diet for the aviation industry. And these are the problems, greatly magnified, that we face in our missile programs. The hard-won knowledge produced from energetic, imaginative research and development programs has enabled the aircraft industry to move with dispatch and confidence into the missile age of weaponry.

DR. Robert H. Goddard in the 1920's and 1930's carried on a lengthy series of experiment in high altitude rocketry, but was unable to arouse any interest in the United States armed forces. There were two schools of thought in the years following World War I regarding missiles. Most aerodynamicists talked about relatively slow vehicles capable of long ranges, powered by reciprocating engines. Military ballistic personnel talked about rocket and gun-propelled projectiles with simple structures and limited guidance and control systems with ranges measured in thousands of yards. It was the eventual wedding of these two ideas that brought about the ballistic missile. These efforts incorporated the structural talents of the airframe industry, the adaptation of the advanced systems

for imparting stability and controlling bomb release from modern airplanes and powering it with high-propulsion rockets to produce a new species of weapons.

THERE are frequently expressed fears that Russia has moved ahead of the U. S. in the intercontinental and intermediate range ballistic missile fields. If the Soviets have indeed moved ahead, it can be traced to the on-again, off-again policies that have plagued our guided missile programs since their very beginnings.

The U. S. first started its ICBM program with a modest research and development contract awarded to an aircraft company in 1946. This project was cancelled in 1948, but the aircraft company continued limited studies with its own funds until 1951 when it was again revived on a conservative scale. It wasn't until 1954 that the project was granted full priority. But out of the 1947 contract which was continued by industry came such developments as a swiveling rocket engine, integral tankage and a separable nose cone. Without these developments the U. S. would be sorely pressed today in its ballistic missile programs.

Missiles, particularly the long-range ballistic types, have captured world attention as no other weapon has in the armed history of man. To most persons outside the military

and industry it seems that the missile suddenly appeared, full-blown, to become the alpha and omega of our defense program. Largely ignored in the near-hypnotic regard for missiles is the fact that there are at least two more generations of manned aircraft that will be built. These future aircraft will have some qualities of their own. The next generation of bombers is aimed at speeds beyond Mach 3 (three times the speed of sound) and operating at altitudes on the order of 75,000 feet. Fighter performances will be even greater. The bombers will be able to strike any target in the world, return without refueling, and have the irreplaceable factor of human judgment present throughout the mission. These performance characteristics, incidentally, are superior to present surface-to-surface missiles with the exception of the ICBM.

Guided missiles are, essentially, another weapon that is taking over some of the missions formerly handled by manned aircraft. It would be foolhardy to throw away the proved striking power of today's bombers and fighters without having operationally reliable missiles at launching sites ready to go. In fact, many military experts reason that a wedding of manned aircraft with missiles launched from the air may prove to be a more accurate and reliable weapon than the long-range ballistic missiles, and less easy to defend against.

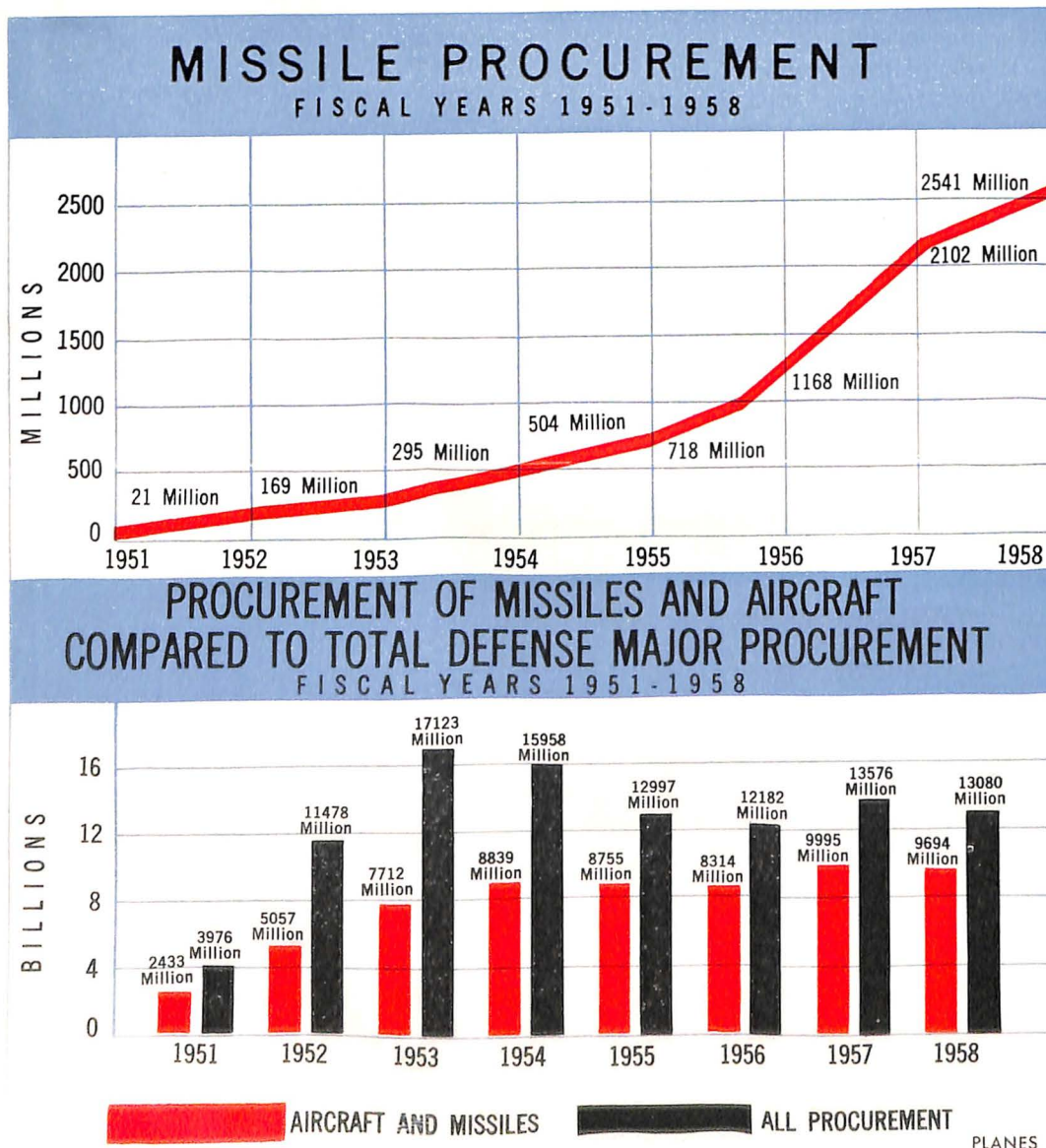
A BALANCED force of high-performance aircraft and missiles poses a more difficult defense problem than complete reliance on just one type of weapon. Aircraft can attack from any direction around Russia's lengthy border, fly at varying altitudes, use electronic counter-measures to avoid or confuse radar detection.

The next step that our scientific and military leaders see beyond the missile is unmanned and manned spacecraft. This vehicle will be much more than a weapon. It will expand man's horizons into the universe. Planets can be explored yielding knowledge that may unfold the innermost secrets of matter itself. It will be possible, perhaps, to control the weather from information gleaned beyond our envelope of atmosphere.

The aircraft industry, building on its experience in aircraft and missiles, today has design studies under way for manned spacecraft. The vehicle that will propel man toward his destiny in space will be a direct descendant of the Wright Brothers' frail wood and fabric machine that made the first powered flight only 54 years ago this month.

The aircraft industry has available today most of the hardware and all of the basic knowledge needed to send a man into space. An expenditure now in the area of \$200 million to \$300 million would put a manned aircraft into space in less than three years.

There must be no action, however well-intentioned, that will scatter design, development and production of aeronautical vehicles, that will diffuse a unified industrial approach to weapon programs. The race into space has assumed transcending importance, and we cannot permit ourselves any false starts.



Everything Except Ava Gardner

The movie film used to photograph the test flights of a modern bomber would make "Gone With The Wind" look like a coming attraction trailer.

Sixty cameras have shot an estimated 100,000 feet of film—enough for a continuous 40-hour showing. "But we're actually only just getting started," says a photographic specialist. "There's a lot more ahead."

During a typical test flight, the bomber carries five movie cameras, and two others are carried by the chase plane to record the bomber's flight characteristics. They compile a significant record of the aircraft's performance at varying temperatures, altitudes and under almost every conceivable condition. In addition to the airborne cameras, two theodolite cameras film the bomber on take-off against a built-in grid from which engineers can measure the plane's attitude, angle of attack and point of takeoff.

With all of the cameras involved in the test program, the photographers are seeking still another camera. This camera would be mounted on the helmet of the pilot in the chase plane following the bomber. The only camera presently available weighs 16 pounds, a bit too heavy for even the most stiff-necked pilot. The photographers are working with engineers to come up with a 16-millimeter camera that will do the job, and weigh not more than two and one-half pounds.

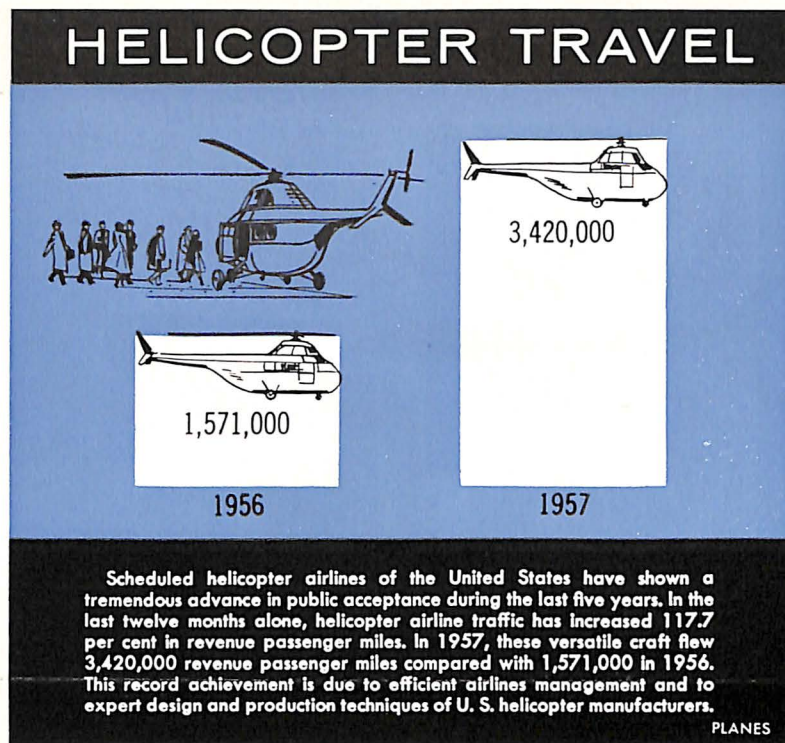
'Moony' Idea Comes Down to Earth

Moon-gazing by an optics expert in the aircraft industry has paid off with the development of an instrument which will check the depth of scratches on machined metals to determine if they should be rejected.

The instrument works on the principle used by astronomers to measure the depth of moon craters. If an astronomer knows the angle at which sunlight strikes a crater rim, he can measure the length of the shadow and determine the crater's depth.

The indicator, the first instrument made which can optically measure the depth of small scratches, also uses a shadow cast from a light source set at a known angle. The operator looks through the lens into the interior of the scratch. The measuring shadow can be manually adjusted by a knob on the lens barrel, and a slight turn causes the arrow-shaped shadow to intersect a mark which represents the known light angle. Calibration on the knob give the depth of the scratch. Measurements are calibrated in ten-thousandths of an inch.

The indicator can also measure thickness of paint and determine if separate painted parts match exactly. Development of this instrument is typical of quality control efforts in the aircraft industry to insure superior aircraft and missiles.



Bankers Urge Meeting To Eliminate Handicaps to Aircraft Industry

A meeting between Defense Department and aircraft industry officials to work out solutions to a host of industry problems has been strongly recommended by the Aviation Securities Committee of the Investment Bankers Association of America.

"Only through such government-industry teamwork, within the framework of our dynamic free enterprise system, will the aircraft industry have the stability and strength to preserve American security in the crucial days ahead," the Committee report stated.

The problems include delayed renegotiations, procurement fluctuations, program terminations, mandatory subcontracts, and non-reimbursed design changes, among many others.

The report noted that the aircraft industry requires massive advance investment in plant, research and prototype development, often without forward commitment of government funds and without security as to volume and profitability of resulting production. "The history of our defense policy is shot full of heavy industry outlays and equally heavy losses on curtailed projects," the IBAA report said.

The aircraft industry is subject to violent expansion and contraction. This is shown by government aircraft spending which shot up from \$587 million in 1941 to \$12.8 billion in 1944, down to \$593 million in 1947, up to \$9.2 billion in 1954, and down to about \$7.8 billion currently.

"With national survival today dependent upon achievements in air technology, America cannot afford to disrupt these unique management and scientific organizations by cutbacks . . ." the investment group warned.

The report said that due to the shifts in defense policy as much as historic industry problems, the investment community has judged air-

craft manufacturers' stability inadequate for the risks involved.

"While free competition in the investment market has reduced aircraft manufacturers to a low priority for new capital investment, the need for such investment in terms of national survival may be greater than at any time in history. . . .

"The solution lies in a Congressional appropriation policy and a Defense Department procurement policy that will afford the aircraft manufacturers adequate stability, allowing them to successfully compete in the free capital markets for additional investment in their high risk industry. In this sense, adequacy must be determined—not by an arbitrary formula or by administrative decree—but by a growth and stability factor that will attract the required capital to ensure American aviation superiority," the report concluded.

Ceramics Produce Tooling Dramatics— Higher Speeds, Better Results

Ceramics to the general public usually denote objects d'art for the home. To the aircraft manufacturer, however, ceramics are the coming materials where great heat resistivity is required.

Most recent use found for the versatile ceramic is in "cutting bits" for the production worker's lathe. The bits look like miniature patio tiles and come in a wide variety of colors, sizes and shapes.

The exact compositions of the bits are closely guarded secrets, but most manufacturers admit that cemented oxide, sintered alumina or aluminum oxide are acceptable names. In general these bits are made by forming powdered material into solids under intense pressure and heat.

Since they are made from ma-

'Copter Booklet for Children

The story of aviation's child prodigy is impressively told in *Helicopters*, one of several booklets published by the National Aviation Education Council, a non-profit organization devoted to broadening the educational horizons of American youth through increased understanding of the impact of aviation upon their world.

Designed for the 8 to 16 age group, *Helicopters* begins with a brief summary of the historical development of what is affectionately termed "an animated eggbeater." The reader is then taken aboard a mail helicopter, following step by step the flight along U. S. Mail Route 96, as the pilot transports his cargo to and from the heliports of a large U. S. city.



After this lifelike introduction to the ambitious whirly-bird, we become acquainted with its unique versatility through vivid pictorial and prose descriptions of its use in forest fire control, cattle round up, crop spraying, power line patrol, search and rescue work, and its many other services to the community and the nation.

Of particular import is the telling account of helicopter duty in Korea and how the spunky little craft evacuated more than 15,000 men and saved the lives of 3,000 seriously wounded by moving them within twenty minutes after they were injured.

Abundantly illustrated with actual photographs, this inspiring story may be obtained by sending 50 cents to the National Education Council, 1025 Connecticut Ave., N. W., Washington 6, D. C.

materials which can withstand much higher temperatures than metal, ceramic tool bits can operate at higher cutting speeds. As any lathe operator knows, this results in better finishes and usually more pieces of finished work per hour.

Both results are of extreme importance to the aircraft manufacturer to whom close tolerance finishes are almost as important as the savings in time and money gained through speeding up this phase of production.

The future of ceramics seems bright as the aircraft industry moves ahead in the use of new special purpose alloys that defy steel or carbide tools and which are of increasing importance in jet, rocket and nuclear equipment.

Giant Centrifuge Tests ICBM

The intercontinental ballistic missile program is in a whirl these days.

Reason is a giant centrifuge designed by the aircraft industry to test components that make up the ICBM. The machine is installed in a concrete-lined pit, with a huge boom weighing ten tons extending across the pit and rising two feet above it. One end of the boom has a streamlined steel box measuring three feet long, two feet wide and two feet deep. Test components are bolted inside the box, and those too large for the box can be attached directly to the boom.

Three electric motors power three hydraulic pumps which cause the centrifuge to rotate. A component weighing 2,000 pounds can be rotated at 121 revolutions per minute or about 170 miles per hour. The energy developed is sufficient to loft a golf ball from California to New York and 700 miles out over the Atlantic Ocean.

By reversing the flow of fluid, the centrifuge can be suddenly braked, and a powerful air brake is available for emergencies.

Components can be subjected to temperatures ranging from 100 degrees below zero to 350 degrees above, while being subjected to very rapid acceleration and deceleration.

This unique machine is just one of a growing array of test units required to test ICBM components to extremes of stress, vibration and temperature.

Hot Fighters Now 'Sweat It Out'

Supersonic fighter planes are "sweating it out" in ground tests to insure that they can withstand the high operating temperatures caused by high-speed, high-altitude flight.

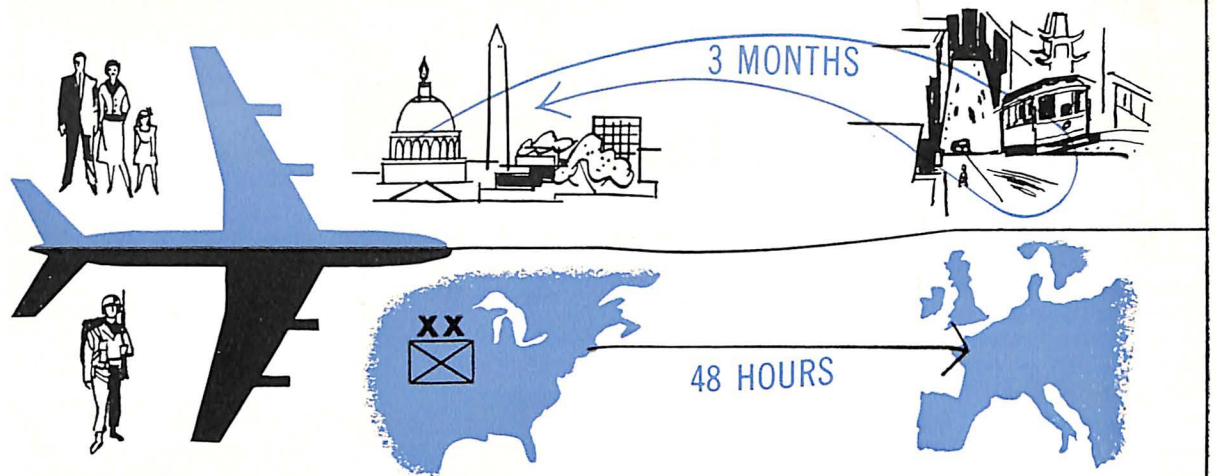
The facility used for these vital tests consists of two 35-foot sections, each 12 feet in diameter. One section is mounted on wheels to allow access to the forward half of the fuselage under test.

The chamber can duplicate altitude conditions up to 100,000 feet and is designed to subject an entire fighter plane fuselage, complete with its electronic fire control and air conditioning equipment, to thermal conditions at supersonic speeds. Not only must the equipment be properly ventilated to remove the heat it generates itself, but the heat conducted, convected and radiated inward from the aerodynamically-heated fuselage skin must be removed.

Nearly six hundred tubular heat lamps inside the chamber can produce the desired temperature in one minute flat. Air evacuation for altitude simulation is handled by steam ejectors and semi-barometric condensers.

Remote control of the system is handled through a graphic panel in the control room.

AIR TRAVELING AMERICA



The 340 huge jet and turboprop airliners now on order by the nation's domestic airlines will be able to furnish a total of 39 billion seat miles per year to the nation's air travelers. This means that these luxurious U. S. manufactured airliners could transport every man, woman and child in metropolitan Washington, D. C., to San Francisco and return every three months. These same planes could also transport the personnel of 5.5 pentomic divisions (75,000 troops) from Westover AFB, Massachusetts to Europe every 48 hours.

PLANES

Renegotiation Legislation Requires Specific Formula for Computing Reasonable Industry Earnings

(Continued from Page 1)

to develop contract techniques that could handle a variety of procurement situations. General Clarence S. Irvine, Deputy Chief of Staff of the U. S. Air Force for Materiel, recently stated:

"Today's contracts are fair to the buyer and seller alike in the various situations that occur in Air Force procurement. They are fair because of a day-to-day review of costs which take into account the situation that existed at the time of a particular expenditure. Military procurement officers have worked intimately with many contractors over the entire period of the contract which, in cases of long production runs, may have a life of several years. These close relationships enable the Air Force to know the high degree of technical and managerial skills involved in each weapons system. A final review, taking into account all factors, is promptly made when the contract is completed.

"The Air Force is engaged in a continuous program of encouraging its contractors to invest their earnings in additional facilities. These contractors would be necessarily chary of committing their investments into facilities for development and production of military materiel if they had to project their investments against the unknown quantity of a reassessment made years after contract completion."

The Air Force takes justifiable pride in a type of contract known as Fixed Price with Incentive. It is a sound method of rewarding superior performance. The contract provides a formula for computing the distribution of savings below, or cost overruns above, the original target costs. In the first production runs, this variance of savings may be divided between the Government and the

contractor on a 95-5 per cent ratio, the Government retaining 95 per cent of the savings. As additional contracts are let, this ratio is usually increased with the division reaching as high as 70-30 per cent. But in these later contracts, production techniques have been developed to a point where the manufacturer is hard-pressed in his search for new methods to reduce costs.

Rep. Carl Vinson, Chairman of the House Armed Services Committee, has stated that renegotiation does no more than prevent or eliminate profits that are clearly excessive and unreasonable on an overall basis—profits that it would be clearly unconscionable for a contractor to retain from his dealing with his Government in circumstances which preclude proper initial pricing. This is the basic intention of renegotiation legislation.

Certainly it is not the intention of the Act to stifle a contractor's incentive to strive for economical production under the Fixed Price with Incentive contract by reclaiming, through renegotiation, reasonable earnings granted by the contracting agency for substantial cost reductions after initial pricing. Neither is it the intention of renegotiation to jeopardize industry's long-range plans for investment of its funds by demanding refunds as much as four years after a contract has been completed.

A report made last year by the Subcommittee for Special Investigations of the House Armed Services Committee, of which I am a member, after hearing detailed testimony from aircraft manufacturers and the Renegotiation Board, stated:

"We are concerned with the Renegotiation Board regulations which provide that their prior actions are not 'controlling precedents,' and the

'formula of an overall evaluation.' Why these factors are not capable of explanation has not been satisfactorily answered, as far as we are concerned.

"We think it is inexcusable to allow statutory renegotiation to be four years behind. If more help is needed, it should be requested and granted. To delay timely redetermination of profits for as much as four years is unfair to the Government and unfair to the contractors who are expected to plan for the future."

This criticism of renegotiation procedures requires careful study. Another criticism that must be given attention concerns the methods of computing excessive profits. There are several cases where the regional office of the Renegotiation Board has determined that the profits of a company are not excessive, and the Board in Washington, working from the same set of facts, determines that profits are excessive by as much as \$10,000,000. And there are cases where the amount of excessive profits determined by the regional office have been reduced by the Board in Washington.

This wide disparity of excessive profit determination within the Renegotiation Board itself is cause for grave concern since it places contractors in a corporate limbo of not knowing where they stand. There is obviously a need for re-examination of renegotiation legislation with the aim of defining in clear, unequivocal language a specific formula for determining whether earnings are or are not excessive.

The next session of the Congress must review this and other legislation to make certain that any artificial barriers to a sound defense program are eliminated, and that the fullest advantage is obtained from our free enterprise system.