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*The Magazine of Aerospace Power* / *Published by the Air Force Association*



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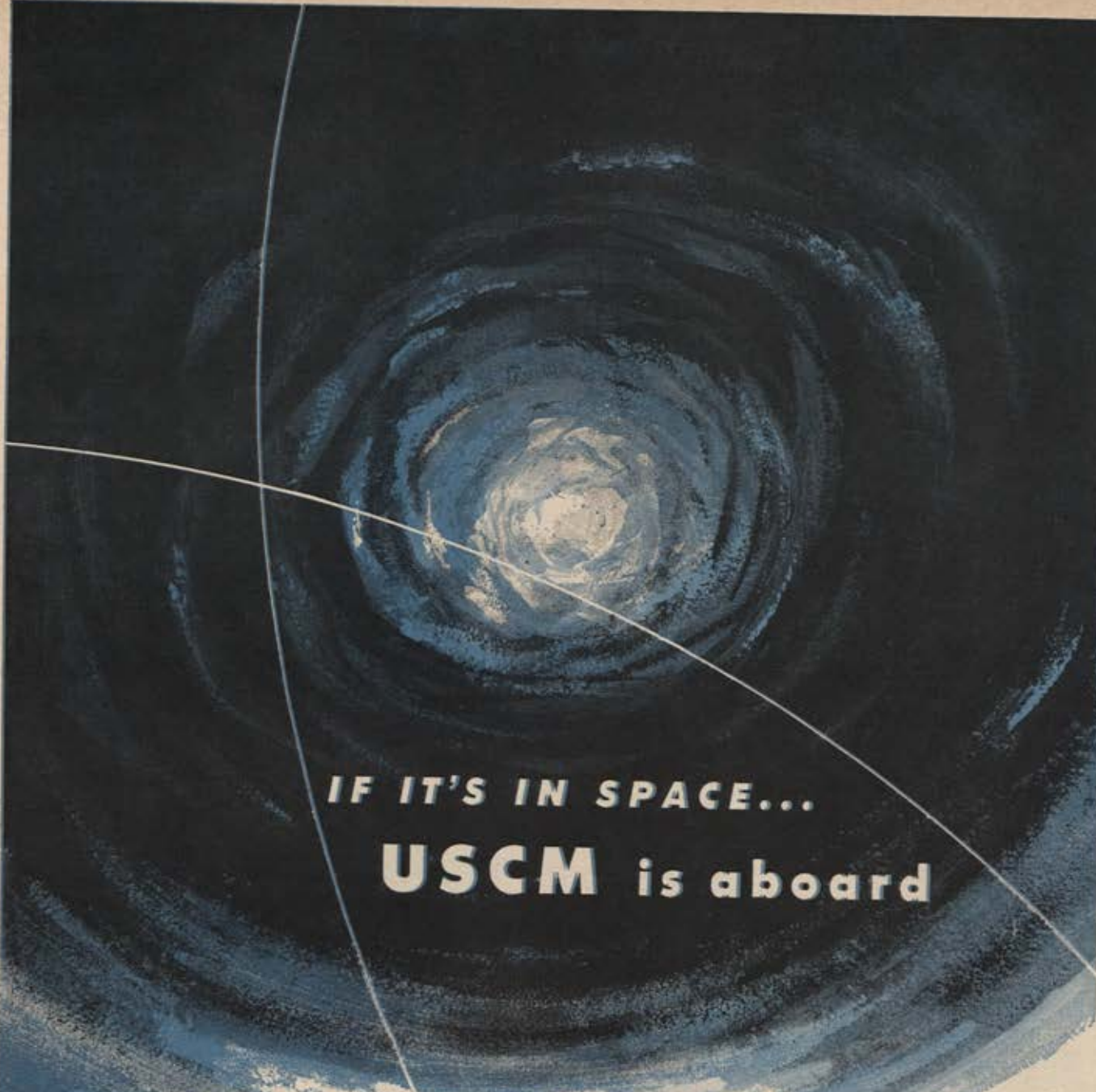
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# AIR FORCE

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# Pay Now... Survive Later

**John F. Loosbrock, Editor**

**I**T IS quite human, in times of stress and crisis, to bleat about lack of executive leadership and loss of a national sense of purpose. We have been guilty of it ourselves on occasion.

In one field, however, we can see no lack either of leadership or of purpose. That is the field of budget balancing. The leadership is firm, and the purpose is clear—to hold the budget in balance without significant changes in the tax structure, come what may.

Needless to say, this is not the kind of leadership or direction of purpose which, we feel, is suited to the exigencies of our times. Nevertheless, these are the conditions that prevail, and any discussion of other national problems is fruitless unless this factor is acknowledged and read into all equations.

The annual budget exercises in the Pentagon have turned into an annual agonizing reappraisal—on a one-way street headed downhill. In what we believe is a mistaken, although sincere, effort to preserve the individual taxpayer's standard of living, the military is being forced into a financial trap in which no individual could live for long—an income frozen at a fixed level combined with inevitably sharply rising costs.

The entire military budgetary process has become as ritualized and therefore as meaningless as the mating dance of the whooping crane. The Joint Chiefs may deliberate for endless days. The National Security Council may meet in solemn session after solemn session. The Congress may debate, and argue, and appropriate until it is blue in its collective face.

But the blunt truth is that the military policy of this nation is being formulated and executed by four men—the President, the Secretary of the Treasury, the Director of the Bureau of the Budget, and the Assistant Secretary of Defense, Comptroller. True, Mr. McNeil, who had filled the latter post ever since there was a Department of Defense, has officially resigned as of November 15. But the fiscal year 1961 budget, now under consideration, bears his stamp, and he has promised to see it through Congress as a consultant.

This one-sided approach is bad because the military requirement is playing second fiddle to the economic requirement instead of being at least an equal partner in the budget debate. The situation reflects, on the one hand, the belief of Mr. Eisenhower and his financial advisers that we have reached the safe limit of federal spending in this country, and, on the other hand, the deep desire of the President to go down in history as the prophet of both peace and prosperity. In neither instance, we submit, is the military or the economic picture being examined in true perspective. It is on the military side that the ice is thin and the danger clear and present. On the economic side the weight of evidence indicates that we have not even approached the point of strain, let alone that of risk.

Writing on the defense budget in the November issue of *Fortune Magazine*, Charles J. V. Murphy points out that the budgetary "squeeze was on before Khrushchev put in his appearance with a timing that was almost eerie."

As Mr. Murphy says, the Khrushchev visit has opened up "new demands from certain quarters of the Administration for military retrenchment. Khrushchev seems earnestly to want a slowdown in the weapons race. Like President Eisenhower, Khrushchev is also on the horns of the economic-military dilemma. The intense pace of the technological revolution in weapons, with its compounding demands for capital in competition with his Seven-Year Plan, must be very worrisome to Mr. Khrushchev."

We agree that the burden of the arms race must be "very worrisome" to Khrushchev. But we seriously question whether President Eisenhower is likewise on "the horns of the economic-military dilemma." Or, to put it another way, we think that Khrushchev's dilemma, given the demands on his economy versus its capabilities, is inescapable. But Mr. Eisenhower's dilemma, using the same yardstick, is less apparent, in fact nonexistent.

It would seem rather that Khrushchev is shrewdly coupling his own need to reduce the pressure of the arms race with the American desire (not need) to do so. His disarmament talk offers a fine excuse to relax US pressure in the arms race, which automatically reduces the pressure on the USSR's own marginal civilian economy, while the Soviet Union emerges as the champion of peace.

Thus, the ability, and the willingness, of this nation to increase its arms effort is a key factor, though not the only one, in establishing world power equations for the future. Currently, and it is an encouraging trend, a good deal of attention is being paid to the comparative economic positions of the USA and the USSR with the well-nigh unanimous conclusion that we can afford whatever we need, if we're ever able to determine what that might be. The bugaboo of economic disaster is being laid where it belongs—at rest.

In this connection, the Subcommittee on Economic Statistics of the Joint Economic Committee of the Congress has just issued a comprehensive three-volume report called "Comparison of the United States and Soviet Economies." It was prepared by an imposing list of experts in almost every conceivable field of economic endeavor and is being used by the committee as the basis for public hearings. The hearings began on November 13 with the testimony of Allen Dulles, Director of the Central Intelligence Agency. Mr. Dulles said, in part:

"If the Soviet industrial growth rate persists at eight or nine percent per annum over the next decade, as is forecast, the gap between our two economies by 1970 will be dangerously narrowed unless our own industrial growth is substantially increased from the present pace."

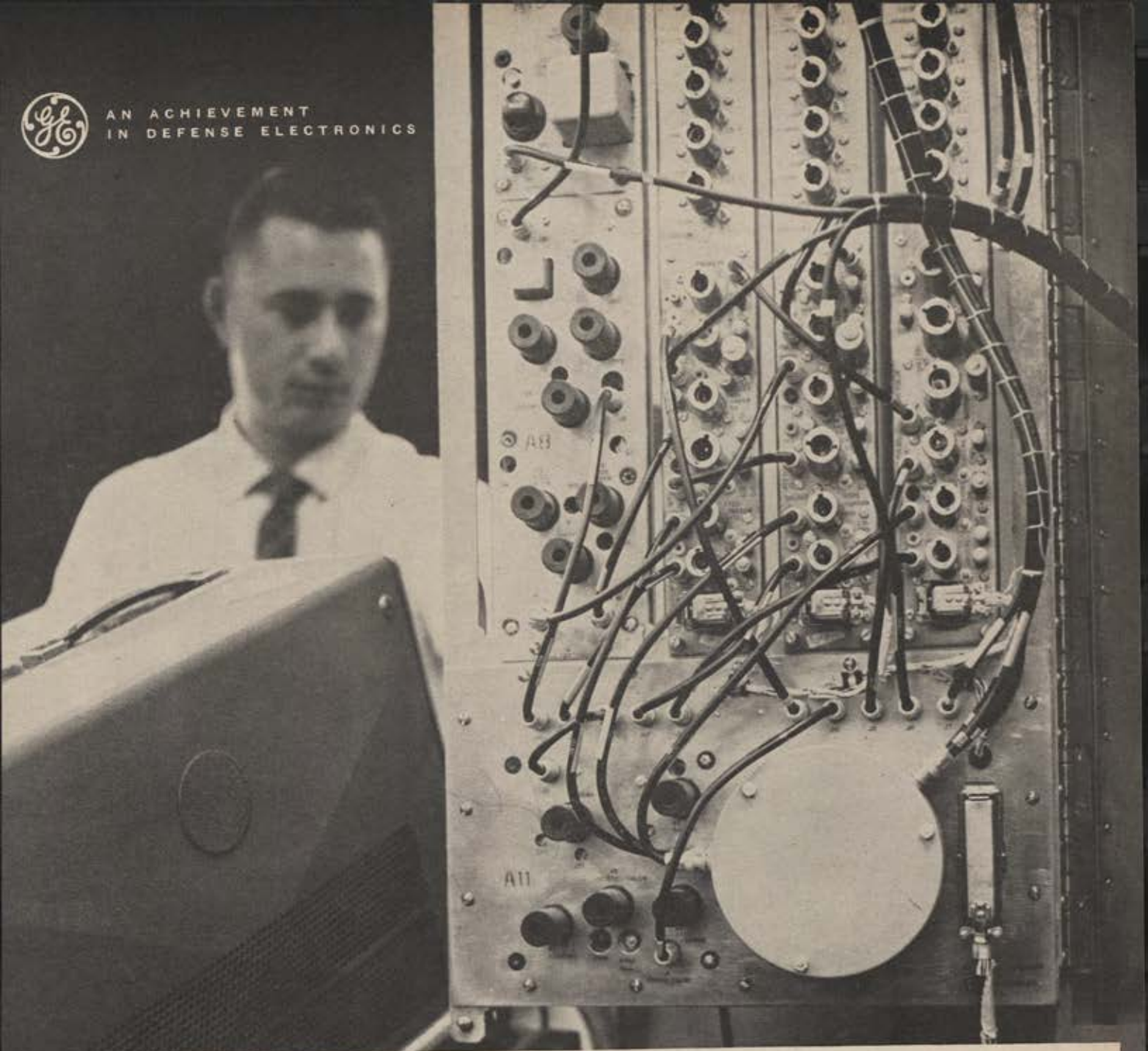
Mr. Dulles pointed out, however, that a simple comparison of gross national products, or even industrial production, is not a true yardstick of relative national power positions. Included must be the percentages that each nation devotes to specialized industrial, military, and power goals. The Russians, for example, concentrate on military projects and basic industrial expansion. Our own economy is fat with consumer goods and services.

*(Continued on page 9)*





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## NEW SONAR SIGNAL PROCESSOR DOES WORK OF 1,000 UNITS

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This advance in sonar signal processing is typical of General Electric's many achievements in defense electronics.

227-3

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A large, detailed illustration of an astronaut in a full space suit, seen from behind, walking away from the viewer towards a launch site. The astronaut is wearing a white helmet and a dark suit with white stitching along the joints. In the background, a rocket is being launched, with a large plume of fire and smoke. The scene is set against a dark, starry sky.

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We hope that the hearings attract wide attention and that the above-mentioned report is well read among the movers and shakers of the nation. A multitude of subjects is covered, but through the report runs the thread that we need have no fear of the effects of an accelerated arms effort on the national economy.

In a brilliant summary paper, W. W. Rostow, of the Massachusetts Institute of Technology, puts his finger squarely on American responsibilities in this area. It should be read against the backdrop of the Khrushchev visit and the almost obsessive preoccupation with the fiscal aspects of national defense exhibited in Washington. In a section called "The Multiple Dimensions of the Soviet Challenge," Dr. Rostow writes:

"The main weight of Soviet policy is being articulated to the Russian peoples and to the world in terms of a non-military struggle which is, indeed, being energetically and frankly pursued. But there is no evidence whatsoever that the Soviet military effort is being reduced; and there are no grounds for building American policy on the assumption that, if the Soviet government believed that it enjoyed a sufficient advantage in nuclear weapons to take out American retaliatory power at a blow, it would not do so. Inhibitions may well exist in the Soviet political system against such a course of action; but there is no objective basis for believing that the United States would be safe should the gap in military capabilities be permitted to open to such an extent. Put it another way, *we Americans have no right before man or God to tempt Moscow's planners with this possibility.*" [Italics supplied.]

In another fascinating study, *The Question of National Defense* (Random House, \$3.95), Oskar Morgenstern poses the problem in a somewhat different manner. (Dr. Morgenstern is Professor of Political Economy, Princeton University, and coauthor, with the late John von Neumann, of *The Theory of Games and Economic Behavior*.) In a chapter dealing with the economic aspects of defense he makes this cogent observation:

"The first point that has to be made absolutely clear is that the economy and the economic well-being of the people are not the dominating concern. Overshadowing everything is the safety and survival of country and nation. . . .

*"The true limit of the burden is the willingness of the people to carry it.*

*"The defense we need is the defense we can afford. . . .*

"Neither in the last world wars nor in the Korean War was the United States in a situation in which a really critical effort was demanded of the people. So great was the power of this country that a tremendous Army and Navy could be raised and a great outpouring of arms and equipment could occur without really depriving the people of very many conveniences. There is no experience to show how the American people would behave if great sacrifices were demanded for a long time. I doubt that they would act differently from others. But it would be necessary to tell them why sacrifices are needed and to prove that they would lead to the desired goal. At present very little is being done to communicate this information, and as a consequence the resistance to more sacrifice—if such it can be called—is considerable.

"The current, widespread belief that any increase in our defense budget must by necessity lead to an unbalanced budget and 'hence' to inflation is completely wrong. . . .

"This country worries about the limits to the military budget, whether we can 'stand,' or 'support,' a two percent, a five percent, or a ten percent expansion of this item at a time when there may be three to four million unemployed. This is such grotesque reasoning that it would be

foolish to add even one word. Always remember that for one billion dollars more per year we can keep a very large part of SAC in the air. . . . And we do not have to wait years for new products to do this. We can start doing it tomorrow. To get some perspective on the cost of this item: We spend per annum about three-quarters of this amount for new swimming pools!"

Before leaving Dr. Morgenstern we would like to quote him once more, because a good deal of the pressure for reduced military spending, disarmament, and the like comes from the feeling, often expressed from the White House on down, that future war will be so terrible that it just can't happen. He writes:

"We are at present focusing attention on the physical holocaust that a large thermonuclear, atomic war would surely bring to the United States. We recoil from that picture of death and destruction, so unbelievably great. Our mind refuses to tell us that life after this war would be possible, or if possible, worth living. This may very well be so. But what about the other life, following a peaceful surrender with no immediate physical destruction and no immediate death for the masses (only the usual mass executions of present-day leaders and their hangers-on)? Though they will not die outright, the masses of the people will still perish, sinking from their present state of freedom and comfort to the subhuman existence of a mass animal.

"Widespread death and destruction are a certainty if a large-scale war is our fate. But it would take a man with great power of illusion to see an acceptable alternative in surrender, and to see surrender in a better light than death."

The point is that imposing an arbitrary budget ceiling and then cutting the requirement to fit is as dangerous as it is false and fallacious. This does not mean we need to license waste. There is some fat in the budget, but the fat should be excised with a skillful scalpel, not hacked off with a cleaver. You can render lard by cooking the whole hog but it's wasteful and inefficient.

Further, the imposition of a budget ceiling is a managerial crutch, which avoids the need to make difficult choices between essential and nonessential spending, in the nonmilitary as well as in the military field.

From where we sit it would seem that a logical course of action would run about as follows:

- Eliminate nonessential nonmilitary spending. This would free billions for needed defense.
- Eliminate nonessential military spending. This calls for hard choices among weapon systems and can best be accomplished, in our opinion, through a unified national military establishment.
- Formulate a budget consistent with present and future enemy capabilities.
- Tell the country how big the bill is and why.

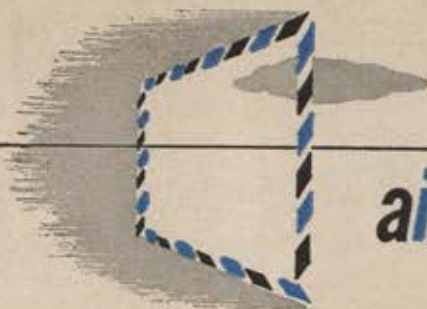
The total bill may or may not be larger than we are now paying. Efficient organization and bold decisions can, in truth, give us "more bang for a buck." But if the bill for survival, under the best of circumstances, means a hike in taxes, let's not hide behind the discredited shibboleth of "what the country can afford."

Let's not sell ourselves short. If we have troubles, think of Khrushchev. Think what pressures a stepped-up American effort would bring to bear on the Soviet economy. Let's not be licked on our own grounds. Let's not be known as the "eagle that squeaked." Let's turn on the economic heat. We can afford it; the Russians can't. It's just as simple as that.

Of course, there's another alternative—a one-word war plan that would save us \$40 billion a year right away.

"Quit."—END





## air mail

### The Hébert Hearings

*Gentlemen:* I have just finished reading your article [*The Witness Is Directed . . .*, by Claude Witze, October '59] on the work of the committee of which I am chairman, and I hasten to congratulate you. It is undoubtedly the most penetrating and interpretative article on the committee that has come to my attention since it first came into being almost ten years ago.

You have made a noteworthy contribution to the problems which confront us in this particular area. There are some instances in which we are not in agreement, but as far as I am concerned I have never asked for agreement. I only ask for respect.

If we had more writers who gave as much thought and study to a piece before they wrote it, the country would be better off. After all, we are all working on the same team, toward the same objectives, but too few fully realize or comprehend the problems which confront it and the manner in which they should be attacked.

Again, let me extend to you my appreciation for a job well done. Your article should be read and re-read by the industry, the military, and the Congress. I cannot compliment you too highly.

F. Edward Hébert (D-La.)  
New Orleans, La.

*Gentlemen:* Claude Witze's special report on the Hébert Subcommittee investigation is an outstanding example of the great service that responsible journalism can do in reporting a complex subject.

The article places in meaningful perspective the purposes, intentions, and problems of both the subcommittee and its witnesses. This is not an easy task when true objectives are often obscured because the insignificant is momentarily sensational.

The evaluation of the efforts of some industry witnesses, one of whom I recognize only too well, is helpful. I cannot completely endorse all of Mr. Witze's conclusions, but they are objective, and obviously are the product of sincere thought. His work is a valuable contribution to good journalism. . . .

. . . my congratulations to Mr. Witze on his splendid performance.  
Orval R. Cook, Pres.  
Aerospace Industries Association  
Washington, D. C.

*Gentlemen:* . . . the Hébert Subcommittee analysis was an excellent piece of interpretative reporting. I . . . wish that more of this kind of thorough, thoughtful commentary on Congress and the defense efforts existed.

And your editorial "You Can't Deter War by Hope Alone" was fine. . . . I was particularly pleased that you quoted so extensively from the Lippmann column—truly one of his best.

John Hoving  
Air Transport Association  
of America  
Washington, D. C.

*Gentlemen:* Of all the pieces written on the Hébert Subcommittee hearings, Claude Witze's is by far the best. It is sound and superior in every respect. The prose is magnificent. Most important, I feel, is that the theme of the article is temperate—this quality giving Mr. Witze's views the stamp of authority.

The illustrations are the best of their kind I have seen in years. Such drawings appear to have gone out of style in recent years, why, I know not. I hope these will revive a trend.

The article was so comprehensive and well done that it deserves the widest distribution.

R. N. McFarlane, Exec. Dir.  
National Security Industrial  
Assoc., Inc.  
Washington, D. C.

*Gentlemen:* Just read "The Witness Is Directed . . ." and think it an excellent treatment, and well thought out. . . .

Carlyle H. Jones  
Sperry Gyroscope Company  
Great Neck, N. Y.

### Fresh Laurels for September

*Gentlemen:* This year's September issue of AIR FORCE/SPACE DIGEST is a fine piece of work. It is an invaluable reference source and presents a clear-cut summary of Air Force progress

within each major air command. . . .

Gen. Curtis E. LeMay  
Vice Chief of Staff, USAF  
Washington, D. C.

*Gentlemen:* . . . It is an admirable piece of work. An organization as large and as widespread as the USAF has a real need for this annual almanac which accurately presents our immediate posture to the people of the United States and the world. It is extremely valuable to all Air Force personnel as a reliable informational source.

Lt. Gen. Robert W. Burns  
Commander, Hq. Fifth Air Force  
APO, San Francisco, Calif.

*Gentlemen:* . . . I wish to express my enthusiasm for the job you and your staff accomplished. The issue has much essential data, and the organization of its contents makes it an invaluable reference source. . . .

Hon. Philip B. Taylor  
Assistant Secretary, USAF  
Washington, D. C.

*Gentlemen:* . . . AIR FORCE Magazine has continued to perform a distinct service by informing the American people, military and civilian, of the functions and capabilities of the USAF. . . .

Both through the authoritative nature of its factual material, and by its clarity and journalistic excellence, AIR FORCE holds an important position in the literature of the USAF. . . .

Gen. Emmett O'Donnell, Jr.  
Commander in Chief, PACAF  
APO, San Francisco, Calif.

*Gentlemen:* I have just returned from a vacation in Europe to read the fine editorial which you inserted in AIR FORCE Magazine having to do with the retirement ceremonies of General Weyland and myself [*Leadership in Being*, September '59]. This was a most gracious piece of writing, and I should like to thank you.

It is not easy to break away from the military service after a lifetime in it, and I hope to continue to maintain some measure of contact with the Air  
(Continued on page 13)

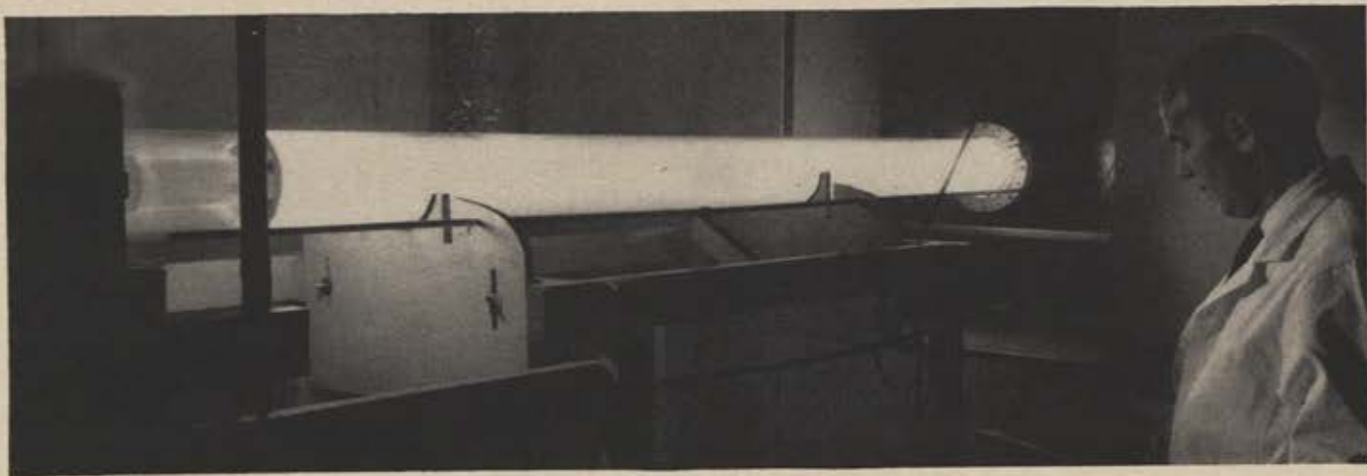


## BULLETIN FROM **BOEING**



**COUNTER-MOON.** Drawing of an orbital vehicle designed by Boeing engineers and scientists for future space research. Manned vehicle, carrying advanced instruments, would orbit in moon's path but maintain position on opposite side of the earth from the moon. Space-age research studies underway at Boeing include other advanced orbital, lunar and interplanetary systems.

**AIR DEFENSE MISSILES.** Supersonic BOMARC missiles being readied for checkout in Boeing plant. In production for Air Defense Command, BOMARCS are nation's longest-range defense missiles and are designed to defend large areas against attacking aircraft. Advanced "B" model, now undergoing flight tests at Cape Canaveral, is designed for a range of more than 400 miles.



**SHOCK TUBE.** Industry's most powerful shock tube, designed and built by Boeing scientists for electromagnetic radiation research using gases at very high temperatures. Related research at Boeing includes extra-terrestrial gases and space gas-system structures. Goal of scientists of the Boeing Scientific Research Laboratories is to develop new and fundamental knowledge at the frontiers of science.

**JET STARTER.** Boeing 502 gas turbine-driven compressor, mounted in Turbo-Starter truck, gives fast, sure starts to jet and turbo-prop engines. Boeing Turbo-Starters have been ordered by major U.S., Canadian and European airlines. Boeing 502 gas turbines also power mine-sweeping launches, the first turbine craft to enter fleet service overseas with the U.S. Navy.



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## LOCKHEED



Force through reading your fine magazine. You are making a real contribution toward better understanding of the Air Force and its activities and I wish you continued success. . . .

Gen. E. E. Partridge, USAF (Ret.)  
Colorado Springs, Colo.

#### A Winner After All

Gentlemen: I certainly agree with your highlighting, in your October editorial [page 19], the anachronism of the school facilities and the race-track situation at Arcadia, Calif.

Arcadia, one of the wealthier cities (per capita) in the United States, has benefited tremendously through the past twenty-five years from local taxes collected from the Santa Anita race-track. . . . Consequently, it is really difficult to understand the reluctance of its citizenry to provide more than adequate school facilities. . . .

I was surprised that you pointed to a handful of pari-mutuel clerks as being responsible for this situation. . . . Regardless of how they voted in the school bond elections, I feel that they played a negligible part in the results since there are approximately 10,000 eligible voters in the city of Arcadia.

Incidentally, the authorization for school bonds for effective modernization of the Arcadia school system was finally voted on October 20.

Lt. Col. Philip R. Ayres, AFRes.  
Altadena, Calif.

• The article speculated that "at least some of the people at the pari-mutuel windows . . . voted against building schools." The reference was to the betting public, not the track employees. In any case, we're happy that the additional classrooms will be built.—THE EDITORS

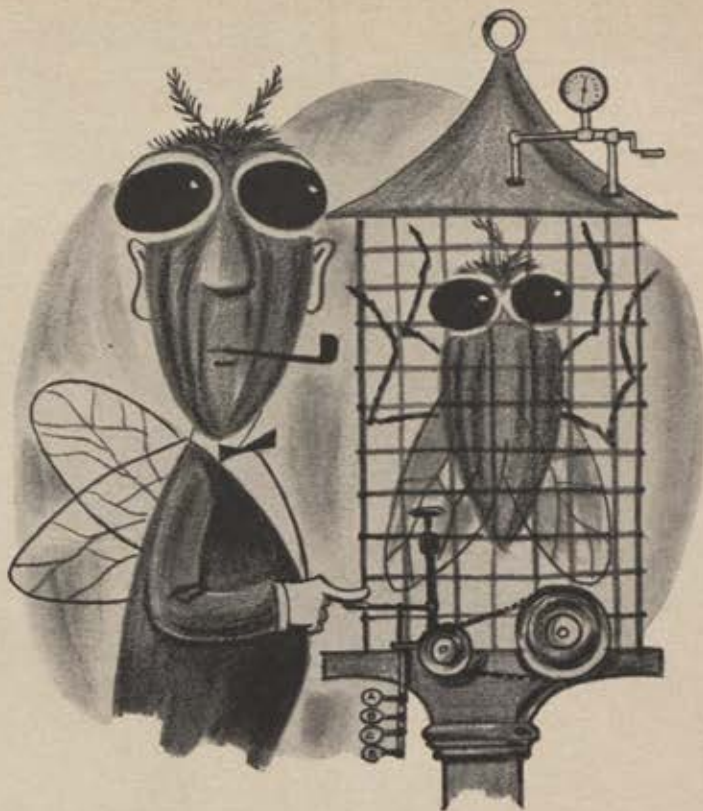
#### Two for the Correction Box

Gentlemen: . . . may I note the following errors in the September and October issues of our magazine?

The September Almanac issue, a complete and valuable reference, shows a picture of the McDonnell 119 in the Air Force inventory as the T-40. At the time of publication, the T-40 requirement was still in competition; since then the competition has been won by Lockheed's JetStar.

The October issue, on page 90, captions a picture: "The 'missile with a man in it,' USAF's Republic F-105. . . ." Of course, the dramatic term in quotes has always referred to the USAF's Lockheed F-104. . . .

C. de Bedts  
Lockheed Aircraft Corporation  
Marietta, Ga.



## Scrubbs on Motherhood

Sir Joshua Wormwood-Scrubbs, FRMS, (1883-1949), developer of the celebrated automated fly trap, summed up a triumph over nature when he said: "The normal mother fly has 320 children four times a year, and yet seems able to go out considerably between times." Good show, say we at HOOVER ELECTRONICS!

We enjoy saluting triumphs, even when (immodestly!) they're of our own making. For example, we've commanded that there be whistle-blowing, bell-ringing, and ratchet-twirling for our new Millivolt Transistorized Oscillator, which has scored a resounding victory (and in the bottom of the ninth inning, too) over DC amplification in telemetering. The MTO, as we affectionately call it, makes it possible to feed the outputs of low-level transducers such as thermo-couples, strain gauges and accelerometers directly into the HOOVER Subcarrier Oscillator without DC amplification. A neat trick!

Another giant stride forward, this Millivolt Transistorized Oscillator eliminates a separate DC amplifier, which means fewer packages, lower power consumption, and the end of one possible source of error—one of telemetry's seven plagues. Ask us for details of this bell-ringing little triumph.



## HOOVER

### ELECTRONICS COMPANY

SUBSIDIARY OF THE HOOVER COMPANY

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Field Liaison Engineers  
Los Angeles, California



How a  
communications  
satellite can  
bring you live TV  
from anywhere  
in the world



World-wide live TV, with no cable or radio relay costs, can develop from outer-space research by government and industry

Among the peaceful applications for scientific break-throughs being made in the study of outer space is a communications satellite.

Using inflated plastic satellites, boosted toward orbit by the Air Force *Thor* rocket, a global TV network could be established. TV signals would bounce to satellite and back to your station, giving you a front-row seat at events anywhere in the world. Cost should be a fraction of coaxial cables and microwave relays now used.

Practicality of *Thor* for this purpose is based on its demonstrated reliability. With Douglas responsible for airframe fabrication and assembly and test of the entire system, *Thor* has helped launch 84% of all payload weight put into space by the U. S.; is the key booster in the Air Force "Discoverer" firings; launched the first nose cone recovered at ICBM range.

*Thor* is another product of the imagination, experience and skills which Douglas has gained in nearly 20 years of missile development.

Foil-covered satellite, folded like a pocket raincoat, would balloon out in orbit as an inexpensive TV relay station

**DOUGLAS**



Builders of the  
DC-8 Jetliner

MISSILE AND SPACE SYSTEMS • MILITARY  
AIRCRAFT • TRANSPORT AIRCRAFT •  
AIRCRAFT • GROUND SUPPORT EQUIPMENT



# What's New With



# RED AIRPOWER

*Here's a summary of the latest available information on Soviet air intelligence. Because of the nature of this material, we are not able to disclose our sources, nor document the information beyond assurance that the sources are trustworthy.*

New cuts in military manpower may be indicated by the latest Soviet budget, which again reduces military spending. Each year since Nikita Khrushchev came to power there has been an apparent cut in the military budget. Moderate manpower cuts have been made on at least two occasions. But spending for scientific research and engineering development continues to go up.

This last is significant, because the armed services in Russia don't pay for very much of the research and development that goes into new weapons, whereas in the US they must pay for almost every new development. This factor clouds the comparative picture.

There's been no admission, but the lack of any display of the Soviet TU-110 transport in the past ten months indicates rather strongly that the airplane has been abandoned.

Meanwhile, the Soviets have begun work on a supersonic transport that will be designed for Mach 2. A. N. Tupolev, dean of Soviet aircraft designers, has the job of getting it out as soon as possible.

The Soviets are sprucing up their airports, both military and civil. A Calvert-type system of landing approach lights is being installed at several civil fields including Moscow's Vnukovo.

Weak, fixed-beam runway lights are being replaced with more powerful types with some form of moderate beam control. Power is controlled through five steps, rather than smoothly over the full range of the system as is common in the US.

East German program for its aircraft industry through

1965 calls for complete reestablishment of the aircraft industry at its prewar level in that part of Germany — expansion of engine production, establishment of more aircraft and engine research centers, and the development and production of passenger aircraft that can compete on the international scene outside the Communist bloc.

Russia has been ferreting out obscure aerial records to break. In their latest exercise, the Soviet set five Fédération Aéronautique Internationale world's records with a TU-104B. The plane flew at 630 miles an hour over a closed course. It set new records for speed attained while bearing loads of one, two, five, ten, and fifteen tons.

Visiting Soviet Premier Khrushchev's fascination with President Eisenhower's helicopter while he was here in September was especially interesting in view of the fact that Russia herself is no slouch in this regard. Khrushchev, according to reports, thought so well of the "chopper" in which the President took him sightseeing that he said he wanted to buy a similar one himself.

Actually, Russia is doing well in this field. She has an operational flying crane helicopter, for one thing, in advance of any that exists in the western world. The table below gives a comprehensive picture of the state of the art in Russian helicopters, including performance parameters.

Close students of Soviet airpower will note two relatively new names among the engine designers. Ivan Ivaschenko is a university professor and an aircraft engine designer in the Soviet Union's principal aircraft engine center, Kuibyshev. Pavel Aleksandrovich Solov'yev is an engine designer long associated with Shvetsov as a member of his design bureau near Moscow.—END

## How the Soviet Helicopters Stack Up

| NATO Code Name    | Hat              | Hen               | Hog               | Hare              | Mil               | Hound                 | Hook                  | Horse              |
|-------------------|------------------|-------------------|-------------------|-------------------|-------------------|-----------------------|-----------------------|--------------------|
| Helicopter Type   | Kamov KA-10      | Kamov KA-15       | Kamov KA-18       | Mil MI-1          | Mil MI-3          | Mil MI-4              | Mil MI-6              | Yakovlev YAK-24    |
| Engine Type       | Ivaschenko A1-4G | Ivaschenko A1-14R | Ivaschenko A1-14W | Ivaschenko A1-26V | Ivaschenko A1-26V | Shvetsov ASch-82V     | Solov'yev TB-28M      | Shvetsov ASch-82V  |
| Number of Engines | 1                | 1                 | 1                 | 1                 | 1                 | 1                     | 2                     | 2                  |
| Power             | 56 hp.           | 200-260 hp.       | 260 hp.           | 575 hp.           | 575 hp.           | 1,700 hp.             | 4,700 hp. (equiv.)    | 1,700 hp.          |
| Length            | 12.8 ft.         | n.a.              | 23.1 ft.          | 42 ft.            | 42 ft.            | 60.3 ft.              | n.a.                  | 92.6 ft.           |
| Rotor Blades      | 3                | 3                 | 3                 | 3                 | 4                 | 4                     | 5                     | 4                  |
| Rotor-disk Area   | 499.8 sq. ft.    | 832.4 sq. ft.     | 832.4 sq. ft.     | 1,717.4 sq. ft.   | 1,717.4 sq. ft.   | 3,694.3 sq. ft.       | 10,289 sq. ft.        | 7,201 sq. ft.      |
| Net Weight        | n.a.             | n.a.              | 2,222 lbs.        | 3,927 lbs.        | 3,953 lbs.        | n.a.                  | n.a.                  | n.a.               |
| Payload           | n.a.             | n.a.              | 440-610 lbs.      | n.a.              | n.a.              | 2,460-3,520 lbs.      | 13,200-17,600 lbs.    | 8,800 lbs.         |
| Maximum Speed     | 72 mph           | 93.2 mph          | 93.2 mph          | 107 mph           | 124 mph           | 125 mph               | n.a.                  | 125 mph            |
| Cruising Speed    | n.a.             | 74 mph            | 74 mph            | 86 mph            | 93.2 mph          | 109 mph               | 124 mph               | 112 mph            |
| Ceiling           | 8,250 ft.        | 9,900 ft.         | 9,900 ft.         | 16,500 ft.        | 14,850 ft.        | 16,100 ft.            | n.a.                  | 18,100 ft.         |
| Range             | 121 mi.          | 298 mi.           | 250 mi.           | 238 mi.           | n.a.              | 250 mi.               | 435 mi.               | 500 mi.            |
| Seating Capacity  | 1                | 2                 | 3-4               | 3-4               | 4                 | 3 crew<br>10-14 pass. | 5 crew<br>70-80 pass. | 3 crew<br>42 pass. |

n.a.—not announced





## AIRPOWER in the news



Claude Witze

SENIOR EDITOR

### Facts Are Hard to Find

WASHINGTON, D. C.

"Now I cannot see for the life of me," said the President of the United States on November 3, 1959, "see any reason why we should be using, or misusing, military talent to explore the moon."

With this statement on the record it still is inevitable that there will be new investigations on Capitol Hill when Congress comes back. The unhappy Charles Van Doren will be replaced on the front pages by some new scoundrel, if the inquisitions can find one. This villain will not be an individual; it will be a collective scapegoat that can, perhaps, be blamed for the fact that the Russians have beaten us to the moon. There is a genuine danger that the US Air Force, despite its brilliant record in this area, will suffer in the outcome. What is more important is that national security is imperiled.

There are some witnesses who will testify to the truth. The esteemed *Wall Street Journal* uncovered some of them, although on an anonymous basis, two days after President Eisenhower delivered his opinion.

The newspaper quoted a high official of the Advanced Research Projects Agency as saying "There isn't anybody, unless it's the President of the United States, who can decide it's worthwhile to beat Russia with the space effort. But that's what we should seek to do."

A scientist employed by the Army said "the decision has to be made at the White House." An industry executive is quoted as tracing the "basic flaw" in the space program to the President's failure to set a space objective.

The *Journal* attributes to this same man the opinion that the President is one of the "older generation of military men who sometimes lack the full comprehension of the impact of science on warfare."

There are some soldiers with good memories who find this situation more baffling because of what Dwight D. Eisenhower wrote of his observations in World War II.

"It seemed likely," he recorded of the Nazi V-2 rocket in *Crusade in Europe*, "that if the German had succeeded in perfecting and using these weapons six months earlier than we did, our invasion of Europe would have proved exceedingly difficult, if not impossible." In other memoirs of other men it has been made clear that Hitler himself was opposed to the rocket idea when it was young and must take basic responsibility that, for the Germans, it was too little and too late.

It is difficult to reconcile an opinion that the V-2 could have changed the course of World War II with one that says there is no military potential in space. One man, high in the administration of space activities from a Washington office, recently was asked to discuss the program with a small but select group of US industry executives. His audience, high powered and rich, did not include men from the defense contracting area. The speaker found his audience poorly informed about the

subject, but this did not disturb him. The revealing thing was that the audience was hostile to the space program.

There is no doubt about it, the board chairman of a soft drink business, the president of an oil company, a monster dry-goods plant, or a far-flung banking empire has little interest in space. Most of these men frown on even modest expenditures for work in this area; they tend to look upon major outlays as a form of embezzlement to support what one of them called celestial baubles in an interplanetary basketball game. And many of them are among the most trusted and constant advisers of the White House.

If we look at the consequences of their approach there are perils to more than the nation's security. There is an added peril to the economy. "We must understand," said the president of the Massachusetts Institute of Technology in a recent address, "that our future economic health, quite as much as our military security, will be governed by our capacity to maintain technological superiority."

If this statement is true the military capability in the field of space, predominantly an Air Force capability, is essential for both our security and our prosperity. Yet there is strong evidence that this capability is being discounted and misrepresented in support of the basic thesis that there is no substantial military mission in space. It is resulting in wide acceptance of the National Aeronautics and Space Administration as the only group with the resources and vehicles capable of competing with Russia. Yet, nearly three years ago, Lt. Gen. Bernard A. Schriever, now head of the Air Research and Development Command, told Congress his Ballistic Missile Division had the capability to tackle ninety percent of the unmanned space projects of the future.

It seems inevitable that much of next year's debate will center on this capability and how it will be used. In the background stands General Schriever's already announced opinion that the Defense Department no longer has any need for an Advanced Research Projects Agency. There also is, in the congressional hearing records, a statement of his opinion that NASA should have been set up on the pattern of its predecessor, the National Advisory Committee for Aeronautics, a procedure that would have kept NASA out of the contracting business.

But NASA was put in the contracting business as part of the effort to emphasize civilian space activity. Concurrently, USAF generals are forbidden to talk about the military potential for exploring the moon as NASA assumes administrative responsibility for Air Force propulsion projects far older than NASA itself. The situation that results has been interpreted, in ill-informed circles, as an indication that the Air Force has no requirement for better propulsion and no program to obtain it.

A simple example of this is found in NASA's Project Centaur, conceived by USAF about three years ago primarily to launch a communications satellite that would

(Continued on page 19)





## MOON GARDEN

You can't grow anything on moon soil . . . but Republic is . . . raising turnips, carrots, beets and snap beans in its lunar greenhouse experimental garden. >>> Republic is working on lunar garden studies as part of a research program to determine the feasibility of establishing a base on the moon. >>> Hyman Stein, manager of space projects and studies for Republic's Applied Research and Development Division . . . and his "green thumb staff" (Bill Taufman seen here), maintain a constant, studious vigil over these tests. >>> A basic aim is to determine at how low a pressure vegetables can be grown to maturity. The lower the pressure, the less weight of the greenhouse structure. And weight is critical in delivering a payload to the moon. >>> These experiments will determine whether significant increases in crop production can be obtained by lengthening the working day as past tests indicate. Our Moon Garden studies are but one of many bold concepts under development as part of Republic's multi-million dollar exploration into the realm of advanced aircraft, missiles, space travel and space.

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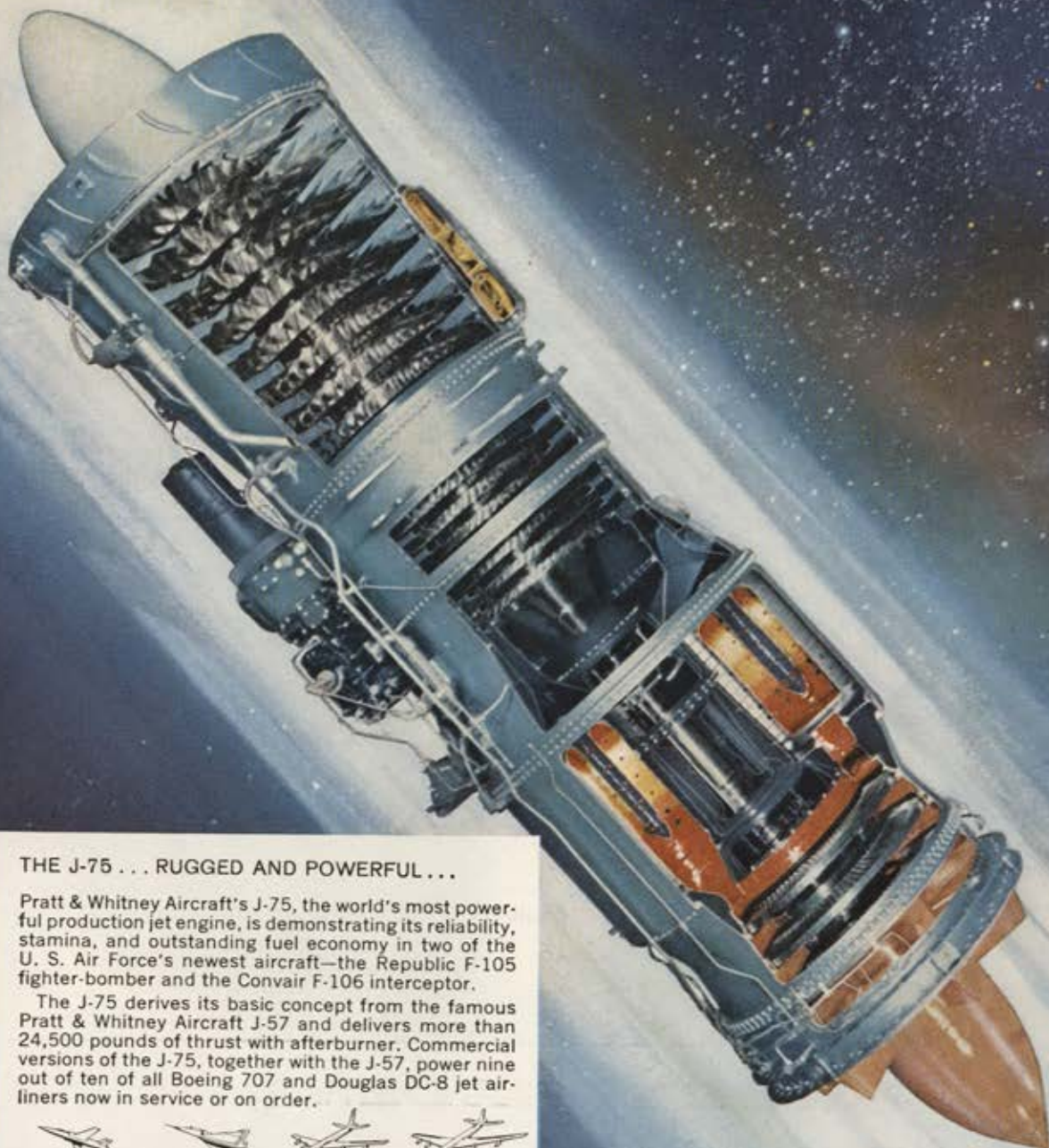


*Designers and Builders of the Incredible* **THUNDER-CRAFT**



Experiments being carried out in Republic's preliminary laboratory will be housed in our new 14 million dollar research and development center, scheduled for operation early in 1960.





#### THE J-75 . . . RUGGED AND POWERFUL . . .

Pratt & Whitney Aircraft's J-75, the world's most powerful production jet engine, is demonstrating its reliability, stamina, and outstanding fuel economy in two of the U. S. Air Force's newest aircraft—the Republic F-105 fighter-bomber and the Convair F-106 interceptor.

The J-75 derives its basic concept from the famous Pratt & Whitney Aircraft J-57 and delivers more than 24,500 pounds of thrust with afterburner. Commercial versions of the J-75, together with the J-57, power nine out of ten of all Boeing 707 and Douglas DC-8 jet airliners now in service or on order.



REPUBLIC F-105



CONVAIR F-106



DOUGLAS DC-8



BOEING 707

## POWER IS THE KEY!

. . . the key to flight without boundaries . . . power that meets every challenge of speed and distance.

Today Pratt & Whitney Aircraft builds jet power for America's quick and rugged fighting aircraft, for guided missiles, rockets, and swift commercial jetliners.

Through constant research and a traditional talent for utilizing the finest engineering tools, propulsion for the future is being developed and produced at Pratt & Whitney Aircraft, including airborne nuclear power and other advanced applications of energy for space vehicles. These projects will open still new frontiers in the world of flight.

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help solve problems in that area for the Strategic Air Command. It also could be extended to moon missions and manned spaceflight. USAF worked hard to sell this program, which finally was taken up by ARPA and then shifted to NASA. USAF and ARPA have put about \$22 million into the project, much of it in liquid hydrogen plants and contracts with Pratt & Whitney and Convair. All USAF identification with Centaur has been abolished. NASA not only claims the program as its own but there is strong evidence that some of the people there would like to rewrite history, thereby robbing Centaur of its true parenthood.

There are other manifestations of this effort to conceal military capability and requirements from the public. One of them might be called the Great Mystery of the Six-Hundred-Mile Limit. This crops up from time to time as a hazily reported Administration edict that forbids military activity beyond that ceiling, which is approximately the one hit by an ICBM. This reporter has asked top military and civilian space administrators for the origin of this rule, if it exists. Almost solidly, they deny knowledge of it. The fact now appears to be that six hundred miles was an arbitrary limit set on military activity by Roy Johnson, recently retired chief of ARPA. It never was put in writing and never appeared as a directive. It is an unwritten rule that was applied by ARPA in making key decisions. There was a time in the history of airpower when military planes from land bases were forbidden to operate more than one hundred miles off shore. This time the distance is longer and straight up. If the six-hundred-mile ceiling is enforced, the action will be taken at the highest level and under other pretenses.

It would seem clear that the Defense Department has not been told such a rule exists today. In late September a number of military projects were taken out of ARPA and turned over to the military services. This edict, reported in the October issue of *AIR FORCE/SPACE DIGEST*, was an in-house decision at the Pentagon. The persistence of the report that the Administration has built a roof over military space interest indicates that NASA will help keep that roof intact. If this is the case the public should know it and so should General Schriever, who has given his expert opinion that the operational theater for manned spacecraft "well into the future" will be from 500 to 25,000 miles above the earth. Enforcing a 600-mile ceiling is equivalent to grounding a true aerospace force.

For all of these restrictions on the Air Force, whether they are in the censorship of military judgment for political purposes or the castration of missions essential to national defense, it remains that USAF has capability which must be used. Most of the projects now under way, as General Schriever has pointed out, involve base facilities, know-how, components, or whole missile systems developed by USAF. Both the Defense Department and NASA will be forced to rely on this experience and hardware in the future.

Recent announcement by the Air Force that contractors have been chosen to develop the Dyna-Soar orbital vehicle resulted in some speculation that NASA has ambitions to swallow this project. As it stands, NASA spokesmen deny the charge, along with another current rumor that there is strong pressure within the agency to form a Military Applications Division. The latter is a proposal known to have support from Defense Department sources outside of the Air Force.

On Capitol Hill there is another facet to the situation. The White House effort to sterilize space from military

contamination may boast some support from such a House committee as the one on Science and Astronautics, headed by Rep. Overton Brooks, Louisiana Democrat. Mr. Brooks has clashed in the past with Rep. Carl Vinson of Georgia, also a Democrat, who heads the committee on Armed Services. A shift of Dyna-Soar, for example, from USAF to NASA, could result in more sharp words between the chairmen, for Mr. Vinson is admittedly jealous of his jurisdiction.

The pathetic and dangerous thing about the space situation two years after the first Sputnik is that the Chief Executive can see no reason why military talent, which is almost the only talent we have, should be bent to lunar exploration. When Congress goes to work on the subject this basic truth should be explored. And the American public should be given the facts about military capability and requirements.

## How to Catch a Caboose

If we want to stop looking at the taillights on the Russian caboose, says Bill Irvine, one of the first things we should do is turn to a single military service. The retired USAF procurement chief, now a vice president of AVCO Corporation, laid it on the line in characteristic style at a recent meeting of the Institute of Aeronautical Sciences in Wichita (see also "Flight Lines," page 25).

He said the Defense Department needs to be cut, in numbers of divisions and numbers of people. The single service, a concept endorsed by the Air Force Association since 1956, General Irvine says, should result in what he calls "functional divisions for land, sea, and aerospace. There should be a single uniform and a single Chief of Staff reporting to the Secretary of Defense.

On top of this, the General had nice words for the ladies. He sees them as an untapped reservoir of talent and brains that should be put into the national effort to catch that Russian caboose. As an added dividend, he said, these gals will raise smart and ambitious children, who ought to work harder if all their mothers are lights in the scientific world.

## USAF Warns Subcontractors

The Hébert Committee, one of many watchdogs of the defense effort, is not on active duty these autumn weeks. But it is coming back to town early next year, and almost everybody knows it, particularly among USAF's contractors.

Out at Dayton, home of the Air Materiel Command, some of these contractors have been told that they must not underestimate the customer; USAF is boss and USAF is on the job.

"At my direction," Air Force Secretary James H. Douglas told a recent symposium at Wright-Patterson Air Force Base, "Air Materiel Command is increasing its attention to the contractors' operations with a view toward eliminating unnecessary weapon complexity, evaluating subcontracting procedures and effectiveness, reducing overhead burdens, and eliminating cost overruns." He continued:

"The Air Force must look closely at your costs and your operations at the risk of being accused of usurping some of management's prerogatives."

Again, he said:

"It is only reasonable and good business for the Air Force to look closely at the contractor's operations to  
(Continued on following page)



Ensure that he is equally concerned with the funds austerity and Air Force objectives."

Mr. Douglas made it clear that there will be particular emphasis on pricing, where the General Accounting Office has been hitting pay dirt in its work for Congress. It will do no good, he said bluntly, to accuse USAF of holding too much control over industry management. So long as GAO and other agencies "are able to find as many instances of mismanagement of subcontracts as they have in the

past two years," he said, "neither you nor we have any sound basis for considering any relaxation of our surveillance."

The Secretary's grim greeting was supported by Maj. Gen. W. Austin Davis, AMC Director of Procurement and Production, who said that GAO has found cases of inadequate USAF supervision. He bemoaned "serious indictments against our ability to perform an adequate job of contract administration" and promised that USAF will tighten the reins.

General Davis then clarified one of the big issues discussed by the Hébert Committee in 1959. Said he: "The Air Force and industry share the burden of producing a weapon system, but the final responsibility lies with the Air Force." [Italics supplied.]

## Don't Print That!

One of the many projects facing a new turn in life during current discussions of the fiscal 1961 budget is the Aircraft Nuclear Propulsion program. There are a number of interesting facts in the printed record, including disagreements on feasibility and the lack of specified objectives. Most of these things were aired last summer at hearings held by the Joint Committee on Atomic Energy, which published a transcript of its sessions and a report.

The Department of Defense holds that there is potential military usefulness in ANP but that the kind of ANP we could build now is not good enough to meet the requirement. The Air Force, on the other hand, is in favor of getting something into the air, even if it serves only as a laboratory that will help teach USAF how to handle the beast.

The final outcome of this argument probably will result more from budget restrictions than it will from any cool evaluation of the technological and operational problems. It is entirely fitting that the case for or against ANP, now or in the future, should be discussed and debated openly by the military, the citizenry, and Congress.

This brings us to the point of reporting that one of the more scholarly military journals is preparing a special edition on the general subject of nuclear propulsion for airplanes. It will review technical aspects of the problem, applicability, and the history of our effort.

Included as part of the record was one chapter composed of excerpts from the transcript of last summer's hearings on Capitol Hill. Also a chronology of the ANP program first printed as an appendix to the report of the Joint Committee, dated last September.

Well, the editors of this scholarly journal had been told, at this writing, that these two items could not be printed in their book. In the opinion of one civilian executive in the Department of Defense, holder of a technical job, the quotes from the transcript and the ANP chronology are unnecessary, irrelevant, and tend to place the Department of Defense in an unfavorable position.—END



**"DID YOU SAY  
ALL-MECHANICAL?"**

## ON TOUR WITH CESSNA'S NEW MINIMUM-MAINTENANCE HELICOPTER: CH-1C

Time: Midway in CH-1C cross-country demonstration tour. Place: High above military air base in Southwest. The pilot, demonstrating and explaining the CH-1C's high stability, was suddenly interrupted. "Did you say *all-mechanical*?" He did, and that is the wonder of this uncommon new aircraft: Free from the complexities and uncertainties that characterize traditional electronic stabilization systems, the CH-1C delivers stability with economy-of-maintenance and dependability until now unknown in helicopter history.

**CESSNA**

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C-81A CONTROL UNIT

## TYPE 15F VHF/VOR/ LOC SYSTEM

CERTIFIED TO FAA TSO'S C-36, C-38, AND C-40 CATEGORY A



To retrofit your earlier model Type 15 system, simply replace the tunable receiver with the R-34A and install the new frequency selector.

This is the latest development in the ARC line of VOR/LOC systems. The Type 15F system was designed using the R-34A, ARC's new crystal-controlled receiver. Combining this unit with the new B-13A-1 Converter and the proven units of previous Type 15 systems, ARC offers you greater ease of operation with increased sensitivity and improved selectivity. The 15F gives you full coverage of all VOR/LOC navigational frequencies from 108.0 through 117.9 mc plus communication frequencies between 118.0 and 126.9 mc. See this new equipment at your ARC dealer now.

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## CONTINUED LEADERSHIP IN SECONDARY POWER EQUIPMENT

CLASSIFIED

NORTH AMERICAN B-70

McDONNELL F4H

CONVAIR F-106

McDONNELL F-101

60,000 FT.

50,000 FT.

CONVAIR 880

MARTIN P6M

40,000 FT.

30,000 FT.

LOCKHEED ELECTRA

DOUGLAS C-133

20,000 FT.

BOEING STRATOCRUISER

10,000 FT.

MACH 1 MACH 2 MACH 3

## General generating

General Electric has been selected to supply the advanced-design secondary electrical power generating system for the North American B-70 Valkyrie, the Air Force's new MACH 3 multi-purpose bomber.\* Designed for supersonic high-altitude operation with inherent long-range flight endurance and large load-carrying capability, the B-70 can be adapted to offense, defense, reconnaissance, or special airlift missions.

The new, specially designed G-E system consists of an Inductor-Lundell generator, controlled-rectifier regulator, and protective panel. The revolutionary generator, newly applied to aircraft systems, will provide extreme system reliability by eliminating normally required brushes, slip rings, commutators, rotating windings, and rotating rectifiers.

Development of this system for MACH 3 aircraft offers a challenge never before encountered in manned aircraft. New lubricating and insulating methods and new sturdy, compact construction are needed to stand flight stresses three times the speed of sound at altitudes previously unreachable by operational aircraft.

Some equipment will be required to withstand temperatures of 600 F, vibration input of 15 g's (as much as 60 g's locally), and shock of 20 g's. Extreme reliability is, of course, a must.

In developing this equipment, General Electric is using experience and knowledge derived from the material and component development phase of a separate Air Force High-temperature (HOTELEC) Program under subcontract from North American Aviation. G.E.'s completely equipped research and manufacturing facilities are ideally suited to develop and produce advanced systems like HOTELEC and the B-70. And, G-E leadership in secondary power equipment extends through 40 years and more than 50 different aircraft.

\*Sundstrand Aviation is manager of the B-70 secondary power system for North American Aviation, Inc.

Aircraft pictured represent only a few of those for which G.E. has developed secondary power-generating systems.



# Electric's new concept in aircraft systems is awarded B-70 contract

## Design Concept

Design innovations in the new G-E generating systems will provide outstanding results in these areas:

• **Reliability**—Key to the increased reliability of the G-E system, is the revolutionary Inductor-Lundell generator. Field windings and rectifiers will be located in the stator instead of the rotor as in conventional machines. Lower component temperatures result from shortening heat-transfer paths between windings and coolant.

In addition, all available control components—relays, transistors, magnetic amplifiers, controlled rectifiers, capacitors, and resistors—were fully evaluated as to performance and reliability. Then exhaustive research—speeded by computers—was conducted on individual circuits of each system to determine the combination of components which would provide maximum reliability and minimum weight for each particular application.

• **Electrical configuration**—It is planned that the B-70 system will consist of four 60-kva generators in parallel for main and emergency power. Through careful system designing, there will be a precise integration of generators with necessary control, regulating, and protective components.

• **Light weight**—Unnecessary weight will be eliminated by (1) combining Inductor and Lundell generator principles, (2) utilizing the generator frame as flux path, (3) use of more efficient magnetic material in the frame, and (4) integrating bearing and cooling and lubricating systems with the Air Vehicle Sundstrand Drive.

Weight also will be saved in another way. In analyzing the complete B-70 system, North American electrical engineers felt that the long feeder runs from generator to load offered an excellent opportunity to evaluate a variety of generator voltages, feeder sizes, and transformer designs to de-

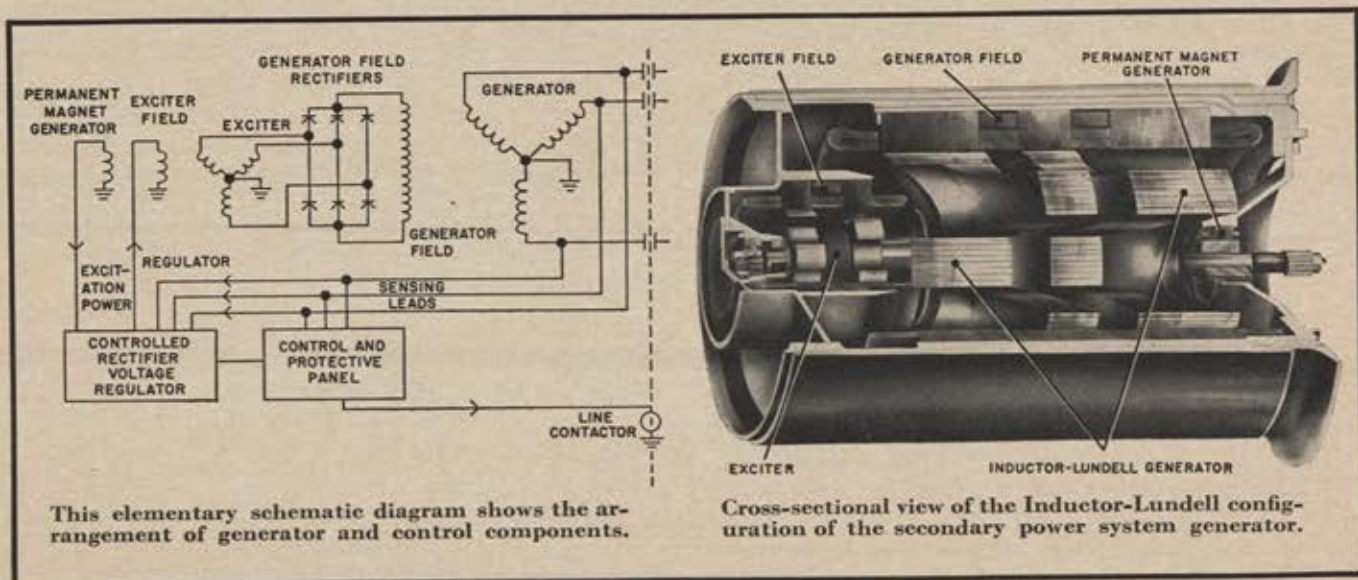
termine the optimum combination. Coordination with General Electric indicated the practicability of such a design breakthrough. As a result, it was decided that power will be generated and transmitted at 240/416 volts and stepped down to 115/200 volts at the load by novel transformers designed specifically for this application. A net weight saving to the aircraft of hundreds of pounds was thus accomplished together with improvement in electrical transmission and cooling efficiencies.

## Future Application

General Electric research on this system holds bright promise for future applications. Further development will make similar systems available in many future ratings and sizes for other types of aircraft. For more details, contact your General Electric Aviation and Defense Equipment Sales Office or write Section 796-1, General Electric Company, Schenectady 5, N. Y.

*Progress Is Our Most Important Product*

GENERAL  ELECTRIC





# FLIGHT LINES



Effectiveness of Soviet radar, missiles, and manned interceptors has brought a shift in SAC training tactics. The Strategic Air Command and the Federal Aviation Agency have established seven special air routes within the US for low-altitude training missions by SAC B-47 and B-52 jet bombers. Code-named Operation Oil Burner, the new SAC program will provide accelerated operational training and enable aircrews to work on modified bombing techniques. The routes, twenty miles wide and up to 500 miles in length, are laid out over sparsely populated areas. The bombers will fly at altitudes above 1,000 feet and speeds of about 300 mph, avoiding sonic booms. Announced plans call for a 400-mile approach at about 1,000 feet, then a climb-out to above 20,000 feet after mock

our survival in a future emergency," he said. "Crash programs are always costly. They are always inefficient. But today they are far worse than that. They can be fatal.

"Every military adviser known to me agrees that we are not likely again, in any major conflict, to have time to mobilize, build armaments, and slowly mount a counter-offensive. This time, as national policy, we must know what we will need at any given time, and then do all that is necessary to see that we have it."

Vital cooperation between the military services and industry, especially in long-range planning, cannot be overemphasized, according to the Westinghouse executive. "The weapons we hope to have at our command in 1965 or 1970 must be in the planning and design stage right



First Cessna T-37B, twin-jet intermediate trainer, has been delivered to Spence AB, Ga., as part of ATC's "all-jet" project to train US Air Force pilots in jet aircraft only.

attack on the "target." The Oil Burner corridors will not be restricted to SAC flying, but will be under tight control.

Changing defense needs have phased a number of air defense bases and units out of the USAF picture. Ethan Allen AFB, Vt., will be deactivated next March. The 37th Fighter-Interceptor Squadron, operating from Burlington Municipal Airport not far from Ethan Allen, will also be deactivated in March. The 86th Fighter-Interceptor Squadron and the 79th Fighter Group Headquarters, operating from Youngstown Municipal Airport, Ohio, will be deactivated this month, although some ADC support facilities will be retained until next April and then transferred to CONAC. At Niagara Falls Municipal Airport, N. Y., the 15th Fighter-Interceptor Group Headquarters and the 47th Fighter-Interceptor Squadron will be deactivated late next summer (see also page 95).

"Crash military programs are obsolete and dangerous."

"The military services have never had the opportunity to carry out a stable, uninterrupted defense program."

Mark W. Cresap, president of Westinghouse Electric Corp., made these cogent points in a recent speech to the National Security Industrial Association. "We need a stable and continuing military program because without it there is no deterrent nor is there any insurance against



Rollout of Boeing 720 jetliner. Eight and a half feet shorter and 45,000 pounds lighter than the 707, the 720 will carry from ninety to 150 passengers at over 600 mph.

now, because of the long lead time between conception and production," he said. "It means that a decision to pull back in research and development because things look calmer this year does not affect us at once; it will affect us five or ten years from now."

Sonic boom damage has been ruled deductible by the tax collector. "Sudden, unexpected, and unusual" property damage caused by jets reaching supersonic speeds at low altitudes, in cases not covered by insurance, qualifies as a casualty loss under the Internal Revenue Service decision. Incidentally, IRS experience is that many claims of sonic boom damage are fraudulent. Taxmen suggest that claims be supported by such evidence as photographs of the actual damage, bills, and news reports.

The North American Air Defense Command is going underground. The United States and Canada, over the next three years, plan to carve a subterranean command post under Cheyenne Mountain, near present NORAD headquarters at Colorado Springs, Colo. As a joint command of the United States and Canada, NORAD would come under the direct command of chief executives of both countries in the event of air attack. Present defenses, keyed primarily to defense against manned bombers, would not be adequate against enemy ICBMs. The under-



ground operations center, constructed to house 1,200 people for periods up to a week, would be used to direct defense operations. NORAD strategists judge that fifteen or twenty minutes' warning time would be essential to survival in event of attack.

Can America presently be adequately defended against manned long-range jet bombers? Twelve ADC interceptor teams met at Tyndall AFB, Fla., in October to evaluate our air defenses. Targets were 100 free-flying radio-controlled Ryan Firebee jet drones. Seventy-two aircraft missions were flown by the twelve teams. In Category I—Northrop F-89J Scorpion fighters firing inert models of the Douglas MB-1 Genie nuclear rocket—winner was the Eastern Air Defense Force's 319th Fighter-Interceptor Squadron, Bunker Hill, AFB, Ind., with a score of 4,900 points. In second place was the 29th Fighter-Interceptor Squadron, Malmstrom AFB, Mont., representing Central Air Defense Force; third, 437th Fighter-Interceptor Squadron, Oxnard AFB, Calif.

In Category II—Convair F-102 Delta Daggers shooting heat-seeking and radar-guided Hughes Falcon missiles—the 460th Fighter-Interceptor Squadron, Western Air Defense Force, Portland International Airport, Ore., won with 4,800 points. Second, 525th Fighter-Interceptor Squadron, Bitburg AB, Germany, USAFE; third, 317th Fighter-Interceptor Squadron, Elmendorf AFB, Alaska, Alaskan Air Command. In the third category—North American F-100 Super Sabres and Lockheed F-104 Starfighters firing the infrared heat-seeking Sidewinder missiles—victor was 538th Fighter-Interceptor Squadron, Larson AFB, Wash., WADF, with a score of 4,500. Second and third place winners were the 152d Fighter-Interceptor Squadron, Arizona ANG, Tucson, Ariz., and the 337th Fighter-Interceptor Squadron, Westover AFB, Mass., EADF.

Retired USAF Gen. Clarence S. Irvine, never known as a man to pull his punches, spoke to the Institute of Aeronautical Sciences last month in Wichita, Kan. Attacking the future problems of civilian transportation, General Irvine recommended a novel combination of civil and military control. "It is imperative that . . . all air traffic communications and flight control systems, both civilian and military, [be aligned] under single civilian type control. In these areas, it is imperative that the senior command and supervisory tasks should be performed by personnel holding military Reserve or National Guard commissions, so that the instant transition from peace to war alert can be accomplished for all individuals involved by a single Department of Defense Executive Order, over their own traffic control circuits." (For a further report on General Irvine's remarks, see "Airpower in the News.")

The interdependence of the economic and military structure of our nation is the theme of the correspondence course, "The Economics of National Security," offered by the Industrial College of the Armed Forces, Fort McNair, Washington, D. C. Based on the ten-month course given to resident senior officers and civilian executives, the correspondence course is organized in five units of study, covering the economic readiness of nations and blocks of nations to wage war. It analyzes the economic, military, political, and psychological factors affecting national security. Open to graduate-level civilians as well as qualified service officers. No tuition.

**IN THE NEWS:** Lt. Gen. William H. Tunner, MATS Commander, received the Reserve Officers Association's annual Distinguished Service Citation. . . . The Society



Dr. Theodore von Karman, dean of aeronautical engineers (left), at the dedication of Arnold Engineering Development Center facility named in his honor at Tullahoma, Tenn. Others, from left, are Lt. Gen. Bernard A. Schriever, ARDC Commander; Dr. Hugh Dryden, Deputy Administrator of NASA; Dr. J. V. Charyk, Ass't AF Sec'y for R&D; and AEDC Commander, Maj. Gen. Troup Miller, Jr.

of Experimental Test Pilots' Iven C. Kincheloe award for outstanding experimental flight test went to AF Maj. Robert G. Ferry, Edwards AFB, for his work on the VTOL Bell XV-3. . . . When reelected British Prime Minister Harold Macmillan shuffled his cabinet, he appointed Duncan Sandys, former Defense Minister, to the new post of Minister of Aviation. . . . Deputy controller for overseas affairs of the British ministry of aviation, Ernest T. Jones, was elected deputy chairman of NATO's Advisory Group for Aeronautical Research and Development at the AGARD meeting in Aachen, Germany, last month. . . . The National Pilots Association has named Max Conrad, light aircraft pioneer from Winona, Minn., as NPA Pilot of the Year, for his record nonstop flight from Casablanca, Morocco, to Los Angeles, Calif., in a single-engine Piper Comanche last June.

Changes on the Civil Aeronautics Board: Allan Boyd, thirty-seven-year-old Miami lawyer, has been appointed to succeed Louis J. Hector; Whitney Gilliland has replaced retiring Harmar D. Denny. . . . Zonta International, organization of business and professional women executives, offers its twenty-second Amelia Earhart Scholarship for graduate study in aeronautical engineering. Qualified women may apply for the \$25,000 grant from Dr. Helen Pearce, 490 Oak St., S. E., Salem, Ore.

**STAFF CHANGES . . .** Brig. Gen. Clarence T. Edwinton, who was Commander, Detachment 2, Willow Run AF Station, Belleville, Mich., Hq. 30th Air Division (SAGE), ADC, Truax Field, Madison, Wis., is now Commandant of the Squadron Officer School, Air University, Maxwell AFB, Ala. . . . Brig. Gen. Joseph T. Kingsley, Jr., former Chief of Staff, AMC, at Wright-Patterson AFB, Ohio, has been reassigned as Deputy Director of Legislative Liaison in the Office of the Secretary of the AF, Hq. USAF, Washington, D. C.

Brig. Gen. James P. Newberry has been transferred from duty as DCS/Materiel, USAFE, to become Assistant to the Commander, ATC, Randolph AFB, Tex. . . . Brig. Gen. Charles B. Root, who was Chief of the Electronics Defense Systems Division, AMC, is the new Commander of Rome Air Materiel Area, AMC, Griffiss AFB, N. Y., replacing Maj. Gen. Clyde H. Mitchell, who is now Commander of AMC's new Electronic Systems Center, at Laurence G. Hanscom Field, Bedford, Mass. . . . Brig. Gen. Joseph R. Holzapple, former Assistant Deputy Commander for Weapon Systems, ARDC, stationed at Wright-Patterson AFB, Ohio, has become Director of Systems Management, ARDC, with no change in additional duty as Commander, Detachment 1, Wright-Patterson AFB.

—MICHAEL B. MILLER





## FLIGHT TEST REPORT ON THE BELL XV-3

THE REVOLUTIONARY BELL XV-3 is the convertiplane that's surpassing expectations. Developed for the U. S. Army as part of the military's over-all VTOL program, the XV-3 has moved well beyond Bell's extensive shakedown tests...has successfully completed a thorough Phase II Air Force evaluation at Edwards AFB, and is currently at Moffett Field being tested by NASA.

### **Demonstrated capabilities to date include—**

- ✓ 67 full conversions in all flight regimes, including climbing turns and descents, full and partial power, with no programmed techniques required.
- ✓ More than 25 gear shifts proving out smooth, high-efficiency cruise flight.
- ✓ All normal airplane maneuvers, including slips, stalls, pull-ups and rolls.
- ✓ Basic emergency procedures, including power-off reconversions from airplane flight to full autorotation helicopter landings.
- ✓ Outstanding STOL performance under overload conditions.

The XV-3 was ready on time for all the 38 scheduled tests of the six-week USAF program. This dependability, plus the technical data obtained, shows without question that the XV-3 has solved VTOL's central problem—that of combining vertical, low-speed capabilities of the helicopter with long-range, high-speed advantages of the airplane in a reliable, serviceable machine.

The XV-3's fixed-wing, low disc loading configuration inherently provides higher hovering efficiencies, lower downwash velocities than other VTOL types. Recent tests have also confirmed superior stability and controllability, lower noise levels in all flight regimes, higher efficiencies in airplane cruise. Now shown to be technically and operationally practical, the XV-3 concept is ready for advanced military VTOL/STOL systems.

**BELL**  
HELICOPTER CORP.

FORT WORTH, TEXAS • SUBSIDIARY OF BELL AIRCRAFT CORPORATION





**Recent USAF film releases of special interest to readers of AIR FORCE**

An Atlas ICBM blazes up from its launch pad. The Air Force Thunderbirds sweep through an aerobatic routine culminating in a spectacular "bomb burst." Electronic "think" gear coaxes a supersonic F-104 interceptor onto the tail of an incoming "enemy" attacker high above the clouds.

In each case, an Air Force photographer is on hand. His filmed record of these and other events in the continuing Air Force drama ultimately become USAF motion picture releases. Today the Air Force film library system, serving USAF and the general public, contains thousands of releases.

The Air Force is in the film distribution business for one reason. Visual aids are an important training tool. They get across the over-all Air Force story as almost no other medium can. They are invaluable, too, in technical instruction of USAF personnel.

For some time now, many of the films in the Air Force film system have also been extremely popular among Reserve units and civilian groups to whom general releases are available on application. Churches, youth groups, civic and patriotic organizations, and defense contractors draw on them heavily.

Below is a partial list of recent film releases judged of special interest to the readers of AIR FORCE/SPACE DIGEST. With each title appears its film library number and a brief description.

Films are available through 131 USAF film libraries located at installations around the world. Hub of the library system is the giant Air Force Film Library Center, 8900 South Broadway, St. Louis, Mo. Major overseas centers are at Chateauroux Air Station, France, and Tachikawa Air Base, Japan. All honor film requests.

AIR FORCE/SPACE DIGEST plans to publish further lists regularly in this new department.

**Arctic Airlift**

**SFP 619**

Before the airplane, the Arctic provided our continent a seemingly impregnable barrier against attack. Today, enemy bombers flying over this polar region can reach some of our major industrial cities in less than four hours after takeoff. The ICBM reduces this time to minutes. "Arctic Airlift" makes this point clear to introduce its main theme—the need for a strong, combat-ready military air transport activity to support arctic defense installations. As electronic eyes of our early-warning system search for an intruder, interceptor crews stand ready to identify the invader and nearby SAC bombers are prepared to launch massive retaliatory strikes on the raider's homeland. Along the arctic transport routes, Military Air Transport Service planes and crews are equally ready to move SAC cargo and personnel immediately. In Color. Eleven minutes.

**Atlas, the ICBM**

**SFP 583**

The story of the Atlas missile; film traces the history of its development, explains the magnitude of the Atlas project. Twenty and a half minutes. Color.

**Any Time—Anything—Any Place**

**SFP 634**

Treats the over-all Military Air Transport Service mission from a documentary standpoint, reviewing MATS's participation in events of historical significance to point

out its vital role in accomplishing the Department of Defense airlift mission. In conclusion, shows that whether it's transporting the mighty Atlas to a launching site or troops to a troubled spot, there's a MATS plane on the runway to do the job. Fourteen minutes. Black and white.

**On Target—Atlas, the ICBM**

**SFP 655**

An exciting account of an Atlas flight from prelaunch activities to target. Twenty-seven and a half minutes. Color.

**Transportation of Missiles**

**SFP 596**

Emphasizes the importance of speed in transporting missiles and support equipment as the governing factor in military reaction time potential. Presents the magnitude of problems involved, compares our air transports with Soviet aircraft, and portrays the vital role of the Military Air Transport Service in providing transportation facilities to meet the challenge of the missile age. Twenty minutes. Color.

**Materials—Key to Progress**

**SFP 530**

Portrays the over-all technical mission of the USAF Materials Research and Development Program and emphasizes the important contributions of industry and science to its progress. Provides visit to Air Force, industrial, and university research laboratories where scientists, engineers, and technicians search for materials that will withstand unprecedented environmental stresses imposed by modern aeronautics and astronautics. Seventeen minutes. Color.

**Air Force Nondestructive Testing**

**TF 1-5226**

Stresses the importance of quality control inspections and explains various defects and their causes. Inspection methods demonstrated include magnetic particle, fluorescent penetrant, X-ray, and ultrasonic. Twenty-eight and a half minutes. Color.

**Supersonic Thunderbirds**

**SFP 637**

The Air Force's famed jet aerobats fly their Super Sabres through the breathtaking maneuvers that have thrilled thousands the world over. A power climb, the graceful cloverleaf turn, and an intricate loop with wing tips overlapping are only part of the day's practice run. A tight 360-degree turn that builds up terrific G forces and the spectacular "bomb burst" show the Thunderbirds at their best. Thirteen and a half minutes. Color.

**In Your Defense**

**SFP 646**

Describes the purpose, development, and capabilities of SAGE, the Semi-Automatic Ground Environment system designed to preclude the penetration of enemy or unidentified aircraft without detection. Functions of the Detection Center and other facets of the system also are explained. Twenty minutes. Color.

**Beyond the Stick and Rudder**

**TF 1-5300**

Explains basic principles of aerodynamics and shows how aircraft designers apply these laws to achieve superior design and performance without detracting from pilot safety. Also emphasizes the pilot's need for a thorough knowledge of these laws for safe flying. Fourteen minutes. Black and white.—END



# VIEWS & COMMENTS

## What Fiscal Peril?

**I**N MY opinion, this Administration has imperiled the nation's security programs by visiting its fiscal troubles on them. I can see little connection between vital security needs and technical finance problems. Fiscal and monetary problems are solved by fiscal and monetary measures—by adjusting tax rates and interest rates; by selling long-term government bonds at propitious moments. To listen to some in the Administration, including the President, one would think that by investing adequate sums in its own security, the United States is destined to become one of a hundred neediest cases. This is nonsense. We are an inordinately rich country. There is more of everything than ever before: more steel in our automobiles, two automobiles in an astonishing number of garages; there are more tax-deductible country club memberships, more backyard swimming pools. Despite its ragged performance of late, the stock

market averages have been generally extremely high—primary reason why the Administration was having such trouble in selling its bonds this year; equities had become more attractive than bonds.

A more disturbing consequence is that in order to solve our relatively short-term fiscal problems, the Administration, presumably with the support of the majority of the American people, has debilitated urgent security programs. How much wiser and more courageous it would be to balance the budget the hard way—by increasing federal revenue. And that is an example of a "tough, mature" decision that we may be forced to make in the very near future.

—From Sen. William Fulbright's "Toward a More Creative Foreign Policy" in November's *Progressive Magazine*.

## Let's USE Our Capability

**P**PRIVATE industry, under our competitive enterprise system, must work hand-in-hand with the Department of Defense, if the military is to have the technologies and products required to meet national objectives. Yet there are still many people who would prefer a cold, arm's-length relationship with ever more elaborate machinery to prevent improprieties and mistakes. Such machinery may prevent some mistakes, and conceal others, but the overelaboration of safeguards where technological innovation is involved can expose us to a much more critical danger—loss of lead time.

The military fully realizes that it cannot define intricate new requirements and expect industry to produce, overnight, the hardware required to satisfy those requirements. The Department of Defense knows that industry today

must be planning, researching, and developing new technologies actually in advance of the military requirements for them. Our military know that Soviet military-industry progress achieved through compulsion must be more than matched by even greater US progress achieved through the full utilization of the superior capabilities of private industry and the basic advantage of the free competitive enterprise system. This is the key to reducing lead time and preventing future gaps in the relative strengths of aggressive communism and the free world.

—From "Industry's Role in Defense Planning," by Dr. George L. Haller, Vice President and General Manager of the Defense Electronics Division, General Electric Company, in the October-December issue of *GE's Defense Quarterly*.

## Money Should Be No Object

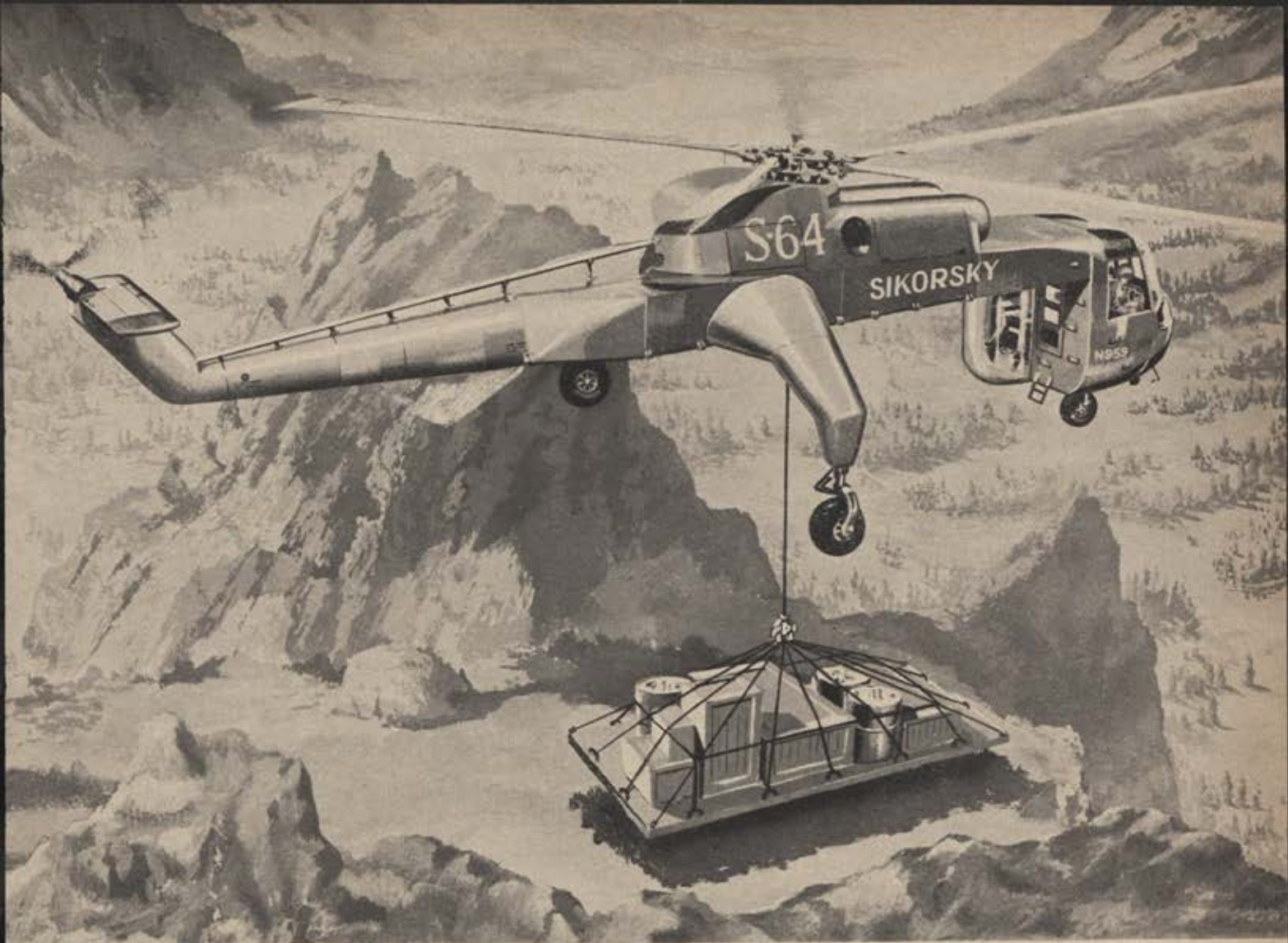
**W**HEN will some political leader arise to state in clarion terms the obvious fact that this is a great and growing country, and that if it is to find and fulfill a national purpose in this time of official aimlessness it will have to spend more money? Only a small part of the increased living standards that most of us enjoy would permit an adequate defense, better education, and an approach to other unmet national problems, and a greater contribution to international economic development.

If this means a federal tax increase, even in an election year, then for heaven's sake let's face it. Presidential candidates, especially, ought to have an awareness of real national needs. The task of leadership is to win public understanding of what is necessary, not to yield meekly to stereotyped notions of what constitutes an adequate budget.

There is another consideration, more immediate than some of the unmet domestic needs. Mr. Khrushchev may indeed want a reduction of tensions and some peaceable stabilization, but he is surely not so enamored of this tactic that he would fail to take advantage of flagging American and Western determination. Nothing could so impair the chances of negotiating on a basis of equality than premature relaxation in the West. To curtail military commitments and armaments because conditions warranted it would be to realize the country's fondest hope; but to trim these and to mortgage our economic assistance for budgetary reasons would be to jeopardize recklessly the attainment of that hope.

—From an editorial in the October 29 issue of the *Washington Post*.





**S**ikorsky S-64  
— new 8-ton  
payload  
turbine-powered  
flying crane

**HIGH CAPACITY**—With an 8-ton payload, Sikorsky's new S-64 turbine-powered crane, will carry *three tons more* than the experimental S-60. It is the first in a new family of Sikorsky turbocranes designed to carry up to 40 tons.

**TOP VERSATILITY**—In restricted areas where even a helicopter cannot land, the S-64 is designed to raise and lower loads on a hoist, as above. Where landings are possible, cargo can be attached by cable to four hard points on the fuselage. The S-64 is designed to straddle bulky loads nine feet high and almost 20 feet wide. A variety of passenger and cargo pods, bins and platforms, plus almost vibration-free suspension will make the S-64 a Universal Transport Vehicle of unprecedented versatility and usefulness for military or commercial service.

**PROVED DEPENDABILITY**—Sikorsky's program of step-by-step progression with thoroughly proved designs and components will assure users utmost dependability. Vital rotor assemblies, gearing, controls, and other dynamic components for the S-64 have been proved by years of service in Marine Corps and Army S-56-type helicopters. The crane concept has been tested and demonstrated for many months in the S-60.

**FIRST FLIGHT**—The first S-64 is programmed for flight in the fall of 1960.

**SIKORSKY AIRCRAFT**, Stratford, Connecticut  
A division of United Aircraft Corporation



## What is knowmanship— and what can it do for you?

As a prime contractor, your task becomes easier—the success of your project more certain—with an associate contractor who can fit into your “team” picture quickly and expertly. And this applies during initial planning stages—when you’re first invited to bid on a major systems contract—as well as during production on the contract.

Such an associate contractor must be heavy on specialized talents—the kind that can’t be acquired overnight. His background can come only from years of experience in sub-system research, development and production. It can come only from practical experience under the Weapons System concept.

Both these indispensable areas are thoroughly covered by Eclipse Pioneer’s KNOWMANSHIP—our word for the critical combination of technical knowledge, experienced management and specialized craftsmanship that an associate contractor must have to offer maximum value to a prime contractor.



Eclipse-Pioneer KNOWMANSHIP under the Weapons System concept dates from the very first contract of this type—in our association with Convair on the Air Force B-58 Hustler. Here, we developed and now supply from production Primary and Automatic Flight Control Systems, Stability Augmentation and Central Air Data Systems. Another of our major sub-system responsibilities is to the Martin Company for Inertial

Guidance, Stable Platform and associated equipment on the Army’s Pershing missile.

Add in our physical resources—9,500 engineers and other highly skilled workers, 1,104,000 square feet of plant space, plus the most modern tools and equipment—and you have the significant *total* reason why Eclipse-Pioneer KNOWMANSHIP makes such a knowledgeable partner for prime contractors on advanced aircraft and missile development and production.

A letter, wire or phone call will bring our representatives to your office with complete facts about E-P associate-contracting capabilities.



69% of E-P’s procurement dollars go to small business.

# ECLIPSE-PIONEER

TETERBORO, N. J.  
DIVISION of



AUTOMATIC FLIGHT CONTROL • CENTRAL AIR DATA SYSTEMS • SPECIALIZED INSTRUMENTATION • NAVIGATION COMPUTERS AND DIRECTORS  
STABLE PLATFORMS • INERTIAL GUIDANCE • RADAR ANTENNA STABILIZATION AND TRACKING SYSTEMS • GROUND SUPPORT EQUIPMENT



# SHOOTING THE BREEZE

WITH THE EDITORS OF AIR FORCE MAGAZINE



The general's trout flies. Rep. John A. Moss of the House Legislative Oversight Subcommittee called on the Defense Department for a snap inquiry one day last month. He wanted to know about some trout flies "rushed" from a California Air Force base to retired Gen. Carl A. (Tooe) Spaatz at a Rouge River, Ore., fishing camp.

A constituent sent Mr. Moss a clipping about the flies and a letter protesting "the use of a special Air Force plane for this purpose." The Pentagon investigated. A friend at the base had sent General Spaatz the flies all right. By bus. He had a \$1.40 receipt to prove it.



**Aviation doubleheader.** October 26, 1909, was an important day in the history of US military aviation. It was the day of the first solo flights. They were performed by Army 1st Lts. Frank P. Lahm and Frederic E. Humphreys, who thus became the new Air Service's first certified pilots. The event took place at College Park, Md.

And now we find that AIR FORCE/SPACE DIGEST Senior Editor Claude Witze, long-time aviation writer and military analyst, first saw the light of day on that very same October 26, fifty years ago. Mr. Witze's career has, in truth, spanned the history of US military flying.



**Model Air Force.** A worthwhile hobby kit containing do-it-yourself models of eighteen current Air Force aircraft recently went on the market. It contains authentic scaled-down versions of most of the key planes in today's inventory—nine jet fighter types including the Lockheed F-104 Starfighter and Republic F-105 Thunderchief; bombers including the Boeing B-47 Stratojet, Boeing B-52 Strato-fortress, Convair B-58 Hustler, and Douglas B-66 Destroyer; and others, including the Boeing KC-135 Strato-tanker.

With the kit comes a booklet de-

scribing the planes and briefly sketching Air Force history. Looking over the kit, we had the feeling that a man with a young son is fortunate indeed. He has an excuse, if one is necessary, for procuring this rather spectacular collection of planes.

The models are a product of Monogram Models, Chicago. They sell under the title "USAF Airpower Kit."



**Sail ho, or the case of the aircraft carrier.** AFA's Board of Directors should just about be getting its land legs back as you read this. They are spending December 2-5 as guests of the Navy and the Navy League on the aircraft carrier *Independence* (see also "AFA News," page 111). As if this weren't enough aircraft carrying for quite some time, comes this word from San Francisco, site of AFA's next National Convention:

Guess what's on the cover of the new San Francisco telephone directory, which will be in use until this time next year? A striking portrait of the Navy's carrier *Ranger* catapulting aircraft off its flight deck.

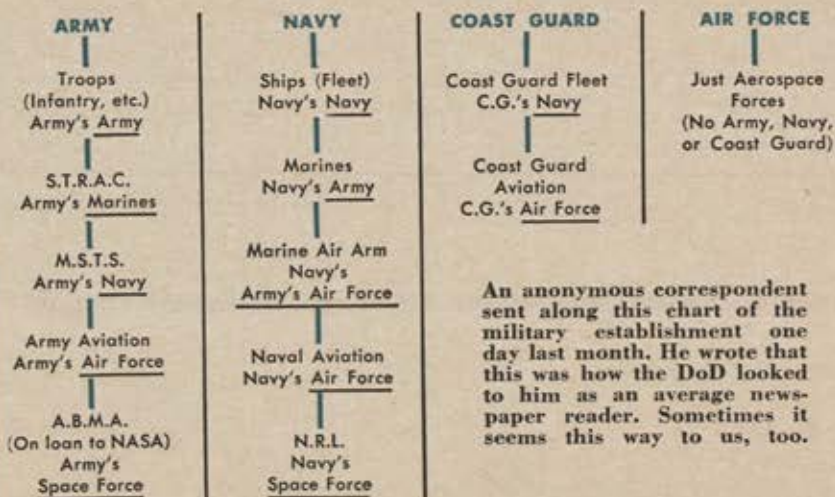
**Echoes of long ago and far away.** Airmen who flew in the vicinity of Borneo in World War II will remember Mt. Kinabulu. The 13,500-foot peak stands guard over the South China Sea from the northernmost part of the island. The people of North Borneo, which belongs to the British Commonwealth, are presently raising a fund to erect a war monument in the shadow of the mountain in memory of Allied servicemen and persons from the area who lost their lives during the war.

Appealing for funds in a letter from Borneo, the memorial's treasurer notes Air Force contributions to victory in that theater and adds: "Our small up-country groups . . . were responsible for rescuing members of your combat crews who crashed in the jungles of the interior."

Anyone interested in trading reminiscences long-range or contributing to the drive may contact Mr. G. S. Carter, Brunei Shell Petroleum Co., Ltd., Seria, State of Brunei, Borneo, or send donations to the fund in care of this magazine. We will be pleased to send them on.—END

## Organization of the Defense Department

(As seen by a man on the street . . .)



An anonymous correspondent sent along this chart of the military establishment one day last month. He wrote that this was how the DoD looked to him as an average newspaper reader. Sometimes it seems this way to us, too.



# It's the Warhead

## that makes a missile pay

The tremendous effort that goes into a missile means little unless the warhead functions properly

Man has been trying to produce positive destruction at an exact location for centuries. With help from the vital and complicated systems found in a guided missile warhead, he is coming closer and closer.

Today's warhead system must rely upon highly accurate safing-arming-fuzing devices to guarantee detonation when and where desired. The degree of sophistication in this system is determined by the specific mission. To date there are six programmed missions: air to air, air to surface, surface to surface, surface to air, underwater to air to surface and underwater to underwater.

### What's in a warhead?

Warhead system performance is always critical. In order that the device be safe, armed and detonate upon delivery, the safing, arming and fuzing functions must perform as one system in perfectly timed sequence.

The *safing* system maintains the warhead in a safe condition during handling, launching and flight until the missile has reached a safe distance away from the launch site and friendly troops. Designed to prevent arming and fuzing operations until the projectile nears the target area, this system must be flexible. Maximum safety can be provided

through utilization of components which sense such things as minimum preset altitudes or missile velocity. Honeywell makes accel switches, baro switches and timers for safing systems.

The *arming* system will examine the flight path of the missile, define range, cross range and preset altitude dimensions. The arming system will then decide, based on data collected, whether to prepare the missile for self destruction or on-target detonation! Honeywell makes inertial instruments, timers, baro switches and temperature switches for use in arming systems.

The *fuzing* system, using ultra-sensitive pressure, proximity, time or acceleration sensors, assures precise detonation when and where desired. The method of fuzing may be air burst, contact burst or air burst with contact burst as a backup. If the mission is to be aborted due to a malfunction of any missile subsystem or component, the warhead may be dudged almost to the time the fuzing process begins. Another possible action is called destruct, which means the warhead will be harmlessly destroyed high in the air. Honeywell makes infrared, baro switch, timer, radar, electrical or piezo electric, mechanical and hydrostatic fuzes for warhead fuzing systems.

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### CORPORATE CAPABILITY AND EXPERIENCE

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Significant capability stems from a depth of Honeywell experience in inertial systems, gyroscopes, accelerometers, computers, air data systems, ballistic trajectory control systems, horizon scanners, fix takers, pressure and temperature sensors. Honeywell is one of the nation's largest contributors to the entire missile industry as well as to warhead

technology. With a notable background in the design, development and production of systems and components, Honeywell is fully qualified for work on all phases of prime missile and space systems management.

For detailed information, call or write Honeywell, Minneapolis 8, Minnesota.

One or more Honeywell warhead systems are on all these missiles:



Redstone



Littlejohn



Terrier

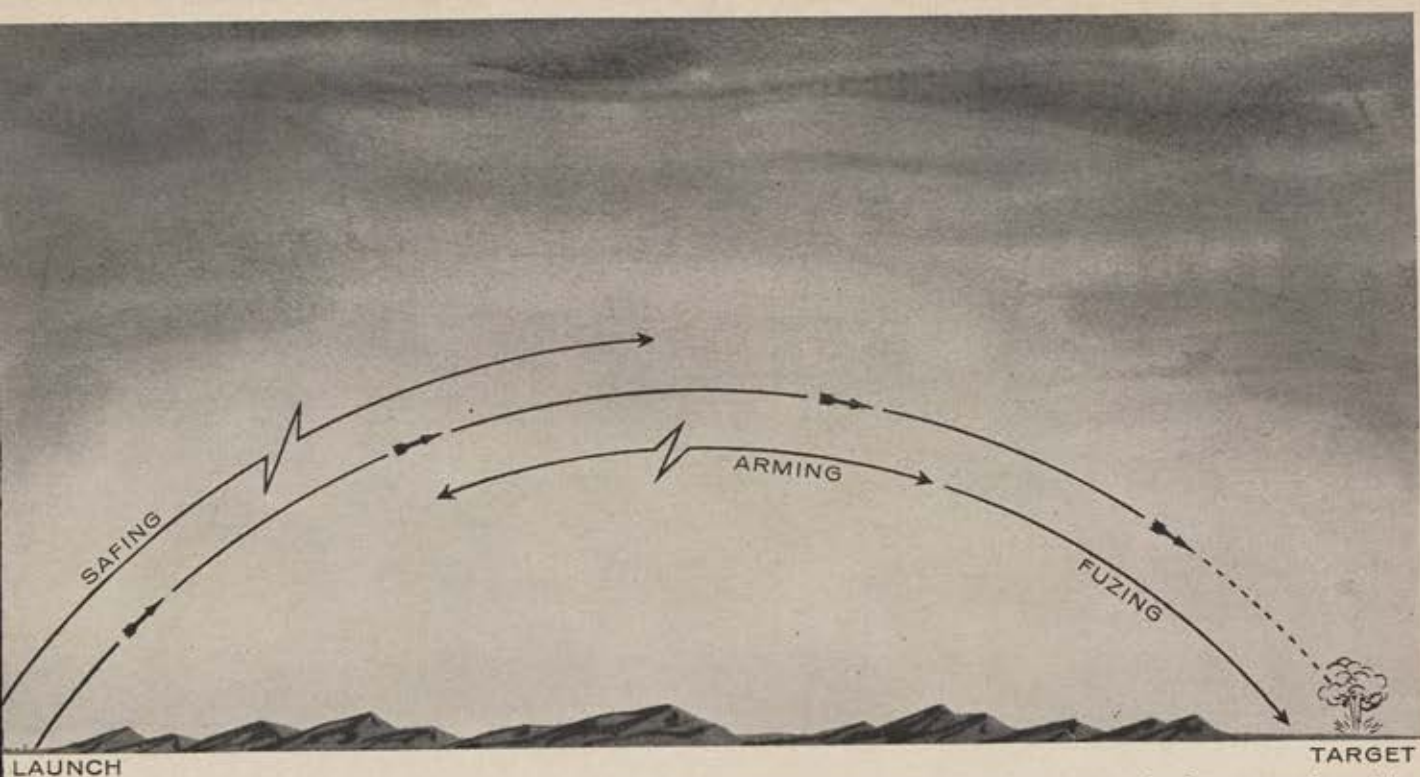


Talos



Sidewinder





There are 3 basic systems in a warhead section. *Safing* for storage, launching and flight over friendly territory, *arming* to make warhead capable of exploding, and *fuzing* to assure precise detonation.

#### GLOSSARY OF WARHEAD TERMINOLOGY

**1. Adaption Kit**—Those items peculiar to the warhead installation less the warhead; namely, the arming and fuzing systems, power supply and all hardware, adaptors, skins, etc., required by a particular installation.

**2. Arming System**—That portion of the weapon which derives (originates) the signals required to arm, safe or re-safe the firing system. Will normally consist of accelerometers, arming baros or similar components.

**3. Dud Probability**—(Warhead Section)—The probability that the warhead fails when launched at a target to produce a nuclear detonation at the desired location.

**4. Firing System**—That portion of the

weapon which, upon signal from the arming system, transforms and stores electrical energy, and upon signal from the fuzing system, discharges this stored electrical energy to detonate the warhead.

**5. Fuzing Systems**—That portion of the weapon which derives (originates) the signals which discharge the firing system. This system normally consists of such components as pressure, proximity, time or acceleration sensing.

**6. Minimum Burst Height**—That height above which only an acceptable degree of ground contamination will occur.

**7. Premature Probability**—The probability that a weapon/warhead explodes before

reaching the intended point of detonation in space, including allowable space tolerances.

**8. Safe Burst Height**—That height above which only an acceptable degree of damage will occur to friendly ground installations.

**9. Safing System**—That portion of a weapon that integrally contains all the apparatus which, on receipt of proper signals from the arming system or by manual operations, functions so as to place the warhead system in an armed or safe condition.

**10. Atomic Warhead Section**—That portion of an atomic weapon which consists of the warhead and the adaption kit.

# Honeywell



Military Products Group



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Falcon



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Sergeant



Corporal





## HOW TO BRING SPACE DOWN TO EARTH

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Aerial view of Hiroshima after it became the victim of the world's first A-bombing on August 6, 1945. But Hiroshima and a host of cities badly scarred by World War II conventional bombs took on energetic rebuilding programs at war's end. Now a city destroyed by "dirty" weapons would face unimaginably complex reconstruction problems.

*Nuclear weapons that produce minimal radioactive fallout would be a more manageable deterrent tool than today's high-yield "dirty" weapons. But there are arguments against them as well. "Clean" weapons cost more, have considerably less punch. The question of their development has far-reaching strategic and budgetary implications . . .*

# THE CLEAN WEAPONS PROBLEM

A SPECIAL ANALYSIS





# THE CLEAN WEAPONS PROBLEM

A SPECIAL ANALYSIS

**T**HE CLEAN weapons problem is one of the most critical facing us today. Little known or understood, it merits a thorough examination.

A so-called "clean" weapon is a nuclear bomb or warhead that produces only about five percent as much radioactivity as a so-called "dirty" bomb or warhead of equal yield.

Would such a weapon, brought to the operational level, be militarily useful?

Would it offer advantages over dirty weapons?

Should the United States expend the sizable effort required to develop a clean weapon capability?

These are some of the questions we shall attempt to answer.

• • •

When the US tested its first H-device, the amount of radioactivity released turned out to be considerably larger than had been anticipated. The hydrogen weapon had been developed primarily to achieve maximum blast and heat effects. When it appeared that radioactivity was among the primary effects of H-weapons, the inclination was to use "fallout" as a bonus.

Radioactive fallout would increase the perimeters of destructiveness. It would deny, for many weeks or months, the reoccupation and utilization of impact sites. It would cause casualties over areas so wide that the attacked nation could be deprived of "places to hide."

Radioactivity, therefore, was the factor which made of the hydrogen bomb the first true area weapon of history. With weapons of this type, nations could be attacked in their entirety and their backs could be broken.

Subsequently, it became apparent that this very effectiveness of the hydrogen bomb tends to make the weapon quite unmanageable and may prevent its utilization.

Widespread, heavy fallout would kill hundreds of thousands outside specific target areas and induce a large disease rate within the surviving population. Sooner or later, uncontrolled fallout would reach neutral states. The fallout would probably also "backfire" against friendly nations and cause heavy casualties among the very peoples, including one's own, whom the military operations were designed to protect.

These undesirable effects would be multiplied if dirty weapons were used by *both* belligerent camps. Finally, since fallout contains radioactive elements of very long half-life, the effects of the nuclear attack ultimately would hurt all nations on earth in some measure.

Fallout may actually preclude success in war. Obviously, the belligerent states would be hit hardest, and this might mean that a "bystander," or third nation, would win such a war. And heavy fallout not only would weaken a nation's ability to make war. It might also, through extreme casualty and disease rates, and residual effects, badly hamper postwar reconstruction—in effect bringing social and political chaos to a participant in a major war.

With all this said, we should note in this discussion that many analysts have exaggerated the effects of radioactive fallout even beyond the dread picture painted here. The fear of fallout has been stimulated to a point where people

believe resort to nuclear weapons would be tantamount to national suicide. The belief that nuclear warfare must result in mutual extermination is even finding credence among decision makers, especially among the allies of the United States.

But this is clearly not the case.

Given certain biological and mathematical assumptions, excessively large amounts of radioactivity could, it is true, lead to the extinction of mankind. However, even in the most murderous nuclear war, the amounts of radioactivity released by bombing would not be anywhere close to those required for mutual extermination. The "extermination threshold" would not be reached even in a "total" nuclear war. Mankind, it can be said with certainty, undoubtedly would survive a nuclear holocaust.

Yet, fallout still would cause millions of immediate and genetic casualties. True, all forms of historical warfare have caused "unnecessary" and indiscriminate casualties. War also has often had long-lasting genetic effects. But the crucial point in this case is that uncontrolled fallout is just that—uncontrolled.

It is like a gun that blows up every fifth shot or like a gas attack launched ten minutes before the wind shifts. The most basic objection to uncontrolled fallout, in fact, is that it would tend to render war unmanageable as a rational tool of policy and national security.

• • •

Fallout may be seen as falling into three categories.

● First, there is the fallout which can be regulated to some extent by the height of burst of a nuclear explosion. Dirty weapons exploded several thousand feet above the ground produce an appreciable amount of various types of fallout. Yet an explosion on or close to the ground, while producing an even larger quantity of radioactivity, tends to concentrate most of the materials near the point of impact. In this case, only a fraction of the radioactive particles produced would move through the atmosphere and be deposited downwind. A great deal of radioactivity, but there would be little fallout, would thus be produced.

Explosions at very high altitudes would also keep short-lived particles out of the atmosphere. Such explosions, directed at objects moving at high altitudes, would have minimal or no effect on ground targets or on populations.

● Second, there is the fallout produced by the fission of uranium contained in the nuclear weapon. This fallout appears within the impact zone as well as at varying distances downwind. The activity which results from uranium fission is *by far* the most important and the most dangerous fallout component which, depending on the yield, could contaminate thousands of square miles. The uranium component is what makes the weapon "dirty."

● Third, there is induced radioactivity which results from neutrons hitting either the ground or the nitrogen in the air. Induced radiation on the ground is weak, short lived, and concentrated within the impact zone. Hence, this ground radiation can be disregarded for all practical purposes. However, induced radiation in the air produces possibly dangerous carbon-14, which has a half-life of 5,600 years and which may remain biologically effective for 8,000 years.

To reduce fallout, the following known methods may be employed:



• The height of burst can be controlled to hold a maximum of radioactivity on the ground and near ground zero. Radioactivity within the impact zone would not increase casualties beyond those caused by heat and blast.

However, local fallout would cause some casualties beyond the periphery of the blast zone and possibly in adjacent areas downwind. This danger could be lessened by reducing the yield of the weapon. At any rate, since these effects would occur within or close to the target area, they can be considered as intended effects rather than as *uncontrolled* fallout.

It may seem feasible to explode bombs consistently at such heights of burst that only minimal amounts of radioactivity would reach areas away from the immediate target. However, this height often would be dictated by overriding tactical factors. Generally speaking, if the weapon has a yield large in relation to the size of an identical target, the decision to explode on or near the ground would be easier to make; the desired destruction would be attained by a low-level explosion. Thus, seemingly, use of larger yield would always make it possible to cut fallout.

Unfortunately, however, use of larger yields for this purpose is partially self-defeating, especially against large targets. First, increased yields themselves produce greater fallout. Second, the very nature of a large-yield explosion itself might cause destruction in so wide an area that its purpose would be questionable.

Attacks on hard military targets usually require very low heights of burst. Since they also call for very hefty yields, the amount of fallout would be considerable.

The method of keeping fallout in check by controlling the height of burst, while important, is for these reasons seen to be less than a complete solution to the fallout problem.

• A technical method of preventing fallout would be to use "clean weapons," the central topic of our discussion here. The aim in development of such weapons would be to reduce or, if possible, eliminate the uranium component of a nuclear explosive. To what extent this can be done, and with what effectiveness, depends on technical proficiency at a given time. If the uranium were taken out entirely, about ninety-five percent of the radioactivity could be eliminated, including the long-lived isotopes of strontium and cesium which have the most durable disease-producing and genetic effects. Thus, the clean weapon would solve the fallout problem to a considerable extent.

• What of the other five percent? This remaining radioactivity would be caused by neutrons produced in the fusion process. Neutron release is an essential feature of fusion. It is theoretically possible to reduce this induced radioactivity to a large extent, although at so heavy a penalty in weight that at present this particular sort of radioactivity will have to be accepted for weapons, though not for each individual explosion.

Most of the induced radioactivity would be deposited within the immediate impact area and thus would not do additional damage. However, the carbon-14 released into the atmosphere would be active over wide areas and for long time spans. This, then, would be a residual fallout

*(Continued on following page)*

The so-called "clean" nuclear weapons appear to many to offer a more manageable deterrent than today's higher yield "dirty" weapons. The chart below summarizes the principal arguments for and against both clean and dirty weapons.

## Clean vs. Dirty Weapons

| Dirty Weapons                                             |                                       | Clean Weapons                                                |                                                             |
|-----------------------------------------------------------|---------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------|
| FOR                                                       | AGAINST                               | FOR                                                          | AGAINST                                                     |
| First true area weapon in history                         | Risk of overkilling                   | Acceptable amounts of fallout                                | Higher cost                                                 |
| Giant-yield explosions with maximum blast and heat effect | Hamper postwar reconstruction         | Technology promises "large enough" yield                     | Less punch                                                  |
| Radioactive fallout as a bonus                            | Raises prospect of genetic casualties | Suitable for operations in, over, or near friendly territory | With fixed yield requirement, more carriers would be needed |



problem which today's clean weapons concept does not attempt to solve.

Carbon-14 normally exists in appreciable quantities within the atmosphere. It is not known whether some diseases and types of degeneracy are due, or partly due, to the "background" presence of carbon-14, but it is known that mankind has been surviving and growing despite the activity, harmful or not, of this isotope.

Many calculations have been made to show by what percentage a nuclear war would increase the level of the C-14 background. Unless hundreds of thousands of megatons were released—and even "total" war would fall far short of such quantities—this increase would be small. If there were a truly "super total" war—a problem about which, perhaps, our grandchildren need worry—the number of casualties produced by blast and heat would render background augmentation of C-14 irrelevant. But what would be the genetic effect of a marginal C-14 increment? This is our current problem, but with our present utterly insufficient knowledge, we can only speculate. We simply do not know whether C-14 has any harmful genetic effects.

Still we must not be complacent about this hazard. We must continue to search for means by which it can be overcome. At the same time, we can be certain that genetic effects caused by a "clean nuclear war" would at worst be several orders of magnitude less than those of a nuclear war fought exclusively with dirty weapons.

We may, on the basis of the above, reach these conclusions. First, it would be well to eliminate both uranium and C-14 from nuclear explosions. Second, the C-14 problem defies us at present. Third, elimination of uranium in itself, or development of "clean" weapons, would greatly reduce the casualty rate in nuclear war and would thus be highly desirable.

Hence, would it be wise to adopt a national clean weapons policy? Before such a final conclusion can be drawn, some very difficult problems must be faced and solved.

Let us assume that weapons can be cleaned up technically. This would be a great technological achievement but our troubles would not be ended. Pound for pound, a clean weapon would have considerably less yield than a dirty type. It would also probably be far more costly.

With a given fixed budget, these two facts have the following implications:

- If we were to switch to a clean weapons program our nuclear industry would have to be enlarged. Within a fixed budget, this could not be done. For this reason, and also because of the higher cost of the individual weapon, the stockpile of warheads and bombs would have to be reduced.

- The individual bomber or missile equipped with clean explosives would carry a much smaller punch to the target and some types of missiles would lose their effectiveness entirely. This reduction in punch would be compounded by the greater need for pinpoint accuracy resulting from use of smaller yields. Further, to carry unreduced explosive power to target, it might be necessary to reduce guidance equipment to make up the weight.

If the yield-on-target requirement is fixed, the number of weapon carriers might have to be increased. If this were precluded by a fixed budget, the adoption of clean weapons would spell a significant reduction in the strength of our nuclear power. This handicap might be decisive if the enemy succeeded, through surprise attack, in knocking out a sizable portion of our strike force. Thus, our whole strategy of deterrence could be weakened.

- It may well be argued that a military force which is compelled to operate with a minimum number of weapons and carriers, which by the very nature of its strategic problem must aim at getting the most punch out of the

fewest weapons, and which must strike back only *after* the enemy has struck, cannot really afford to replace dirty by clean nuclear weapons.

This type of arithmetic, in reality, must weigh heavily against energetic "cleaning up" of our nuclear stockpile so long as our military budget remains sharply limited.

These points, it must be emphasized at this juncture, provide only a box score of difficulties associated with development of clean weapons. They are not necessarily conclusive.

While clean weapons may continue to suffer from a yield handicap, this factor may not remain so significant as it is today. As thrust increases, missiles will carry ever larger payloads. As nuclear technologies improve, clean weapons can conceivably be devised with yields large enough to suit any military purpose.

Nuclear weapons may be a positive requirement for operations in territories inhabited by friendly populations. They may be necessary for ground warfare. Clean weapons in these cases obviously would be more than preferable. Also, the yield factor may sometimes not be important.

We also must bear in mind that fully effective ground-to-air rockets and anti-ICBM weapons can be made only with nuclear warheads. But these warheads must be filled with clean explosives lest radioactivity be deposited on the defense forces and the population they protect.

Over-all, it would seem that replacement of dirty by clean weapons may be one of the more feasible approaches to assuring that the destructiveness of any future conflict is kept within bounds. The elimination of massive uncontrolled fallout would be in the interests of all belligerents and neutrals in the event war comes again to our planet.

From the point of view of a nation which does not contemplate aggression and whose elements of strength are strung out all over the countryside, the switch from dirty to clean weapons by both sides would offer the considerable advantage of reducing the effectiveness of hostile surprise attack.

The availability of clean weapons would make it far more practical to employ nuclear force in the defense of national interests. With an entirely dirty arsenal, there must be a great deal of reluctance to use nuclear weapons in any crisis but the supreme showdown.

The question of safeguards against possible enemy use of dirty weapons inevitably arises. The answer here is that if an enemy used dirty weapons, we would know it. Part of a clean weapons strategy would have to be retention of dirty weapons to use if required. This capability would surely deter an enemy from using dirty weapons.

Where does the United States stand on this important issue? High American officials have made a few statements evincing interest in the clean weapons concept, but no decision has been made to adopt such weapons as an integral element of our strategy. The US Army is interested in them but is not pushing the concept. USAF, partly for operational and budgetary reasons, partly because of an intellectual time lag, appears more or less hostile.

The Atomic Energy Commission continues development of clean weapons, but the current nuclear test ban is seriously hampering these efforts. If the ban lasts, militarily useful clean weapons probably will not become feasible. Thus, the supposedly humanitarian test ban could cost mankind dearly. Whether or not the US presently has usable clean weapons has not been disclosed. But it is a fair inference that the current US capability in these weapons can only be limited.

This, then, is an examination of the clean weapons problem. It appears to many that, on balance, the United States should press its efforts to develop such a weapon capability as soon as possible.—END





Workmen high in the Arctic are dwarfed by the giant backstays that hold one of the BMEWS antennas firmly in place against winds up to 185 mph. The electronic network is being built to warn against incoming enemy ICBMs. Other BMEWS facilities to warn against enemy missile attacks from the east or west could be located on our overseas bases.

*Contrary to a military concept that is gaining some currency, the author declares, speeding technology has enhanced the importance of . . .*

## Overseas Bases in Unlimited War

Maj. Gen. Dale O. Smith, USAF

**A** MILITARY concept being preached today alleges that, since overseas bases are particularly vulnerable to enemy missile attack, they are of less value than heretofore.

The first premise of this argument is a statement of fact. Overseas bases *are* becoming more and more vulnerable to missile attack. However, the conclusion is false.

Domestic bases are also more vulnerable to attack by missiles. Bases in Kansas expect four hours of warning time in the event of attack by manned aircraft. In the event of missile attack, their warning time would be diminished to minutes.

On the other hand, many bases overseas have long

been geared to an assured warning of only minutes in the case of attack by either missile or airplane. Advanced bases overseas have lost little warning time with the progress of weaponry. It is domestic bases that have lost much.

Actually, therefore, overseas air bases have become of greater, not less, value to the free world. Relatively, their vulnerability is not increasing as fast as that of domestic bases.

There's also another way of looking at it. Vulnerable as they may be, overseas bases can provide America with advance warning of an attack. Additionally, overseas bases

*(Continued on following page)*

*This article was prepared by General Smith under the auspices of the Committee for National Security Policy Research of the Social Science Research Council.*



## OVERSEAS BASES IN UNLIMITED WAR

would permit a quicker reaction to an enemy attack.

Overseas bases can provide more accurate electronic warning than Stateside bases simply because they are nearer to enemy launching sites. As long as electromagnetic power decreases with the square of the distance from its source—and this law of physics is not likely to be repealed—earlier and more detailed electronic warning can be expected from scopes located at advanced bases. By the same principle, the giant Ballistic Missile Early Warning System (BMEWS) being constructed in the Far North to detect missile launchings will do a better job the nearer it is to the launching bases of our potential enemy.

And in the present state of missile technology, it would be foolhardy to focus all defenses against missiles expected to attack from over the Arctic. Missiles could come from any direction. Where should we locate our BMEWS to warn us against an east or west attack?

Nor is electronic warning the most significant aspect in the value of overseas bases. Just as Communist missiles could quickly destroy these bases, our intermediate-range missiles on these bases could wreak havoc on targets in the Communist bloc countries. Thus advanced bases are a true threat which the enemy would have to destroy before launching an unlimited attack on the US.

RAND expert Albert J. Wohlstetter, in an article in *AIR FORCE Magazine* ("The Delicate Balance of Terror," February '59), depreciates the value of overseas bases. He points out correctly that it would be no major problem for the Soviets to compute a TOT (time over target) for simultaneous strikes at both continental and overseas bases.

Mr. Wohlstetter fails to mention, however, that time of flight would be considerably more, for example, from Vladivostok to San Francisco than from Vladivostok to Okinawa. Therefore, the missile dispatched to destroy San Francisco would have to depart some minutes earlier than the one destined to destroy Okinawa.

Now, assuming a warning station is at work on Okinawa or elsewhere in the general area, we would see the missile depart for San Francisco. And, assuming a technically feasible reaction time, we could launch an IRBM from Okinawa that could destroy Vladivostok before the Soviet missile reached San Francisco.

The destruction of Vladivostok would not save San Francisco. But it might save Okinawa provided Vladivostok also had the mission of destroying that island. And with Okinawa saved, many more IRBMs would be on their way to Communist targets.

Assume, now, that the Soviets decide to destroy Okinawa first in order to prevent the rapid retaliation we have hypothesized. The prior destruction of Okinawa then would presage an unlimited war. The United States could presumably, on the heels of the Okinawa aggression, launch its missiles ahead of the impending rain of Soviet missiles.

It might be reasoned that by varying the trajectory, enemy missiles could be launched simultaneously, and hit simultaneously, both on overseas and continental targets. This would mean that both San Francisco and Okinawa would most certainly be destroyed. But by varying the time of flight between Vladivostok and Okinawa to equal that between Vladivostok and San Francisco, the enemy has given the forces on Okinawa more time to react. Okinawa could conceivably dispatch missiles for Vladivostok before being destroyed, as could US-based forces, for that matter.

Since Okinawa is so much nearer to Vladivostok than is San Francisco, a missile from Okinawa directed at



1. If the Soviets launched an ICBM from Vladivostok toward San Francisco, early warning on Okinawa could enable us to launch an IRBM from that island base to destroy Vladivostok before the ICBM reached the US.

Vladivostok could, under these conditions, destroy Vladivostok before the Vladivostok missile had reached either San Francisco or Okinawa. So it would seem rather fruitless for the Vladivostok missiles to be launched in the first place, because the only sensible purpose in initiating an all-out surprise attack would have been to destroy our ability to retaliate.

Neither the TOT strategy of simultaneous destruction, nor the sequential tactics of hitting overseas targets first, seems to present a picture of successful surprise attack. But remove the overseas bases and we lay ourselves open to less warning and a poorer chance for instantaneous reaction.

To give up our advanced bases would be to reduce our deterrent probability, degrade our warning if the deterrent failed, and destroy a good portion of our strike-back capabilities.

Some have reasoned that advanced bases would be of value only should we take the initiative to strike first, and that thus our advanced bases were provocative and might work against our deterrent policy. This argument overlooks overseas bases' defensive value. It also posits that advanced bases could be destroyed before launching their weapons.

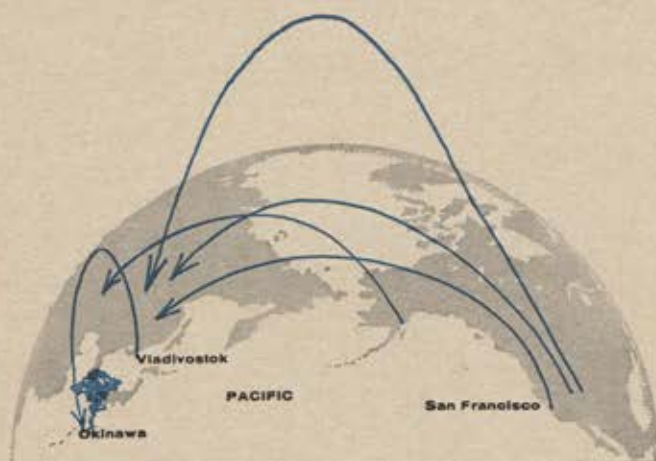
The implied conclusion is that we should pull back to hardened and dispersed continental bases. These would be more difficult to hit. Their dispersion would leave us with enough power after an aggressor's attack to hit back hard against him.

This is the philosophy of "fortress America," or military isolation in a new dress. But she's the same old deceptive girl. The ultimate results could be fatal to the free world—politically as well as militarily.

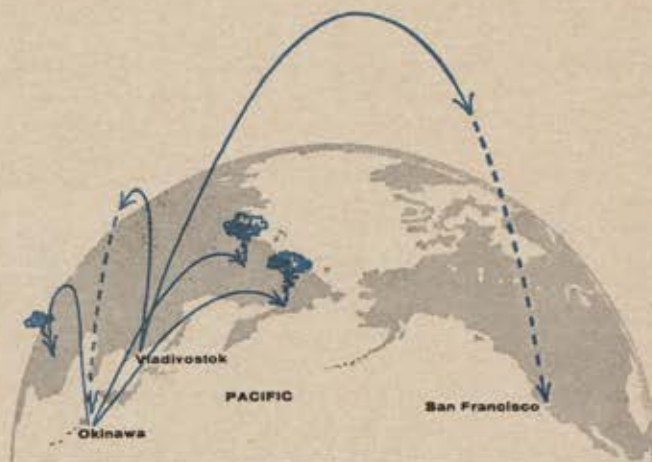
Our allies would most certainly believe we had forsaken them and had thrown them to the Communist wolves. Communism could then march inexorably across one small nation after another, until the United States stood alone against the world. Our alliances would wither and die. The United Nations, in these circumstances, could well become an instrument of communism. Could we stay free very long under such circumstances?

Let us examine the Far East situation as it might develop. How long could the Republic of China last without





2. If the Soviets decided to destroy Okinawa first in order to prevent rapid retaliation from that bastion, we could presumably launch our missiles from the US against Soviet targets ahead of the rain of USSR weapons.



3. If enemy missiles were launched with varying trajectories to enable them to hit Okinawa and San Francisco simultaneously, our island base would still have enough time to retaliate while the enemy missiles were en route.

our direct military support? Or the Republic of Korea? Or other free Asian countries one could name? Could Japan hold out or would it be subverted by a combination of force and fear?

No thinking statesman in free Asia wants us to strike our tents and go home. To do so would write the death sentence for many nations eager to remain free.

Okinawa is our military keystone in the Far East. On it are strong US bases equipped with modern aircraft ready to strike in any direction against aggression. Some day the Red Chinese may have nuclear missiles zeroed in on Okinawa. But if they should press the button to launch their missiles, time, as we have seen above, would be provided for US missiles to be launched in counter-attack.

The Far East supplies the most obvious examples of what might be expected if we pulled back our military strength. Results elsewhere, we may be sure, would be equally disadvantageous.

In essence, then:

- Overseas bases give us better electronic warning.
- To a would-be aggressor, our overseas bases present a threat that must be destroyed if an all-out war is launched against the free world.

If our overseas bases were destroyed first, our deep bases would be warned.

If overseas bases were attacked simultaneously with continental bases, launchings directed at overseas bases might follow launchings destined for the continent. In that case, the overseas bases would be warned and could destroy the enemy site before the short-range shot's blastoff. Some overseas bases would thus be certain to survive and retaliate.

Should the enemy vary trajectories so that both blastoff and strike times for all missiles were simultaneous, the advanced base would have more time to retaliate and might well destroy the enemy launching area before enemy missiles hit either overseas or continental targets. This would present a distinctly discouraging prospect to an enemy hoping to win a one-mission war.

- From the standpoint of cold war tactics, withdrawal from overseas bases would be tantamount to sur-

render. Our allies, as well as neutrals, would be pushed in the direction of the Communist camp. Many might ultimately be forced to succumb to Communist expansion. Only the US is strong enough to provide the central force in a global free world coalition. Disappearance of such a coalition would greatly weaken both America and the rest of the free world.

A word now on the Navy's submarine-launched Polaris missile and the Air Force's air-launched ballistic missile as they apply to the question of overseas bases. Both, first of all, are still developmental. Second, neither, when ready to go, would lessen the need for overseas bases. It is hoped that they will provide powerful augmentation to these bases, placing further weapons on the side of the free world.

But such weapons have their own peculiar vulnerabilities and limitations. They hardly affect the base situation.

Overseas bases are, in fact, a valuable and necessary feature of a grand design for free world survival. As long as they provide us with distinct tactical, political, and psychological advantages, it would be folly to entertain thoughts of abandoning them.—END



The author, Maj. Gen. Dale Smith, is currently serving on Okinawa, an overseas base assigned a prominent role in his argument above. He is Commander of the 313th Air Division of the Pacific Air Forces on the strategic island. General Smith has previously been Chief, US Military Training Mission, Saudi Arabia, and Chief of the Policy Division, Directorate of Plans, under

the Deputy Chief of Staff/Operations. A West Point graduate, General Smith flew thirty-one combat missions as a B-17 Group Commander in Europe during World War II. He has been both student and staff member at the War College. Several of his strategy papers have been widely read throughout the armed forces. General Smith is a native of Reno, Nev.



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# G.91—NATO LIGHTWEIGHT



New NATO tactical strike fighter, looking very much like a shrunk version of F-86, carries potent armament, takes off in about 1,000 feet on grass or macadam, is designed for low vulnerability and top performance in ground support.

**J**OE LOUIS once said of a prospective opponent with a penchant for evasive action, "He can run, but he can't hide."

Forces with the ability to run, hide, hit and run, and hide again have long been the apple of the military tactician's eye. In the case of the airplane, however, the innate mobility of the weapon, once airborne, has been increasingly compromised as the ground-support elements have sunk deeper and deeper into concrete. The need for ever longer and heavier runways for high-performance aircraft, together with complex and diversified support installations, has led to a point where one authority has said, "If this keeps up we'll have to pave the world and paint it green."

In this age of nuclear-tipped missiles the vulnerability of fixed-ground installations has increased astronomically, and the normal palliatives—concealment, dispersal, and hardening—are expensive and not wholly satisfactory. This is particularly true of tactical air units designed to work closely with ground troops.

Nowhere is this more strikingly demonstrated than in the shield forces of NATO, where the need for simple, easily maintained tactical strike aircraft quickly became apparent. Such an aircraft would have to be divorced from

dependence on the conventional fixed base and the concrete runway, able to operate from grass strips or sections of highway. It would have to be light in weight, with high performance at low altitudes, flexible as to mixes of armament for a variety of targets and missions. And it should be relatively low in cost.

There was nothing in the inventory of the NATO nations that came close to meeting this requirement. SHAPE started working on the problem some years ago, setting up an Advisory Committee for the NATO Lightweight Strike Fighter, under the aegis of Dr. Theodore von Kármán and his Advisory Group for Aeronautical Research and Development. The aim was to meet the NATO requirement out of NATO technical and production capabilities.

The result, after intensive competition, is the G.91 Lightweight Strike and Reconnaissance (LWSR) aircraft. Its airframe was designed and built by Fiat of Italy. It is powered by the British Bristol Orpheus engine, with a weight-to-thrust ratio of almost six pounds of thrust to one of weight. Components, instrumentation, and accessories represent contributions of several NATO nations.

The G.91 is a rugged little fellow, looking very much like a shrunk F-86. It is 34' 1" long, 13' 1" high, with a span of 28' 3". It can and does take off from and land on





Side view closeup of G.91 during a takeoff in operational field trials held in northeast Italy last summer.

grass or macadam in astonishingly short distances—about 1,000 feet on takeoffs, less than 500 feet on landings. Its maximum speed at 20,000 feet is Mach .91, and it nudges beyond the speed of sound in shallow dives. Stalling speed is 127 miles per hour.

The internal armament, four .50-caliber machine guns or two 20-mm. cannons, are quickly interchangeable, being prepackaged in ingenious panels which snap in and out of the fuselage in a matter of minutes. The G.91 comes apart like an Erector set, with interchangeable wing and tail assemblies.

The latter feature is an important one for operating from mobile air bases, since it is possible to cannibalize the plane quickly and thus minimize the amount of time lost through damage.

Unlike its heavier brothers in the fighter-bomber class, the G.91 is specifically designed for high performance at altitudes under 1,000 feet. It can withstand prolonged buffeting. It has a comparatively low degree of vulnerability to ground fire.

In short, the G.91 is well equipped to survive, on the ground and in the air, and to take out its assigned targets—enemy troops, artillery, armor, and missile installations—within the enemy division area, i.e., within about seventy miles or so of the front lines.

These attributes were vividly demonstrated during operational field trials in northeast Italy last summer, when a provisional squadron of the Italian Air Force, first NATO unit to be equipped with the Lightweight Strike and Reconnaissance fighter, went through its paces.

The "experts" had predicted that, based on experience and analysis, the best the squadron might expect to do,

with everything in its favor, was a maximum effort of 2.7 sorties per aircraft per day.

Instead, the two flights (four aircraft each) of the experimental squadron flew an average of nine sorties per aircraft on the maximum effort day. And this was accomplished in spite of the fact that the officer directing the trials, in a demonstration of field mobility, ordered the flights moved at midday. One moved thirty-five miles, the other eighteen miles across country, with all ground and air personnel and equipment, set up shop, and quickly were operating again. And there was still enough daylight for three more sorties by the time the programmed trials had finished.

The NATO dignitaries watching were impressed. A high-ranking West German Air Force officer called the G.91 "the most serviceable aircraft I have ever seen."

Enthusiasm for the G.91 concept is not unanimous, however. Some, particularly in USAF, see it as a step backward toward single-purpose aircraft, parceled out in penny packets for essentially a ground mission. On the other hand, the price is low, about \$300,000 as compared with upwards of \$1 million for a conventional modern fighter-bomber type. The price tag appeals to the smaller countries of NATO, with their limited defense budgets.

And backers of the G.91 concept see themselves as the main surviving force after a nuclear attack against Western Europe.

"We'll be operating after the big fixed bases have gone up in vapor," they say. They call the G.91 a truly World War III aircraft, meaning that the big fighter-bomber might not be around after the first sneak attack.

—JOHN F. LOOSBROCK

Lineup of G.91s on grass during tests. Planes, enthusiasm for which is not unanimous, have high front-line mobility.







General Arnold and General Marshall at US-British Cairo Conference in 1943. By "foresight and eager recognition of technological advance," Marshall helped create USAF.

# Marshall as an Architect

of

## Modern Airpower

**S**OMEHOW, in all of the tributes paid to George Catlett Marshall by soldiers and statesmen, there was no reference to the man as an architect of American airpower. This was probably because so few were aware of his role in shaping the Army Air Forces as an autonomous military force.

The great general was laid to rest in Arlington National Cemetery on a sunny autumn day while the nation was reminded that he once was called the "greatest living American," the "finest soldier," "true organizer of victory," and boss of "the best conducted war in American history."

All of these things are true, but General Marshall also was one of the greatest exponents of military airpower of our time. This part of the truth no doubt is clouded by the fact that he also was an infantryman and that in later years he succeeded where so many others have failed. He created a public image of himself that overwhelmed his military background. George Marshall was a man in a business suit, not a man in uniform. However, for the record, it must be entered that by his foresight and eager recognition of technological advance he, in effect, created the United States Air Force.

There is ample authority for this statement, not in documents or the fourteen-carbons rigmarole of military administration, but in the personal recollections of the men who worked with him in World War II. Every one of them points first to General Marshall's more or less illegitimate promotion of Gen. H. H. Arnold to a seat with the Joint Chiefs of Staff. This was because General Arnold headed the Army Air Forces, and it can be argued that USAF, in the embryo to be sure, was conceived when this chair was set aside for AAF's commander.

The setup, General Arnold wrote in his book, *Global Mission*, involved, "as some people still fail to understand, a practically autonomous American Air Force within the Army, but coequal with the total of the Army's ground forces, its commander serving as Deputy Chief of Staff of the Army, as well as sitting on both the Combined and Joint Staffs."

At another point, relating events of 1940, General Arnold recalls that the infant Allied air arsenal was im-

periled by a shortage of aluminum. His efforts to do something about this were brushed off with the charge that he was a pessimist, while German submarines continued to sink the ore at sea. Finally, he used a ruse to get General Marshall into an aircraft plant, where the machines were standing idle. The Chief of Staff, Arnold says, put in his own grim plea and "overnight, the attitude of the men in charge . . . changed."

At this time, there is no doubt, both the Navy and the ground forces had important needs, but the recollection of all who knew the inside story is that George Marshall granted his top priority to the tools of airpower.

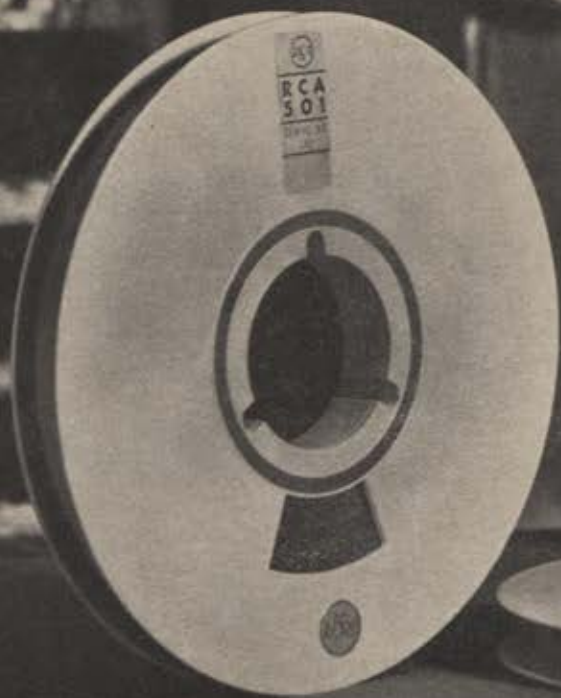
The man who has been compared favorably with another graduate of the Virginia Military Institute—Stonewall Jackson—undoubtedly made such decisions in a coldly intellectual fashion. He had no romantic attachment to flying as a way of life, as did early Air Corps leaders. Indeed, he was a bred-in-the-bone doughfoot, and his work on behalf of airpower must have risked the alienation of old and valued friends. It is also interesting to speculate where the Air Force might be today if President Roosevelt had not had the guts to override seniority and dip deep into his list of Army general officers for Marshall's nomination to Chief of Staff. A Chief the likes of, say, Hugh Drum, would have given the ebullient Arnold a cold reception in those days. And, without the delivery system which Arnold and his cohorts developed, the atomic bomb would have been an interesting mental exercise.

So the world can add to the long list of debts it owes to George Catlett Marshall. The tool he helped to forge not only was the decisive factor in winning the first truly global conflict but to date has successfully forestalled a repetition.

Much of the history he lived remains to be written, from his records and forty hours of recorded interviews now in the hands of the George C. Marshall Research Foundation at VMI. It was typical of the man, who scorned politics, that he would not permit publication of this material in his lifetime and that he never wrote his memoirs. When this fountain of knowledge is released, it may add a new chapter to the real history of airpower.

—CLAUDE WITZE





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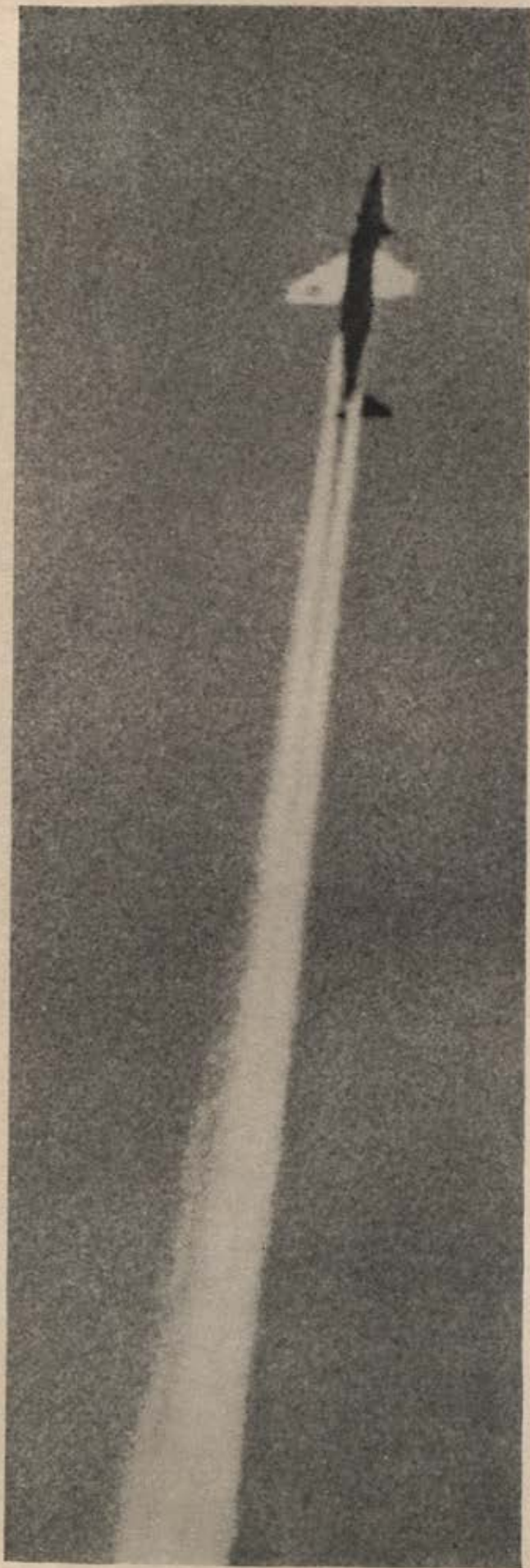
It "remembers" millions of letters, numbers, and symbols that are "read" onto its magnetic tapes by such things as punch cards and paper tapes. In a fraction of a second, it can do thousands of calculating, sorting, and comparing operations—and checks each step. Finally, it writes such things as bills, reports, payrolls in plain English at 72,000 characters per minute.

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The best way to foster understanding of the Air Force is to let people see for themselves what it's all about. That's what more than 100,000,000 people in all parts of the free world have done since 1947. These people now have first-hand knowledge of the role of air-power in national defense, after seeing the exhibits of the far-ranging USAF Orientation Group . . .

# HAVE SHOW . . . WILL TRAVEL

**Lt. Col. Carroll V. Glines, USAF**

**S**OMEWHERE in the world, at this moment, a unit of deadly Air Force weapons may be airborne en route to a peaceful rendezvous.

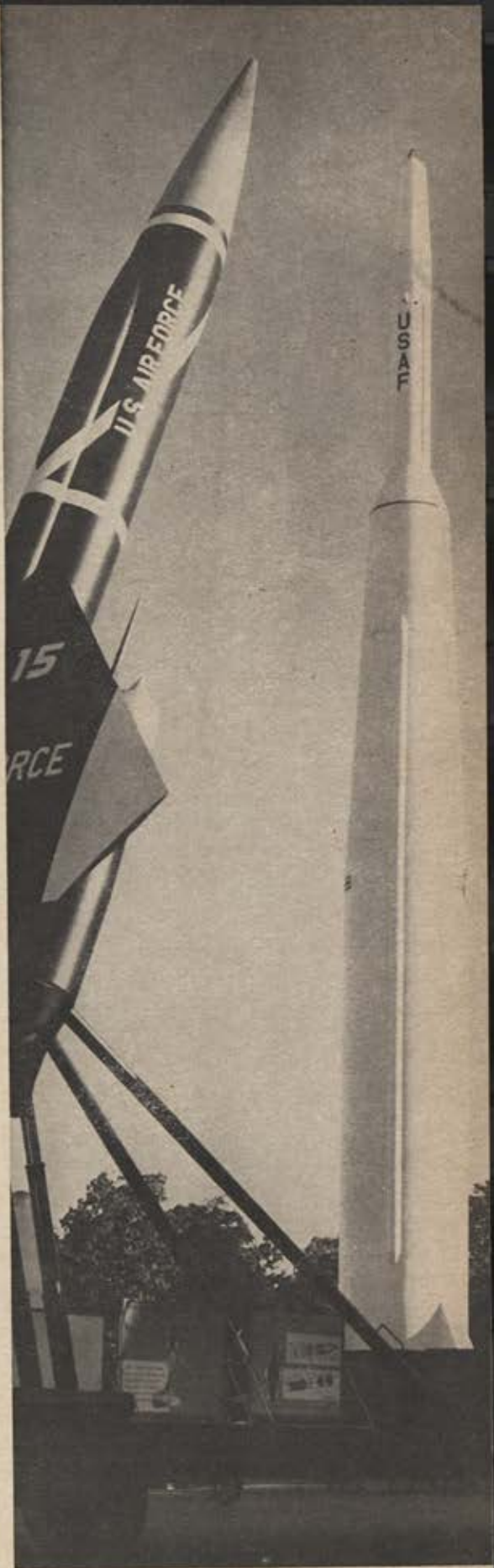
Impact of the weapons on target will bring no explosion, no destruction, no shouts of pain. In their place will be smiles, rapt attention, and perhaps a few gasps of astonishment.

This is the mission of the Air Force Orientation Group, which daily and throughout the year carts a small arsenal of USAF hardware across the country and the world. They introduce the Air Force far and near with what is undoubtedly the most unique linking of mobility and firepower in the history of military strength.

The concept behind the operation is simple. The best way to foster understanding of the Air Force is to let people see what it is and what it's all about. Perhaps in a democracy, or in an international alliance of democracies for that matter, this is no more than the public's due.

Every minute of every day finds members of the Orientation Group putting on a show of Air Force weapons, on the road traveling between Stateside shows, or winging their way to overseas points with their somewhat awe-inspiring displays.

Last year more than ten million persons saw the Group's shows at some  
(Continued on following page)



USAF Orientation Group outdoes itself for the annual Armed Forces Day and the AFA Conventions. Above, a lethal pair of missiles, Bomarc and Thor-Able in Washington last Armed Forces Day.



500 fairs, industrial conventions, international expositions, and similar public events. The Group presented a mammoth Air Force exhibit at this year's Air Force Association National Convention and Aerospace Panorama at Miami Beach, as it had at previous AFA Conventions.

The AFA Convention display, in fact, once again provided an example of what the Group can do. It included the first public showing of the Martin Titan intercontinental ballistic missile, a Mach 2 Republic F-105 Thunderchief fighter-bomber, a Martin Mace missile, a model of the North American X-15 aerospace test vehicle, and much more. The AFA Convention is one of the major regular events of the Group's annual calendar.

The Orientation Group is made up of eighteen officers and 236 airmen. Headed by Col. Reginald M. Cram, a soft-spoken, efficient gentleman from Vermont, it works directly under the Office of the Secretary of the Air Force. Group headquarters are at Wright-Patterson AFB, Ohio.

Group members range from artists to welders, from draftsmen to model-makers. All men assigned to the organization double in brass as drivers and displaymen. Each man is skilled in handling the huge tractors on the busiest highway, setting up and dismantling the exhibits, and explaining the Air Force mission to the public.

When a request is received asking that the Air Force put on a display, the request is carefully screened to make sure that there is no commercialization and that the display will be open to the general public. In any display the Air Force must be represented in a dignified manner because its purpose will be to afford a more complete understanding of the Air Force and the role of airpower in the security of the nation.

Other limitations on Air Force displays are the cost, the availability of the equipment to be shown, and the ability to match the displays to the occasion. Contrary to a common opinion, the shows requested by a county fair, for example, are not sent "for free." When a request is received and all other requirements are met, it is Colonel Cram's job to inform those requesting the show that it can go on but not at government expense.

"It is surprising how many requests are withdrawn when convention chairmen find that Uncle Sam can't foot the bill to provide an exhibit thousands of miles away," Colonel Cram said recently. "However, if we decide that it is in the best interests of the United

States, we'll send our men around the world regardless of the cost.

"For example, last year, when the Air Force shot for the moon with a small instrumented payload as a part of this country's contribution to the International Geophysical Year, we immediately laid plans to place exhibits in strategic places around the globe. We called it 'Project Pioneer,' and its purpose was to support the public relations program covering the lunar probes.

"When this directive was received," Colonel Cram continued, "we had just three weeks to design an exhibit, build it, fly it to the designated cities, and display the finished product. This was no easy task when you consider that we had to build ten exhibits and had to have them in place in such cities as Cologne, Germany; Tokyo, Japan; Santiago, Chile; and Tunisia."

This request is typical of the kind the Group receives in the course of a year. The pattern from original request to final display is the same although each exhibit is different. In the case of the lunar probe, a project officer was designated and flown to the Air Force Ballistic Missile Division at Inglewood, Calif., for a briefing on the probe vehicle.

The discussions he had with BMD officials resulted in two decisions. First, a one-to-twenty scale model of the Thor-Able missile, used in the moon shots, was placed in the exhibit. Second, a full-scale plastic payload was integrated into the exhibit.

Hours later, the project officer was briefing Colonel Cram and his staff back at Wright-Patterson. Present were the artists, designers, model-makers, carpenters, writers, and displaymen who would work around the clock to meet the deadline.

After being briefed on the purpose of the program, the artists went to their drawing boards and came up with colorful sketches depicting their concept of what the display should look like. It was then the designers' job to translate these artists' drawings into blueprints. Once this was done, blueprints and work orders were sent to the metal, wood, printing, paint, and machine shops.

Meanwhile, once the general shape, size, and number of exhibits were known, the operations staff laid its plans. They decided on the routes and modes of travel, the number of officers and men needed to set up, maintain, and explain the display, the types of brochures and press kits to be used, and the time schedule to be followed.

The result of all this? When the



Artist's drawing is the first step in making a new display. Here two Orientation Group staff artists talk over a proposed exhibit for Armed Forces Day.



Draftsmen, in uniform and out, work over artists' approved drawings in next step. Draftsmen's work goes then to a host of skilled craftsmen.

Two master electricians of the Orientation Group wire the rear of a complicated display. Group includes virtually every skill area in the Air Force.





Air Force announced that the launching had been at least a partial success, the Group's teams were in place and the public viewed the exhibits shortly after the firing was announced. At the same time, the Group's Thor in its Pioneer lunar-probe configuration, was standing in front of the Smithsonian Institution in Washington.

"We think that any of our exhibits must do four things," Capt. Perry E. Hudson, Jr., the unit's information services officer, explained recently. "First, it must entertain. We do this by audience participation such as pushing buttons, moving levers, sitting in or on the actual hardware or an accurate facsimile.

"Second, they must interest a spectator sufficiently to cause him to stop and take a closer look, read the copy, see and remember what he sees by pleasant association. This we achieve by animation, form, color, texture, lighting, and sound, or a combination of these things.

"Then, we must inform our audience—not just adults but high school and grammar school kids as well. We've got to make the most complicated theory seem simple and logical and the most technical device interesting and clear. But even if some of the viewers don't fully comprehend what they see, we think the Air Force profits by having them gain a healthy respect for what our scientists and researchers are doing.

"And, last but not least," Captain Hudson said, "we think our exhibits must inspire those who see them. If we meet our first three requirements, the chances are good that spectators will leave our exhibits feeling that the Air Force is doing its job and doing it well."

When the show arrives at its destination, the drivers and their buddies riding "shotgun" spring into action unloading and setting up their exhibits. On opening day, the men change into their Class A uniforms to act as display guides.

As soon as the event is over, the men change back into their fatigues, tear down, pack, and load the exhibits. Then they either return with them to Wright-Patterson or drive on to another scheduled display.

When they get back home, each man returns to his respective job—whether it be spray painting, pounding a typewriter, making airplane models, or running a lathe in the machine shop—getting another show ready for the road.

The displaymen find that a knowledge of foreign languages comes in

handy. When the Pioneer lunar-probe exhibits were flown to overseas sites, Lt. Lawrence C. Waterman, who majored in Spanish in college, was selected as project officer for the Chilean exhibit. T/Sgt. M. H. Dewees, who speaks French, was sent to Tunis. A/IC Wolfram Stadler, who is a German-born airman, went along to Bonn. Maj. Richard F. Hum, who went to Japan, has a working knowledge of Japanese. Other members of the unit speak Italian, Portuguese, Greek, and various other languages.

The Group has six kinds of displays regularly ready to roll:

- The full-scale outdoor exhibit. These might include the Atlas, Thor, or Bomarc missiles, the zero-launch F-84, the F-104, or other major weapon systems. Such an exhibit is complete with appropriate posters and recorded voices explaining the purpose and details of each weapon.

- The traveling, self-contained exhibits. These come in either modified standard Air Force vans or specially built trailers of the walk-through variety. These are especially useful for telling about the new Air Force Academy or explaining the sonic booms which have received so much public attention in the past couple of years. Six new "expandable" vans are being constructed, which will be push-button, hydraulically operated with their own heating, air-conditioning, and power supply. Their sides will open out and provide more "message" space. Four of these vans will remain with the Wright-Patterson unit while the other two will be delivered to the detachment stationed at Norton AFB, Calif. Floats for parades would also fall into this category.

- The "custom-design" exhibit. An example of this was a graphic-aid exhibit sent to Paris in 1955 for Gen. Curtis LeMay to use in a Strategic Air Command presentation to North Atlantic Treaty Organization chiefs.

- The "general-purpose modular." These are adaptable to almost any theme, and are a unique arrangement of "slip-fit" modules that adjust to any height, depth, and length. Pre-built sections can be converted into any number of separate or connected exhibits with minor modification in a matter of minutes.

- Window displays. Using an unusual folding drape arrangement, displays to fit any size of store window can be made in a short time.

- The "major-event display." These are the well rounded, twice-a-year displays annually made ready for

(Continued on following page)



Two more skilled members of the Group put finishing touches on a model of the B-58 Hustler supersonic bomber. Model is a perfect one in every detail.



Overseas showing. Plastic model of X-15 aerospace test vehicle arrives in MATS C-124 at Le Bourget Field, Paris, for the latest Paris Air Show.

Group Commander, Col. Reginald Cram, escorts France's President Charles deGaulle through the USAF exhibit at Paris show, last summer.







Somewhat offbeat highlight for children at shows often has been this radio-controlled model, which zips about display area under push-button control of USAF airman.



Static displays of actual Air Force aircraft play major part in exhibits. This is a model of Cessna T-37 jet trainer hooked to power cart for purposes of demonstration.

Armed Forces Day and the AFA Convention.

For Armed Forces Day this year, the Group featured the X-15 as the central theme along with full-scale models of the latest aircraft and missiles. In June this same display was sent to Paris for the 23d International Air Show at Le Bourget Field, with all posters and handout material translated into French. Then the exhibit was flown back to Detroit for the International Freedom Festival in July.

After the AFA Convention at Miami Beach, the entire USAF exhibit was shipped to another national show.

Colonel Cram says he could "write a book" of anecdotes on the Group's road trips. "Take the time a couple of our men were driving their flat bed through Florida," he said. "On the trailer was the huge X-17 space test vehicle en route to Jacksonville for display. There were no covers on the missile so anyone could tell what it was.

"The men stopped for lunch at a roadside restaurant, pulling the trailer off the road. Motorists driving by would stop and look it over. One motorist, however, was suspicious. As far as he was concerned, all missiles should be at Cape Canaveral and not on a trailer headed in the opposite direction. He pulled in up the road and called the State Police and FBI, reporting that two suspicious-looking characters were stealing a giant missile.

"Police cars, sirens screaming, converged on the restaurant from all directions, and the two surprised drivers were surrounded by more lawmen than they had seen in a week on the road. But they were up to the situation. They identified themselves, told

the gathering crowd about the Orientation Group, and invited everyone to take a good look at the missile their tax dollars had bought. Acting as displaymen then they went into their 'pitch' and for two hours the hapless police directed traffic."

The Orientation Group dates to the end of World War II. Gen. Henry H. "Hap" Arnold in 1945 conceived the idea of having a small group of men who would be specialists in the fine art of putting on "road shows" in the public interest.

Today his brainchild is an impressive organization. Its supply account lists nearly \$10 million worth of trucks, machines, office equipment, and supplies. The inventory of displays includes most of the modern Air Force missiles and aircraft as well as theme exhibits. The largest items on display are the Thor and Titan. The smallest is a white mouse used in a photosynthesis display showing how man will stay alive in his space travels by breathing air made by plants which thrive on his exhaled carbon dioxide.

In order to maintain an up-to-date inventory, the exhibits must be constantly changed. At the moment, old aircraft models such as the F-84 and XF-92 are being replaced by the supersonic T-38, F-102, and F-104. As the new missiles come into the active inventory, they are added while the old and less spectacular ones are scrapped.



The author, Lt. Col. Carroll V. Glines, is Chief, Plans and Analysis Branch, Quality Control, Headquarters, AMC, Wright-Patterson AFB, Ohio. A prolific part-time author, Colonel Glines has previously contributed "Wanted, Old Planes" (March '59) and "Billion Dollar Boneyard" (August '59) to AIR FORCE/SPACE DIGEST. His latest book, on the C-47, is reviewed in this month's issue (page 115).



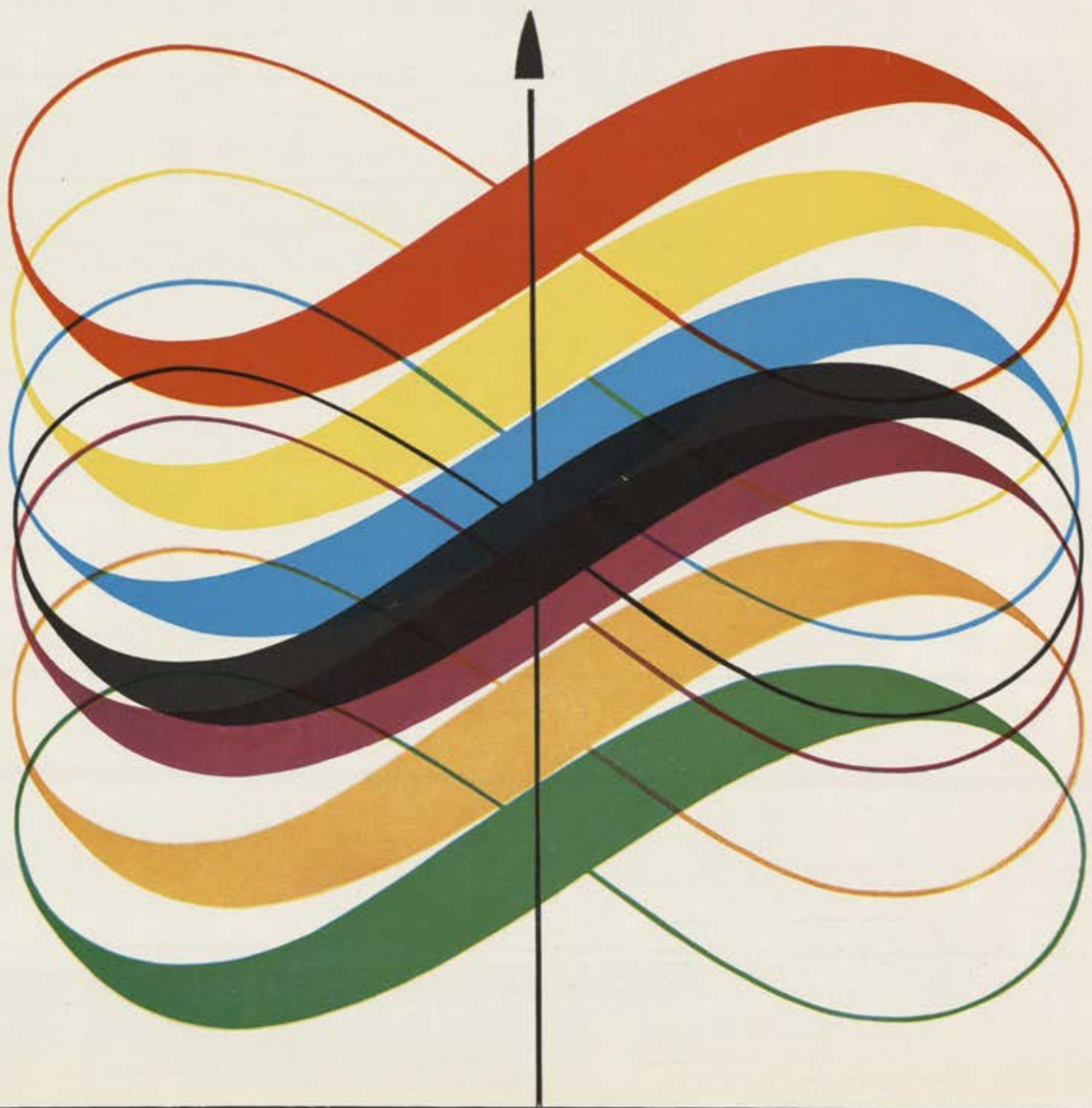
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# SPACE



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# SPACE DIGEST

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### *From the Editors...*

OF THE fact that space technology is serious business there can be little doubt, and on these pages, since the inception of SPACE DIGEST, we have tried to make that point. But it is refreshing to note that, despite the seriousness of the technological war, humor has not died.

There is a growing store of jokes on missile mishaps, most of which a visitor to Cape Canaveral can hear repeated over and over again. And there is the refreshing approach of writers like M. J. Arlen, whose "After Progress, What?" we reprint with relish from a recent issue of the *New Yorker Magazine*, a journal that for more than twenty-five years has urbanely delighted American readers, yet once gave over its entire editorial space to the famous John Hersey account of the bombing of Hiroshima.

In this issue of SPACE DIGEST we think you will find other—straight—material especially stimulating. British researcher John Allen writes of new roles for aircraft in the space age; Walter Sullivan of the *New York Times* reports on how we check Soviet space claims; there is a survey of the federal investment in research on college campuses and at research centers; the dangers of Soviet psychological warfare are discussed; also George Arthur gives an engineer's view of man in space; and we have a report on Russian efforts at machine translation.

There are people who still ask: Why all this concern about space? But we doubt if there are many questioners among SPACE DIGEST readers. Space, and the explosion of ideas it is generating, are here to stay.



THE REDS COULD ROUT US IN SPACE-AGE COLD WAR WITH . . .

## *The Newest Weapon: Astro-Psychological Warfare*

WILLIAM LEAVITT  
Associate Editor

**N**OVEMBER 7, the forty-second anniversary of the October Revolution that marked the Communist assumption of power in Russia, came and went, happily without any grand new public demonstrations of astronautical prowess by the Soviets.

But they can rest on their laurels for more than a little while. Their achievement with Lunik III in rounding the moon and relaying a recognizable photo of the far side (*see cut*), aside from its obvious demonstration of thrust and guidance capability, shatters the rationale of any further claims by our side that our instrumentation, in quality and miniaturization, is superior to theirs. The instrumentation on both sides is probably about equal in quality, but the basic point stands that the best of instrumentation needs available and reliable thrust to take it where it will do its designed job.

The Russian moon picture was crude, and the chances are good that by the time a US rocket does the same job, it will send back something a lot clearer (one group of space scientists at the National Aeronautics and Space Administration's Jet Propulsion Laboratory is working on a photo-relay technique which they say will give an image not unlike the sort of picture you get on your home television set). But much time will have passed before that happens, and the Russians may well be trying to fish a man or men out of orbit by then or reporting to an excited world on the progress of a manned trip to the moon. In fact, with the enormous head start they already have, the Soviets can do with words what they have already done with rockets, and manage to keep Western observers chewing their fingernails. Astro-psychological warfare, you might call it.

Not too long ago, a fragmentary report of what was described as a Soviet program to orbit two men around the earth before the year is out, then launch a manned round trip to the moon, was published in the Dusseldorf, West Germany, *Der Mittag*. *Der Mittag's* story was picked up in the

US and featured widely in the press here. The article also reported that by next March or April the Reds would send two men and two women for a six-month orbit around the moon and would try to pick them up with an unmanned Lunik late in 1960. The source of the *Mittag* story is supposed to have been a famous duo of Soviet space scientists, Anatoly A. Blagonravov and Evgeny K. Federov.

What makes the authenticity of the story sus-

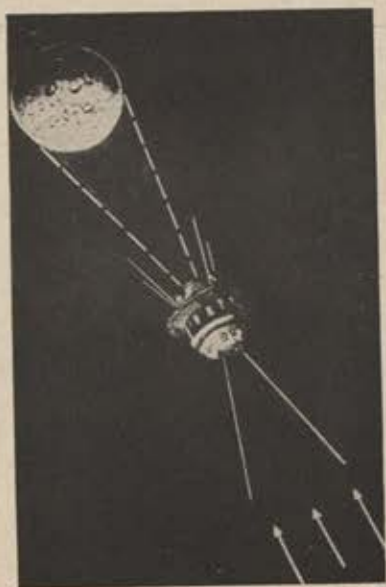


*New USAF two-man space cabin simulator now installed in the recently dedicated Air Force Aerospace Medical Center. The new facility is located at Brooks AFB, San Antonio, Texas.*





Sorfoto



Sorfoto

*Left, first look at the far side of the moon, courtesy of the Russians. Photo was relayed by Lunik III, the October-launched "automatic interplanetary station." At right, Soviet depiction of the position of Lunik's position when pictures were taken. Arrows show the rays of the sun.*

pect is the reported Blagonravov-Federov candor in saying that the chances of survival of the space-crews are slight. With their backlog of space successes, it seems unlikely that the Russians would make such a strong point of the human risks involved in spaceflight. A reading of the original *Der Mittag* story gives no indication of exactly where the original Blagonravov-Federov paper was presented or in what Soviet journal it might have appeared. And more recently one well known columnist reported that the Russians had fired a man to an altitude of 240 miles and recovered him, but that the astronaut had become insane. The report also asserted that Russia would fire its Lunik IV carrying a thousand-pound instrument payload to land on the moon before the year was out.

Whether the stories are true or not, their prominence further underscores the present Soviet power to press its propaganda advantage and create the impression that the Russians are indeed hell-bent for the planets and have the people and propulsion to do it. In short, that they do have a well thought-out space program.

We don't have such a program, despite the assurances of the national leadership that (1) we needn't worry about the military potential of space and (2) it's really a civilian job that can be handled almost totally by the National Aeronautics and Space Administration. Neither of these assertions is true. So long as the cold war continues, at whatever temperature, we can be quite sure that, if it suits their purposes, the

Soviets will not hesitate to exploit space militarily.

Some months ago, Dr. Walter Dornberger, who headed the German V-2 operation in World War II, delivered a blunt and frightening speech in Washington in which he suggested that the Russians, to enforce a Pax Sovietica, might launch a string of bomb-carrying satellites into orbit as a total-destruction threat to the rest of the world. One might add that it really wouldn't matter whether the bombs could pinpoint targets or if the payloads were even real bombs. They could be cream puffs and save the Russians money, because the announcement from Radio Moscow to the world that the Soviet "space patrol" was in orbit would suffice to paralyze most of the world.

Nikita Khrushchev is an old man in a hurry. As French President Charles de Gaulle remarked recently, the Russians know that they have not sold their system to the peoples whose countries they occupy, and they know that their Red Chinese partner is on the move, too. Their big sell must be delivered fast and tough. Their own people must be convinced that if they go along with their leadership they will individually get the best of everything as becomes the citizenry of the world's leading power-to-be, and the rest of the world must be scared into submission.

The suggestion that NASA can do the job alone is equally difficult to justify. NASA is committed to perform peaceful scientific space experiments, yet must continue to lean on the military for the military's acknowledged capability in both hardware and human factors. NASA cannot, unless





*Missile platform in the sky, USAF style. Boeing B-47 carrying Martin-built air-launched ballistic missile (ALBM) on test flight prior to blast of the ALBM into the path of the Explorer VI vehicle.*

we want to lay ourselves open to charges of hypocrisy, evolve into a US space force, as has been suggested by some segments of the press, since it would then be a quasi-military organization—and the President (see *"Airpower in the News,"* page 16) would be defeating his own apparent purpose in stressing US peaceful intent. Further, except for the small core of legislators who are truly disturbed by the continuing national complacency concerning space, Congress does not really seem willing to pay the full tab for an all-out NASA program.

Add to that an item like the transfer of the Army Ballistic Missile Agency to NASA—just about a year after NASA first made its bid for the Von Braun group—and you get a feeling of the indecision in the Executive branch. A year ago, NASA wanted ABMA and probably had plans worked out for its absorption and a decision on the fate of the once highly touted Saturn million-pound-thrust engine cluster. But a year later, as one NASA official has now put it privately, "It's like marrying a girl and discovering that she's three months along and that she's got a widowed mother who desperately needs an expensive operation."

At this late date, about the only item decided by the transfer of ABMA was that the Army was to get out of the space business and that Dr. Von Braun was to be silenced by submerging him in the growing NASA organization. In political circles, the German-born rocket engineer has his enthusiasts and his detractors, but no one can blame him for his frustrations.

The President remarked recently that he did not regard space as a race between us and the

Russians. In the sense that we can't try to match everything the Russians do or will do, he may be right, since they have the head start. But in the larger sense, it is difficult to understand how he can make such a bland assertion.

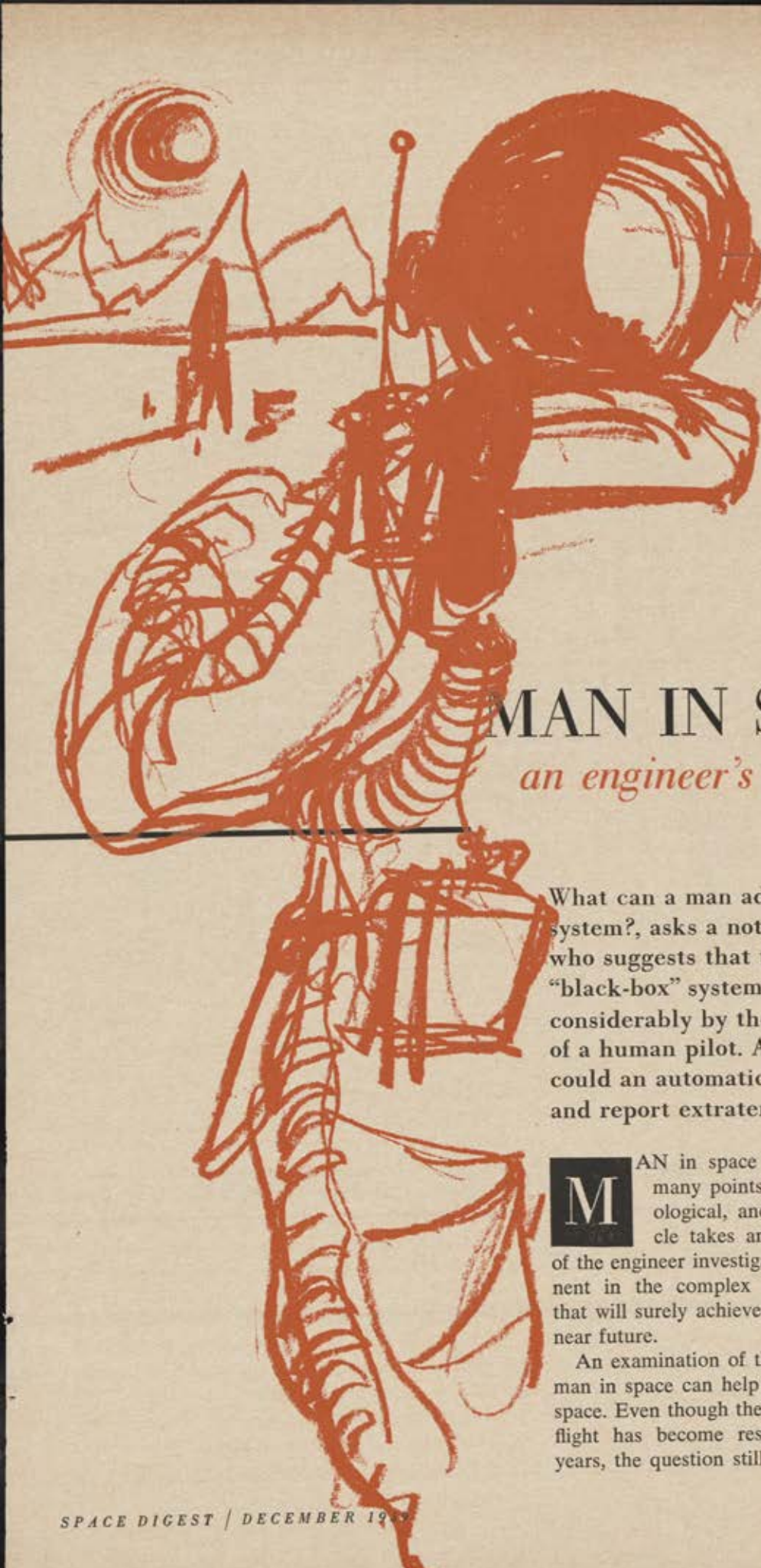
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All is not unreason, though. Last month saw action on the long-studied Dyna-Soar program, the plan for a skip-glide rocket-boosted suborbital craft that would be the prelude to a true orbital patrol bomber system, a true space weapon capability. The Air Force announced that it was letting contracts to Boeing for the vehicle and Martin for the booster, probably using the 300,000-pound-thrust Titan. The Air Force itself will be the "prime contractor" in the sense that the Weapon System Project Office of Air Research and Development Command's Wright Air Development Division will be making the system integration decisions and the selections of subcontractors. Ballistic Missile Division will handle adaptation of boosters, while AMC's Ballistic Missiles Center will provide logistical support in propulsion system procurement. USAF prime contractorship is similar to procedures used with Minuteman.

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In San Antonio, Tex., last month, aeromedical pioneers and dignitaries including Senate Majority Leader Lyndon B. Johnson; Maj. Gen. Oliver K. Neiss, Air Force Surgeon General; Col. Paul A. Campbell, Chief, USAF Division of Space Medicine; and Dr. Hubertus Strughold, "Father of Space Medicine" attended the dedication of the new \$9 million Aerospace Medical Center, geared to research in medical problems of flight. Maj. Gen. Otis O. Benson, Jr., commands the facility.—END





GEORGE R. ARTHUR

Reprinted from October 1959  
*Automatic Control Magazine*

# WHY MAN IN SPACE?

*an engineer's view*

What can a man add to an automatic system?, asks a noted engineer, who suggests that the reliability of "black-box" systems can be enhanced considerably by the fine adjustments of a human pilot. And he asks too, could an automatic system recognize and report extraterrestrial life?

**M**AN in space has been discussed from many points of view—political, physiological, and psychological. This article takes another point of view, that of the engineer investigating the man as a component in the complex automatic control system that will surely achieve manned spaceflight in the near future.

An examination of the engineering elements of man in space can help decide the *why* of man in space. Even though the concept of manned spaceflight has become respectable in the past few years, the question still arises as to why we want





to put the man into space and eventually land him on the moon and the planets. One school of thought says man is obsolete, a luxury. Automatic systems can do better. Another states man must make all the pioneering flights. These, of course, are extremes. It is hoped that as the reader reviews this article he will see a middle course, the marriage of the man and machine.

To answer the question, why is man needed at all, reasons can be classified as: emotional; political and/or military; and technical.

The first is obvious. Man will go into space because it is there. This is the same reason people climb mountains, explore caves, or sail to uncharted islands. It was partly this idea that drove Columbus to the New World and impelled Charles Lindbergh to fly the Atlantic. The explorers in the old days never needed reasons; they just went off when they got enough money, although one must admit that the profit motive certainly precipitated some exploration. If you think about the problems of exploration it may be seen that the barriers that faced the explorers of the fifteenth and sixteenth centuries are really still with us. In history the main deterrents to exploration of new parts of the world in most cases were propulsion, guidance, and environment. These problems were just as severe then, relative to the state of the art, as they are now. We have now reached an age in which it appears that propulsion for near space is solved. Environment now looms as a major threat.

Consider the second reason, political and/or military. Here we must face reality. Whether we like it or not, the United States is in a race with the Soviet Union. We cannot afford to lose this by default. Our reputation and our political strength in the world are directly dependent on our achievements in scientific enterprises and especially in astronautics.

The farther into space we go or the more elaborate a system we desire, the more severe the requirements become, and the more difficult it is to realize the equipment physically. But there is available a most valuable component, *man*. Man is both versatile and reliable. In the right job—and this should be emphasized—a man can perform as well or better than many automatic devices and can usually do it more reliably.

What is meant by "more reliably"? Various terms have been defined by the engineering community to represent reliability. It's usually expressed as the breakdown frequency or some mean time to failure of a particular device, equipment, or system. It is well known that the frequency of



breakdown is a function, among other things, of the number of parts in the system and its environment. Each part has a probability of failure, and when the parts work together we get an over-all probability of failure. It is one of the most obvious facts of our present-day technology that reliability is one of the primary requirements of space systems.

Complexity means a lack of reliability. The military has been struggling with this problem for years. Missiles, communications equipment, radar, etc., are useless unless some life can be expected of them. By the same token a guidance system which operates outside of tolerance five out of six times isn't much good. We are still a long way from solving these problems. Therefore, two of the major technical reasons for utilizing the man as part of our space vehicle are reliability and versatility.

How can man help reliability? Assume for the moment the problem of survival is solved. How we actually stand on this is covered later. Trace a space mission after liftoff. For a satellite this may include: cutoff; coast to injection; orbit injection; attitude changes; observations and communications; orbit changes; and recovery.

It is well known that velocity and other parameters are critical for proper injection into orbit or flight to another body such as the moon. The man in the automatic control [system] can be an aid in orbital injection by making fine adjustments which might alleviate accuracy requirements and permit a simpler system. If a certain cutoff velocity were needed on a mission for a lunar impact rather than for earth orbit, the man can supply this final adjustment. The man also adds the additional flexibility in that he may be in the [system] or not as the need arises. In addition, the man is an asset in the other phases listed. By utilizing him for attitude changes, a less complex [system] may be needed. Man plus a visual display could accomplish this.

In communications, although automatic frequency shifting and gain control are common, the man can well be in the [system] or act as a monitor to shift frequency when appropriate, to supply gain adjustments, to select proper information, and the like. This definitely could increase the reliability of getting data back. Man is vastly superior also in making certain observations which we must have in these future systems.

Man is an aid when [alternate automatic sequences are] used. In automatic systems, complex detection schemes are usually needed to determine when to utilize alternate modes. Although



possible, this is still a space and weight addition. With a number of alternate modes and a simple check sequence it can be accomplished more easily with a human operator. (This approach, in fact, has already been achieved successfully in a number of complex bombing systems in use today.) Man can improve reliability since it may be possible for him not only to achieve inflight test but also inflight repair. This approach would permit us to live with the finite mean life figures of electronic and other equipment.

When it comes to versatility, it appears man offers a tremendous advantage.

Man is probably the most compact computer and the most adaptable device we have today. He has a tremendous storage capacity, that is, ability to store information, and, in the language of the computer expert, he requires a minimum of programming. He is capable of changing his mind, and his mind is a good filter. Automatic systems will not be able to filter the tremendous amounts of redundant data given to them in space systems. The man, on the other hand, may do this. This then could lead to a more efficient communication system from the standpoint of useful data.

Man also possesses greater perception powers for marginal situations, and it is possible, and many times necessary, for him to make unrehearsed decisions on the spot. As a result of these attributes he offers us great promise for getting the most out of space exploration.

If you were to list the capability of the man as a computer and then tell an engineer that you





could offer him this computer for about 180 lbs., 5' 8" in length, he would be happy to get such equipment.

The consensus in the field is that we are generally defeating the problem of survival in space. In fact, it is felt we will be able to defeat this problem quicker than that of making intricate complex devices to replace the man and survive over long periods of time just from a breakdown point of view. If this were not the case, of course, it would be foolish to consider the man. However, there is general optimism about our ability to create the proper environment.

In this regard, there has grown up in past years a tremendous science of space medicine, the study of life processes in space and the basic biosciences which study the effects of space on living organisms and the possible existence of extraterrestrial life. Here's another instance where man will certainly serve us well. It seems a little difficult to achieve a machine which would recognize life on other planets.

Now just how do we feel about this problem of survival? We are confident, for example, that man can survive the expected G forces. A large amount of information exists on this. If you consider weightlessness, that's another problem entirely. We have been able to achieve short-term weightless flights, but until we actually get man in isolation where we can subject him to weightlessness in some kind of space laboratory for a long time period, all that can be done is extrapolation. At present the result of this extrapolation is that man can adapt to this condition.

In our Project Mercury program we expect to make a great number of test flights before we actually shoot a man into space. We will be using smaller boosters such as Redstone to shoot up monkeys and possibly chimpanzees, and we will run a number of suborbital flights before we actually put man in orbit. (The recent shot with the monkeys Able and Baker is an example of this type of test program.) So safety is a big factor on which a lot of money, time, and effort is being spent. The Project Mercury program features a very elaborate escape mechanism which allows the man, if there is an abort on the pad, to eject the nose capsule well clear of the missile and settle down to earth by parachute.

Much of the present planning is based on our propulsion capability, and this is what is meant when we say that for the time being the propulsion problem has been solved. That is, we do have the thrust necessary for satellites, lunar shots, and even Martian trips. (This, of course, is for small payloads. Programs in process such as Centaur, Vega, and Nova will increase our capability here.) We still are, and actually will forever be, groping with the problem of reliability and marriage of the man-machine. Much of our effort now should go into this survival and instrumentation problem, and it is our ability to make lightweight instrumentation to allow the man to survive in a closed ecological system that is very necessary if we are ever going to achieve manned spaceflight of more than a few days' duration.

The important thing is to include the man as the valuable building block he is. This problem about environment is not without answers. It is certainly true that many of our systems today are adapted to suit man as he is now. However, there is no reason to disbelieve that we may be able to develop in the future a race which will be better adapted to the environments of space than at present. This, of course, is a long-term projection. The idea of some evolutionary change due to the environment of space has long fascinated science-fiction writers. Now it is a subject of study by astro-biologists. The next millennium could see its beginning. After all, air and land were just as foreign to the creatures that crawled out of the sea millions of years ago and evolved into other animals, as space is to man today. The move into space is merely a logical continuation or logical manifestation of what is still an evolutionary part of the process of life. As a shorter-term projection it seems certain man will be on the moon before the next century.

In this breathtaking period of discovery, black boxes, machines, and computers can only fill in recognized gaps of knowledge. Only man can discern new problems and find ways to study them. To fulfill his destiny and evolution man himself must go into the new world of space.—END



*George R. Arthur, current President of the American Astronautical Society, is manager of design engineering, Airborne Systems Department, RCA Defense Electronic Products. This article is condensed from Automatic Control Magazine, October 1959 and is reprinted with permission.*



*Federally sponsored research at nonprofit institutions... colleges, universities, and research centers provide the government with*

## R & D BACKUP

**B**ACK in 1940, when World War II was a distant inferno and space travel a science-fiction dream, federal support of scientific research and development at nonprofit institutions—colleges, universities, and the then much smaller number of research centers—amounted to less than \$20 million annually.

Most of that money, which seems truly piddling in these days when a single but terribly complicated aircraft or missile can cost millions, was devoted to small-scale agricultural research at state experimental stations operating with federal funds on the campuses of state universities, plus some very limited public health studies at educational institutions. The bulk of federally financed research and development was performed in the government's own laboratories, standbys such as the Bureau of Standards or the National Advisory Committee for Aeronautics, now grown into the National Aeronautics and Space Administration, the present budget of which alone dwarfs the entire federal research and development outlay in the last uneasy year before America entered World War II.

The war changed that pastoral picture irrevocably. Pressed with the urgent need for rapid technological advance, the federal government tapped the academic world for teams of specialists, particularly in the physical sciences. Intensive work, with no financial holds barred, led to perfection of such military (and now civilian) tools as workable radar, and of course the great breakthrough in nuclear physics which cut short the war and ushered in a new age. The government and the academics joined in a great new partnership which was to become the postwar and post-Sputnik pattern.

Today, for fiscal 1959, some \$800 million is obligated by the federal government for research

and development at nonprofit institutions, colleges, universities, and what, in federal parlance, are called research centers—the bands of specialists at sites across the country involved with projects ranging from cosmic radiation to the nature of the balance of power in the world two decades from now.

That \$800 million, the latest estimated fiscal '59 obligation figure available from the National Science Foundation, is nearly one-third of the total sum of more than \$7 billion listed in the 1959 federal budget as earmarked for research and development expenditure. The \$7 billion figure is based on a new broadened federal definition of research and development, designed to match industrial methods of totaling scientific budgets. Of course, not all of the \$800 million is going for the research and development projects per se; one of the problems of listing research and development expenditures is accurately gauging how much is being spent on the projects themselves and how much for increased plumbing or improved sidewalks, clerical assistance, and the like. And there is the additional problem of listing scientific expenditures for hardware such as a new bevatron or radio telescope facility, which are carried as part of separate "capital equipment" budgets in most federal agencies. Also, it is important to note that the cited \$800 million figure includes recently heavily augmented funds for the Health, Education, and Welfare Department for medical research.

But it is probable that, under the pressures of the technological war, the now vast complex of federally sponsored projects at colleges, universities, and research centers will, if anything, increase in size. In some quarters, there are expressed fears that too great a load of federal projects will lead to a loss of independence in university research operations (see "Putting a Solid Founda-



tion Under the 'Ivory Tower,'" by Lawrence H. O'Neill, *SPACE DIGEST*, April '59). This view is based on fears that fluctuations in federal funding can lead to considerable uncertainty at researching institutions, and that often the mission of the sponsoring federal agency, military or civilian, presses too hard on researchers, if the university view of the project is that of *basic* research and the sponsoring agency's view of the project is in terms of some sort of hardware payoff.

The military is particularly aware of this reticence among university research people. Through the three principal basic research contracting agencies in the Department of Defense—the Air Force's Office of Scientific Research, the Navy's Office of Naval Research, and the Army's Office of Ordnance Research—DoD has attempted to give maximum freedom to basic researchers in the very broad areas of the physical, and biological sciences, and to fund projects for up to three years to assure continuity. Thus, a university or foundation researcher may well be working with military money on a project involving the brain mechanism of insects, with only the remotest chance of a developmental payoff—truly an effort to add to the pool of knowledge. The people running the military basic research contracting agencies wish there were more money for purely basic studies.

In the years since 1940, three specific kinds of government-sponsored research and development programs at nonprofit institutions have developed.

- *Basic research projects at universities and research centers, where the investigator is financed to perform studies of their own choice—non-directed basic research.*

In this category fall many of the programs of the three agencies described above, all of the grant programs of the National Science Foundation, the cost-sharing programs of the Atomic Energy Commission, some of the grant programs of the Department of Agriculture, some projects of the National Aeronautics and Space Administration and the Advanced Research Projects Agency, and programs of the medical services of the three military services.

- *Programs of applied research whereby government departments contract with universities for studies geared to specific systems related to their missions. These programs would include exploratory research specifically related to the mission of the agencies.*

Examples would include the contract programs of the Air Research and Development Command, full cost programs of the AEC, applied research

programs of ONR, NASA, ARPA, and many others. The main effort in this sort of "directed" research and development is to find the answers to the problems involved in specific projects, and the government's method is to hire the services of a college laboratory or staff or a research center as it would contract for the services of industry.

Of course, there are cross-overs. In some cases, the basic knowledge to make a project feasible is so "far out" that the research involved is barely indistinguishable from nondirected exploratory research.

- *Research and development at government-owned, university-managed laboratories, some of which are so complex that they are managed by groups of universities.*

These centers, such as Massachusetts Institute of Technology's Lincoln Laboratory or the University of California's Los Alamos Scientific Laboratory and Cal Tech's Jet Propulsion Laboratory, are virtually independent operations geared to broad problems such as air defense, atomic energy, or space technology. They have their principal relationship with a specific government agency. They offer the dual advantage of allowing the government to buy academic skills without too badly disrupting the traditional teaching functions of the universities proper and saving the government the need for establishing new laboratories of its own, where talent is already available.

Add to these the proliferation of research institutes and foundations across the country, some of which split themselves into profit-making and nonprofit divisions—the "brain factories" such as Stanford Research Institute, Southwest Research Institute, and many others, which will take on practically *any* problem of a fundamental or applied nature on a contract basis.

How much of this latest grand total of \$800 million can be classed as part of the national space effort? There's no real way of knowing. Even if you added all of the expenditures for contracts having a conceivable application in space technology, you would still have no real picture since it is impossible to know, particularly in basic research, what is going to emerge in the way of usable knowledge. And even an expensive development program can lead to failure.

But it is fair to say that research and development is big federal business and an indispensable contributor to the varied complex that adds up to the US space effort.

—WILLIAM LEAVITT



# AERODYNAMICS

## *at the*

# FRINGE OF SPACE

.....

As forecast by the X-15 and its successor project, the Dyna-Soar orbital skip-glide craft, the airplane—in space-age form—is expected to play an increasingly important role in astronautics as the manned “ferry” between the earth and vehicles launched into orbit . . .

JOHN E. ALLEN

*Condensed with permission,  
courtesy The New Scientist,  
London, September 3, 1959*

**A**ERONAUTICS never rests—no sooner does one class of vehicle become developed than new tasks demand different solutions. Because of this there have always been technical tussles—balloon vs. airplane, biplane vs. monoplane, metal or fabric, pilot or automatic, landplane or seaplane. It is this continual struggle for survival in design that creates the fascination for the researcher, demands ingenuity of the designers, and incidentally makes astronautics so expensive.

At present the stage is being set for another design contest arising out of the attainment of satellite and escape speed made possible by the long-range ballistic rocket. Prior to this the airplane had triumphed in a series of battles by ousting the balloon and the airship and cleverly circumventing the speed limitation imposed by the propeller with the introduction of the jet engine. Winged airplanes are already capable of flying three times faster than sound, with range, height, and weight increasing steadily year by year. Even as long ago as 1933 a project had

been envisaged for a rocket-driven airplane to fly nonstop halfway round the world.

Who could ask for more? The airplane was clearly always to remain supreme in the skies. But the need for very long range introduced the high-thrust chemical rocket, and this—by extending the performance of the rifle bullet—has entered the lists to challenge the winged vehicle. Ballistic rockets form ideal boosters for artificial satellites, lunar probes, and instrumented explorations of the planets, most of which—like the nuclear warhead—do not have to return gently to earth. There are also signs that ballistic rocketry could be used to transport troops in emergency into battle areas from distant and safe territory. But to do so some way of making a safe landing must be found.

Attention is now being given to this problem of bringing payloads safely down through the atmosphere at the termination of flights through outer space, and in this task—which includes that of returning men to earth—it appears that the airplane is going to reassert itself as a contender



to purely ballistic devices. In this context "airplane" is defined as a vehicle with some forms of lifting surface capable of changing the direction of its flight path by changes in aerodynamic forces.

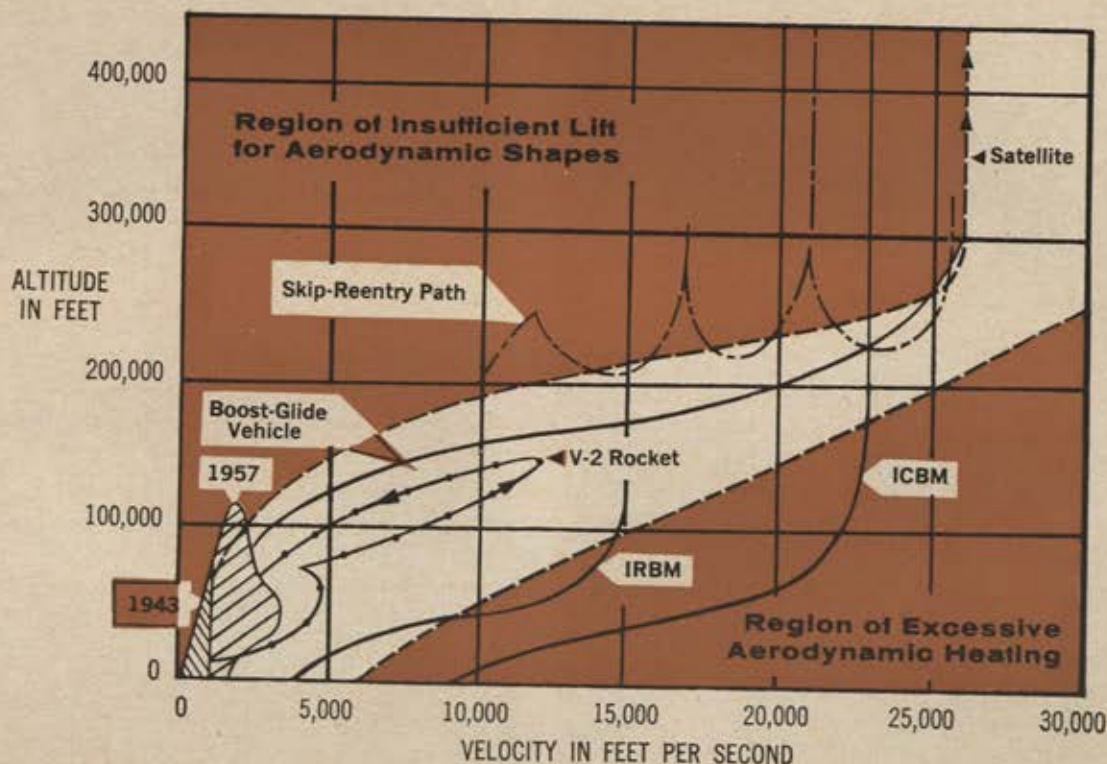
In fully atmospheric flight the airplane uses the air in three ways—for lift on its wings, for propulsion, and for the maintenance of life of its occupants. As air-breathing engines have developed so has the flight speed, and this has helped the airplane to fly higher. The accompanying chart shows this and also the flight paths used by ballistic rockets, satellites, and other reentering vehicles. On this chart the area occupied by the airplane (up to the present) seems trivial compared to that opened up by ballistic rockets. The shaded areas are regimes prohibited to the airplane in steady flight, and the white "corridor" indicates the scope of possible future developments. These boundaries are not hard and fast—for the upper one could be raised by more efficient lifting surfaces and lower structural weight, and the lower reduced by materials of higher strength at elevated temperature.

The air at rest at the higher altitudes in the flight corridor is a very different gas from that near the surface. At 300,000 feet the density is reduced to a millionth of the sea level value. In

order to fly here at all, the speed of any vehicle must be many times that of sound and the whole design of wings, bodies, and tails changed. A feature of the airflow past bodies moving at speeds greater than sound is the compressibility shock waves, which create heat, part of which is transferred to the airplane's skin. It is now customary to refer to flight exceeding five times that of sound up to satellite speed, which is about 26,000 ft./sec., as "hypersonic."

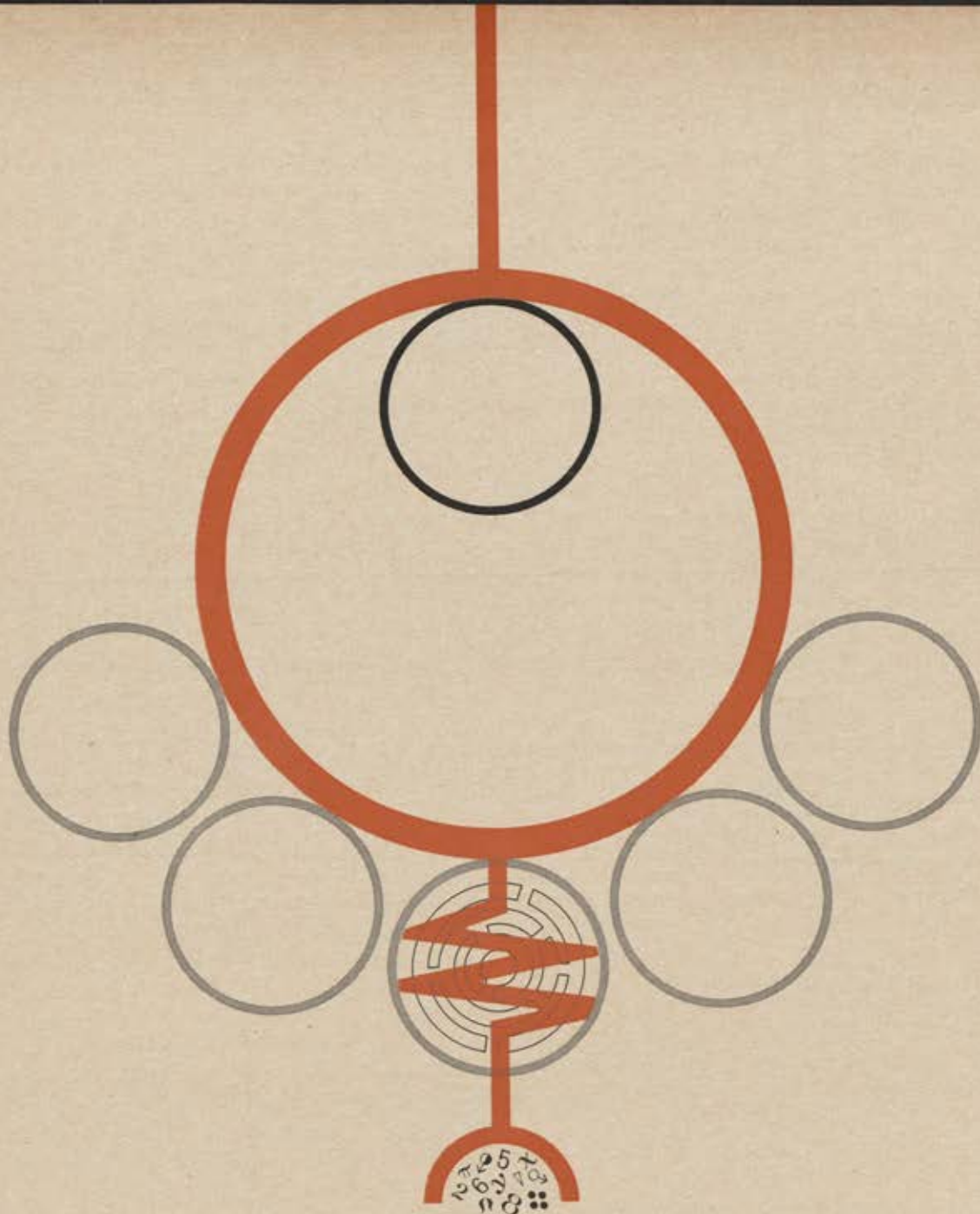
At hypersonic speeds the temperature rise across the shock waves ahead of a body is very high—several thousands of degrees centigrade—and effects in the gas such as dissociation, ionization, and electronic excitation occur. Aerochemical effects are also significant, such as the creation of nitric oxide by the combination of nitrogen and oxygen, which considerably influences the transfer of heat to the body. Because of these essentially hypersonic phenomena a great deal of fundamental research must be undertaken to assist the design of vehicles to fly under these conditions. This requires new experimental facilities, such as the electric arc-driven "hot-shot" wind tunnel to represent the very high stagnation temperatures, and many man-years of careful theoretical work.

Theoretical and experimental work in hyper-



**The Flight Corridor in Earth's Atmosphere**





## COMPUTATION — PRIMED FOR THE TEAM PROGRAM

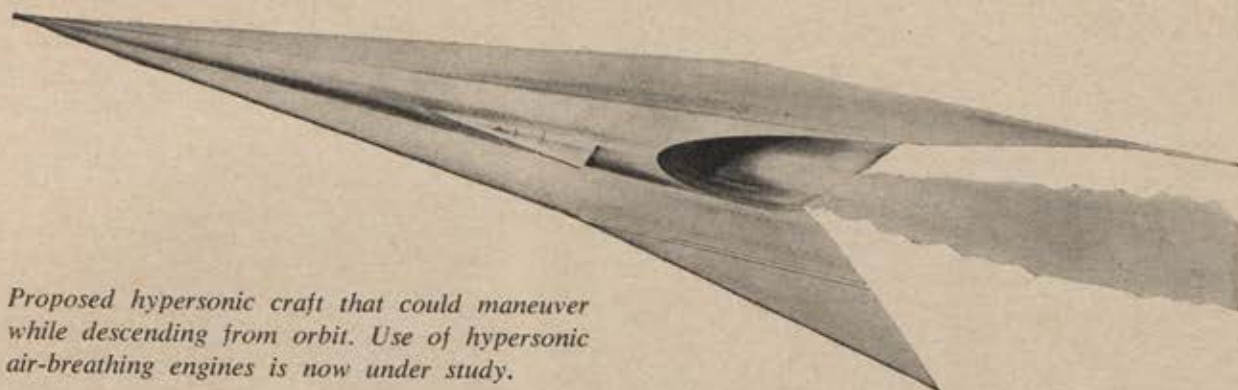
BURROUGHS CORPORATION IS UNIQUELY PREPARED TO CAPTAIN OR CREW THE CONTRACT TEAM PROGRAM. ITS MAJOR CONCERNS ARE COMPUTATION—AND COOPERATION. THE FORMER RANGING FROM BASIC RESEARCH AND SYSTEMS ENGINEERING THROUGH PRODUCTION TO FIELD SERVICE; THE LATTER DEMONSTRATED BY EFFECTIVE INTERFACING RELATIONSHIPS AND INTER-TEAM COMMUNICATION. WITH THE BENEFIT OF BOTH, THE TEAM APPROACH TO ANY SPACE AGE PROBLEM IS SMOOTHER, STRONGER, AND ABOVE ALL, SUCCESSFUL.



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*Proposed hypersonic craft that could maneuver while descending from orbit. Use of hypersonic air-breathing engines is now under study.*

sonics has been under way in the United States for some years, and much knowledge and test plant which has been acquired for the ballistic missile program will be of direct benefit to the hypersonic airplane. A great deal of new ground must be broken, however, into the behavior of those features which are peculiar to the winged shape, such as control and stability with lift and maneuverability. Free flight experiments are playing an important part in this research.

American space research directed to recovering man from satellite orbit is proceeding along two lines: One is the ballistic capsule of Project Mercury, using heat shield and parachute; the second is the X-15 manned airplane. Intermediate blunt shapes capable of developing lift and turning are also in progress.

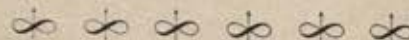
The outcome is that spaceflight reentry developments are proceeding with some urgency toward hypersonic vehicles having many of the properties of the airplane. The development of the airplane for atmospheric flight between points on the earth's surface suggests the possibility of speed increasing to the hypersonic regions.

It is one thing to establish the design of a hypersonic vehicle capable of maneuvering during its descent from a satellite orbit. This vehicle is a glider and to be a true airplane, propulsion to maintain speed and height should be available. How, then, should a hypersonic airplane be propelled? The case for the rocket-propelled, very-long-range airplane has been made by many researchers in the United States, and their "Dyna-Soar" hypersonic boost-glide vehicle is an outcome of this work. The possibility of hypersonic air-breathing engines has only recently entered into technical discussions, but fundamental re-

search and combustion experiments give hope that this may greatly alter the situation for the hypersonic airplane. The attraction is, of course, the much greater specific impulse of the air breather (approximately 2,000 pounds per second per pound of fuel) compared to the chemical rocket (approximately 250 to 300 pounds per second per pound of fuel), which has to carry its own oxygen. These are early days to speak of ramjet-propelled hypersonic airplanes, but combining the design trends suggested by elementary fundamental research leads to an airplane having these characteristics.

The wings would be of sharp arrow shape with rounded leading edges with tip control surfaces. The body would be an underslung half-cone and the ramjet would burn fuel externally aft of a re-entrant rear section near the wing root.

The purpose of such theoretical projects is that they evaluate the relative contributions to efficiency from the separate elements, such as lift, drag, structure, weight, engine weight, and propulsive efficiency. These calculations then indicate directions research should take, and provided they are frequently revised in the light of more certain data assist the designer in knowing when he can with reasonable confidence proceed with detailed design. This scheme seems in recent months to have passed from the impossible state to that of being just feasible and should be watched for the future.—END



*Mr. Allen, a member of the council of the British Interplanetary Society, is head of Aerodynamics in the Projects and Assessment Department, Guided Weapons Research Division, of A. V. Roe.*



## SEASONED IN THE SERVICE



William Wheeler, vice president in charge of Motorola's Military Electronics Division discusses participation role in the B-70 project being developed for the Strategic Air Command at North American.

"North American's pre-award analysis and evaluation, before awarding the contract for the Mission and Traffic Control System of the B-70 Valkyrie to Motorola, was one of the most thorough and extensive ever made."— North American Aviation, Inc.

*On the next two pages: Motorola's Seasoned Military Service Record.*



*Since before World War II, Motorola has demonstrated its exceptional ability in military electronics on assignments that include communications equipment...radar...missile guidance...data processing and display...antisubmarine warfare...demonstrating with each success the value of a technical task force that is...*



Roy Olson, general manager of Motorola's Chicago Military Electronics Center, which emphasizes work in surface and sub-surface electronic equipments and systems.

## Seasoned in the service

Few weapon systems now under development are expected to play as important a role in U.S. defense in the coming decade as the B-70 Valkyrie. This fantastic new weapon will cruise at more than 2000 m.p.h. at altitudes over 70,000 feet.

Motorola's long record of military electronic achievements led to its appointment as major systems manager to develop and build the B-70's vital Mission and Traffic Control System.

This major system encompasses the communications, navigation, identification (IFF), and landing aids. It will keep B-70 crews in constant contact with each other and with U.S. headquarters from anywhere on the globe. It will provide the Valkyrie with its capability to be electronically directed to a designated target anywhere in the world and be immediately recalled on command.

High-level responsibilities such as this are not new to Motorola. It was in June of 1940 that the prototypes of the history-making Motorola walkie-talkie were delivered to the U.S. Army Signal Corps. During World War II, Motorola not only supplied vast quantities of equipment that kept advancing U.S. ground troops in constant communications, but was also chosen by the Signal Corps to direct and manage the supply of the entire U.S. Army's need for electronic crystals. These critical frequency-determining

components were vital to radio communications.

In the late forties and early fifties it was weapon fuses, radar bombsights and tactical microwave communications. Today, in company-owned research and production centers across the country, thousands of Motorola engineers and scientists are at work on a broad range of military projects. Included are missile guidance, high-resolution radar, sonobuoys, the next generation of equipment for radio-telephone communications between ground troops, and advancement of the frontier of knowledge in solid-state electronics.

Motorola's exclusive concentration in electronics, its cost-conscious approach to producibility, and its preoccupation with reliability are evident in every military product from the smallest solid-state device to the most complex weapon systems. Small wonder that with the military, Motorola rates one of the highest confidence quotients among suppliers of electronics equipment. For in the development and production of military electronics, it has been proved time after time, *there is no substitute for seasoned experience.*

For a comprehensive brochure on Motorola's Military Electronics capabilities, write Technical Data Service, Motorola, Inc., Military Electronics Division, 8201 East McDowell Road, Scottsdale, Arizona.



Hundreds of thousands of Motorola walkie-talkies were produced for World War II combat use.



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Joe Chambers, Motorola vice president and general manager of the Western Military Electronics Center, directs Phoenix laboratories concerned primarily with work on sophisticated airborne and spaceborne electronics.



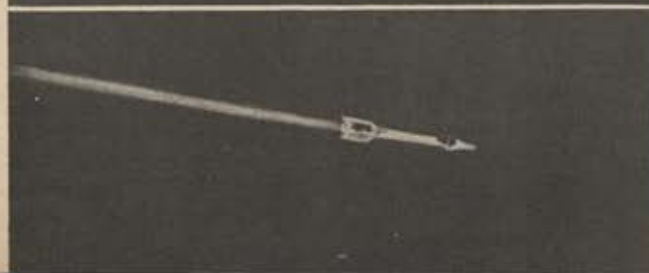
John Byrne heads highly classified advanced study and developmental work on a wide variety of military contracts at Motorola's Systems Research Laboratory, Riverside, California.



Development of passive seeker by Motorola, Riverside, is under contract to the Signal Corps for use with U.S. Army drones capable of performing night, day, and all-weather surveillance.



Motorola's surging capabilities in the solid state electronics art is achieving new dimensions in complexity, performance and reliability for new electronic concepts.



Inspection, the eyes of quality control, helps convert experience into reliability at Motorola.

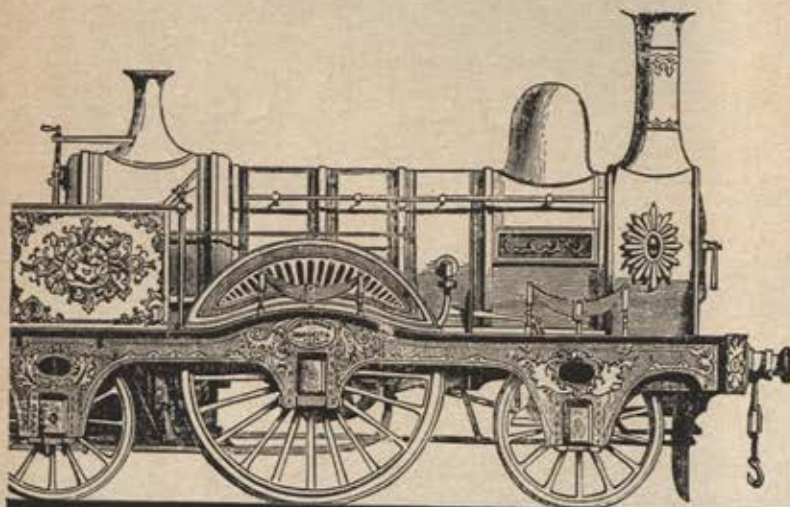


AN/SSQ-23 Sonobuoys for the anti-submarine warfare program in volume production at Motorola Chicago.

Motorola is making significant design contributions to advanced guidance head for Sidewinder air-to-air missile which is under fabrication at Phoenix laboratories.



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*Quietly, the Russians are working on an automation technique, which, if practicable, could revolutionize the world's information systems and possibly lead to a vast new era in technology. An idea that has fascinated many Western scientists too is a reliable system of ...*



## MACHINE TRANSLATIONS

SONYA MACHELSON

**I**MPORTANT work in the field of mechanical translation has been done in the USSR. The scope of the work and the number of institutions and scientists participating in the study of and experimentation with mechanical translation has grown tremendously.

Here are some highlights of the development of Soviet research on mechanical translation.

**LANGUAGES:** In 1955, translations were made from English and French into Russian. At the present time, translations are being made from more than twenty languages among which are Hungarian, Chinese, Japanese, Indonesian, Burmese, Hindi, etc.

**SCOPE:** In 1955, a special text in mathematics was translated from English into Russian. At present, the scope of translated subject matter has grown to include articles on physics, chemistry,





biology, nuclear energy, electronics, and even political discourses.

**INSTITUTIONS:** In 1955, only two institutes were active in research on machine translation: the Institute of Precision Mechanics and Computer Engineering under the direction of D. Yu. Panov and the Steklov Institute of Mathematics, under the direction of A. A. Lyapunov. Both groups consisted of no more than twelve scientists. Now, seventy-nine institutions are engaged in research on machine translation, among them twenty-one institutes of the Academy of Sciences, USSR, eight institutes of the Academies of Sciences of the Soviet republics, eleven universities, and ten other schools of higher learning. Dr. Panov's group consists of approximately 500 mathematicians, linguists, and clerical personnel.

An Experimental Laboratory for Machine Translation, the first of its kind in the world, has been established at Leningrad University. Eighteen working groups have been organized for translating from Russian, English, German, French, Chinese, Czech, Vietnamese, Spanish, Norwegian, Arabic, Hindi, Indonesian, Japanese, Burmese, Turkish, and Guarani (Paraguay's official language).

A Department of Mathematical Linguistics, the first of its kind in the world, where students receive training in mathematics and linguistics, was established at Leningrad University. The first collection of papers from the Experimental Laboratory for Machine Translation was published in 1958.

An Association for Machine Translation Problems has been functioning since 1956 and has issued three bulletins.

Soviet scientists insist that all current research on machine translation should be regarded only as the initial stage of a more extensive program of using electronic machines as tools of human thinking, to make the machines capable of performing various operations with texts written in different languages, to enable them not only to translate, but also to edit, make abstracts, furnish bibliographical and other references. Important research on developing small-size machine translators has been conducted in the USSR. It is expected that in 1960-1961 these machines will serve as translators in many scientific institutes.

Research work is also being done on an interesting project—to use a machine for translating the sound of a spoken language. The machine would be placed among persons speaking different languages. The machine would be set to operate, and the individuals present would be able to conduct a conversation in their own language. However, all this belongs to the future.

As for the present, there are some scientists in the USSR as well as in the US who still do not believe that machine translation without post-editing is feasible. For instance, Alexander Mikhaylov, the Director of the Institute of Scientific Information in Moscow, strongly believes that a machine cannot replace the human mind, and the machine is only as good as the dictionary supplied to it by the human scientist. It seems to me that the only difference between a translating machine and a human translator who knows the target language well and has only a fair knowledge of the source language is his ability to think. And this is not always an advantage!

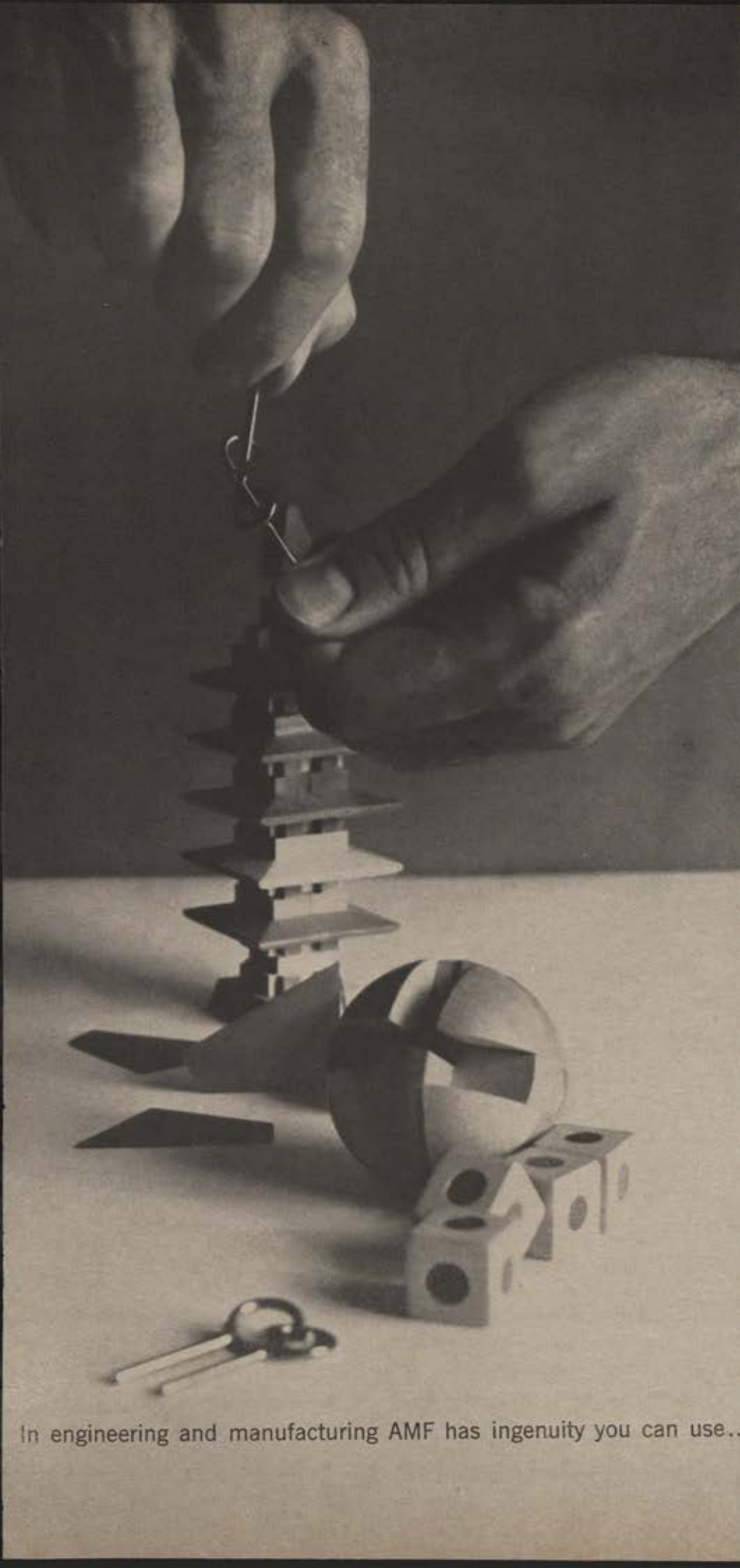
Let me illustrate this with an example. A human translator had to translate the title: *pervobytnaya zhenshchina* which means "primitive woman." Since translators are always under pressure to produce quantity, he didn't take time to look up the word *pervobytnaya*. He knew that *pervaya* means *first*, *zhenshchina* means *woman*. As an American he used the familiar expression "first lady" instead of "primitive woman." The machine, I believe, could not have made such a mistake. Let's take another example: *produktiya kletok*. *Kletka* means *cell* or *cage*. The article was in a journal of medicine and dealt with "propagation of cells." The translator did not waste any time looking up the source, and his translation read: "manufacture of cages." I am not sure how the machine would have translated the title.

If the Soviet scientists (or anyone else) do succeed in inventing all these wonderful machines, our information system could be revolutionized, and we would be propelled into a new era of science and technology.—END



*A chemical engineer and graduate of the University of Latvia, Miss Machelson, in the US since 1939, specializes in Soviet technical information documentation. She is now a senior research analyst at the Library of Congress. The material above is condensed from a report presented to the American Chemical Society.*





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Three generations of ARMA computers:  
THE SECOND GENERATION

A stylized line drawing of a hand holding a small cube. The hand is rendered with simple outlines and some shading. The cube is a small 3D object. Several circles of different patterns (solid black, stippled, and cross-hatched) are scattered around the hand and the cube.

**FOUND:**  
an intellect  
that can think  
anywhere

The systems of tomorrow will require digital computers that can think *anywhere*—intellects that will remain superior in any environment.

ARMA—already producing computers for its inertial guidance system in the ATLAS ICBM—has accepted the challenge and developed a lightweight, second-generation digital computer applicable to *all* types of navigation. It can be used in space, atmospheric, surface, subsurface and

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This all-solid state computer, with *no moving parts* and using silicon semiconductors exclusively, has a memory that is non-volatile and has non-destructive readout. And this computer has 40 per cent fewer parts than ARMA's first-generation production model, which has a test performance unequalled by any other digital computer.

An even more sophisticated third-generation computer, surpassing the reliability of the first two with still less weight, will be produced in the future by ARMA. The reliability of all three generations will be assured by thorough testing in ARMA's environmental facilities—the most complete in the industry.

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# After Progress, What?

(A few notes on rockets, missiles, satellites, space, and so forth, jotted down after reading one too many articles on the subjects)

M. J. ARLEN



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**T**HE LARGEST rocket made so far in the United States is the new five-stage Wozzek. The Wozzek is ninety-five feet tall, weighs 94,500 pounds, and is constructed entirely out of heat-resistant planum. Built at a cost of \$15 million, the Wozzek is designed to be fired from a standing position. After firing, thrust from the first three stages will accelerate the rocket to a speed of roughly 15,000 feet per second. When the rocket reaches an altitude of 450 miles, the first three stages will fall off and drop into downtown Tacoma, Wash. Power for the Wozzek is supplied by twenty-three pounds of Gebirium, a sticky gelatinous fuel that delivers upward of 35,000 eisenstaedts per cubic foot—enough power to drive three cruisers of the *Comstock* class from Newport to the Bay of Fundy, via the Cape Cod Canal.

When completed, the Wozzek will contain 230,000 movable parts and is expected to attain a range of 23,000 miles (equivalent to five times the distance between South Bend and Moscow, nine times the distance between Montreal and Dakar, or twice the total trackage of the New York Central system, not counting the West Shore Branch). In flight, the Wozzek will be guided by the new Zeitz Directional Computer. Based on an invention by Hector Zeitz and manufactured under patent by General Transistor (a division of the National Luncheon Meat Company), the ZDC combines basic principles of light-wave refraction, astrodynamic parallax, and long division to keep the rocket on a straight line between the star Sirius and the Hayden Planetarium. The Wozzek also contains two short-wave radio transmitters, encased in pink vinyl plastic, and if the rocket should start traveling upside down, this information would be relayed instantly to the ground.

Air Force authorities consider that a rocket of the Wozzek configuration could conceivably be used for launching man into space. To date, fifteen rockets of the Wozzek configuration have been built and fired. Unfortunately, owing to failures in the Gebirium release indicator, the linear monowave transmission, the steering mechanism, and the rudder and clutch, and the apparent total breakdown of the Zeitz Directional Com-



puter, each of these rockets either failed to leave the pad or was destroyed in midair. Air Force spokesmen have pointed out that the IJ-4G triggering device, which makes it possible to destroy a rocket immediately after launching, is the only device of its kind in the non-Communist world.

Scientists, doctors, and dietitians have declared, however, that before an actual attempt is made to launch man into space, they would "like to know more about" several problems that have not yet been answered to their satisfaction. Foremost among these problems is that of weightlessness, so called from the tendency of travelers in space to lose weight, look peaked, catch colds, and suffer from nosebleeds and stuffed-up ears, all in direct proportion to the duration of the spaceflight. Almost as challenging are difficulties posed by reentry (the Passport Division of the State Department is preparing a definitive statement on this matter) and by food intake.

Stated briefly, the central problem of food intake (or "eating") has been to find a way for the space traveler to intake (or "eat") food during a seven-month space journey without removing his pressurized helmet. To solve this obstacle, two beefed-up special programs are now under way—a \$300 million crash project at Oswego Field, where the Air Force has been investigating the possibilities of shrinking ordinary ham sandwiches down to tablet size, and the Navy's \$1.5 billion crash program, Project Astrolunch, in which thirty-two recent honors graduates of the Naval Academy have been subsisting since February 1958 entirely on brewer's yeast and frozen pineapple-grapefruit juice squirted into their ears.

At present, plans for putting man into space call for the following sequence of events: (1) Launching of the giant experimental piloted missile "Herbert Hoover." The fastest missile of its kind ever built, the Herbert Hoover contains 250 pounds of special electronic equipment, and will be fired, at 22,000 miles per hour, 3,000 miles out into the South Atlantic. It is expected to be caught before striking the water, somewhere between fifty-five and 520 miles northwest of Saint Helena, in a huge fish net towed by fifteen planes of the Air Force's 17th Missile Retrieval Squadron. (2) Launching of the Wozzek rocket containing two dogs. (3) Launching of the Wozzek Major rocket containing two dogs and one large rabbit. (4) Launching of the Zeus, the United States' first manned satellite, containing two dogs, one large rabbit, and one veterinarian.

United States space advisers consider that when all pertinent information has been received from

the Zeus and other sources, manned flight to the moon and to other planets will be feasible. At the moment, some of this country's most daring pilots are undergoing rigorous tests to determine which one of them will be chosen to ride the first United States rocketship to the moon. These tests, which are being conducted jointly by the Department of Defense and Time-Life, Inc., include celestial navigation, syntax, gym, and elements of narrative prose.

Last week, in a signed article in *Life*, Milton Berlinger, thirty-nine, one of the potential US spacemen, described his own deep, personal feelings toward the forthcoming moon flight: "Like most Americans my age, I have a normal desire to be shot off into space. I have given this whole thing a good deal of thought, and the way I see it, getting to the moon is the biggest challenge left to man now that things have gotten so dull down here. People often tell me that it can't be done. Well, if I remember aright, they said that nobody would ever climb to the top of Mount Everest, or beat the Yankees, or go over Niagara Falls in a barrel and live. Taking into account the physiological-stress factor, possible guidance malfunction, discomfort, and the personal-fear characteristic, we expect that the pilot should have a 76.524 percentile chance for a successful mission. Columbus didn't have odds like that, and, besides, he wasn't in shape."

Military planners have pointed out the patriotic and moral advantages of an early moon landing by the United States. In a recent address to the graduating class at Densher Junior College, Maj. Gen. Melvin Belfrage acclaimed the approaching moon expedition as an event "of the greatest magnitude in the history of man's achievement," and added that a United States lunar outpost might provide priceless strategic benefits in our ability to drop "small objects" back onto the earth, and would allow us to maintain a "friendly round-the-clock vigil" on any space ventures that might be conducted in the future by other major powers, including France.

Scientists, for their part, admit that to date little is known about exact conditions on the moon, but are quick to agree with Dr. Heinz Bamberg, the so-called Father of Spaceflight (formerly Professor of Explosives, Heidelberg), that it is of "the utmost importance to humanity" that we get a man up there, preferably a US citizen, as soon as possible. Experts have already privately named June 1965, May 1972, or September 1980 as final target date for the first flight.—END





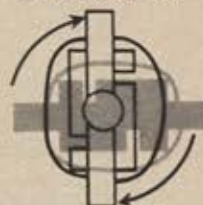
## Pedigree of a Hound Dog



The guidance and control system of America's HOUND DOG missiles—best of breed—has a pedigree 13 years long. Created by Autonetics, the HOUND DOG's inertial autonavigation system sends this supersonic air-to-surface missile from mother-ship to target anywhere in the world, in any weather. Equipped with an invulnerable sense, HOUND DOG extends the retaliatory effectiveness of SAC's B-52c bombers by hundreds of miles.

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# How We Check on Russian Space Claims

WALTER SULLIVAN

**V**IRTUALLY no specialist in space technology has questioned the basic validity of the Soviet [space] claims. Why are they so sure? . . .

The conviction of the specialists that the Russians, at least broadly speaking, are telling the truth, rests on the fact that it has been possible to "watch" what was going on to a degree far greater than most people realize.

A variety of instruments and methods makes such observation possible. . . .

**RADIO RECEIVERS.** Approximate tracking information can be obtained by even a simple receiver listening for the signals broadcast by a space vehicle. The Russians announce the frequencies their vehicles are broadcasting on, and Westerners can hear these signals even if they cannot interpret the . . . data being transmitted. . . .

**ELECTRONIC TRACKING SYSTEMS.** These systems analyze incoming radio waves from a space vehicle, and thus determine with a great precision the direction to the vehicle.

**RADIO TELESCOPES.** These are sensitive receivers with directional antennas which can track space vehicles by following their radio signals. Changes in signal strength indicate changes in distance. Changes in the radio frequency indicate variations in the speed of the vehicles.

**RADAR.** By bouncing a radio signal off a passing space vehicle, the most powerful radars can determine both range and direction at limited distances.

**OPTICAL TELESCOPES.** Satellites can be picked up by relatively simple telescopes. Hundreds of "moonwatch" volunteers in this country and abroad check on satellite orbits by recording the direction in which they sight the moving specks of light, and the exact times of the observations.

**ASTRONOMICAL CAMERAS.** Mounted on powerful telescopes, these can photograph even the smallest satellite and often record its position against a background of stars whose positions are known. . . .

In the case of Lunik II, it was possible [for the Jodrell Bank radio telescope] to "hear" it fall into the moon. The horn of a passing car drops in pitch when its motion, relative to the listener, shifts from approach to departure. If the speed

of a car driving away suddenly begins to increase, there is a similar lowering of the pitch of its horn.

The same principle applied to the radio signals from Lunik II. As with a stone thrown into the air, the vehicle slowed down as it got higher and higher, and this tended to raise the "pitch" or frequency of its radio signals. But then, suddenly, the pitch began to drop.

The vehicle was gaining speed again, for it had fallen victim to the moon's gravity. Soon thereafter its signals stopped abruptly. To Western radio astronomers this sequence of events was almost as convincing evidence as if they had been standing on the moon and seen the impact with their own eyes.

Photography and computation played a part in giving us details on the rocket that launched Sputnik I. Photographs taken with American astronomical cameras indicated that this rocket was almost the size of a Pullman car. Scientists at the Smithsonian Astrophysical Observatory in Cambridge, Mass., studied the "decay" of its orbit as an indication of its weight. As with a halfback charging the line, the greater the weight in motion, the more effectively it would punch through the thin air at such elevations. . . .

Since we have no pictures of our own showing the back of the moon, we cannot prove that the one displayed by the Russians is genuine or false. But it seems highly unlikely that they would fake it. Why should they?

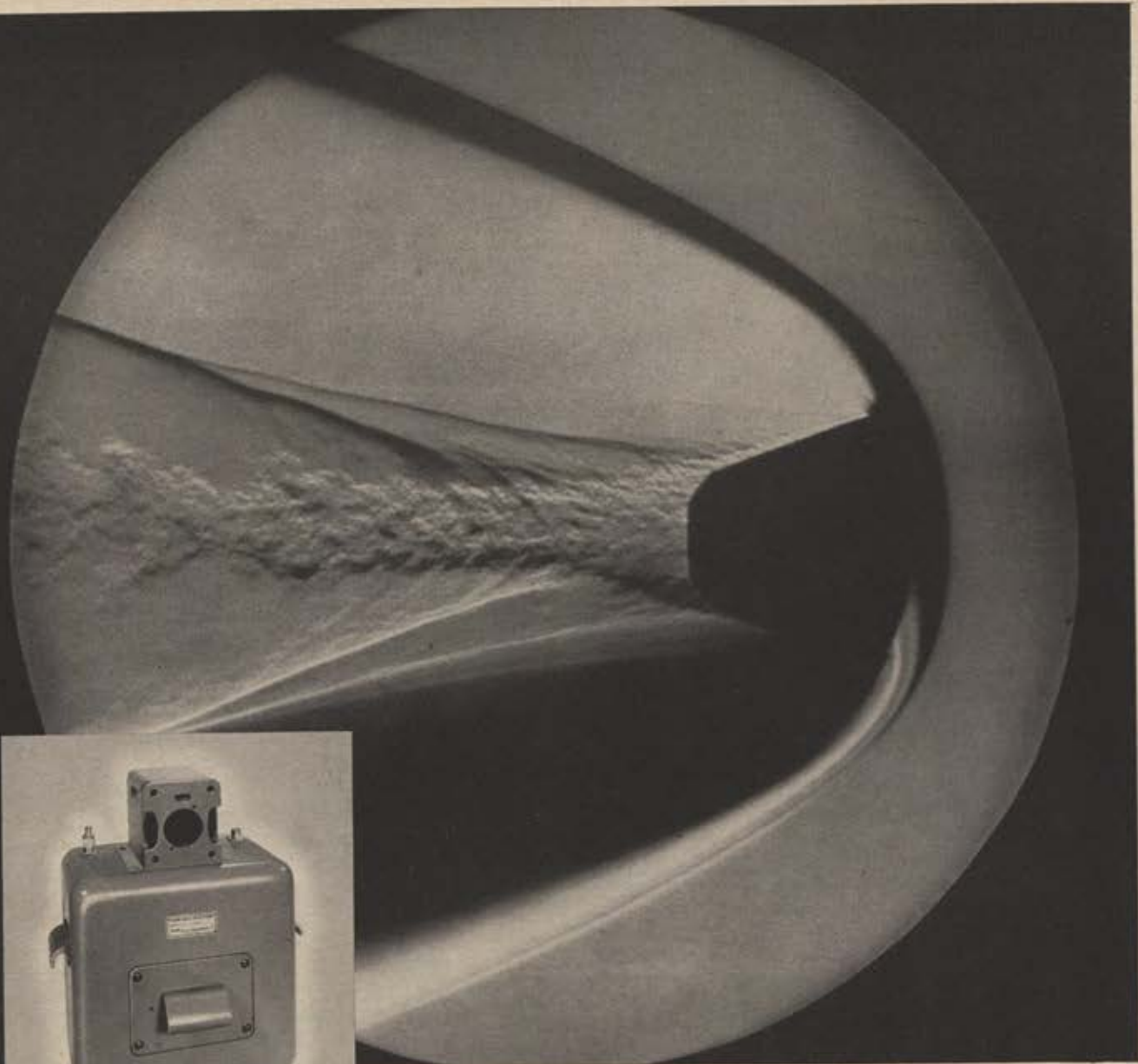
Could anything be more disastrous, from the Soviet point of view, than to be caught in such a fraud? A moon picture could easily be fabricated, but it could soon be discredited. . . .

It is public knowledge that the United States is preparing its own moon scanner. Within a few years, perhaps within months, this country will have its own pictures. If they did not match the Soviet picture, the West would never let Moscow forget it. . . .—END



*Mr. Sullivan is on the science news staff of the New York Times. The above is condensed, with permission, from his dispatch of November 1.*





Above: Nose cone test shape traveling at 5,500 feet per second photographed with Avco Schlieren System at 0.05  $\mu$ sec exposure. Inset: Avco Kerr Cell. Permits exposure from 0.005 to 0.1  $\mu$ sec; available as an independent module.

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complete Kerr Cell Shadowgraph and Schlieren photograph systems.

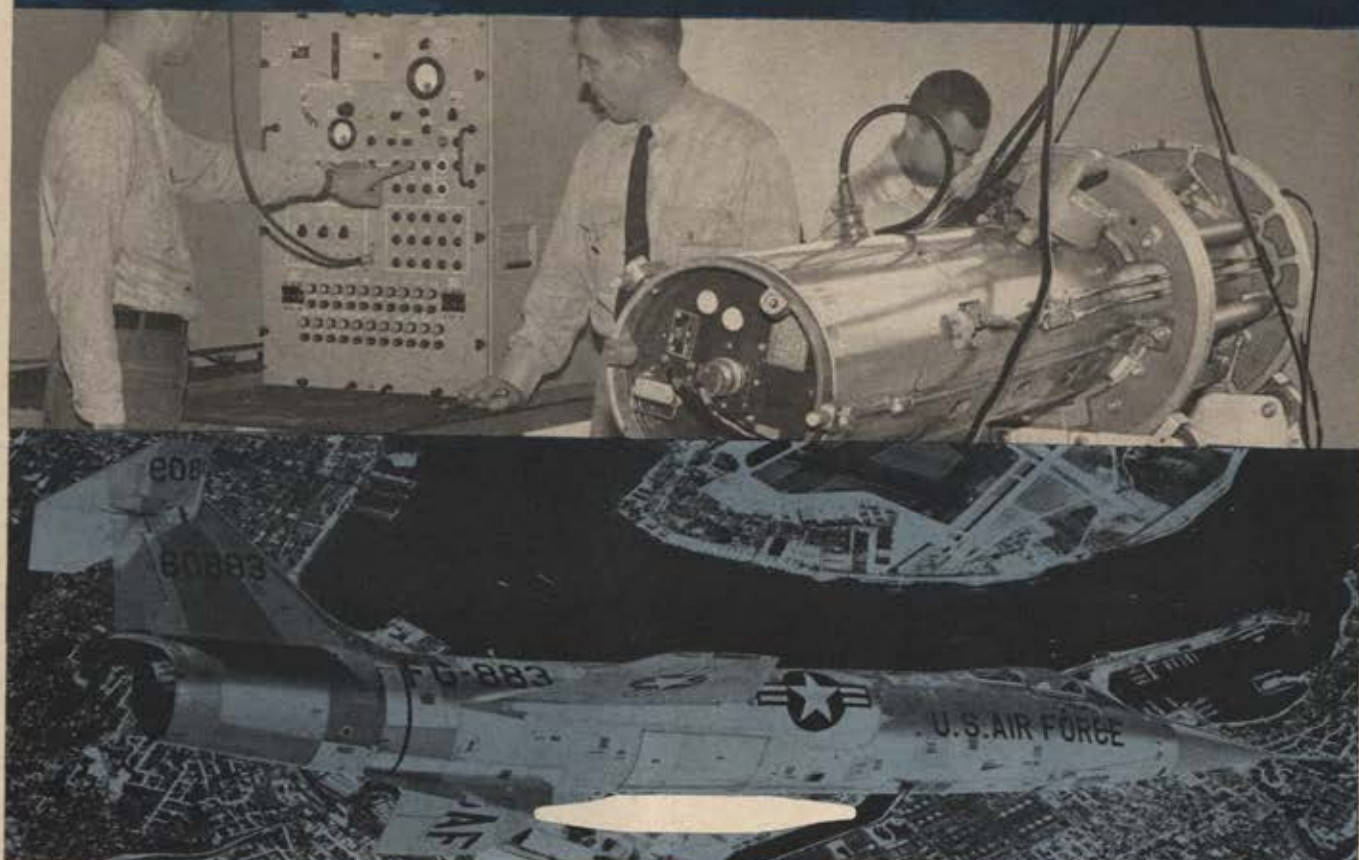
Write for bulletins describing Avco's products and systems in the fields of Hypervelocity Instrumentation, Major Research Facilities and Environmental Test Equipment. Write to: Products and Services Dept., Research and Advanced Development Division, Avco Corporation, 201 Lowell Street, Wilmington, Mass.

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# Speaking of SPACE



## Spaceship over the Tungus?

Soviet scientists, whose reports on various projects are gathering more credence in the US these days, have come up with a fascinating set of facts and speculations on a crater formed by the June 30, 1908, explosion in the Siberian Tungus. Long thought to be meteoric in origin, the explosion was the object of a USSR exploratory group seeking meteoritic dust or debris. Uprooted trees, telegraphic timber, led to the conclusion that the explosion had occurred above the ground. Radiometric and metalometric investigations were made of the site from the center of the explosion to the edge of the fallen forest, during which some 500 samples were taken for laboratory analysis.

The provocative suggestion of Soviet engineer Dr. Gennadi Pleinkhanov, of the Tomsk Medical College, reported in *Sovietskaya Rossiya*: "Was the



Charles L. Critchfield, left, appointed to succeed Roy Johnson as ARPA director, decided to remain in his Convair research job to preclude "conflict of interest" investigation. Donald L. Putt, right, United Research Corp. president, was elected 1960 head of the Institute of the Aeronautical Sciences.

nuclear explosion caused by a radioactive meteorite still unknown to our science, or by a so-called 'antisubstance,' as some scientists assert, or was it actually an interstellar spaceship, on the existence of which some imaginative scientists insist?"

GEORGE "MOON" MEYERS—By Jack Tippit



"That moon-trip character, George Meyers, says to leave the mozzarella off his pizza and substitute this green cheese."

## House Space Hearings

The House Committee on Science and Astronautics will begin hearings next month to determine why the US is lagging in space exploration. Chairman Overton Brooks (D-La.) has scheduled at least a month of hearings to find out what can be done to "place the US where it belongs, in the forefront." Recent addition to the space committee staff: Lt. Col. Francis J. Dillon, Jr., formerly assistant to USAF Director of Advanced Technology, Gen. Homer A. Boushey.

## Space Communications

The International Telecommunication Union has set up an *ad hoc* group to study the problems of space communications. The group was asked to recommend the sections of the radio spectrum where frequency allocations should be made for space research, on the basis of known requirements for the immediate future, and to indicate the amount of spectrum space which should be allo-





*Space ferry, designed by Lockheed and Hughes to shuttle men and materials between earth and outer space, could be ready for flight around 1965-66.*

cated in each section when specific frequency allocations are considered. Since radio transmission from satellites and space probes is the only practical way for the scientist to get information and to track the source of vehicles, which will probably number in the hundreds in the next few years, it is essential that radio frequencies will not be interfered with by terrestrial radio transmission.

### Science for Early Risers

Now that the NBC-TV morning program, "Today," is partially filmed yesterday, important men of science, who don't necessarily get up early, can be seen by those who do. Some of the taped highlights of recent 7-9 a.m. programs: Chemist and astronomer Harold Urey, on the Soviet moon boomerang rocket: "The most important event since Columbus . . . guidance very good . . . scientific apparatus very well done . . . the Russians are four years ahead of us, and we are dropping behind."

William H. Pickering, Australian-born director of the California Institute of Technology's Jet Propulsion Lab: "The size of the Jupiter missile was partially determined by the size of the MATS C-130 planned for airlift and the size of the tunnel to Berne in Switzerland through which the Jupiter might have to be deployed. . . . The rocket that

takes man to the moon will have seven or eight stages . . . and will not be launched for several years."

### Teaching Machine

Tutor, the teaching machine of the Western Design Division of U.S. Industries, may reduce technician training time as much as twenty percent. Designed especially for military and industrial training, Tutor is the first teaching machine to become commercially available. Partly a picture projector, partly an automated reader that locates and presents selected images when the student pushes a numbered keyboard, the machine develops the student's knowledge at his own pace. Tutor differs from other teaching machines in this way: The student has a choice of answers. He pushes button combinations to indicate the answer he believes correct. A wrong answer presents him with an image that says in effect that he's wrong, and, more important, tries to indicate where his reasoning was invalid. He's told to go back and try again.

The correct answer gives him an image that may review his correct answer, expand upon it, then ask another question, eliciting another answer. And so on.

Tutor will be available from \$200 to \$12,000 per machine.

—MICHAEL B. MILLER



*REMAB.—Radiation Equivalent Mannikin-Absorption—by Alderson Research, Inc., may precede Mercury men into space to measure radioactivity.*





OFFICIAL U.S. A.F. PHOTO  
of the Atlas lift-off  
at Vandenberg A.F.B.  
on September 9, 1959.  
This was the first official  
firing by SAC crew to  
test operational capability.

## *A memorable event in the Album of Space Technology*

Many significant achievements will be added to those already recorded in the chronicles of military and scientific space technology. Many important milestones in the conquest of space will be passed. None, however, will surpass the realization of America's operational capability in Intercontinental Ballistic Missiles. The threshold of this phase of our national defense was passed on September 9, 1959, with the historic launch of an Atlas by a Strategic Air Command crew at Vandenberg Air Force Base, California. Measured by any standard no event could have been more timely... more rewarding.

Five years ago the free world had no functional ballistic missile rocket engines, no guidance systems, no nose cones, no tracking stations, no launching pads, no trained missile squadrons. Today all those who have contributed to this present state of operational reality may take justifiable pride.

In this effort, Space Technology Laboratories is also proud of its privilege in performing the functions of systems engineering and technical direction for the Air Force Ballistic Missile Division, in close and continuing cooperation with the Air Force Ballistic Missiles Center, Strategic Air Command-MIKE, and such major associate contractors as: Convair, a Division of General Dynamics Corp., for airframe, assembly and test; General Electric Co., and Burroughs Corporation for radio guidance; Arma, a Division of American Bosch Arma Corporation, for all-inertial guidance; Rocketdyne Division, North American Aviation, Inc., for propulsion; General Electric Co., for re-entry vehicle; and Acoustica Associates, for propellant utilization.

*All have worked in concert, with vigor and dedication to the objective of providing the nation with this fundamental addition to its defense capability.*

# SPACE TECHNOLOGY LABORATORIES, INC.



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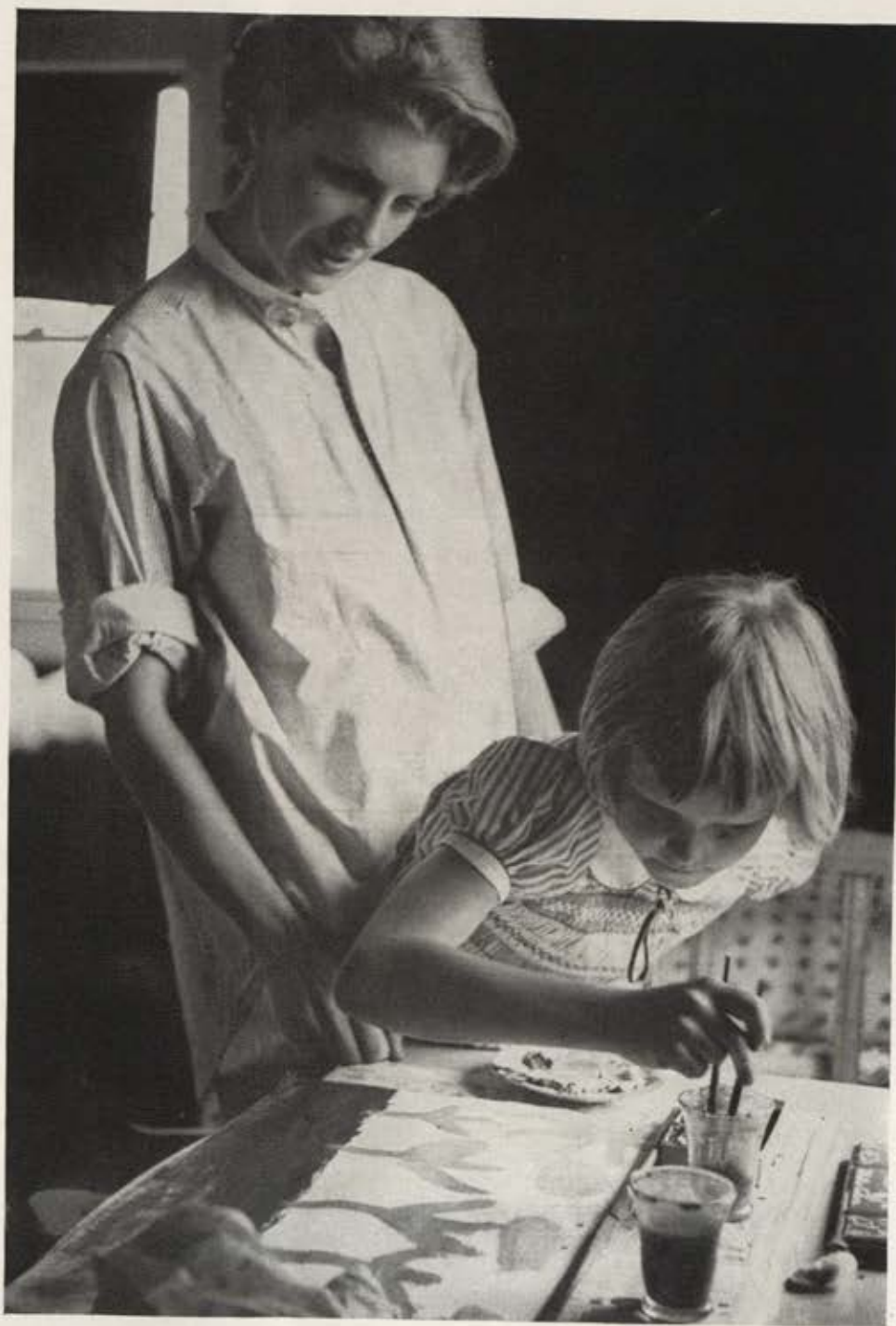
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*Men, Machines,  
Missiles ...*

A SPECIAL REPORT

# USAF IN TRANSITION

**T**HE AIR FORCE is getting smaller and tougher. As missiles move into the operational inventory, joining manned aircraft in a potent "mixed force," the service's manpower problem shifts in a new direction.

"Retention," the trouble word a few years ago, is gone from the scene. USAF is not short on men. Budget restrictions, in fact, are militating a force cut. A notable shortage continues in critical skill areas, but, by and large, the Air Force is becoming more thoroughly professional all the time.

*(Continued on following page)*



"The Air Force is becoming more thoroughly professional all the time." But its officers and airmen, like the jet pilots above, must be ready with each tomorrow to adapt to missiles, faster aircraft, ever-changing "black boxes."



At the center of today's crop of Air Force plans and problems is another word, "transition." For the armed forces, times seem to be changing faster than ever. The requirement to move into new weapons fields with each tomorrow, to adapt to missiles, faster planes, ever-changing "black boxes," is helping shape a force of military men different from their uniformed forebears stretching back into history.

USAF's manpower story in these early years of the aerospace age could fill volumes. Here, in skeletal form, is an analysis of the main factors that today characterize this vital side of the service picture:

### Four Major Steps

Some concern has been expressed that Air Force ca-

- Increased activity in research and development in such programs as ballistic missiles, military astronautics, basic research, technical development, and research and development testing.

- An increase in the number of strategic missile units.
- Buildup in the use of air defense missiles.
- Introduction of new equipment into the inventory and modernization of strategic and air defense units through conversion to new aircraft, including the B-58 bomber and the F-106 supersonic all-weather interceptor.

### Keeping the Best

One of the most gratifying developments for the Air Force during the past year has been the increase in the retention rate of military personnel. Better pay, better



General Electric J-73 jet engine undergoes maintenance at USAF base. Such daily tasks grow increasingly complex.



Head-on view of Republic F-105 Thunderchief, new Mach 2 fighter-bomber—a mighty mount for its single USAF pilot.

pabilities have been weakened by reduction of the Air Force combat wing structure from 137 in fiscal year 1957 to the 102 now programmed for the end of fiscal year 1960. But Defense Department officials point out that this reduction does not reflect the upgrading in quality which is continually being achieved.

The reduction of thirty-five combat wings during this three-year period has been primarily in the fighter field. At the same time, the input of missiles and the resultant aircraft-missile mix permits the Air Force to exploit the best features of both systems.

During fiscal year 1959, which ended on June 30, Air Force military personnel strength was reduced. Strength at the start of fiscal year 1959 was 871,156. By June 30, 1960, the figure is scheduled to reach 825,000.

Civilian strength objectives for fiscal year 1960 called for 313,471 direct hire and 52,000 contractual hire civilian personnel. Actual employment on June 30, 1958, was 372,689. Air Force budget estimates reflected successive reductions of 5,738 in fiscal year 1959, and 1,280 in fiscal year 1960.

Statistically, the Air Force manpower problem seemed practically solved. But this was deceptive. A real problem lay in adapting the manpower resources to advances in technology and changing defense concepts.

Within established military and civilian personnel objectives, USAF will have to adjust manpower to accommodate certain changes in operations. They include:

housing, and numerous administrative actions taken to make a military career more attractive have combined to produce this improvement.

Military pay legislation passed by the last Congress not only increased military pay but also provided an effective system of proficiency pay. This contributed to better retention of airmen with the technical skills so essential to the operation of a modern Air Force, and helped make it possible for the Air Force to be more selective about personnel. This improvement in the personnel situation was an important consideration in reaching the conclusion that the Air Force could reduce military personnel from 850,000 to 825,000 in fiscal year 1960.

It also permitted the Air Force to be more vigorous in its program to raise professional standards. The objective of this program is to procure, train, and retrain only highly skilled and motivated personnel.

At the same time, the rates of reenlistment among first-term airmen in some technical skills were still short of those required to maintain the force at desired levels. In the very vital electronics occupational group, for example, from fiscal year 1955 through fiscal year 1958, the first-term reenlistment rate increased from eleven percent to thirty-three percent. But the minimum desirable reenlistment rate for this group of skills is forty-one percent.

On the other hand, the Air Force still has a surplus of career airman personnel in certain skills. This surplus is the result of reduced requirements caused by changing



weapon systems. For example, the change from propeller-driven aircraft to jet-type aircraft left a surplus of airmen skilled in the maintenance of the former. High retention has also produced a surplus in such less critical areas as food service personnel, motor vehicle operators, air police, and in some administrative fields.

These airmen are now being transitioned into critical skill areas such as guided missiles, atomic weapons, aircraft control and warning radar repair, intelligence, and others. As a result of this retraining program, the Air Force is entering approximately 1,000 surplus skill career airmen into retraining each month. By the end of fiscal year 1960, about 30,000 career airmen will have been retrained. Air Training Command has reported that retrainees are superior scholastically to nonprior service men, with school elimination rates of one to two percent compared to four to ten percent for students with no service background.

### Increasing Requirement

As in the case of airmen, the attractiveness of an Air Force officer career has been increased considerably by passage of incentive legislation such as the Regular Augmentation Act of 1956 and the Military Pay Act of 1958. Consequently, programs to increase officer retention and stability are becoming more effective. The combined percentage of Regular and career Reserve officers is increasing while the percentage of noncareer officers is decreasing. However, there is still room for improvement, particularly in the retention of nonrated officers to maintain and operate the complex weapon systems.

Among officers, the program to raise professional standards has been following several general courses. The first of these is to procure the maximum number of college graduates with educational backgrounds to match specific requirements. Air Force ROTC remains the major officer procurement source. ROTC is being augmented this year by an officer training school program and an officer candidate education program to provide an additional source of college-trained men.

On July 15, the Air Force announced that no new warrant officers would be added for an indefinite time, but the WO category will not be eliminated. Warrant officers currently on duty will be classified and assigned to fill company grade officer positions. This means WOs will not be used in NCO superintendent ladders of AFSCs as has been the case. However, with the move into officer positions, limitations on the utilization of warrants will still be governed by the rules laid down in law, and which have been the operating charter controlling the scope of responsibility and authority of WOs.

### Pilots and Navigators

The number of new officers to be trained as pilots and navigators is a very important element of the over-all officer program. The Air Force tries to keep the numbers of young men receiving this training to a minimum. Some 2,700 pilots and 1,700 navigators were turned out in fiscal year 1959, a significant reduction from the years just previous. Programmed figures for the current fiscal year were unchanged.

During the past two years, the Air Force has conducted a comprehensive reevaluation of its requirements with a view to ensuring that only those personnel with the professional qualifications to contribute to the Air Force missions are retained on flying status. As a result, 2,851 rated officers were suspended from flying status in calendar years 1957 and 1958. Also, in fiscal year 1958, 7,609 total losses were sustained. Reduced training of new rated officers, combined with the losses, resulted in a net decline of 4,147 rated officers during the period.

Increasing the stability among rated personnel is the program announced last year which required a minimum tour of five years for officers entering flying training. Under this program, retention of pilot and navigator trainees, procured from the Air Force ROTC, is forecast to increase from thirty-five percent to sixty-five percent. Retention of aviation cadet graduates, now programmed at sixty percent, is also expected to improve to sixty-five percent.

*(Continued on following page)*



Comparison between crews of B-36 and B-52 in terms of size and composition illustrates changing USAF requirements for officers, airmen. B-36 crew, left, included eight officers, seven airmen in standard configuration. B-52 crew at right is made up of five officers, one airman. Today's transitional Air Force requires larger proportion of officers.



On March 31 of this year new policies governing the administration of proficiency flying by members of the armed forces were announced by the Department of Defense. Proficiency flying is defined as flying by aircrew personnel to maintain basic flying skills in cases where current duty assignments do not provide such time.

The policies recognized the importance of proficiency flying. But DoD directed that the proficiency programs be closely controlled to ensure that the services got the most for their money.

## Changing Ratio

With the advent of today's weapons, another significant manpower problem has begun to emerge. This has to do with the officer-airman ratio and the increasing necessity for a higher mix of officers in the force.

The officer-airman ratio can no longer be considered as a supervisor-worker ratio. More and more officers are becoming technicians whose technical and professional ability must be compensated at the officer pay level. These types of positions often do not include traditional command and supervisory responsibilities.

Furthermore, the trend in crews for new aircraft is toward more officers and fewer airmen. The atomic capability of these aircraft increases the responsibility of the crew to a major degree. This means that experienced and mature officers are required more than ever.

A graphic illustration of this trend is seen in the conversion of old B-36 wings to B-52 aircraft. A B-36 crew consisted of eight officers and seven airmen. The B-52 crew is made up of five officers and one airman. The number of aircraft per wing has been increased from thirty to forty-five and the number of crews per aircraft from one to 1.6. The net result of these actions is a requirement for 360 officers and seventy-two airmen to provide crews for the aircraft of a B-52 wing against 240 officers and 210 airmen required for a B-36 wing.

Further, an increasing number of officers and airmen in higher grades are required for such organizations as NATO, EURCOM, and MAAG, the Joint Chiefs of Staff, and joint headquarters and programs. The total requirement for these types of organizations is now approximately one officer to two airmen.

Industrial, professional, and service contracting have also affected the officer-airman ratio. These contracts reduce the requirement for airmen, since airman-level employees are hired by the contractor, but the policy, planning, and administration of these contracts must still be done by Air Force personnel, and such personnel are largely of officer qualifications.

Electronic computing, data processing, and other similar advances in technology have reduced manual processing, thereby additionally reducing the workload for airmen and increasing the analysis, evaluation, and decision-making work requiring officer qualifications.

Fortunately, other developments may tend to offset these added requirements for officers. The standard of performance of enlisted personnel is steadily improving. As the competence of the professional enlisted force improves, and as greater numbers of men with maturity and sound judgment are retained in service, the Air Force will be able to broaden the managerial area in which these men work. Eventually, it may be possible to move officers out of jobs which can properly be included within the scope of a full professional enlisted career.

Officer strength at the end of the last fiscal year stood at 15.6 percent of total USAF military strength.

## New Safety Consciousness

Air Force people are becoming increasingly safety conscious. USAF continues to improve its flying safety record. The major accident rate reached an all-time low with only ten major accidents per 100,000 flying hours in calendar year 1958.

This showed a marked improvement over the rate for 1957, when there were fourteen major accidents for the same number of flying hours. The rate in 1956 was fifteen accidents.

This improved record was achieved during a period of continuing transition to jets. More Air Force personnel were flying in high-performance jet planes than ever before.

The Air Force's annual flight safety award went this year to the Tactical Air Command. TAC won the silver cup Daedalian Trophy over other major commands which fly a total of 100,000 hours or more yearly. TAC had achieved a thirty-two percent reduction in its aircraft accident rate in calendar year 1958.

The record on the ground was also extremely good. In April, the Air Force was cited for the ninth consecutive year by the National Safety Council for outstanding achievement in ground accident prevention.

The per capita cost of ground accidents, calculated as an average figure for 1956-57, was \$29.98; last year, the Air Force chopped the per capita rate to \$25.93. Included in this price tag is the cost of damaged and destroyed property, as well as cost of injuries and fatalities. Naturally, automobile accidents involving both government-owned and private vehicles accounted for the great majority of accidents.

Official USAF emphasis on safety was pointed up by creation in July of the new post of Deputy Inspector General for Safety to centralize control of all facets of the service's safety program. Maj. Gen. Joseph D. Caldara, formerly Director, Flight Safety Research, was named to the new job.

## Doctors of the Sky

The USAF Medical Service, which plays its own important role in maintaining Air Force combat readiness, celebrated its tenth anniversary in July. Maj. Gen. Oliver K. Niess, Air Force Surgeon General, rededicated it to "maximum medical support of the Air Force mission and complete clinical care of the Air Force man and his family."

The Medical Service now has 46,000 people. In ten years' time, the Air Force has built more than 200 new medical and dental facilities. Today there are eleven USAF hospital centers in the continental United States and one in each major overseas command. They offer care in thirty-one medical specialties.

The transition from conventional aircraft to the jet age, the surgeon general said, has demanded "more and more new medical research and development to enable man to meet and overcome the physical, mental, and environmental problems encountered in high performance, high altitude, and spaceflight."

The Air Force's residency program in aviation medicine helped establish it as a specialty in 1953. The Air Force now has more than 100 Air Force physicians in this specialty. The School of Aviation Medicine is offering a new advanced course in aerospace medicine to senior medical officers from the air forces of our allies at its new home at Brooks AFB, Tex.—END



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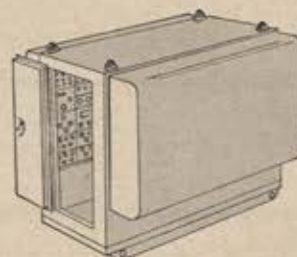
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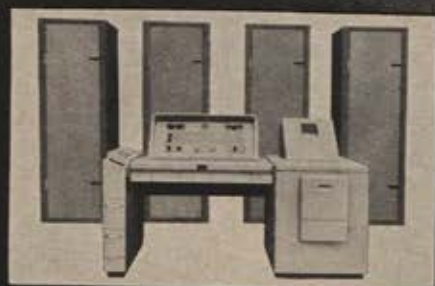
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Dynamics Corporation, prime contractor for the ATLAS Intercontinental Ballistic Missile.

The system being supplied to Convair for the ATLAS Program includes a console and four rack cabinets providing both analog and discrete test functions with a resulting printed and GO-NO GO indication. As a product of RCA's Missile Electronics and Controls Department, Burlington, Massachusetts, APCHE is one of the latest RCA developments in the field of military weapon readiness equipments.



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Where the earth meets the sky...

# Groundwork for Spacepower

Capt. William M. Mack, USAF

USAF engineer at work in Korea, 1950. Runways, other ground facilities, are gaining increasing importance.



**T**HE AEROSPACE revolution of recent years has, interestingly, placed new emphasis on ground facilities.

More than ever today, whether a commander's primary weapon is a manned aircraft, an air-breathing missile, or an ICBM, his combat capability is closely linked with the installation from which he operates.

Side by side with development of missiles, ultrasonic aircraft, and space capabilities, the Air Force daily faces new challenges in the design and construction of ground facilities to serve in both offensive and defensive capacities.

Consider some terms of our everyday military vocabulary in this dawning aerospace age: launch pad, hardened site, base dispersal, DEW Line, silo, SAGE facilities, missile complex, BMEWS.

Consider also, the new Air Force Aerospace Medical Center at Brooks AFB, Tex., the Air Force Academy standing proudly in the foothills of the Rocky Mountains, or the thousands of much-needed housing units now appearing in increasing numbers on USAF bases across the country.

These suggest the scope of the Air Force Military Construction Program, its problems and achievements. Now let us view some of its areas in greater detail.

SAC ballistic missile bases naturally have a high priority. They pose special problems. It not only requires a long lead time—some two years—to transform a construction concept into a fully developed concrete-and-steel operational facility, but adaptability must be designed and built into the facility so it will fit in with the Air Force's long-range and ever-changing mission requirements.

Construction of the earlier ICBM sites was begun long before the first Atlas missiles, now operational, had passed the research and development stage. Unlike the airfield, which had evolved and improved over a period of several decades, no operational experience was available to guide the engineer.

Recognizing the kinship of the missile base to its mission, the Air Force civil engineer has overcome the prob-

lem by using a weapon system approach for establishment of missile base requirements. In this way, compatibility between the weapon and its support component is assured.

To date the Air Force has announced plans to construct ICBM facilities on or in the vicinity of eleven existing Air Force bases: Francis E. Warren, Wyo.; Schilling, Kan.; Vandenberg, Calif.; Forbes, Kan.; Offutt and Lincoln, Neb.; Fairchild, Wash.; Lowry, Colo.; Ellsworth, S. D.; Mountain Home, Idaho; Larson, Wash.

The first seven of these sites will serve the Atlas ICBM. The remaining will be Titan ICBM bases, when the Titan becomes operational. The parent air bases will furnish technical and logistic support and community facilities. Construction at six of these sites is well under way.

Test and prototype launching facilities for the second-generation Minuteman ICBM are now in their early stages.

At Vandenberg, the first operational Atlases are housed in an upright position utilizing the thirteen-story gantry crane widely associated with the missile art through test firings at Cape Canaveral, Fla. Newer launch facilities at the California base will maintain the missiles in a horizontal position, still above ground but protected by massive doors which move back before the missiles are raised to firing position.

In the summer of 1958, the decision was made to "harden" additional Atlas sites to protect them against nuclear attack. In this hardened configuration, the Atlas will rest horizontally in a coffinlike structure built partially below ground level. The missiles also will be protected from all but direct attack by banks of earth surrounding each launch area.

The Titan, representing a further step in missile development, will be protected by fully hardened sites. Each Titan will be housed in a 165-foot subterranean silo along with its control center, power unit, maintenance support, and fuel storage area. All facilities will be joined by connecting service tunnels far below the surface.

During a training exercise, or in combat employment, only the control center will be occupied. There launch

*(Continued on following page)*





A pictorial roll call of critical Air Force ground facilities. Top row, left to right: an Atlas ICBM rises to firing position on its pad; DEW Line radar stations stand guard in the Far North; and badly needed dependents' housing at a Texas base. Bottom row: a USAF base at the ready, F-102 interceptors lining its runway, and the proud new Air Force Academy near Colorado Springs. A new chapel and hospital are to be built.

## GROUNDWORK FOR SPACEPOWER

CONTINUED

crew members will set in motion a sequence of operations to move back massive concrete doors at ground level, raise Titan from its silo, and launch the missile after a brief countdown. An operational squadron will use three underground complexes, each containing three of the ninety-foot Titans.

Titan bases are designed to withstand substantial overpressures in the event of enemy attack. In addition, a high degree of survivability is assured through dispersal of the complexes from each other and from the support base.

The Titan complexes in the Lowry AFB area are costing some \$45 million including support equipment, access roads, and utilities. Major savings, however, are expected to be made at Ellsworth, Mountain Home, and Larson through standardization. Design and engineering costs are being kept to a minimum for actual construction and miscellaneous support equipment such as air-conditioning and utilities. In addition, standard facilities are expected to result in greater efficiency on the part of the operation crews.

Just as the development of missiles has established an urgent requirement for adequate launch facilities, the threat posed by Soviet missiles has made the construction of a Ballistic Missile Early Warning System an essential item.

BMEWS, estimated to cost some \$800 million for construction, procurement, and installation of advanced electronic equipment, will provide early warning in the event of an enemy missile attack. As an indication of the complexity of this system, the antennas required to detect enemy missiles up to three thousand miles away are larger than a football field, able to withstand gale-force winds and resist arctic temperatures ranging as low as sixty degrees below zero. It has been estimated that the power requirements at each BMEWS station will equal those of a small city.

According to present plans, three BMEWS stations will monitor the most likely routes for a ballistic missile attack on North America. The midstation at Thule AFB, Greenland, is rapidly approaching completion and will be the first with an operational capability. At Clear, Alaska, a second station is under construction. Work on a third BMEWS site at a location still to be announced is expected to begin at an early date.

Also high on the defensive side are the Distant Early Warning Line and Semi-Automatic Ground Environment systems. These are designed to provide advance warning of enemy air attack and assure that the enemy is engaged as far away from the target as possible.

The DEW Line, with some fifty radar stations in operation across the arctic wastes, has been extended westward over the Aleutian chain. It is also being extended across Greenland on the east. SAGE, which went into operation last year at McGuire AFB, N. J., is being refined to improve warning techniques.

Plans are under way both to build new SAGE centers in a hardened configuration and revamp their equipment to make greater use of transistorized computers, a true breakthrough in the electronic field. While the hardened facilities will make the air defense system less vulnerable to attack, the new SAGE combat centers will also give an air defense commander more information on the tactical situation and better control of his weapons. Some \$90 million is planned for construction of modernized SAGE facilities in the current Military Construction Program.

The Bomarc air defense missile puts added teeth in our highly sophisticated electronic warning system. Under construction at present are a string of Bomarc sites. First operational site, announced in September, is at McGuire AFB, N. J. Present plans call for twelve Bomarc installations. As in the case of the ICBMs, each is to be on or near an existing base.

So far, all the programs we have listed have been in the fields of air defense or missilery. Actually, one of the most critical current USAF construction projects falls in neither category. It is the Strategic Air Command base dispersal program, designed to make it more difficult for an enemy to strike all SAC bases at once. Spread out at a greater number of bases, SAC bombers would also be able to get into the air faster.

Necessary construction under this program is reaching completion at thirty-three bases. B-52 bombers, current mainstay of free world deterrent strength, are being protectively dispersed to these bases, one squadron to each. Additional facilities are also planned for the great US bomber fleet.

As might be assumed, the major shares of the Air Force construction dollar go to strategic deterrent capabilities and air defense. The strategic forces get more than half the allocation, air defense about twenty-five percent. The remainder is divided between tactical and general support requirements.

Budgetary factors are an important consideration here as elsewhere in the Air Force. Excluded from this year's construction planning was \$4 billion worth of work recommended by USAF commanders in different parts of the world. The construction budget for the current fiscal year

(Continued on page 99)



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was cut to what amounted to bare bone, about a billion dollars in what Air Force Secretary James H. Douglas described as "many exacting reviews."

Maj. Gen. A. M. Minton, Air Force Director of Civil Engineering, says the service is placing continuing emphasis on design improvement with a view to efficiency and financial savings. Whenever possible, existing facilities are adapted rather than a new design being developed for each project. In a recent appearance before Congress, General Minton cited the use of this procedure for Bomarc, Titan, Atlas, and SAGE.

No major new bases are being built this year. The Air Force currently runs 276 major operational, training, logistic, and research installations—163 in the United States and 113 overseas. New construction is planned to modernize and expand facilities at 127 major installations, ninety within the United States and thirty-seven in foreign territory. Also programmed are facilities at 200 miscellaneous sites essential to the Air Force mission.

Three small air defense squadrons and their facilities will be deactivated in the near future. They are located at Ethan Allen AFB, Vt., Youngstown Municipal Airport, Ohio, and Niagara Falls Municipal Airport, N. Y. Deactivation of other less essential bases, caught in a financial and technological crossfire, was expected.

In addition, construction of Richard I. Bong AFB, Wis., which was well along, has been abandoned. Bong would have served as a B-58 base. Facilities for the B-58s became available elsewhere through the phase-out of B-47 units.

The Air Force, when possible, seeks to use facilities for a number of missions. A prime example of this multiple tenancy is McGuire AFB. There one finds MATS air transport squadrons, ADC fighters, the Bomarc missile, a SAGE center, a SAC air refueling squadron, and a New Jersey Air National Guard tactical fighter unit. Other examples are provided by construction of missile sites to draw on support of existing bases.

USAF, of course, is people even more than hardware. The portion of Air Force construction devoted to the officers and men of the service reflects this fact.

Now wrestling with the question of how best to train young men to be officers in a rapidly changing weapon situation is the Air Force Academy, nestled in its sparkling newness at the foot of the Rockies' Rampart Range close to Colorado Springs. Construction of a 135-bed hospital this year will bring basic facilities of the \$134 million professional education complex to over ninety-eight percent of completion. The contract for the last major structure, an interdenominational chapel, will be let this month. Still not programmed is the Academy's own airfield, which has been recommended thrice by the Academy's Board of Visitors.

Construction in many parts of the country of new barracks, community facilities—some replacing wartime "temporary" structures—and hospitals has suffered from the competition for the Air Force construction dollar. However, this year some 13,700 airmen and 980 officers will enjoy new bachelor quarters now being completed. Modern dining halls for 10,133 airmen and 300 officers are also under way at several bases. These, with eighty-one other community support structures are being built at far-flung Air Force bases at home and overseas. Support facilities include commissaries, base exchanges, gymnasiums, schools, service and NCO clubs, recreation workshops, chapels—all planned to contribute to the welfare of airmen, officers, and families.

Air Force medical facilities are also being improved

with new hospitals going up on fourteen bases. Five of these will replace obsolete facilities used since World War II. Brooks's great Aerospace Medical Center went into operation earlier this year.

During fiscal year 1960, four hospitals and three dispensaries are planned together with housing, community, and recreational facilities costing over \$36 million.

Title VIII of the National Housing (Capehart-Rains) Act today is the foremost source of housing for Air Force families. More commonly known as Capehart housing, the units completed under the authorization are considered to be a major contribution to the welfare of Air Force personnel. But in addition to morale, Capehart projects assure better mission performance by keeping combat crews in easy reach of their bases and by reducing personnel turnover caused by substandard family support facilities. Since the cost of these projects is amortized by the occupants, much like civilian housing, they do not funnel off large sums required for other programs vital to the Air Force missions.

To date, the Air Force has some 64,000 units of Capehart housing at 110 Stateside bases in its construction program. An estimated 100 Air Force families move daily into these quarters. Housing projects average 400 to 500 units and vary from single to multiple family dwellings depending upon location and local construction costs.

In housing projects, site planning takes into consideration topography, climatic conditions, and proper use of terrain to keep site preparation and construction costs to a minimum. Interiors of units are open and give a feeling of spaciousness although limited in area. Kitchens are equipped with range and refrigerator, utility rooms have a washer and dryer.

Besides Capehart, limited numbers of housing units have been provided this year from appropriated funds, chiefly in remote areas. Overseas, 6,000 units are being built under arrangements with host governments, which provide materials in exchange for American agricultural products.

By year's end the Air Force is expected to have close to 130,000 units of all types in its inventory. This, however, is only part of the number required for the officers and airmen entitled to quarters by law and for lower-grade airmen who are not authorized government quarters under current legislation.

All of these facilities fall within the purview of the Air Force civil engineers under General Minton. The civil engineers build the facilities and take care of them.

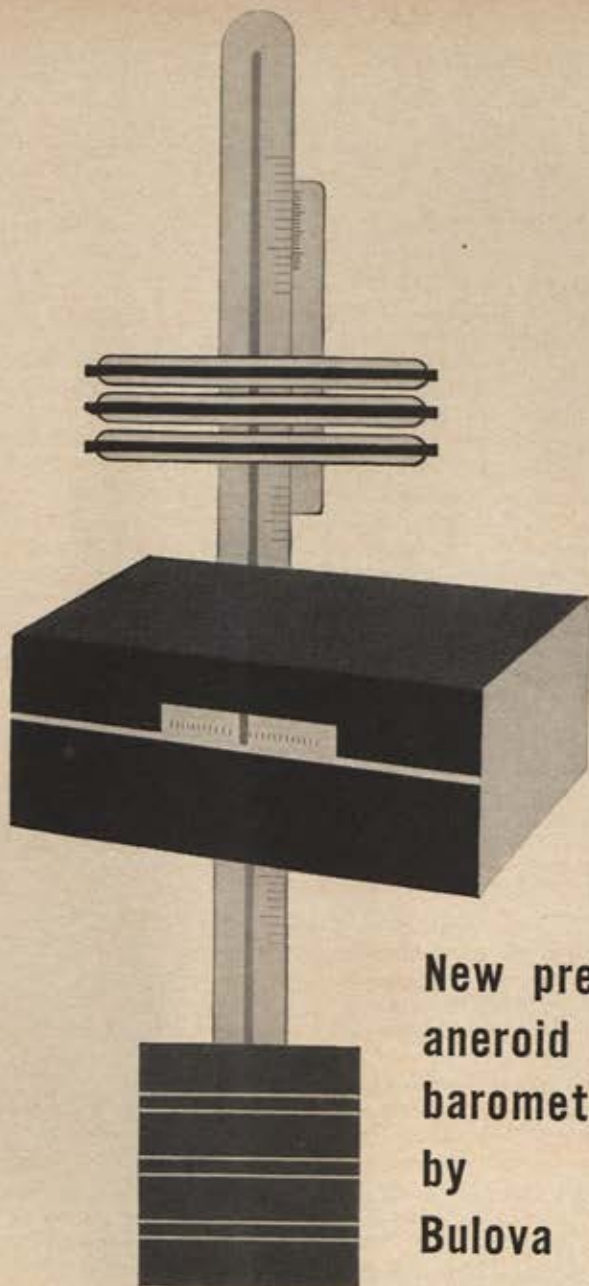
On major jobs, civilian contractors or the Army's Corps of Engineers often enter the picture with their considerable resources and skills after the requirement for the project has been set up and it is past the design stage. In all cases, the Air Force people hang onto the reins of authority throughout, then take over the massive responsibility of keeping the facility in shape to meet its mission after construction is completed.

The task is a big one—as big as the Air Force itself.—  
END

---

*The author, Capt. William M. Mack, is Deputy Chief of the Air Force's Magazine Branch. He served previously as ISO of the Eighteenth Air Force at Donaldson AFB, S. C., and Chief, Press, Magazine, and Pictorial Branch, Far East Air Force, Tokyo. Captain Mack took part as a glider pilot in the Normandy invasion and the Allied crossing of the Rhine River during World War II. He left the service at the end of that war and was recalled in 1951.*





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# The READY ROOM

RESERVE AND AIR GUARD NEWS

## New Approach to Reserves

On October 23, the Air Force Association appeared before the Reserve Forces Review Group, headed by Maj. Gen. Sory Smith, which was appointed to study requirements and missions for the Air Reserve Forces. (See AIR FORCE/SPACE DIGEST, November 1959.)

The formal presentation was given by James H. Straubel, Air Force Association's Executive Director, who has personally assumed AFA staff responsibility for Air Reserve forces activities since the death of Ed Wilson. AFA's Administrative Director, John O. Gray, is assisting Mr. Straubel and is maintaining liaison with the Air Reserve and Air National Guard Councils. (See "Councils Appointed," on the following page.)

The October 23 presentation, somewhat condensed, follows:

• • •

The Air Force Association is engaged in a continuing study on utilization of the Reserve forces by the Regular Air Force establishment.

Our Association studies to date have been in relatively unexplored fields. For example: Our study of possible utilization of the Air National Guard to operate Bomarc sites; and our more recent study of utilization by the Reserve forces of surplus airline equipment of the DC-6 and DC-7 category.

We mention these only to make this point: We have currently tabled such examinations to concentrate our thinking on a new approach to a Reserve problem. Actually it is a new approach to a problem of the regular Air Force—the most pressing problem we can think of—namely, money, or the lack of it.

The Reserve forces represent a direct annual expenditure of more than \$500 million. That is a lot of money in anybody's book. In fact, the budget for our Air Reserve forces equals that of the Ballistic Missile Agency in Huntsville, Ala. This is mentioned only because it might be the kind of analogy a congressman would draw when the Reserve forces budget comes under close examination.

We are not proposing that the Reserve forces budget be cut. In fact, it might be to the detriment of the Regular establishment to do so. We are concerned about the use that is made of that \$500 million. By approaching the problem differently we might achieve a net gain in the dollar position of the Air Force. If fast enough action is taken we should be able to gain some dollars for the Air Force in the FY '61 budget.

Please add the assumption that the Air Force is committed to a substantial outlay for financing the Air Reserve and Air National Guard. Whether it is \$500 million or not is beside the point. The Air Force is committed by its own announced policy and, more importantly, by its statements on the record before the Congress.

This money represents "earmarked" funds, defended separately before the Congress, and subject to different political pressures, to the extent that, for practical purposes, we are really dealing with two budgets: Regular and Reserve. A substantial Reserve budget can be maintained without compromising the established Regular budget. At the same time, a reduction in the Reserve budget does not necessarily mean an increase in the Regular budget.

The main point is this: At present the Regular budget gains little, if anything, from the Reserve budget, and for good reason. Whatever the proficiencies of the Reserve

forces, their activities are, under present policy, *fringe benefits* for the Regular establishment—involving functions *additional to*, but not *in lieu of*, functions of the Regulars. Thus, they contribute little or nothing to a solution of Air Force funding problems.

It is true that the Reserve forces already are performing some tasks normally accomplished by Regular units. But we have yet to see concrete evidence that the Regular budget realizes a net gain in dollars as a result of Reserve forces activity. We suggest that this situation need not continue. In light of the funding squeeze, it seems mandatory that missions expensed against the Reserve budget should automatically make money available for other uses in the Regular budget. The Reserve budget should represent, in effect, a separate and new source of income for the Regular establishment.

When an Air Force mission can be performed by a Reserve forces unit, that mission should be assigned to the Reserve forces and funded out of the Reserve forces budget; and the money originally programmed for that function should be reallocated to another activity within the Regular budget. On the other hand, when the Air Force is obliged to cut its program, because of a budget squeeze, the cut should be applied, when practicable, to those areas in which the Air Guard and Air Reserve have proved capability, and where the activity involved can be funded with money already earmarked for the Reserve forces.

For example, the target flying now being done by the Air Guard for Air Defense Command—as part of the SAGE activation program—is worthy of consideration. If the *replacement* approach is applied in this area, a net gain of some \$30 million might be realized for the Regular budget.

Another area worthy of study is the extension of the Reserves' Swiftlift program to MATS, and its relation to the Civil Reserve Air Fleet program, with both Air Guard and Air Reserve participating in the transport mission. Along with the money-gaining potential involved, this might help solve another Air Force problem—namely, the extensive pressure from the airlines and some congressmen on MATS to get out of what they call the "scheduled airline business."

This money-gaining program for the Air Force is, of course, contingent upon: (1) the ability of the Reserve forces to satisfactorily *replace* Regular units in performing certain basic Air Force missions, and (2) the willingness of the Regular establishment to have such units replaced by Reserve forces units.

Taking these contingencies in turn, Reserve capability has long been the subject of study in the Pentagon, but seldom if ever are the findings costed out to determine what, if any, dollar savings might be realized due to these capabilities. If adequate emphasis is placed on the potential dollar values involved it should be possible to establish the impact of the Reserve forces on Air Force funding problems.

As for the second contingency mentioned above: Understandably, there may be reluctance to admit that military jobs now being performed by active-duty personnel can be accomplished equally well, or at least satisfactorily, by Reserve forces personnel. Also, the question of control inevitably will arise. However, the budget pinch is so tight that compromise must be made with tradition regarding use of the Reserve forces. For example, the Reserve

(Continued on following page)





Brig. Gen. Joseph A. Cunningham (left) presents MATS Annual Flying Safety Award to Maj. Frank J. Englert, of Miami Reserve 301st Air Rescue Squadron, marking the first time the MATS award has gone to a Reserve unit.

forces must be prepared to take on more support missions; the Regular establishment must be prepared for less direct control of personnel performing these missions. In each instance, satisfactory performance must be the only criterion.

In conclusion: We suggest that until this new approach to the Reserve forces is fully explored, the Air Force cannot expect Congress to be fully sympathetic to its funding needs.

## Councils Appointed

AFA President Howard T. Markey has announced appointment of the following to the National Air Reserve and Air National Guard Councils of the Air Force Association:

### Air National Guard Council:

Chairman, Col. Robert D. Campbell, Sherman Oaks, Calif.; Vice Chairman, Brig. Gen. Donald J. Strait, Basking Ridge, N.J.; Lt. Col. Robert P. Knight, White Bear Lake, Minn.; Brig. Gen. Philip E. Tukey, Jr., Bangor, Me.;



Maj. John T. Guice, of the Arizona Air Guard, fired a perfect score at USAF worldwide fighter weapons meet in October.

Col. Roy E. Cooper, Cheyenne, Wyo.; Col. Vito J. Castellano, Armonk, N.Y.

### Air Reserve Council:

Chairman, Brig. Gen. Roy T. Sessums, New Orleans, La.; Vice Chairman, Brig. Gen. Daniel De Brier, Atlantic City, N.J.; Col. L. Gary Clemente, New York, N.Y.; Lt. Col. Frank Ward, Battle Creek, Mich.; Lt. Col. Gordon W. Edwards, Colorado Springs, Colo.; Col. James H. McPartlin, Birmingham, Mich.; Col. Robert Keim, New York, N.Y.

## Successful ISO Seminar

"Power and Its Image" was the theme of the 5th Annual Information Services Seminar, sponsored by New York's 9215th Air Reserve Information Services Squadron. Considered the most successful of the seminars sponsored over the past five years, it was held at New York's Belmont Plaza Hotel on November 5 and 6. More than 200 Air Force information officers from all major commands were on hand. A principal feature of the seminar was a two-hour radio and television conference sponsored by the National Broadcasting Company.

## Air Reserve Policy Committee

Meeting in Washington in late October, the Air Reserve Forces Policy Committee recommended:

- That individuals hospitalized for thirty days or more as a result of injury on duty, or disease incurred while on duty, should be given points for drills held by their units while they are hospitalized.
- That the Air Staff give swift consideration to a National Guard Bureau proposal to make use of ANG communications and electronics units on the West Coast now scheduled for deactivation by December 31.
- That Reservists retiring under Title III (at age sixty) should be permitted to make a contingency option for their dependents three years before retirement, rather than before completion of eighteen years of service, for pay purposes. A Department of Defense request for such legislation is now at the Bureau of the Budget and is expected to go to Congress when it reconvenes in January. This action would also permit those who failed to declare an option before completing eighteen years to do so before reaching age fifty-seven.
- That individuals be allowed to retire in the highest grade held in any branch of the service, and noted that this will be taken care of by passage of HR 2492.
- That USAF regulations be revised to permit Air Reserve technicians to wear their uniforms on the job.

## Shoot-Out at Tyndall

The Air National Guard produced an individual top scorer (*see cut*) and took second place in its category at the USAF worldwide fighter weapons meet at Tyndall AFB, Fla., late in October.

Represented by the 152d Fighter-Interceptor Squadron of Tucson, Ariz., the Air Guard finished with 4,400 points out of a possible 6,000. This was just 100 points behind USAF's 538th Fighter-Interceptor Squadron of Larson AFB, Wash., in the F-100/F-104 category.

The Arizona Guardsmen flew the North American F-100 Super Sabre. The 538th and the 337th FI Squadron of Westover AFB, Mass., which finished third, flew Lockheed F-104 Starfires. All were equipped with GAR-8 Sidewinder missiles, built by Philco.—END



# Is an Air Force career an intelligent financial investment?



Leslie Gould  
Financial Editor  
N.Y. Journal American



## An observation directed to young Air Force officers

A very close parallel may be drawn between the nature of various investments and the career opportunities open to young men today. Like bonds, some careers are relatively stable, but appreciate very slowly. Others, like a "blue chip" common stock, have somewhat less stability, but offer a very sound, long-range growth potential. Thirdly, of course, there is the highly speculative stock (and career), with its immediate promise of extraordinary return—that may or may not be fulfilled or sustained.

Of these three categories, an Air Force career would seem most closely to approximate a "blue chip" stock. Whereas once the military was generally considered a sinecure, tech-

nological and scientific advances today demand a high degree of professionalism from the military's "stockholders." Absolute stability can no longer be assumed. At the same time, the real and monetary income of the trained Air Force officer continues to show growth potential, as evidenced by the recently adjusted pay scales.

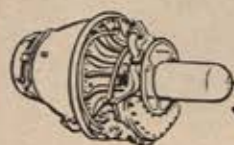
Finally, the retirement income an Air Force officer may expect might well be likened, on an income basis, to a \$100,000 investment portfolio—a financial situation that few people realize in their lifetimes.

Generally regarded, an Air Force career is a very intelligent financial investment.

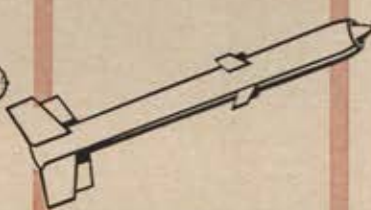


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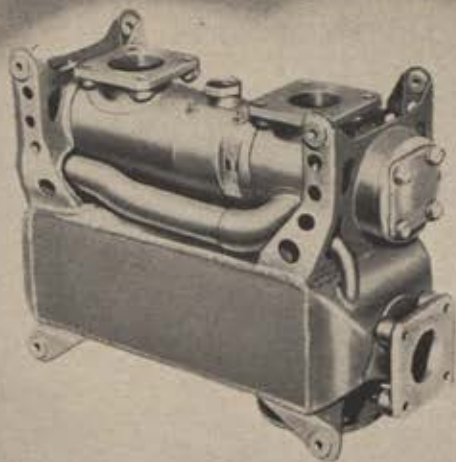
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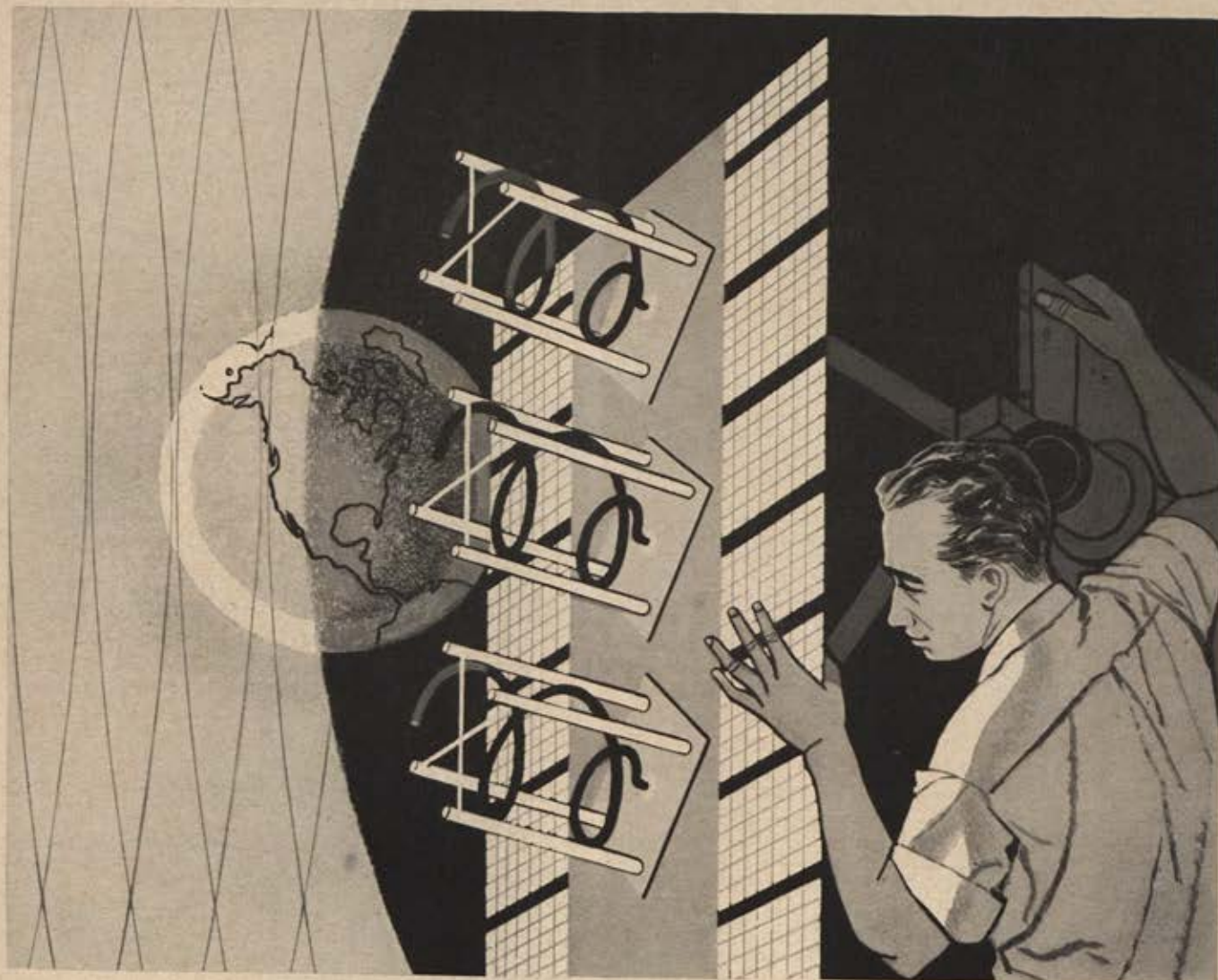
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## SQUADRON OF THE MONTH

*Metropolitan Philadelphia Squadron, Cited for effectively combining education of its membership and emphasis on area contributions to the aerospace age through the medium of its aerospace luncheon series.*

Philadelphia Squadron, while pushing for a future AFA National Convention, is not neglecting its internal affairs. Latest campaign, which began in June, is a series of monthly aerospace luncheons, featuring top speakers in the area and spotlighting contributions of Delaware Valley industries in the aerospace age.

The first luncheon welcomed the new director of aviation for the city, David G. Davis, who took his position the day before the luncheon. In July the speaker was Samuel Berkowitz, executive engineer with the Philco Corporation, who spoke on "A New Approach to Air Traffic Control." Subsequent meetings have featured Martin Decker, president of the Decker Corporation (*see cut*), who had just returned from Russia as a delegate to the Fédération Aéronautique Internationale meeting, and spoke on his trip; Frederick E. Rushlow, General Electric's Space Vehicles Department, who spoke on "Space Age Combat"; and Dr. Douglas H. Worf, National Aeronautics and Space Administration, who detailed "The Role of Biology in Space Exploration."

Squadron commander Sally Downing and program chairman Bernard Burt are primarily responsible for the success of the meetings, but the size of the luncheons, and their rapid growth, indicate that the entire membership, along with leading individ-

uals and area industries, are pitching in to make them successful. We're proud to name this fine unit the Squadron of the Month.

Forty-five delegates attended the opening session of the New Jersey Wing convention, held at the Berkeley-Cartaret Hotel in Asbury Park, October 10. Twin features of the one-day affair were the election of officers to serve during the next year and the annual awards banquet.

Lloyd Nelson was reelected commander, with these other Jersey leaders to serve with him (*see cut*): Henry Carnicelli and Tom Gagen, vice commanders; John Russo, secretary; Italo Quinto, treasurer; and Bill Bromirski, wing organization director. Ken Hamler and Frank DePhillips were appointed to serve as liaison officers with the Civil Air Patrol in New Jersey.

At the awards banquet, the top trophy went to Tenney Engineering, Inc., of Union, N. J., manufacturers of environmental test chambers, for their contributions to the development of airpower in the state in 1958. Monroe Seligman, president of the firm, accepted the award from Nelson.

The Midyear Conference, a feature of the AFA year in California, was held in Riverside, Calif., October 24, and was attended by representatives of most of the Squadrons in the Wing.



Sally Downing and Martin Decker discuss his recent Soviet tour before his appearance at Philadelphia lunch.

Bill Gilson, wing commander, was in charge of the meeting, which wound up with a dinner at the Mission Inn, at which the principal speaker was AFA President Howard T. Markey. The subject he chose for his remarks was "Complacency—A National Disease."

The Midyear, which gets down to the brass tacks of business without sacrificing much time for social affairs, featured a series of workshops devoted to the specific problems encountered. (Continued on following page)



At New Jersey Wing convention are, standing, Bill Bromirski, Tom Gagen, Lloyd Nelson, John Russo, and Henry Carnicelli. Seated at table are Ches Richardson, Monroe Seligman, Col. J. J. McCabe, and the Rev. Bill Laird.



San Diego Squadron arranged for this WW II Zero, owned by the city, to be donated to the Air Force Museum. Jim Snapp, left, accepts it from City Parks and Recreation Director Leo Calland, Convention Bureau's Ray Stauffer.

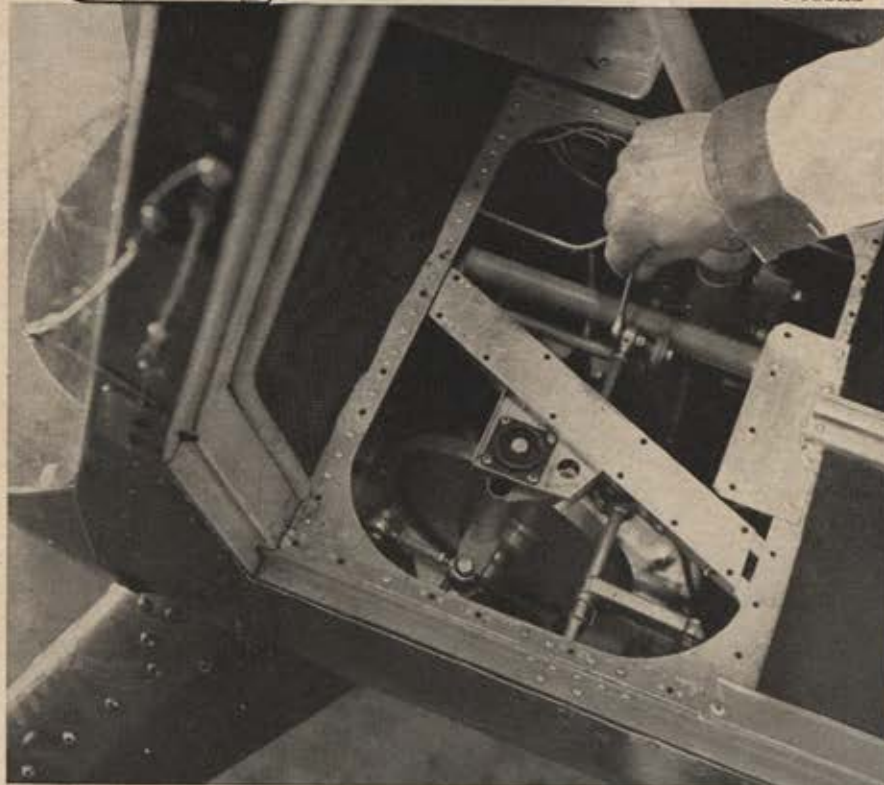
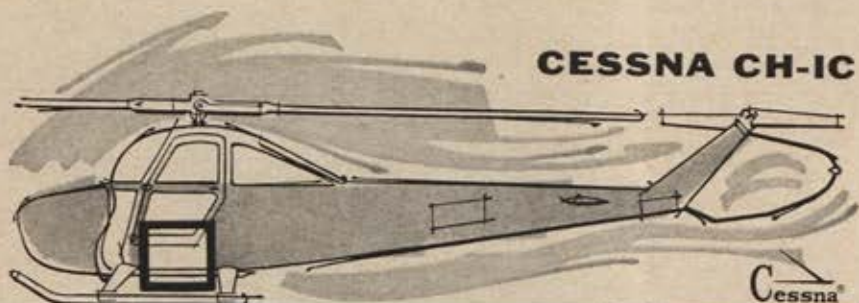




Dale Erickson, vice president, is shown installing new Utah Wing officers—Lee Florence, treasurer, Karl Caldwell, vice commander, Bill Farmer, commander. Wing meeting was held in Ogden, Utah, during official Air Force Association Week proclaimed by Gov. George D. Clyde of Utah.



Walter Black, left, Nebraska Wing commander, presents scholarship checks to teachers attending University of Nebraska summer aviation workshop. Donation was made by Wing through AFA's Space Education Foundation. This is the third year Nebraska Wing has awarded scholarships.



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## AFA NEWS—CONTINUED

countered by each Squadron officer, as well as general sessions. At the same time as these meetings were being held, the Wing Auxiliary was holding its own meetings, led by Helen Henderson, president. Each Squadron commander, each Wing officer, and the chairmen of the various Wing committees gave five-minute reports.

Michigan's Wiley Post Squadron outdid itself with the presentation on October 12 of "Air Education Day" at Lakeview High School, St. Claire Shores, Mich. The program featured Jerry Green, Wing commander, who served as master of ceremonies; Dr. Eugene Emme, then a member of the Battle Creek Squadron but who has since joined NASA as its historian, who spoke on "The Conquest of Space"; and Col. John D. W. Haesler, commander of the 1st Fighter Group at Selfridge AFB, who spoke on "The Sonic Boom."

Several USAF, Navy, and Army exhibits were also on hand for public viewing. Over 450 students and adults took part in the program, which was arranged by Charles Y. Cheriez, one of the leaders in the Squadron.

Lt. Col. L. J. Churchill, Director of Military Studies, Air Force Academy, was a guest of the Syracuse, N. Y., Squadron on October 29, to outline the Academy's admission requirements. Gordon Thiel, Squadron commander, reports the largest attendance of recent months. During his two-day stay in the city, Colonel Churchill appeared at several high school assemblies, where he discussed the entrance requirements with the students.

The Air Force Association's fine outfit in Chico, Calif., is now in the process of lending a strong assist to the public information policies of the  
(Continued on page 111)





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Ed Gagliardi, Beaver Valley Squadron, received diploma, special award at ARDC's Noncom Academy in September.

Strategic Air Command, which will shortly begin operations at its new installation, Beale AFB, near Chico. This will be one of the sites for the Titan ICBM, and nearby communities have been bombarding USAF representatives with many questions regarding the new intercontinental missile and its operation.

Tom Mason, commander of the Squadron, has headed groups that have been taken on guided tours of the base, and given an opportunity to toss the questions at the top people there, headed by Col. Paul Carlton, commander of the 4126th Strategic Wing, and Lt. Col. Floyd Creasman, base commander. Mason also arranged for the most recent luncheon meeting of the Squadron, and obtained as a speaker Lt. Col. Charles Lutman, Chief of Field Operations for USAF's Ballistic Missile Division.

The series of Jet Age Conferences sponsored by AFA units beginning in 1956 dealt, at least in part, with the sonic boom problem, and many of our Squadrons appear to feel that the problem is licked permanently. It is evident, however, that this is a constant problem, and continues to crop up all across the nation—a problem characteristic of our age.

The Norman Lyle Squadron, of Birmingham, Mich., is the latest to feel the pressure of public opinion on this score. It has come up with a series of meetings designed to educate the community on the causes of, and necessity for, this "new sound of freedom." As a matter of fact, that's the title of a new official Air Force film, which the Squadron is featuring in its presentations.

## Welcome to our new Shareholders

Hundreds of Americans from every walk of life — who became shareholders in Southwest Airmotive through our first public issue of stock, October 28, 1959 — now have joined with Company employees in a tradition of dedicated aviation service dating back to 1932.

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to add bright, new chapters to an already-honored history of corporate accomplishment.

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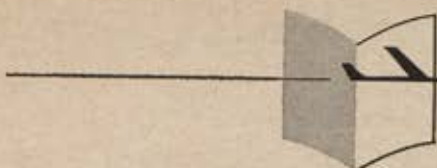
Bob Saltsman is commander of this fine Squadron, which is currently embarking on sponsorship of an Air Explorer Troop in addition to its other community activities.

**CROSS COUNTRY . . .** Several new Squadrons are in the process of being formed, one in Alamogordo, N. M., the drive there being headed by Arthur H. Abernathy; one in Springfield, Va., headed by Bentley Hahn, Wing organization director, and one in Aurora, Ill., at the Marmion Military Academy. To be composed of cadets there, it is being spurred on by John M. McNerney. . . . As this

issue goes to press, the Missouri Wing is planning its first Wing convention, to be held in Jefferson City. We'll have details next month. . . . Its official now: AFA's next Board of Directors meeting will be held aboard the Navy carrier *Independence*, December 2-5. Our Board will be guests of the US Navy and the Navy League, and will receive a briefing on carrier operations worldwide. Sometime in the near future, the Air Force Association Board will arrange a similar program and briefing for the Navy League's Executive Board at an installation of the US Air Force.

—GUS DUDA





## airman's bookshelf

### The Nature of War

*The War Lover*, by John Hersey (Alfred A. Knopf, 1959, \$5)

Reviewed by Capt. Frank W. Anderson, Jr., AFRS.

As we near the end of the 1950s, a decade that will probably be noted in history for its almost incessant world tension and for a desperate determination to avoid war, it is worthwhile to consider the insights of a major writer when he examines the nature of man's attitude toward war.

*The War Lover* is set in familiar surroundings, an Eighth Air Force B-17 base in England during World War II. The focus is on one aircrew and its aircraft, *The Body*, and most particularly on the relationship between the pilot and his copilot. The pilot, Buzz Marrow, is the villain of the piece—the war lover. A big, brawny, loud-mouthed extrovert with a streak of cruelty, Buzz apparently is in his element in war. A “born flyer,” he frankly considers the aircraft as simply an extension of himself, and his light, deft touch on the controls makes others believe it. On combat missions he cuts loose with a wild war whoop when enemy fighters pounce on the bomber formation. For his copilot he exhibits a belittling contempt.

The copilot, Charles Boman, is the narrator of the novel. Small, young, groping toward maturity, sensitive beneath the lash of Marrow's contempt, Boman sweats out each mission toward the magic number twenty-five. Even as he grows in experience, his confidence is undermined by his reverence for the abilities of Marrow. For all the indignities that he suffers from his pilot, he considers Marrow everything that a man ought to be. Boman's ultimate salvation comes through his love affair with an English girl, Daphne. Much wiser and more experienced than her lover, Daphne soothes his psychic wounds. She ultimately makes him see the shabby weakness of his hero.

*The Body* and her crew are lucky in their early missions. Then they begin to get hit, sometimes badly. The oddly assorted crew, most of whom hate each other, function together ever less well as the accumulated strain of missions tells on them. Psychologically, Marrow peels off in a long dive toward disintegration and

death. Copilot Boman responds to the vacuum in leadership and starts his arduous climb toward maturity and manhood.

The climax finally comes when *The Body* is viciously mauled. Two engines are knocked out. A life-and-death struggle begins to get her out of Germany and to the English Channel before the faltering third engine goes too. This is when the war lover, the great Marrow, comes apart completely and finally.

Mr. Hersey has obviously done considerable research on the B-17. Details of each crew member's job are meticulously reported (see excerpt from this novel, page 116). Similarly the mechanics of forming up and flying a formation combat mission are well handled.

With all of this material, with its natural drama and its inherent potential for a strong anti-war argument, it is unfortunate that *The War Lover* falls short both as a novel and as an argument. Technically the novel fails in several important areas of craftsmanship. The characterization is poor. Several of the characters are recognizable types, but none of them really comes to life, and it is hard for the reader to be greatly concerned over their fate. The bulk of the story is told with excessive use of a tired device, the flashback. For all the detail of the aircraft and the duties of the crewmen, the reader feels that he is simply being told about these things, not that the characters are actually experiencing them.

An even greater failure appears in presentation of the anti-war argument. All good war books are by their very insight anti-war. But a book that consciously preaches tends to compromise its effectiveness.

*The War Lover* has much to say against war. But there is little that truly comes through. War is assumed to be bad. The cause of war seems to be the war lovers, who are chiefly brute males craving the killing and annihilation of war as the ultimate expression of their own manliness. But this, the book says, is really a façade, because these men only feel compelled to prove their manliness because they really are not manly. From a psychological standpoint, in addition, they seek darkness and death rather than light and life.

There are germs of truth in these

and other of the book's viewpoints. But *The War Lover* is a pretty feeble attempt to present them, relate them to real human behavior, and translate the findings into a novel that will say these things compellingly to other people.

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About the reviewer: Managing Editor of the Air University Quarterly Review, Dr. Anderson received his Ph.D. in English literature from the University of North Carolina, where he also was a member of the faculty. Dr. Anderson has contributed to *AIR FORCE/SPACE DIGEST* in the past. He has edited a distinguished aviation literature anthology, *Great Flying Stories*.

### The Ardennes Revisited

*Battle: The Story of the Bulge*, by John Toland (Random House, \$5)

Reviewed by Lt. Col. Glenn W. Goodman, USA

Fifteen years ago this month, the Allied world was shocked out of complacency and self-delusion that existed as a result of a string of victories on the Western Front. On December 16, 1944, Hitler launched his last, most desperate offensive against American troops manning the “Ghost Front” in the Ardennes. In *Battle*, John Toland, author of *Ships in the Sky*, skillfully recaptures the atmosphere pervading this historic encounter.

This hour-by-hour account of the greatest pitched battle ever fought by US troops deftly switches back and forth from one side to the other, reflecting the reactions of one, the actions of the other. It reconstructs the heroic stands made along Elsenborn Ridge, at St. Vith, and at Bastogne, and spells out the frustration and humiliation of defeat felt by the two commanders surrendering their regiments in the Schnee Eifel (Snow Mountains), as the 106th passed out of existence as a division.

The author pulls no punches in describing the actions of inept and inexperienced commanders. His grim portrayal of the horrors of war and his descriptions of death and injury on the frozen battlefield are particularly vivid. The picture he paints of the confusion and panic which reign among the units caught in the initial onslaught is effective. There is the

(Continued on page 115)



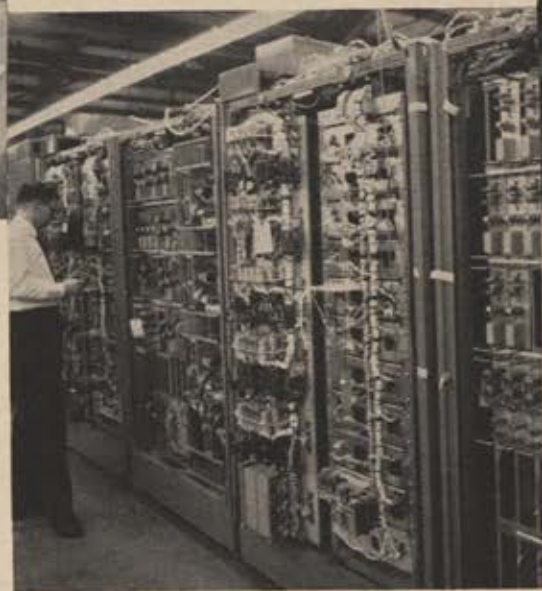
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tragedy of friendly units firing on each other as the chaos increases; the heroism and cowardice as cooks, clerks, and headquarters personnel are quickly mustered for the defense of command posts and other critical points. Finally, there is terror in the eyes of recently liberated civilians as they watch the retreat by US forces.

Mr. Toland fills his book with dialogue recreated from interviews and years of research. Sketch maps trace the growing Bulge and a section of excellent photographs depicts many of the principals on both sides.

Across the pages of *Battle* parade the heroes, cowards, leaders, and goldbricks of the Bulge. Names like Montgomery, Bradley, Hodges, Patton, Collins, McAuliffe, Clarke, and Ridgway are familiar to all. But author Toland also tells the story of the men in the foxholes.

He likewise presents the story from the German side, giving an intimate picture of Hitler's army commanders who were to carry out his final big gamble.

The Bulge was an unorthodox battle with fluid or nonexistent lines. It was often fought by small, isolated groups operating independently and without communications. Much of the campaign was a ground war due largely to the limitations imposed by "Hitler weather" over the Ardennes. Rightly or wrongly, Gen. Hoyt Vandenberg's Ninth Air Force gets little play in this account.

The author refers to the failure of American intelligence officers to foresee the German offensive and then handily disposes of it. He excuses the "primitive, naive American intelligence system," pointing out that a sophisticated British system was equally blind. He would absolve those in high places such as Patton, Hodges, Bradley, and Eisenhower. Concluding that the whole Allied world must share the blame for having fallen into the trap of complacency and overconfidence, he blames near disaster on failure of imagination rather than intelligence.

Some military historians will consider Toland's approach an oversimplification of the problem. They would point to faulty interpretation of available intelligence as the major factor in our failure to perceive of German intentions. This school holds that, despite limited combat patrolling and lack of aerial reconnaissance because of poor weather, the intelligence material at hand, properly evaluated, was sufficient to indicate the nature of the coming offensive.

The story of the Bulge has been written before by Brig. Gen. S. L. A. Marshall, Col. R. E. Dupuy, Robert Merriam, and others. Whether or not one has read these books, he is likely to find author Toland's "you-are-there" account fascinating.

About the reviewer: Lt. Col. Glenn W. Goodman is currently assigned to the Adjutant General's Office, Hq. US Army. During World War II, he served with antiaircraft elements of the First, Third, and Ninth Armies in Europe. He saw action during the Bulge fighting. He is a recent graduate of the US Army Command and General Staff College.

## Heroes and Hardware

Whether or not technology has pushed the air ace into obsolescence, recent years have brought a literary revival of this twentieth-century hero. *Air Aces of the 1914-1918 War* (Harleyford, England, \$8.50) is new and comprehensive. It covers the men and the planes of all nations in eight sections: British, French, American, Italian, Belgian, Russian, German, and Austro-Hungarian. Each section gives biographies of the aces, a thumbnail sketch of their combat record, and their contributions to the air war. It tabulates aces by scores and carries photos of the men and the aircraft they flew.

For more than a quarter century the faithful old "Gooney Bird" has been a familiar sight on airways of the world. The story of the Douglas DC-3, certainly a warm, tender chronicle to the hearts of airmen everywhere, is finally told by two USAF officers, Lt. Col. Carroll V. Glines and Lt. Col. Wendell F. Moseley in *Grand Old Lady* (Pennington Press, \$3.95). It contains scores of DC-3 stories in peace and war.

The USAF Air Rescue Service has done the lion's share to demonstrate to peoples of all lands, colors, creeds, and political ideologies just how America's peacetime airpower can benefit mankind. Many books and magazine articles have praised this humanitarian Air Force mission. The official story is now available in *A History of the Air Rescue Service*, prepared under the editorship of John L. Vandergrift, ARS historian, and published by ARS at Orlando, Fla.

—MAJ. JAMES F. SUNDERMAN



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# PORTRAIT OF A

## B-17

From *The War Lover* by JOHN HERSEY

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**C**HECK IN," said Prien from the tail, and he began to count us off, and as he did I visualized our plane, and the men in it, and this gave me comfort, for I worried about *The Body* and loved her, not in Marrow's erotic way, but because she was familiar, and reliable, and her interior walls curved about me, cupping me as I took life-giving nourishment from her oxygen tubes; perhaps because I had entrusted my existence to her so many times.

"One!"

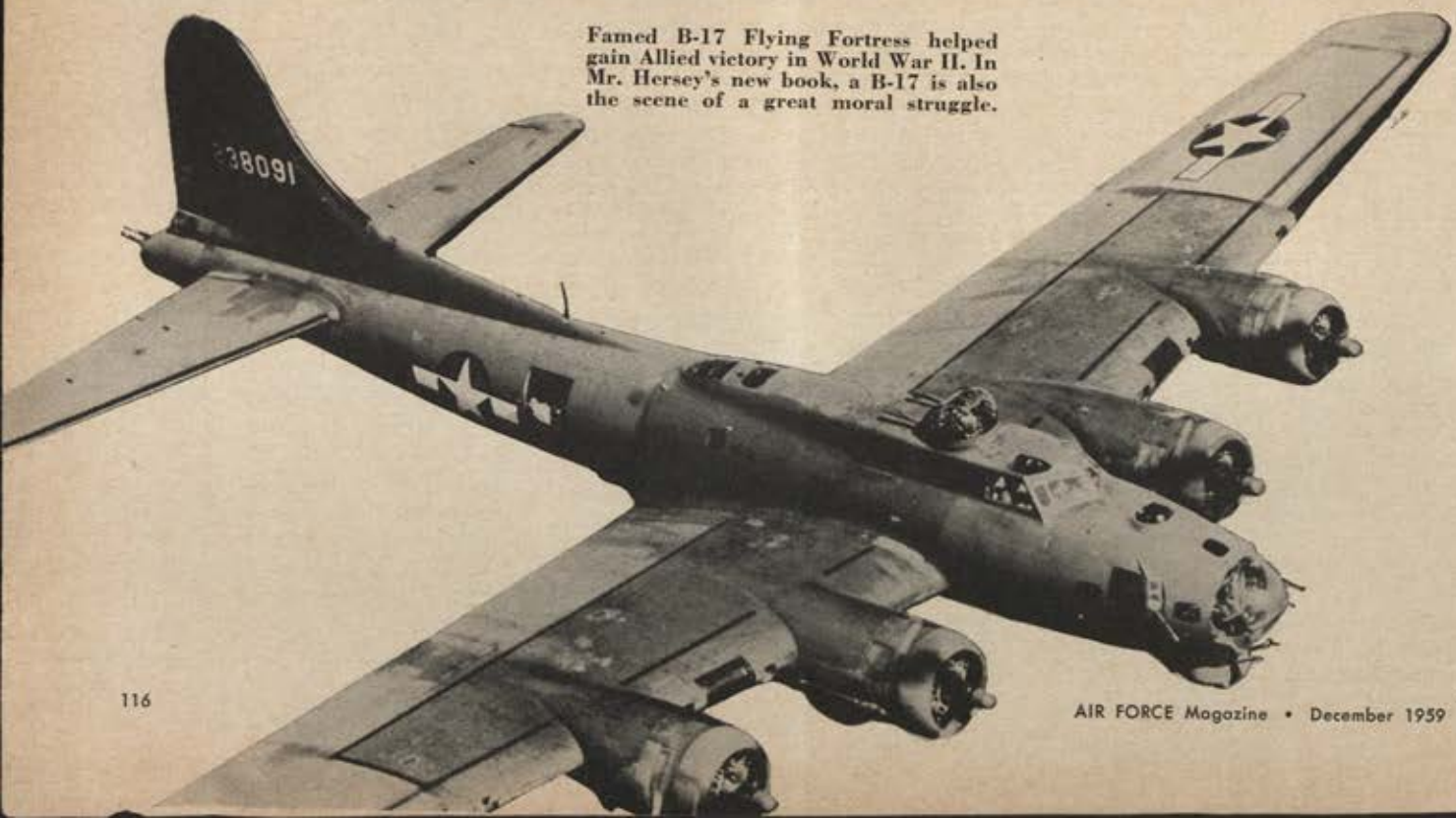
"O.K.," Max said.

Max Brindt would be in the bombardier's seat in the very nose, leaning forward in his tense way in the air, bathed in greenish light. Before him, source of that light, was a conical Plexiglas windshield with a lozenge-shaped panel in the middle of its lower part, through which the

concentrated sightings for bombardment, the aim and point of our missions, were made. There were also low windows in the plane's walls on both sides of Max. Just now Max would be ready at the handle of a hand-held fifty-caliber machine gun with a post-and-ring sight which was poked out through a kind of nipple up near the center of the nose; in action he might also have to jump to another gun farther back in the left side of the nose.

To Max's right, on the side wall, were his oxygen regulator, suit-heater outlet, interphone jackbox, and brackets to stow the nose gun. To his left were his instrument panel and bomb controls: a round-knobbed handle which, along with a switch, worked the bomb-bay doors; another handle, which could either lock or salvo the bombs, or set them to be toggled out at electrically controlled intervals; and a release switch, covered by a

Famed B-17 Flying Fortress helped gain Allied victory in World War II. In Mr. Hersey's new book, a B-17 is also the scene of a great moral struggle.



The following material is from Chapter Five of John Hersey's new novel *The War Lover*, published this fall by Alfred A. Knopf, New York (\$5), and appears here with permission. The novel, set in England in World War II, at an Eighth Air Force base, tells the story of an American bomber crew and their plane, *The Body*, before and during a raid against the German city Regensburg. The story is told by the Flying Fort's copilot, Lt. Charles "Bo" Boman. The other members of the crew include Capt. William S. "Buzz" Marrow; Lieutenants Clint Haverstraw (navigator) and Max Brindt (bombardier); and Sergeants Handown (engineer), Lamb (radio operator), Bragnani and Farr (waist gunners), Sallen (ball turret gunner), and Prien (tail gunner). This excerpt, describing the interior of Buzz Marrow's B-17, should evoke poignant memories in many readers of *AIR FORCE*. A complete review of *The War Lover* appears in "Airman's Bookshelf," on page 112 of this issue.—THE EDITORS





B-17s and escort fighters under fire on their way to Germany. Flying Fortresses could absorb awesome punishment.

protective guard, for this toggling. Fastened to the curving wall above these controls was a goose-neck lamp that might have been on an office desk in some peaceful place.

The navigator's area was directly behind Max's at a somewhat lower level, but with no physical barrier between the two so-called compartments. Clint Haverstraw's province was lit by two pairs of windows in the sidewalls, by the navigator's astrodome overhead, and indirectly by the Plexiglas nose. Clint's desk, with a dial of the radio compass recessed in its right side, stretched across the back of the bombardier's seat and ran to the right side wall; on the left was Max's passageway forward.

Along the side wall to Clint's right were a bulbous driftmeter, a storage box for the bombsight, an aperiodic compass, and Clint's suit heater and oxygen outlets. On his left, beyond the narrow passageway, were the radio compass and its control panel, Clint's map case, his interphone jackbox, and another oxygen regulator. Everything was neat as a pin; Clint had even installed a set of grip holders on the wall over his desk to hold a comb. Just now Clint was manning, doubtless with distaste, a fifty-caliber gun that poked out of a large covered window on the right side of the nose, at the forward end of his compartment. A corresponding gun on the left side was Max Brindt's alternative weapon.

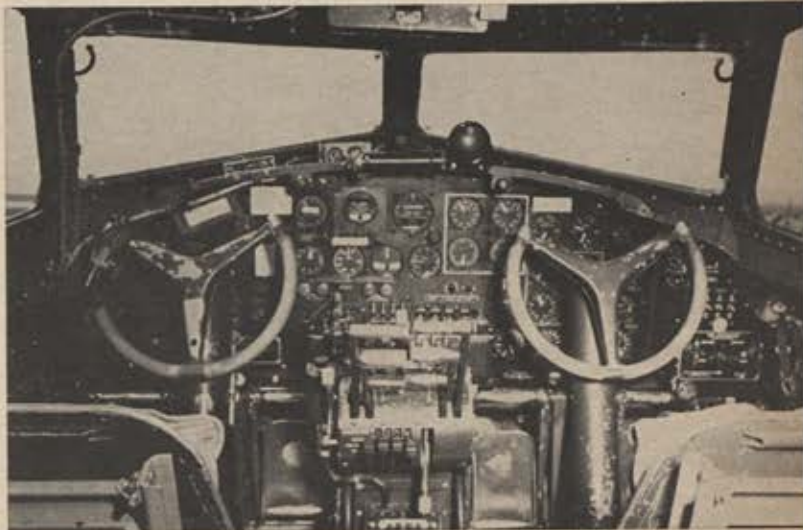
Aft of the navigator's compartment was a section of the plane that was divided into two levels. The upper one was the pilots' cockpit, and to reach it, one had to climb up through a trap door between Buzz's seat and mine. The space of the lower level, which was only about four feet high, was in part for the storage of large oxygen bottles, but it also provided access to the forward escape hatch of the plane, in the bottom of the ship.

Buzz and I sat at the top of the plane, looking out through a windshield which ran across over the nose; we had side windows, too. We were, it seemed, embedded in instruments. The main panel spread like a swollen dashboard before us, while the powerplant controls—throttles, turbo levers, mixture levers, and propeller-pitch handles—were in a central stand between the two flight columns; below that stand, forward of the trap door on the floor between us, was another block containing the automatic pilot with its many knobs and switches; each of us had a pair of side control panels, on the wall and floor beside him; radio-tuning apparatus was on the ceiling above us. Altogether there were more than a hundred and fifty dials, switches, levers, indicators, handles, cranks, knobs, buttons—any one of which might, at a moment of crisis, save or lose the plane and all of us.

Directly in back of the cockpit was the engineer's

working space; Negrocus Handown's. Now Neg was in the upper turret, above it. This was a ribbed Plexiglas dome, shaped something like the gun turret of a tank, with room for Handown's head and shoulders in it. From it extruded a pair of fifty-caliber guns; the whole dome could revolve, under power, on a cogged track, while the guns, which Neg fired through an automatic computing sight, could be elevated and depressed by an electrical mechanism. It was a pity Neg had only two hands. There were two handles with which to charge the guns with ammunition; a pair of hand grips to control the azimuth and elevation of the guns; triggers on them; a range knob between them; and the usual gadgets for heat and oxygen and communication, as well as hand cranks in case the power failed—all to be manipulated at once, it seemed, in response to lightning reactions under the threat of death from an attacker.

The engineer's compartment ended at a bulkhead, in



"Buzz and I sat at the top of the plane, looking out through a windshield . . . embedded, it seemed, in instruments."

the center of which was a door leading into the bomb bay: a windowless cavern containing a big vee of racks for the bombs. One had to step down two steps from the doorway to reach a narrow catwalk to the rest of the ship; I had gone in there one day—it was on the Huls mission, on June 22—when the bomb-bay doors, like great longitudinal jaws, had been jammed open by a wedge of flak, to help Neg crank them shut by hand, and we had nothing between us and the good earth but twenty thousand feet of air. It took us an hour to fix it. Another time, over Kassel, Max had leaned way down off the catwalk into space to fuse some of his bombs by hand when the arming mechanism had failed.

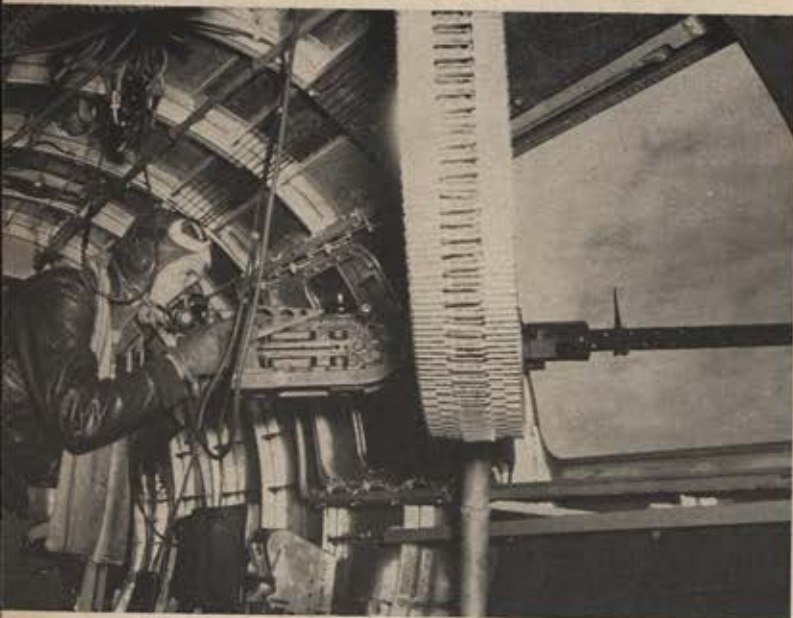
Next, going back, was the radio compartment, Butcher Lamb's place. This was the only self-contained roomlike space on the ship, a kind of cabin, where Butcher, at a table on the left side, operated, as needed, the main controls for the VHF and liaison sets, interphone, marker-beacon equipment, radio altimeter, radio-compass recorder, and homing set. The receivers and transmitters were disposed around the room; in one corner there was a stack of five transmitters which looked something like a high layered office file. Besides Lamb's seat, there were two others, where Bragnani and Farr, the waist gunners, commonly sat on takeoffs and landings. Behind one of them was lashed a portable emergency transmitter, for

(Continued on following page)



use in case of a ditching in the sea. At the end of a mission Butcher's compartment was littered with pencil stubs, butts, scraps of paper, and, above all, Westerns and comic books in which he immersed himself at crucial moments, sometimes reading while supposedly manning his hand-held gun which pointed rearward out of a slot at the top of the cabin. Handown caught him doing that once—firing when a fighter took a pass at us, then reading a few sentences, then firing again, absent-minded, dreamy-eyed, like a certain kind of man fussing with a pipe he is smoking while he reads.

Moving aft out of the radioman's room one came next to the ball turret, set like a knuckle in its socket in the bottom of the plane. The ball turret differed from the upper turret in one vital way: Junior Sailen had to let himself down into it and sit in it, hunched up like an embryo, firing between his spread legs, with a door locked above him, and with the whole turret revolving not only in azimuth, as did the upper turret, but also in elevation, as the upper turret did not. In other words, Sailen, locked into the ball, spun and tilted with the motion of the ball, which he controlled himself by power as he aimed at the enemy. His mechanisms were even more complicated than Neg Handown's; in order to adjust the reticles of his gunsight for range he had to use a left-foot pedal, and to press the talk switch of his interphone he had to use his right foot, while he tracked the target with hand grips and fired with switches on top of the grip handles. The door of the turret could only be unlocked if the ball was properly upright. It was no wonder that Junior had repeatedly made his crewmates swear that they would get him out if it ever got stuck.



"Aft the ball turret was the waist gunners' post. Here one was in the long tube of the naked fuselage."

Aft the ball turret was the waist gunners' post. Here one was in the long tube of the naked fuselage, its walls honeycombed with ribs and frames. Farr on the right and Bragnani on the left would be standing with their guns on brackets pointing out the two large open waist-high windows; the main entrance door of the plane was to Farr's right, and beyond that a chemical toilet, which was the center of much kidding of Prien with his bad stomach.

Prien himself was beyond a doorway in a final bulkhead; his station was in the narrow wedge of the very tail of the plane. He sat perched on an oversized bicycle seat, and when he was actually firing he heaved his body further to the rear and knelt on a pair of knee pads. He fired twin-fifties hung on pulleys and cables, with a ring-and-post sight. . . .

In battle, under attack, I was supposed to be in charge of fire control and interphone discipline, though of course no one could really be in charge because no one man could see all the sectors of possible attack; and there was the added fact that Marrow could not stand letting anyone else be truly in charge of anything. Each gunner was assigned a definite segment of the sky, corresponding to the zone of fire of his gun or guns, and he was supposed to cut that piece of sky into small sections in his mind and to search those sections systematically for enemy planes. Neg Handown in the top turret searched ahead and above—from ten o'clock to two o'clock, high; Junior Sailen in the ball turret searched ten to two, low; Butcher Lamb searched (if he could tear his eyes from his book) four to eight, high; and Prien, in the tail, four to eight, low; Farr, at the right waist window, searched two to four, high and low, and Bragnani, on the left, eight to ten, high and low. From time to time each man might take a look outside his sector; Neg Handown and Junior Sailen, for instance, intermittently made three-hundred-sixty-degree sweeps with their turrets. The officers, having other duties, were not assigned definite sectors to watch, but of course we scanned the sky as much as we could.

When a man sighted an enemy fighter in his sector, he was supposed to call it in at once, and generally speaking I was supposed to coordinate our firing, but in practice Buzz often jumped in ahead of me, and in the heat of action the gunners often called directly to each other, the man who sighted a fighter in his sector alerting another who was apt to get a good crack at the attacker as he passed. The greatest menace to our efficiency was everyone's talking at once, and here I was supposed to ride herd; though, again, Marrow couldn't keep his big mouth shut for long. Since our mutual safety was at stake in all this, no one stood on ceremony. We were eager to help each other and were not jealous for rank or duty, and occasionally, singing out at the sight of the enemy, calling back and forth to save our skins, we had (or at least I know I did, and I believe the others did) a feeling of the close brotherhood of crewmates, so that we who were so diverse, gentle Sailen, thuglike Farr, tidy and compulsive Haverstraw, cold-fish Prien, and the others, all of us, who got along rather badly as human beings, some of us bearing deep hatreds for others—all were drawn together under attack by what, for most of us, was the second strongest love on earth, second only to self-love: the love of those upon whom our lives depended.—END



The author, John Hersey, has been a reporter, editor, war correspondent, and novelist. He has written five novels. The first, *A Bell for Adano*, won the Pulitzer Prize for 1945. The others were *The Wall*, *The Marmot Drive*, and *A Single Pebble*. His non-fiction *Hiroshima* was considered the best account of the first A-bombing.



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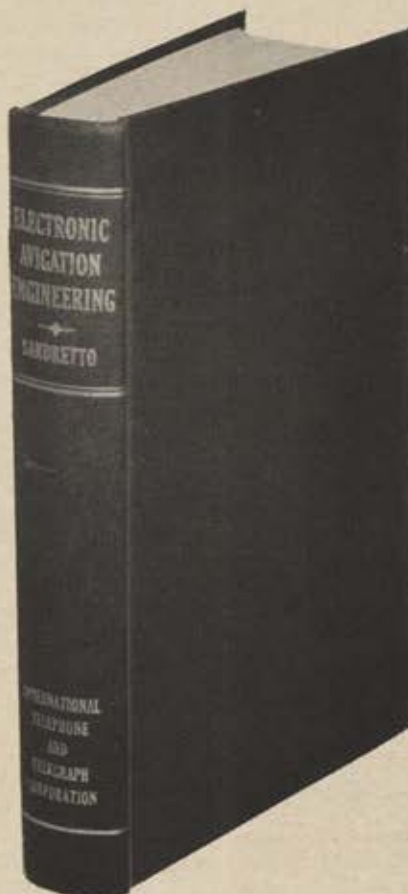
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