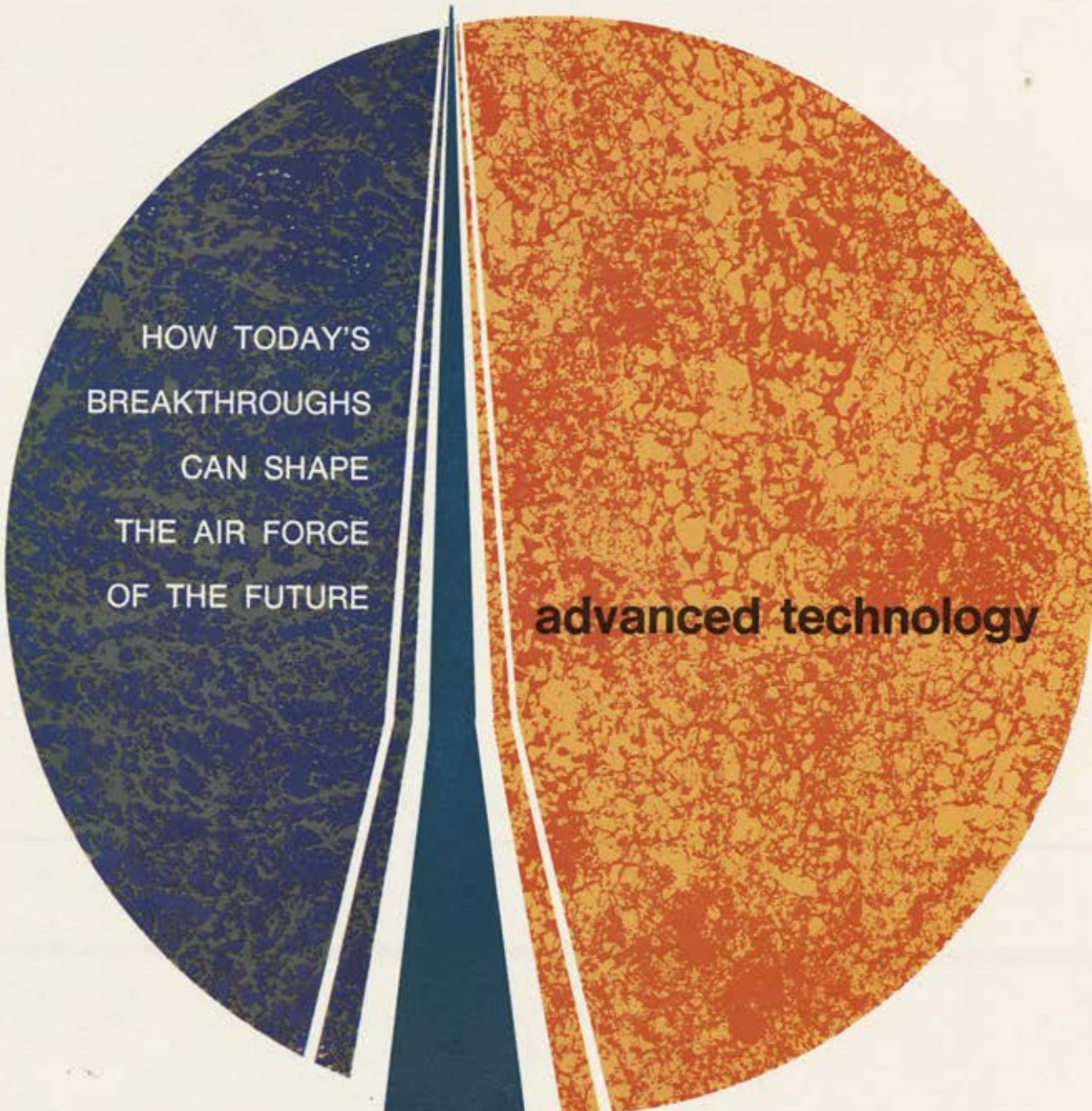


May 1969 / \$1.25

AIR FORCE

and **SPACE DIGEST**

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



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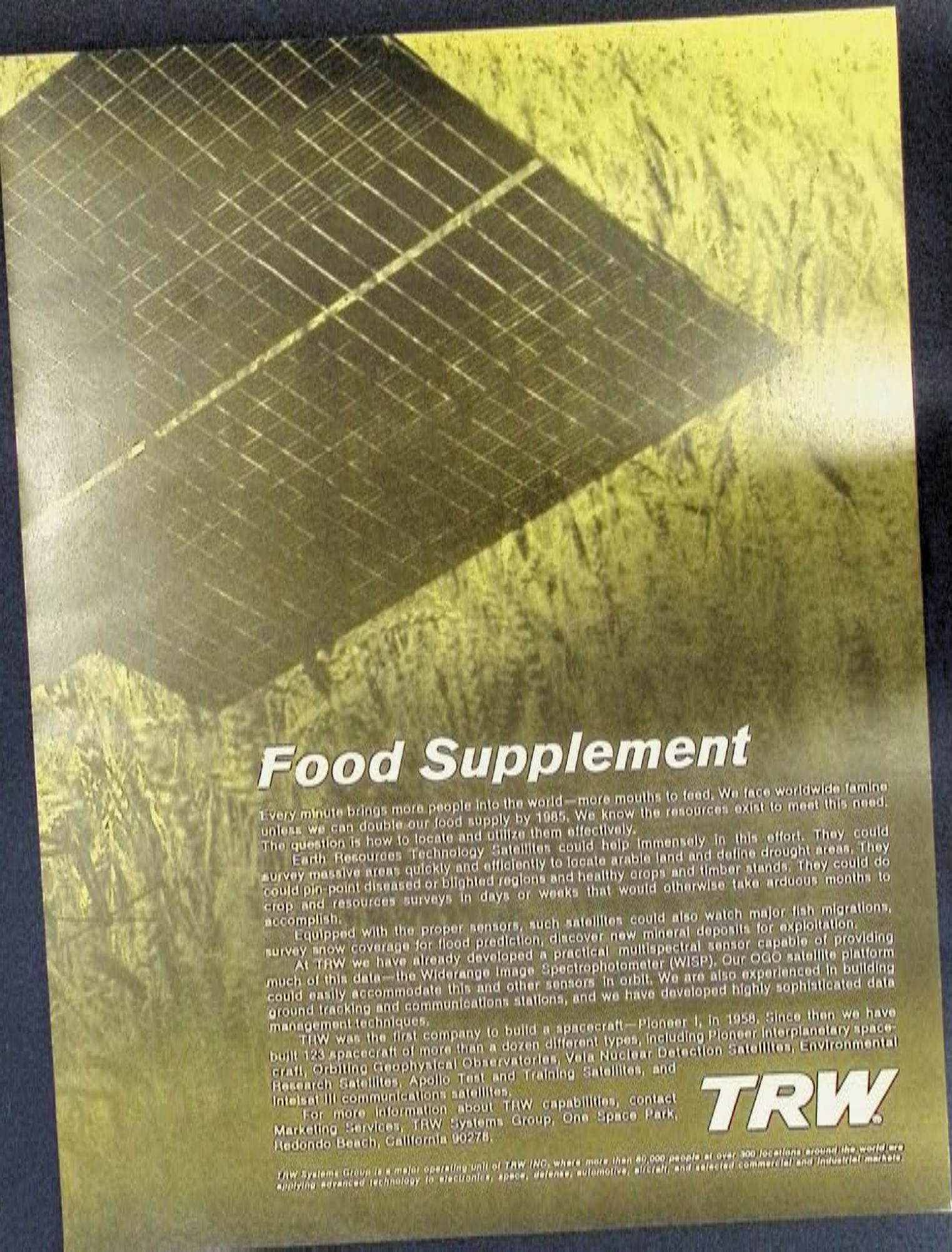
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52a, Apt. 123.

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Charles E. Cruze, Director of Sales, 880 Third
Ave., New York, N. Y. 10022 (212-752-0235).

Laurence W. Zoeller, Director of Promotion;
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20006 (202-298-9123).

Carole K. Zoeller, Production Manager, Suite
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and SPACE DIGEST

The Magazine of Aerospace Power
Published by the Air Force Association



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ADVANCED TECHNOLOGY ALMANAC

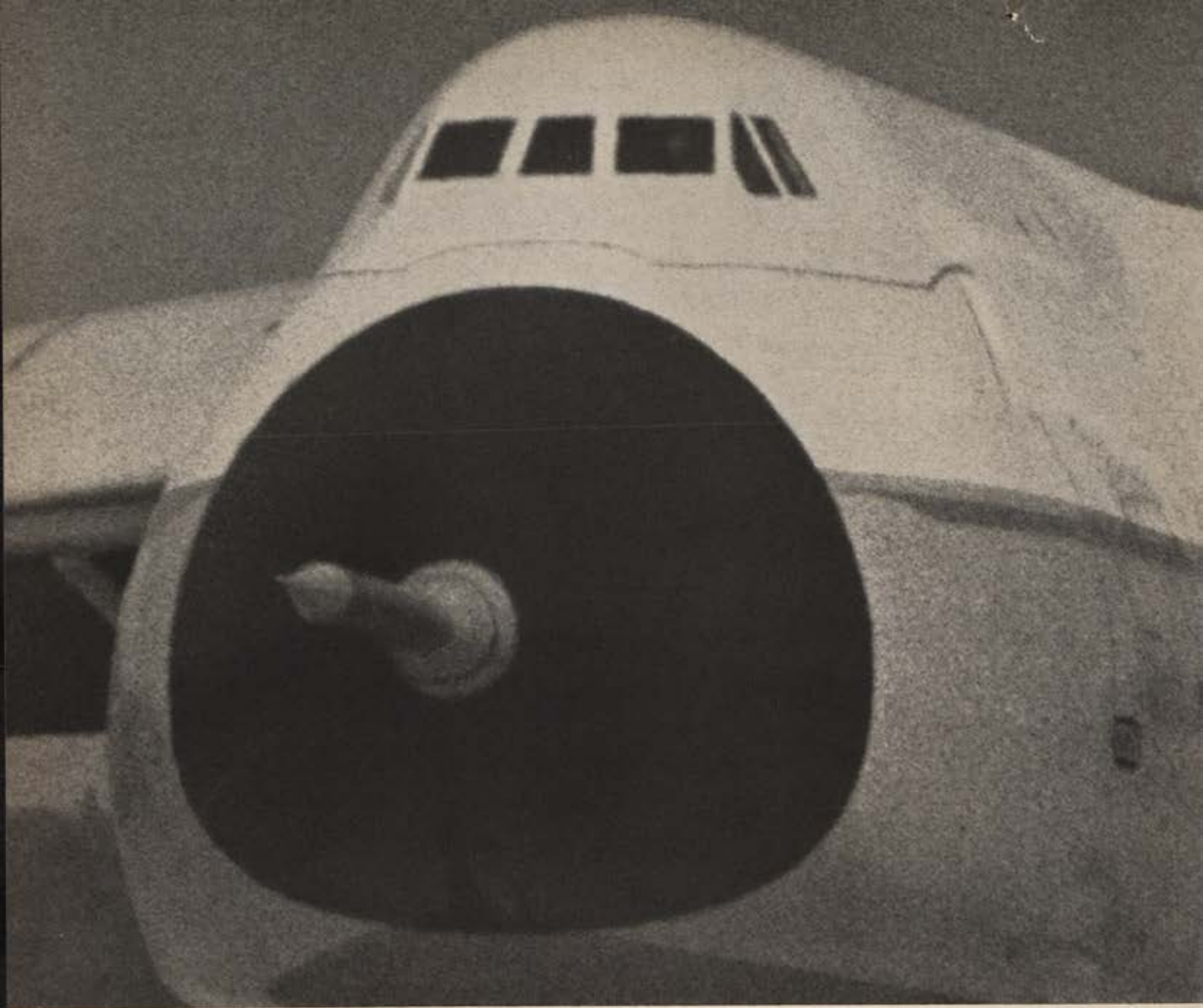
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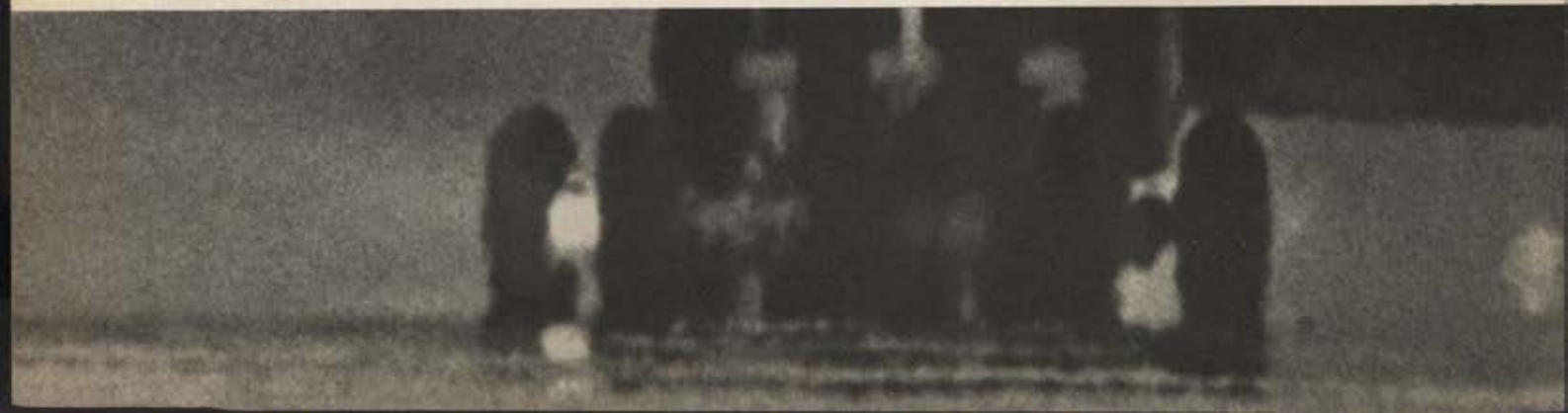
At 250 tons, it stops in 500 yards.

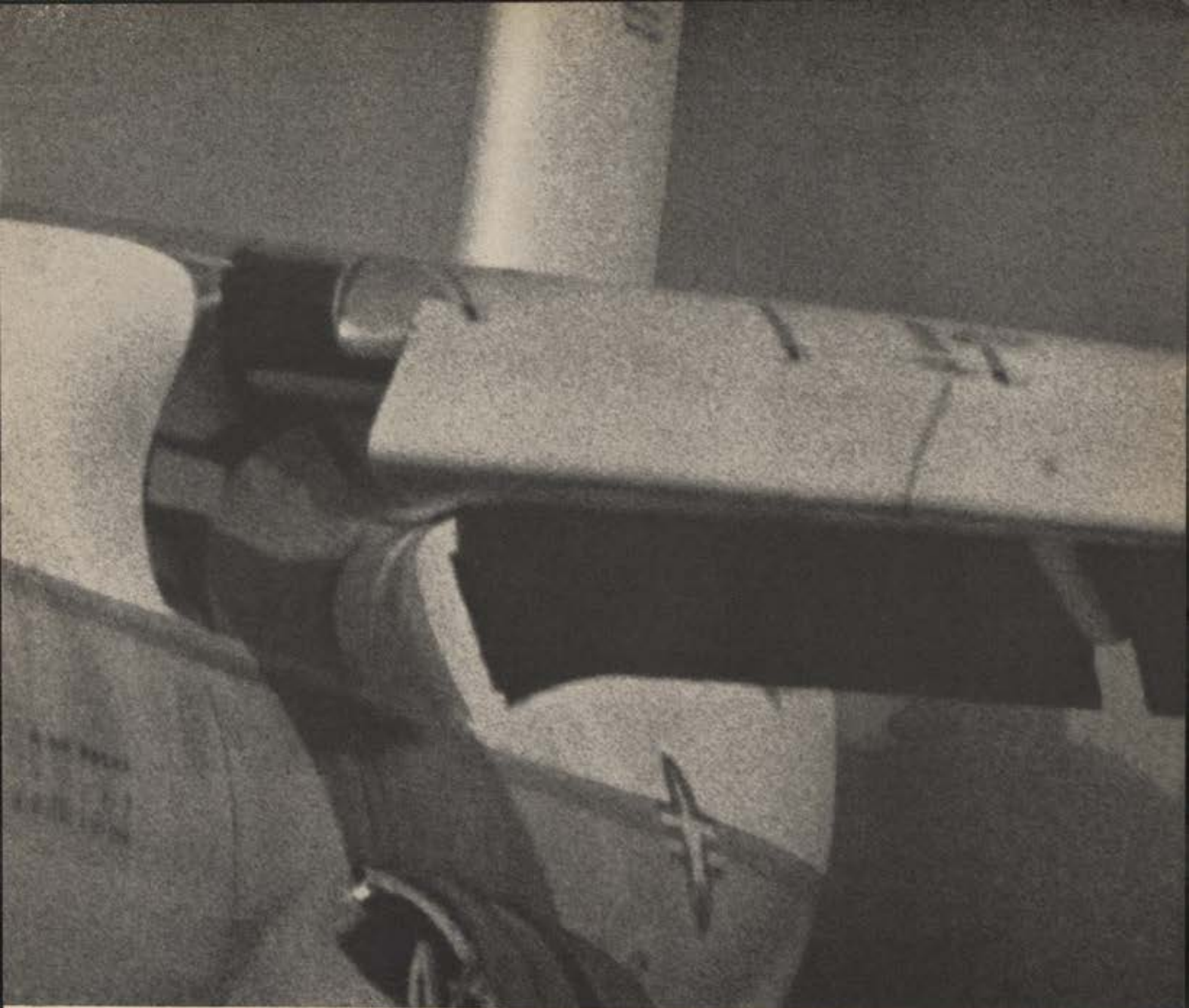
The world's largest airplane has landed with a ground roll of less than six times its own length. Touching down at a gross weight of one-half million lbs., the C-5's advanced technology, including its beryllium brakes, halted it in less

than 500 yards. This latest phase of flight testing has verified the exceptional stopping power of this new airplane.

As flight testing of the C-5 continues, it is meeting and surpassing its design requirements. Take-off

and landing performance has been exceptional. The giant has lifted off at a record 635,450 lbs. gross weight with a take-off run of only 5,500 feet. Coming in, it touches down 10% to 15% slower than smaller jet transports. On wet runways, its landing





roll is only 2,600 feet. Jetliners only half the size of the C-5 require 8,000 feet in the same conditions.

The advanced-technology C-5 is proving its worth. With every flight, it expands the scope of military airlift capabilities.

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Adopted at the Houston Convention...

The Air Force Association's 1969-70 Statement of Policy

Following is the complete text of the Air Force Association's 1969-70 Statement of Policy, as unanimously adopted on March 19, 1969, by delegates to AFA's twenty-third annual National Convention, at Houston, Tex.

THE new national Administration faces twin challenges which together represent a national task more complex than any within living memory. These are the constitutionally imposed obligations of providing for the common defense while at the same time ensuring domestic tranquillity.

There are voices abroad in the land, growing in numbers and in volume, that say that these goals are incompatible, that the one can be achieved only at the expense of the other, that the United States is neither powerful enough nor wise enough to do both.

The Air Force Association rejects out of hand any such philosophy of despair. We believe the United States can do both. We believe it must do both. Peace and freedom must be viewed as an indissoluble entity, both at home and abroad. Any national effort that does not hold both goals to be attainable betrays the ideals of the Revolution in which this nation was born and from which it has taken its strength for almost two centuries.

Providing for the common defense requires a penetrating evaluation of present and potential threats to national security. Those who wish to provide for domestic tranquillity at the expense of the common defense justify their position either by saying that the external threat has somehow lessened or that it has become too great to be coped with by other than diplomatic means. The one is wishful thinking. The other represents at best apathy, at worst the prospect of appeasement.

We view the threat to our nation's security as greater than ever. At the same time, it has become more complicated. A decade ago the threat represented a simple bipolar confrontation between the world's only two nuclear superpowers—the United States and the Soviet Union. Now it is three-pronged. The Soviet Union has

tightened its grip on its satellites by naked force while continuing its buildup of both sophisticated advanced weaponry and conventional forces. Red China continues its domination of the landmass of Asia by sheer weight of numbers while at the same time thrusting toward full-fledged status as a nuclear superpower in its own right. Both Communist powers urge, aid, and abet so-called “wars of national liberation” in the less-developed areas of the world. Any one of these developments poses grave risks for the United States in its position as leader of the Free World. Taken together they represent a threat of greater magnitude than any this nation has faced to date.

To the Air Force Association the facts are clear. While there may be areas in which the United States can negotiate safely and with advantage to ourselves and to our adversaries, such negotiations must proceed from a basis of undefeatable strength and in concert with our Allies, who must provide a fair share of that strength. *Domestic problems must be solved in ways that do not weaken our position at the international bargaining table.* Our adversaries are counting on both external and internal conflicts to weaken American strength and American will. This need not happen. It cannot be permitted to happen.

At the same time, *the Air Force Association recognizes that the quest for freedom and justice for all Americans at home makes equally compelling demands on our national resources and national will.* There is no contradiction here. Indeed, the US military has pioneered in the erasure of racial, ethnic, religious, and social discrimination. Likewise, it has succeeded in imparting educational experiences and vocational skills to those whom civil society has discarded as unteachable and unusable. The aerospace industry, on which the armed forces depend for advanced weaponry, has accumulated skills and resources which are being put

to work in the solution of pressing domestic problems ranging from education to housing. *Taken together, the military-industry team, which protects our national interest against foreign enemies, constitutes at the same time a vital national resource that contributes on an ever-increasing scale to solutions for many of our domestic ills.*

The greatest single factor in the current debate over national purpose and national resources obviously is the war in Vietnam. The unpredicted costs and ill-defined objectives of that conflict helped to create the economic and social pressures that are now eroding public support for essential defense measures and programs. Hence, the military and political lessons of Vietnam require the closest scrutiny. *In the military sense, Vietnam has demonstrated anew the utility and flexibility of properly managed airpower in close support of ground troops, as a highly effective tactical weapon, and as an indispensable logistic tool—all in the context of over-all strategic deterrence.* The impasse in Vietnam is not military. Rather, it marks the failure of a political doctrine to evoke the kind of response from our adversary that it was expected to evoke.

Out of the bitter Vietnam experience must come a broader understanding of the range and nature of military power required for the 1970s as well as the need to correlate political policies to the military facts of life. Our forces must be tailored to deter aggression across the spectrum of conflict, from subversion and guerrilla activity to the potential intercontinental exchange of massive nuclear weapons. In achieving such

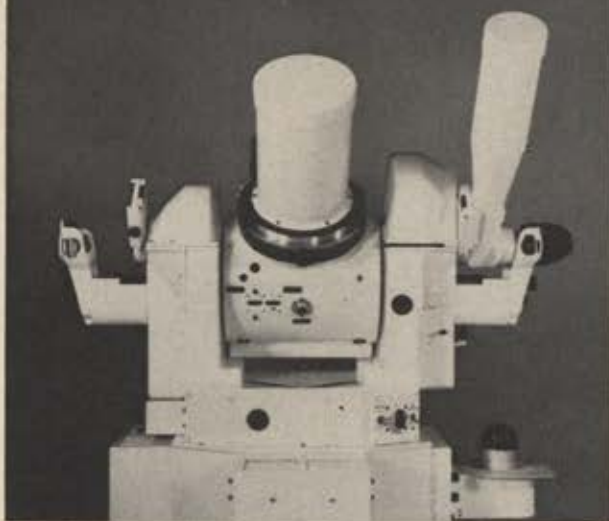
a posture we must take full advantage of available technology and ensure that future technological advances—whether defensive or offensive—do not become a monopoly of a potential adversary.

We must order our priorities so as to separate peripheral threats from those that are vital to our own national survival and that of our Allies. We cannot, as in the case of Vietnam, rob our strategic forces of money and technology to pay for indecisive and expensive adventures in conventional warfare. Above all, the American people must be told the truth about the price and the purpose of our military and political commitments.

American resources are vast but not unlimited. American willingness to make sacrifices and take risks in the interest of peace and freedom must be shared by those who share the benefits of that peace and that freedom. In the future, therefore, we should examine carefully any political and military involvements into which our friends and Allies are unwilling to accompany us or even support us.

The Air Force Association believes that the time for a deep and searching reassessment and evaluation of national purposes, priorities, and interests is long overdue. A new national Administration provides an ideal opportunity for such an appraisal. Parochialism, partisanship, self-interest, and self-deception have no part in it. All such narrow considerations must be swept aside in a quest for national unity in a spirit of candor and trust. Only thus can both the common defense and domestic tranquillity best be served.—END

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Kham Duc Revisited

Gentlemen: Flint DuPre's account (March '69 AIR FORCE/SPACE DIGEST, page 98) of how Lt. Col. Joe Jackson won the Medal of Honor put the name of Kham Duc into print, at last. I have been watching the war news for nearly five years, waiting for some mention of this lonesome outpost in the jungle. Now it has appeared in the news, and there are some coincidences that cannot be left unrecorded.

In the summer of 1964, while the Kham Duc camp was still under construction, I visited the site in company with Kenneth Sams, USAF historian, and during our stay I took some pictures (*see below*).

At this year's AFA Convention in Houston I had an opportunity to show the pictures to Medal of Honor winner Jackson and came up with these unlikely bits of erudition:

1. During the rescue mission, Colonel Jackson and his C-123 crew stayed on the runway no longer than necessary, of course. If they'd had an opportunity to enter the camp—or what was left of it—at the side of the airstrip they might have discovered that the Special Forces who built it called the site "Camp Jackson," in

honor of a SFC William E. Jackson (*see photo*), a Green Beret hero who died as the result of wounds received in a nearby skirmish in January of 1964.

2. When Ken Sams and I visited Camp Jackson nearly five years ago, we flew in from Da Nang in a C-123. Its tail number was 542. And what was the number of Joe Jackson's aircraft? That's right—old 542!

CLAUDE WITZE
Bethesda, Md.

Long Live Gooney

Gentlemen: I thoroughly enjoyed Lt. Col. Gordon Furbish's article ["Grandpa Goes to War," March '69 issue] about his experiences as a retreat Gooney jock.

Perhaps "Gordo" Furbish and your readers might like to know that Maj. Warren Tomsett, his instructor, won the Mackay Trophy in 1963 for "The Most Meritorious Flight of the Year." Flying an ancient Gooney, Tomsett and his crew accepted a rescue mission on the night of July 20, 1963, and performed what was later termed an "impossible" feat with the Grand Old Lady. Tomsett landed on a strip at Loc Ninh at night and six badly

wounded South Vietnamese were loaded aboard. What made the flight one for the books was that it was made under blackout conditions on a 3,600-foot strip that was completely surrounded by 200-foot trees and about a hundred Viet Cong. The blinking lights that Tomsett saw on the final approach were the muzzle flashes of the enemy who were intent upon taking that particular Gooney out of the AF inventory.

The irreplaceable Gooney lives on. The third generation of pilots is finding out that the only replacement for a Gooney is another Gooney.

COL. C. V. GLINES, USAF (RET.)
McLean, Va.

Could Be

Gentlemen: Reference Mr. Thomas H. Long's article "Tek.nol'o-ji and Its Effect on Language," March 1969.

A term heard within the military is, "Calculated Risks Are Necessary Evils." Would that be CRANE?

CMSGT. PAUL B. CRANE, USAF
Camp Springs, Md.

"In Honor Of"

Gentlemen: I was flattered in 1954
(Continued on page 13)



These two photos were taken in the summer of 1964. At left, marker honoring SFC William E. Jackson, "US Special Forces Detachment A-732, died as a result of wounds received at Tra My, RVN, 19 January 1964." Above is C-123 No. 542. On May 12, 1968, Lt. Col. Joe Jackson landed this same C-123 at this same camp in the rescue mission that earned him the Medal of Honor (*see text*).

SCIENCE/SCOPE

For the first time in air-weapons history, the U.S. Navy recently launched two missiles from a single aircraft almost simultaneously and scored "hits" on two distant, widely separated airborne targets. The missile firing was a test of the Navy's Phoenix missile and its AWG-9 missile-control system, both developed by Hughes Aircraft Company. The AWG-9 is the only air-to-air system with a track-while-scan radar mode that enables it to launch several missiles and keep them on course while simultaneously searching the skies for other targets.

The Phoenix missiles scored "hits" on Ryan Firebee jet drones by passing so close they would have destroyed a full-size aircraft. The Phoenix and AWG-9 will be used in the Navy's new F-14A fighter to provide long-range air defense for the fleet and air-combat superiority for "dogfight" situations.

Some of the mysteries of Mars may be solved late this summer by earthbound scientists, thanks to the two-channel radiometers aboard the Mars Mariners NASA launched on February 24 and March 27. The precision instruments, designed and built by Santa Barbara Research Center, a Hughes subsidiary, will perform the key role of "taking the temperature" of Mars when the two spacecraft fly-by in July and August. By studying the temperature characteristics, scientists hope to learn something about the planet's surface and possibly about its atmosphere.

11 papers on ion engine electric propulsion by Hughes Research Laboratories scientists were presented at the American Institute of Aeronautics and Astronautics' 7th Electric Propulsion Conference in Williamsburg, Va., recently. Hughes has been active in this field since 1958, when it won the first NASA ion engine development contract, and is currently at work on major programs for Jet Propulsion Laboratory, Lewis Research Center, and Goddard Space Flight Center.

Cameras used to film below-zero sequences for two forthcoming motion pictures -- Universal's "Airport" and Twentieth Century-Fox's "Patton" -- were checked out at temperatures as low as -20°F. in one of the temperature/humidity chambers at Hughes Ground Systems Group at Fullerton, Calif. Chambers are ordinarily used to test antenna pedestals and drive systems, high-speed military computer modules, and even tiny components like resistors and capacitors at temperatures ranging from +300°F. to -100°F.

One of the world's largest particle accelerators, now under construction by Brookhaven National Laboratory at Upton, N.Y. will use 54 sputter ion pumps built by Hughes Vacuum Tube Products Division at Oceanside, Calif. The pumps will be used to produce a high vacuum for the operation of the 200 MV linear accelerator. They can pump at a rate of 1500 liters per second, and are a unique dual-diode type manufactured only by Hughes.

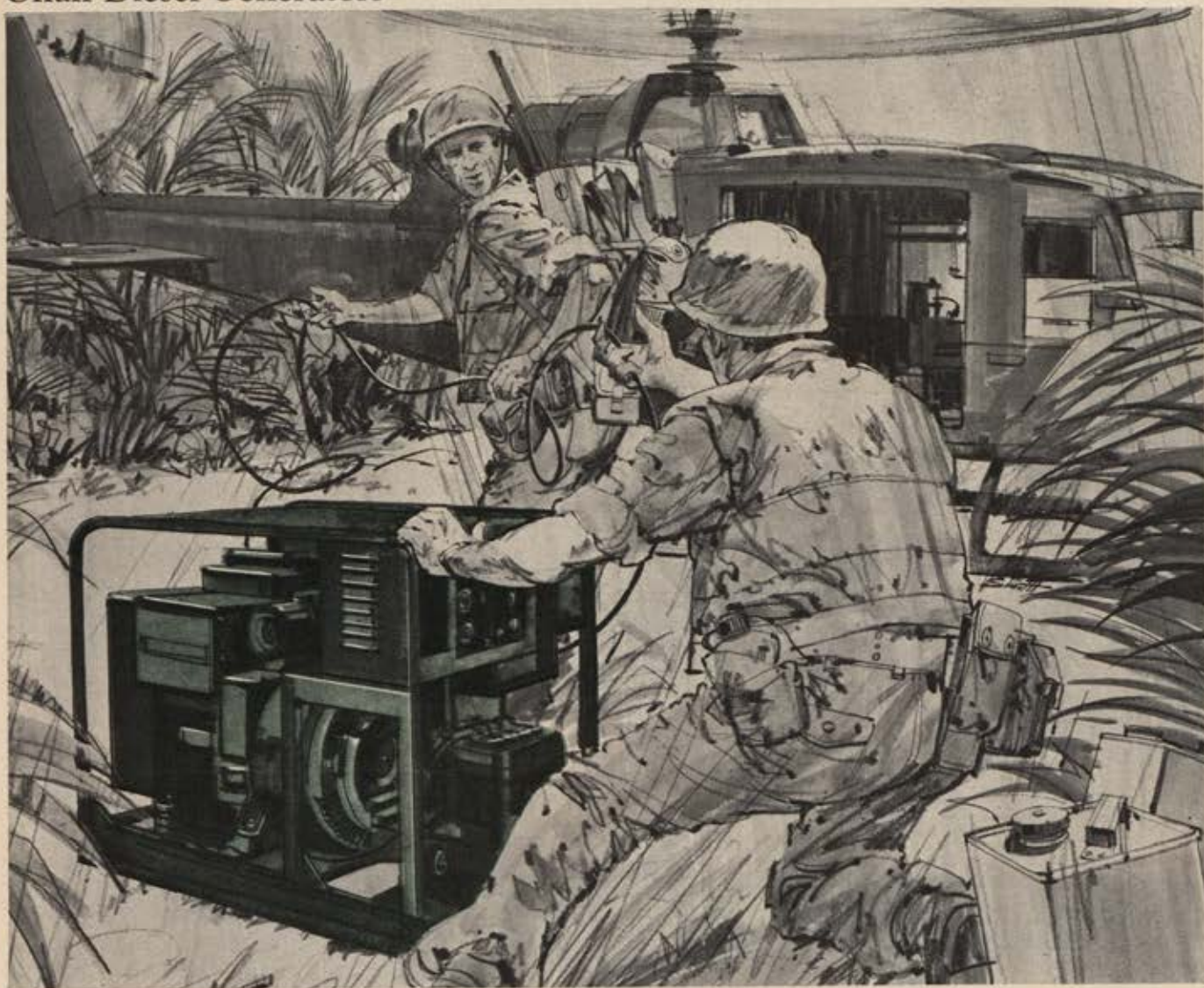
Belgium, The Netherlands, and West Germany have begun operating a new, three-nation electronic air defense control system, following successful completion of all tests. Advanced system, which will detect, track, and identify airborne targets and control interceptor aircraft, was built, installed, and tested by Hughes Ground Systems. Its growth into a major link of NADGE (NATO Air Defense Ground Environment) will be completed by Hughes during the next 30 months.

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when my colleagues and friends established a professorship in my name at MIT upon my retirement as Head of the Department of Aeronautical Engineering. Please accept this letter as proof, however, that the chair was not established "in memory" of me as reported in your article on . . . this year's Hunsaker Professor, Dr. Robert Channing Seamans, Jr. ["New Secretary of the Air Force," by Claude Witze, March '69 issue].

DR. JEROME C. HUNSAKER
Professor of Aeronautical
Engineering Emeritus
MIT
Cambridge, Mass.

THE Magazine

Gentlemen: I should like very much to mention that on December 24, 1968, I discontinued getting the local newspaper, the Pittsburgh Press, and last but not least, the Pittsburgh Sunday paper! People then asked me, "How do you keep abreast of world events?" I replied that I have television and radio, but most of all I receive the monthly magazine entitled *AIR FORCE/SPACE DIGEST*. In my opinion, it keeps you abreast more than *Life* and *Time* magazines put together, and the photographs are superb.

It truly is the magazine of magazines.

HOWARD C. MEWHERTER
Latrobe, Pa.

UNIT REUNIONS

1st Air Commando Squadron

The reunion of the 1st Air Commando Squadron will be held in Washington, D. C., May 9-11, 1969. For further information contact any one of the following:

Col. Eugene P. Deatrick
1013 E. Taylor Run Pkwy.
Alexandria, Va. 22302

Home: (703) 683-2274

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MSgt. Frank Zaken, III
10716 Kelley Dr.
Fairfax, Va. 22030

Home: (703) 591-6176

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2d Air Division Association

The 22d annual reunion of the 2d Air Division Association of the 8th Air Force, World War II, will be held in Gettysburg, Pa., at the Holiday Inn, June 20-22, 1969. Contact Cochairmen

Charles O. Stine and
Howard H. Baum
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98th Bomb Group (H)

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485th Bomb Group

The 5th annual reunion of the 485th Bomb Group, 15th Air Force, will be held August 16-17, 1969, in St. Louis, Mo. For additional details and the annual newsletter, contact

Carl P. Gigowski
344 Eola St., S. E.
Grand Rapids, Mich. 49507

487th Bomb Group

The 3d annual reunion of the 487th Bomb Group and Supporting Units will be held July

31, August 1, 2, and 3, 1969, at Atlanta, Ga. For details get in touch with

L. J. "SI" Avery
P. O. Drawer A. K.
Warner Robins, Ga. 31093
or
Arthur W. Silva
1002 N. Rosiland Dr.
Santa Maria, Calif. 93454

555th Tactical Fighter Squadron

The famed 555th TFS "Triple Nickel" will hold a gala practice reunion July 25-27, 1969, at the International Inn, Tampa, Fla. Mailing lists are being compiled so all members, past and present, are urged to write for details.

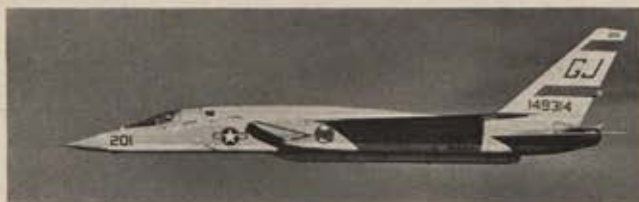
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By Claude Witze

SENIOR EDITOR, AIR FORCE/SPACE DIGEST

Shades of Senator Nye

WASHINGTON, D. C., APRIL 8, 1969

As expected, the arguments about the antiballistic missile system, revised and rechristened Safeguard by President Nixon, have not abated. It can be said that the ABM's foes are a little less shrill and, with a few exceptions, have stopped blaming all our ills on the military-industrial complex. Congressman Bertram L. Podell of New York continues to beat straw men over the head, but nobody is listening. One Senator thinks that Safeguard is an Air Force project, which it is not, and we have actually seen a two-day seminar in Washington where otherwise sensible people charged that we have a "national security state" where the military opinion always prevails.

That this judgment can be made after what has happened to the military power of persuasion during the last eight years is almost unbelievable. We recall that in 1963 a Chief of Naval Operations, Adm. George W. Anderson,



—Wide World Photos

Heads together over the ABM: Gen. Earle Wheeler, who is Chairman of the Joint Chiefs of Staff, confers with John Foster, Director of Defense Research and Engineering, and Secretary of Defense Melvin Laird. They were defending decision before Senate Foreign Relations Subcommittee.

retired with a blast complaining about civilian interference with the performance of his duty. There are words engraved in our desk from the mouth of Gen. Thomas D. White, who pointed with alarm at the erosion of military expertise from the time it first was assaulted by the Whiz Kids. And who has forgotten that the military Source Selection Board was overruled on the F-111 decision? And that military influence was pretty weak in the first place, when the concept of commonality was forced on the Navy and Air Force?

If there is any further doubt, the supreme example came out only a couple of days ago with new emphasis. The story of the war in Vietnam is an old one, but it has been capped in a new 347-page book called *Report on the War in Vietnam*, by Adm. U. S. G. Sharp, Commander in Chief, Pacific, and Gen. William C. Westmoreland, Commander, MACV. (For a copy, send \$6 to the Superintendent of Documents, US Government Printing Office, Wash-

ington, D. C., 20402.) In it, CINCPAC details again the application of airpower in the effort to make North Vietnam "cease its support and direction of the insurgencies in South Vietnam and Laos." The former military commanders were convinced this job could be done. But there were "strict controls and specific guidance" from "higher authority." Admiral Sharp makes it clear that the military influence on key decisions was minimal. Our files are packed with testimony from USAF veterans of high rank who have deplored the sheer bad management of the war in Southeast Asia. It is not military management they are talking about.

In the long list of witnesses called to Capitol Hill in the past month it is, furthermore, hard to find uniforms. Gen. Earle Wheeler, Chairman of the Joint Chiefs of Staff, was present, but appears to have been rated as a relatively unimportant proponent. The headlines and klieg lights were centered on some scientists, whose testimony was more than faintly reminiscent of the case made some years ago against development of the H-bomb and of the MIT expert who once swore on the stand that it never would be possible to build an ICBM. The testimony will not be reviewed here, because of its irrelevance. The history of weaponry probably remains the best justification for investing today in an early and admittedly crude ABM system. What history proves is that there will be a defense against attacks out of space, which is what an ICBM attack would be, and that if we do not take the first—perhaps faltering—steps, we will leave ourselves, and the free world, vulnerable to blackmail.

Probably the most interesting and important facet of this mobilization of ABM critics is the way many men with valuable reputations are lending themselves to an almost crude political effort. The 1968 election marked a turn to the right—however narrow the margin of the Nixon victory—and a rejection of the favored tenets of the noisiest critics of Lyndon B. Johnson, be they Democrats or Republicans. A roster of the ringleaders in this assault on the ABM—and the military—reads like nothing but a list of the men most disappointed in the decision of the American voters when they turned to Nixon. There are Senator Edward M. Kennedy and Senators William Fulbright, Eugene M. McCarthy, George S. McGovern, William Proxmire, and Albert Gore, as well as Stuart Symington and Charles Percy.

Now there is a report that a new organization, called "Americans United to Stop the ABM," is about to make its debut, which must be a blow to the organizers of the older National Committee for a Sane Nuclear Policy. The new organization appears to get its full-time staff strength, for the most part, from a couple of political mercenaries, Richard N. Goodwin and William vanden Heuvel, who last year went through the Kennedy-McCarthy-McGovern cycle of candidacies trying hard to come up riding a winner.

At this writing, Senator Kennedy is setting off on a tour of villages in Alaska, as part of an effort to find another issue, largely because he is not on a Senate Committee where the ABM is debated. He has replaced his late brother, Robert, as Chairman of the Subcommittee on Indian Education of the Committee on Labor and Pub-

lic Welfare. On his tour, according to the New York Times he will be accompanied by twenty-five newspaper and television reporters, photographers, and television crewmen. There is reason to believe, the Times says, "that the principal reason for their presence is not to report on native education, but to record how Edward M. Kennedy takes over the role so effectively assumed by his brother Robert—that of representative to, and advocate for, racial minorities and the poverty-stricken." It will be a basic thesis of the "Americans United to Stop the ABM," according to the record so far, that the plight of the poverty-stricken will be cured, to a large degree, if the national security program is cut back. Not far removed as an issue is the draft. Senator Kennedy has spoken out on this issue, along with others of the New Left. For the most part, they favor a professional Army. It never has been explained how this is made palatable to liberals, who should favor the citizen Army for both philosophical reasons and because Richard Nixon has spoken in favor of an all-volunteer force.

Equally political in motive are the side-by-side Capitol Hill hearings by various committees and subcommittees. The spectacle of pro-ABM sessions on one morning, followed the next day by anti-ABM hearings, is not destined to elevate public understanding or respect for the Senate. Starting on March 19 and running until Congress went home for Easter, there were several performances. Star witness, of course, was Melvin R. Laird, the Nixon Defense Secretary, who is himself a veteran of the House of Representatives and no stranger to the political in-fighting. Quite properly, it was the Senate Armed Services Committee, chaired by John Stennis, that started with a hearing on the Nixon Administration's budget revisions and the ABM system. Mr. Laird was not optimistic about the war in Vietnam as he asked for \$156 million to equip the South Vietnamese Army for a more active role. As for our own defense, he said, "never have the challenges to our national security exceeded in number and gravity those which we found upon taking office." He did not hold his fire in putting the blame for many of his problems on the Pentagon management under Robert S. McNamara.

For USAF, the most significant specific was Mr. Laird's

announcement that he proposes to cut back our procurement of the FB-111, bomber version of the General Dynamics F-111, and to increase funding for the Advanced Manned Strategic Aircraft (AMSA). This was a reversal of a McNamara decision. The new Defense Secretary seeks an increase of \$23 million for AMSA, to \$100.2 million for Fiscal 1970. He would cut back FB-111 funds by \$107 million in Fiscal 1969 and eliminate them entirely for Fiscal 1970. He also would drop \$54.6 million from the Fiscal 1969 budget that had been put there to support the McNamara-inspired electronic barrier in Vietnam. It was a proposal never endorsed by the military and is another example of military impotency in recent years.

Next, Mr. Laird went ahead with his case for the Safeguard ABM. Here he took a page from the McNamara book and disclosed some classified information that supported his case. He said Russia is speeding the deployment of a new and bigger ICBM, the SS-9, of Polaris-type submarines, and of the Fractional Orbit Bombardment System (FOBS). He called Safeguard a "building block" to peace, arguing that it will give the Soviets an "added incentive to negotiate." In view of the stand taken earlier by Secretary McNamara, it was significant that Mr. Laird rejected both a boost in US offensive strength and a "thick" ABM system as provocative. If his dovish critics gave him any credit for this, they did not spread it in the committee's record.

The Secretary's third straight day on the stand was before the Subcommittee on International Organization and Disarmament Affairs of the Senate Foreign Relations Committee. The Chairman is Senator Gore. Here, Mr. Laird repeated what he had said the day before, but in an atmosphere of hostility. Senator Fulbright, chairman of the parent committee, turned the show into a major discussion about Vietnam, accusing the Administration of escalating the war, despite the fact that current headlines from the front told about the increased enemy offensives. So far as the ABM is concerned, Chairman Gore gave the opinion that it will "endanger our security; it would make an armaments-limitation agreement more difficult, if not impossible, to attain, and thus ultimately could degrade our deterrent." Other critics, including Senator Stuart

(Continued on following page)



—Wide World Photos

Defense Secretary Melvin Laird and other witnesses, center, appear before Senate Foreign Relations Subcommittee and face cross-examination on the proposed Safeguard ABM. The hearing was on national television, as interest in the debate soared.

Symington, came up with the hawkish suggestion that our ICBMs would be more convincing if they were not protected, but kept ready to go after a Soviet first strike was launched, but before it hit US targets. Mr. Laird and David Packard, his deputy, replied that this would call for fast decision-making and that an ABM in place would give the President more flexibility.

After a few days of rest, Mr. Packard was called back to repeat that US capability will be threatened by what the Russians will have in the 1970s. He said the Soviet Union has reached parity with the US in total missile forces. Again the subject was brought up of a plan to fire in retaliation before attacking Russian missiles can reach targets in the US. Mr. Packard replied that such an "automatic and inexorable" nuclear response had "all of the terrifying defects of a doomsday machine." Again, the



—Wide World Photos

David R. Packard, Deputy Defense Secretary, testifying before Senate Foreign Relations Subcommittee on Disarmament, argued that ABM may help arms-limitation effort.

doves did not see the position they had taken as resting in the nest of the hawks.

Another important point made by Mr. Packard was that an ABM system, even modified and imperfect, would preserve our ability to carry out a second strike with missiles and bombers. He said the Safeguard program will permit testing, continued evaluation of the threat, and possible negotiation for an arms agreement. There was no emphasis on the fact that the Russians are deploying an ABM and that this deployment has not had an effect on the US disposition to talk about disarmament. As of yesterday, as a matter of fact, Secretary of State William P. Rogers said the US expects to begin talks with Russia on the limitation of strategic missiles in "late spring or early summer." He said "nothing stands in the way" and was confident that Moscow's desire to talk has not been diminished by the Nixon ABM decision.

As Easter neared, the Gore subcommittee called in three scientists. They were Wolfgang Panofsky of Stanford, George W. Rathjens of MIT and formerly employed by the Arms Control and Disarmament Agency, and Donald G. Brennan, of the Hudson Institute. Both Panofsky and Rathjens opposed the ABM, partly on technical grounds, but more loudly because they view it as provocative. Brennan defended the project, as a step toward arms limitation and disarmament. He said that the superiority once held by offensive weapons "is beginning to be somewhat trammled." He said technology has not

produced an effective, economic way to overcome a good defense. He doubts Russia will pay for such a development. Dr. Brennan also delivered the clear opinion that Congress may not be the right place to make a technical decision.

Looking for a cool head in the midst of this wrangle is not easy, except for the fact that Senator Henry M. Jackson of Washington remains an unchallenged expert on national security and one that his anti-ABM compatriots hold in distant respect. Mr. Jackson does not join, as a rule, in the debate on the Hill, where he clearly is distressed by the flood of misinformation and erroneous interpretation. He is seriously concerned about the myths that float around and used a platform of the Associated General Contractors of America to expound about them.

In the Jackson book:

- Myth No. 1 is that the Soviets are on a fixed course toward more peaceful and moderate policies, and are ready to leave their neighbors alone. Ask a Czech or a Yugoslav. Look at the efficiency of their invasion of Prague. Look at their missile buildup, and the Senator repeats that they are *deploying FOBS*, a weapon system that can be used *only* for a first strike.

- Myth No. 2 is that the Soviet rulers are becoming progressively more liberal and civil-rights conscious, and are about ready to rejoin Western society. Again, the opposite is true. They are moving to the right. There are more intellectuals in Soviet prisons today than at any time in the history of the Soviet Union.

- Myth No. 3 is the idea that it is the US that is responsible for heating up the arms race. It was Russia that first acted to develop the ICBM, first test-fired an ABM against an incoming nuclear-armed missile and still is the only nation to have done so, first to develop and test a sixty-megaton bomb, first to develop and deploy FOBS, and first to deploy an ABM. He does not understand Americans who say we are escalating the arms race.

- Myth No. 4 is the notion that the only way to manage our problems with the Soviet Union is "instant negotiation." We must learn that negotiating can be a way to continue a conflict and that Moscow is expert at this.

- Myth No. 5 "is the latest version of the devil theory of history—some people have conjured up what they call a 'military-industrial complex.'" The last one to do so was Senator Gerald Nye, the man who ignored Hitler.—END



—Wide World Photos

Senators hear opinions of three scientists: Dr. George W. Rathjens of MIT, Dr. Donald G. Brennan of the Hudson Institute of New York, and Dr. Wolfgang K. H. Panofsky of Stanford. They did not agree on the ABM system, largely because Dr. Brennan believes deployment by the US will be a step toward real arms limitation and disarmament.



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By William P. Schlitz

NEWS EDITOR, AIR FORCE/SPACE DIGEST

The terrain is very rugged up on the northern border of Laos and South Vietnam. The roads snake through stretches of dense jungle and mountains scarred with caves and ravines. It is here that the A Shau Valley road provides a major artery for the flow of supplies from the North to enemy units in Quang Nam and Thua Thien Provinces. It is an area very good for an enemy adept at camouflage.

Back in December, Air Force for-

ward air controllers on reconnaissance flights spotted heavy traffic on the road, and a project, conducted by the Horn Direct Air Support Center located in the I Corps area in support of the 1st Marine Division, was undertaken to choke off that flow.

Two-man FAC crews in O-2 Super Skymasters flew daily missions in the area.

The three points picked for interdiction along the road were bombed day and night by Air Force, Navy,

and Marine aircraft. F-4 Phantoms, F-100 Supersabres, A-6 Intruders, and A-4 Skyhawks performed the strike missions. AC-119 gunships also worked at night, "hosing down" suspicious ground activity illuminated by flares.

As usual the FACs had it rough. Because of heavy small-arms fire coming from excellently concealed positions, they had to fly zigzag patterns from treetop level to 5,000-foot altitudes. Enemy gunners couldn't resist firing on the little planes, and so the FACs, while harassed, were able to spot the fire sources and call air strikes on them.

The interdiction operation, which lasted two months, began to have such an effect on the movement of supplies that to contend with it the enemy moved in batteries of antiaircraft artillery, which when spotted were promptly knocked out.

The enemy persisted. "It was amazing how fast they could repair the roads," said Col. Frederick Webster, Commander of the Direct Air Support Center. "At dusk, we photographed areas of the road which we pockmarked with bombs during the day, and by the next morning the road was repaired. When we got the best of their roads they began moving supplies on specially built bicycles."

But the air attacks, dangerous and exhausting, paid off.

When men of the 9th US Marine Regiment swept into the area they found 400 tons of abandoned war materials, including much dumped into storage areas and hastily camouflaged.



After Apollo-11 and the hoped-for climatic manned lunar landing—what next?

A few years ago, when the moon program got going full speed, before Vietnam heated up and started chewing up enormous amounts of money from the federal budget, before the problems of the cities assumed the status of a full-scale crisis, and when people were worried less about inflation, it was generally assumed that, after Americans landed on the moon,



The blackened hulks of two Soviet-built PT-76 tanks lie on a dirt road in Kontum Province, South Vietnam. Spotted by a forward air controller who requested an air strike, the tanks were destroyed by A-1 Skyraiders from the 633d Special Operations Wing at Pleiku Air Base. Photograph was taken by an RF-101 Voodoo from the 45th Tactical Reconnaissance Squadron, Tan Son Nhut Air Base.



—Wide World Photos

Apollo-10 mission scheduled this month is to put Astronauts (from left) Thomas Stafford, John Young, and Eugene Cernan in lunar orbit. Stafford and Cernan are to fly lunar module to within 50,000 feet of moon's surface.

an orderly program of further manned flights to the moon and establishment of scientific stations there would follow, along with a sizable effort to develop a large-scale manned earth-orbital space-station capability.

But the crises enumerated above have clouded the all-out space effort that NASA planners had once envisioned. Today the space agency is engaged in a busy effort to kindle enthusiasm in Congress and the public for a vigorous space program for the 1970s.

The process has not been easy. The last budget, prepared for Fiscal Year 1970 by the outgoing Johnson Administration, provided for not much more than finishing up the Apollo program through the first manned landing plus a few follow-on-landing flights and in general represented a holding action on the over-all space program, leaving decisions as to new commitments up to the incoming Nixon Administration.

The new President and his advisers understandably are devoting most of their energies to higher-priority questions, particularly the Vietnam War, although a Nixon task force appointed to study space goals has long since turned in its report to the White House. That report was not made public. And now Presidential Science Adviser Dr. Lee DuBridge has appointed another task force with a September 1969 deadline to study space goals and programs for the 1970s.

In the face of this leisurely approach to space by the new Admin-

istration, there is a certain restiveness among the membership of the space committees on Capitol Hill. Concerned, in the words of one House space committee aide, that "if something isn't done" to get the space program going again "our capability will disappear," the Manned Spaceflight Subcommittee of the House space committee is recommending that sizable funds be added to the last Johnson budget in order to keep the flagging Saturn-V-Apollo production line going and to allow a series of post-initial-landing manned missions to the moon well into the 1970s.

In effect, the subcommittee proposes to restore more than \$200 million to the NASA Fiscal 1970 budget that had been cut out by the Bureau of the Budget, some of it for the Saturn-V-Apollo production line, some for lunar-exploration projects, and some for space station development.

Although the emphasis is on manned missions, subcommittee sources say there is flexibility for reprogramming

money to unmanned missions if that makes more sense.

How the subcommittee's recommendations fare in the full House Committee and in the Senate will provide a good test of the popularity of the space program on Capitol Hill.

Not surprisingly, there are conflicting views among space-minded legislators on the question of manned vs. unmanned space operations in this season of tight money.



The mechanism of sea-air interaction, which is the cause of atmosphere circulation and weather systems, is little understood. But, before weather prediction can extend beyond a period of just a few days, this relationship must be thoroughly explored and analyzed.

In May, the US, in cooperation with the government of Barbados, will begin a massive study of the link between sea and air. The project—Barbados Oceanographic and Meteorological—
(Continued on following page)

How NOT to Be a Leader

In this complex and information-oriented age of communication, when we constantly are being instructed on "how to do" something, the reverse tack, "how not to do," constitutes a refreshing change.

So it was recently during remarks on leadership by Lt. Gen. Seth J. McKee, Assistant Vice Chief of Staff, USAF, to the graduating class of the Squadron Officers School, Maxwell AFB, Ala.

"I can describe," General McKee said in regard to the application of leadership techniques, "some styles of leadership I've observed that may serve as a handy guide on how not to do it."

"First, **The Anemometer**: He makes sure of wind direction and velocity before setting a course. Always flies downwind.

"**The Gyroscope**: This man maintains a rapid, stable rate of rotation around a fixed axis, with imperceptible forward movement.

"**Attila the Hun**: Leads through fear. Apparently suffers from chronic indigestion or badly decayed molars. Guaranteed to discourage new ideas and dampen initiative.

"**Linus, the Less-Than-Lion-Hearted**: He's the officer who uses his staff as a security blanket. This may be okay when you begin a new and strange assignment, but you'd better not go that route for very long.

"**The Super-Ego**: Believes he was favored above all men when brains were issued. Creates bottlenecks with curves in them by redoing everything his staff does.

"**The Green-Eyed Monster**: The guy who doesn't trust anyone and won't give credit to his subordinates. He has forgotten that, without their support, his ladder to success has no rungs.

"**The Hermit Crab**: Lives in splendid isolation, gathering more and more ignorance of what goes on in his organization.

"**The Madison Avenue Minion**: Thinks leadership is a popularity contest to be won on transparent superficialities. Avoids the hard decisions that won't move the applause meter off the high scale.

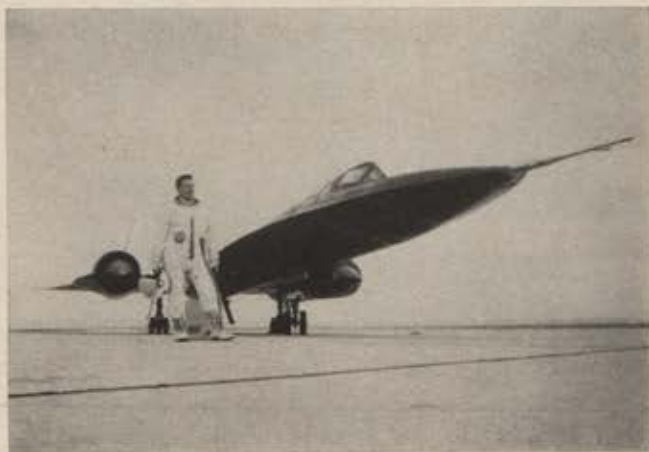
"Finally, **The Mushroom Grower**: Keeps everyone in the dark and fertilizes regularly.

"Whatever your own style of leadership may be," the General went on, "there are two attitudes you should never tolerate in your organization. The first is, 'Don't rock the boat'; the other, 'Don't stick your neck out.' There wouldn't be an Air Force as we know it today—or maybe even a country—if it weren't for some of your predecessors who were willing to pay a price for constructive change.

"Every one of us has to be prepared at some time to lay his career—or at least his ER—on the line for what he believes to be right. This is not something to be done frivolously or impulsively—certainly not to the prejudice of discipline. Knowing when the end justifies a risk of great personal sacrifice—either in combat or in management—is the mark of a true professional."



Maj. Gen. Burl McLaughline, Commander, 834th Air Division, presents Distinguished Flying Cross to LBJ son-in-law, Patrick J. Nugent, for outstanding airmanship during a resupply mission January 2 that came under mortar attack. Airman Nugent has since returned to the United States, upon completion of his tour of duty in Southeast Asia.



William C. Park, chief engineering test pilot for advanced development projects at Lockheed Aircraft Corp., is shown with Lockheed-built SR-71. Park in March received the Octave Chanute Award for "flight-test development of Mach-3-plus aircraft." He is the first test pilot to fly SR-71 and YF-12A at design speeds—faster than Mach 3.

orological Experiment (BOMEX)—is billed as the most extensive scientific investigation ever made over a large ocean area.

Through most of the summer, twenty-four planes, ten ships, several satellites, a dozen buoys—and a vessel that "flips" from horizontal to vertical position at sea—will gather data from an area covering 90,000 square miles of the Atlantic Ocean east of Barbados, and vertically from an ocean depth of 18,000 feet to 100,000 feet in altitude.

About 1,500 people will be involved in eighty separate projects in the program.

Taking part will be representatives from the oceanographic and meteorological scientific communities, seven federal departments and independent agencies, nineteen universities, and seven industrial laboratories.

BOMEX is the first of a series of large-scale research projects planned by the nations of the world under the Global Atmosphere Research Pro-

gram, directed toward development of the so-called World Weather Watch.

As explained by BOMEX Director Dr. Joachim P. Kuettner, the air-sea interface is the scene of a complex and continuous exchange of energy, water, gases, and particulates.

"Most of the heat received from the sun," he said, "is stored in the tropical oceans between the latitudes of thirty degrees north and thirty degrees south, a region representing half the earth's surface.

"In contrast, the earth loses heat by radiation almost uniformly at all latitudes, so heat has to be transported from equatorial regions to higher latitudes. This transport is not done by the ocean but by the atmosphere. This process, of which relatively little is known, occurs in three stages.

"First, the energy in the ocean transfers to the atmosphere in a turbulent boundary layer about 6,000 feet thick. Most of this energy moves from ocean to air as latent heat in the form of water vapor. Next, the energy finds its way from the boundary layer to the upper layers of the troposphere. Finally, it is transported to higher latitudes by fast-moving air currents, sometimes in the nature of jet streams."

BOMEX will explore the first two steps, examining in detail the exchange of energy between ocean and atmosphere and the vertical and horizontal spreading of these energies within each fluid. In addition, an attempt will be made to predict the area-wide sea-air interactions in a mathematical model based on conventional and satellite observations.

(Continued on page 27)



Pilots and crew chiefs race to their F-106 Delta Dart interceptors during a practice scramble. The men and aircraft, part of the 71st Fighter Interceptor Squadron at Osan Air Base, South Korea, provided air defense and combat air patrol during Exercise Focus Retina, a "rapid-reaction" test of the ability to augment friendly forces overseas with units based in the United States. The operation, which took place in March, was billed as the "longest airborne assault in history" and involved the airlift of two battalions of the 82d Airborne Division from Ft. Bragg, N. C., 8,500 miles to South Korea. There the airborne units joined ROK and Korea-stationed US troops in war games. Exercise Focus Retina was the first exercise of its type ever undertaken in South Korea (see April AF/SD, page 22).

Thud.

Officially, it's the F-105 Thunderchief. A Mach 2 fighter-bomber. Air Force pilots shortened its name to "Thud," solid-sounding nickname for a solid performer. F-105 pilots call themselves Thud Drivers. They flew 75 percent of the Air Force strike missions against the toughest military targets in North Viet Nam. Quite a record. Quite an airplane.

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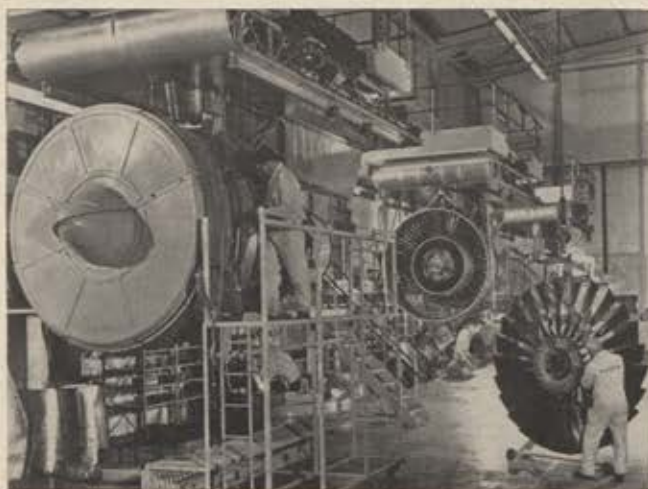
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Rolls-Royce Ltd. has put into operation a new facility at its Aero Engine Division, Derby, England, to prepare the giant RB.211 jet engines for ground-test operation. The company plans to begin delivery of the engines to Lockheed-California for installation in the new TriStar jetliners next year following a series of engine flight tests.



This antenna is one of several in the one-tenth-scale prototype of advanced design array radar (ADAR) being built for the Air Force by Hughes Aircraft Co., Fullerton, Calif. The phased-array radar, the most powerful yet built, is designed to be a sensor for satellite identification and as a ballistic missile defense designation/discrimination sensor.

In its latest multiyear forecast, the Federal Aviation Administration has fielded an interesting, even staggering, set of figures on aviation growth through the next decade to 1980.

The FAA uses the projections on air traffic growth to help it determine what services and facilities will be required during that time span. And, if its predictions hold true, the agency and the aerospace industry as a whole certainly will have their work cut out for them. For example, FAA anticipates that in 1980 airlines will carry about 470 million passengers, more than three times FY 1968's total of 152.6 million. This growth rate,

ten percent annually, is somewhat less than those of recent years. (In comparison, in FY 1968 the passenger traffic increase was 20.7 percent over the previous year; in the FY 1964-68 period, the average annual increase was 16.5 percent.)

The FAA says that airlines' revenue passenger-miles in 1980 will climb to 379 billion from FY 1968's 106.5 billion, and better than ninety percent of the 3,600 airline aircraft being utilized will be jets, with heavy emphasis on two-engine planes and three-engine airbuses. In FY 1968 a little more than fifty percent of the 2,452 aircraft in use were jets.

In the general aviation area, aircraft in service will double by 1980, from 114,186 in FY 1968 to 214,000; here, the greatest increase will be in turbine-powered, fixed-wing aircraft—a sixfold rise to 7,800 from 1,281 in FY 1968.

While civil aircraft, and engine production, will double by 1980, transport production will decrease to 250 from FY 1968's 625, the largest annual output on record, because the aircraft will be growing in size and speed. Air hours for commercial general aviation are to climb to 9.4 million, from '68's 4.1 million, with air taxi service
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AEROSPACE WORLD

CONTINUED

accounting for the lion's share of this.

One of the most significant figures present in the FAA prognostications is that for the growth of the number of takeoffs and landings at controlled airports, expected to rise to 171.5 million, triple the fifty-three million of FY 1968.



Theoretically, at least, the intention has been that eventually the South Vietnamese armed forces will be able to assume considerably more of the burden of defending their homeland, regardless of any moves by the US toward withdrawal or deescalation.

There is evidence that the South Vietnamese army is indeed toughening up, with the help of better training and more modern equipment, since its low ebb just prior to the big American buildup beginning in 1965. The South Vietnamese army then was

a drifting hulk, with disintegrating equipment and morale, shaky leadership, and a history of defeats on the battlefield stretching back a decade.

Rebuilding that army entailed a task far from over, of herculean dimensions, and at least the cloud of pessimism concerning it has lifted a bit.

As for the Vietnamese Air Force, a program sponsored by the USAF currently is under way to train Vietnamese pilots in flying the jet aircraft that will replace the aging Douglas A-1 Skyraiders now flown by five of the six Vietnamese fighter squadrons. One squadron, the 522d based at Bien Hoa near Saigon, went operational last July in Northrop F-5As. The 524th Squadron, the second to convert to jets, has been training at England AFB, La. Possibly two more squadrons will go to the A-37B sometime in the future.

(Continued on page 31)

NEW BOOKS IN BRIEF

America and East Asia: A New Thirty Years War? by Richard Harris. This short book reminds us that the US involvement in Vietnam is a variation of our relationship with China and Chinese-influenced cultures, a relationship for the most part ill-defined and unsettled from its beginning. These ideologically different cultures do not separate doctrine and government. Consequently, says Mr. Harris, Western efforts at "liberation" fail because they appear to offer only an empty "anti-communism" which is untenable and unappealing to Eastern thinking. The author, born in China, has been the London *Times* Asian correspondent for several years. Braziller, N. Y. 80 pages. \$3.50.

The Brass Factories, by J. Arthur Heise. Growing public awareness of the three major military educational institutions—West Point, the Naval Academy at Annapolis, and the Air Force Academy—has been stimulated in recent years principally through academic scandals at all three. But the inevitable governmental probing is much more comprehensive in scope. Here, a former faculty AF Academy staff officer examines the merits of sending servicemen through these "brass factories" at an average cost to the taxpayer of \$48,000 per man. Public Affairs Press, Washington, D.C. 190 pages. \$6.

Great Air Races, by Don Vorderman. Although air racing was once a stimulant to the development of improved aircraft and engines and to public interest in aviation, it has

"largely outlived its usefulness," Gen. Jimmy Doolittle says in the introduction. The glamour and excitement of these races attracted thousands of spectators to watch the overgrown kites of 1909, the popular amphibians of the '20s, and the stubby record-breakers that claimed the trophies until World War II caused cancellation of the competitions in 1939. Over 200 photographs from these meets are included. Doubleday, N. Y. 288 pages. \$6.95.

Politics and Society, by Robert M. MacIver. In a collection of essays written over sixty years, this noted authority on political science presents his views on ethics, freedom, authority, economics, and the conditions for a viable international order. Included are examinations of the ideas of Bertrand Russell, Hitler, and Bosanquet. This sort of philosophy is an unsuitable candidate for speed reading or casual perusal. Bibliography and index. Atherton Press, N. Y. 571 pages. \$11.50.

The Roads to Russia, by Robert Huhn Jones. The establishment of a lend-lease program between the US and Russia during World War II was largely responsible for Soviet success in resisting the Nazis in Europe, even though it can be argued that a strengthened USSR affected the US adversely after the war. This book presents a good review of the \$10.2 billion lend-lease program; with appendices and maps. University of Oklahoma Press, Norman, Okla. 326 pages. \$6.95. —MARIA T. ESTEVEZ

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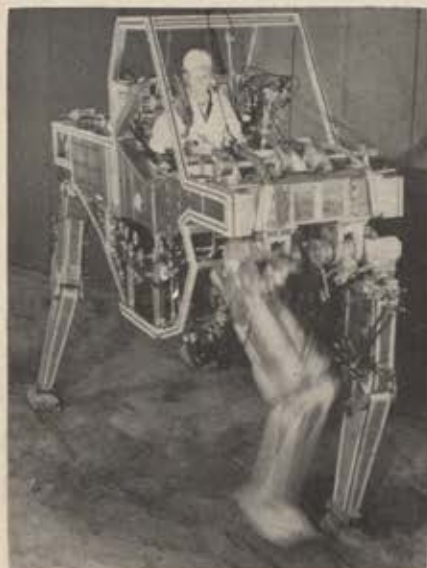
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U.S. Army Photo



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Of the four VNAF transport squadrons, one replaced its C-47s with Fairchild C-119Gs in February, and the others are to receive C-119Gs in future months.

As of mid-February, some sixty South Vietnamese were being trained in the US to fly more modern helicopters. The five VNAF helicopter squadrons are being converted from the Sikorsky H-34 to the Bell UH-1 Iroquois.

Other VNAF personnel are receiving stateside training in Operations, Communications / Electronics, Maintenance, Logistics, and Administration, all aimed at improving the VNAF's combat capability.



The Boeing Co. is exploring the market potential for a new, high-capacity version of its popular 727 trijet that employs advanced technology engines. In discreet discussions with airline executives, Boeing spokesmen describe the new version as the 727-300 with a range of 2,700 nautical miles and a capacity of 200 passengers.

While the proposed aircraft is being planned as either a trijet or twin-engine aircraft, depending on what the majority of the airlines prefer, principal interest is said to center on the twin proposal.

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B/G Earl O. Anderson, from Cmdr., Reserve, 452d Military Airlift Wg., March AFB, Calif., recalled to active duty as Dep. Chief, AFRes, Hq. USAF . . . **B/G Richard L. Ault**, from Cmdr., 6100th Support Wg., PACAF, Tachikawa AB, Japan, to Dir., Compensation & Career Development, OASD (Manpower and Reserve Affairs), Washington, D. C. . . **B/G James A. Bailey**, from Vice Cmdr., WRAMA, AFLC, Robins AFB, Ga., to Cmdr., Pacific Exchange Service . . . **B/G Jo-**

seph H. Belser, from Vice Cmdr., 1st AF, ADC, Stewart AFB, N. Y., to Dir./Ops, J-3, NORAD/CONAD, Ent AFB, Colo.

Dr. Hans G. Clamann, from Scientific Dir. (Bioastronautics), to Chief Scientist, Aerospace Medical Div., AFSC . . . **Dr. Reginald Downing**, from Dean, School of Engineering, to Academic Director, AFIT, AU . . . **Col. (B/G selectee) Jack K. Gamble**, from Cmdr., 52d Ftr. Gp., Suffolk County AFB, N. Y., to Cmdr., 35th Air Div., ADC, Hancock Field, Syracuse, N. Y., replacing **B/G Clayton M. Isaacson** . . . **Col. (B/G selectee) Clifford W. Hargrove**, from Cmdr., 72d

(Continued on following page)



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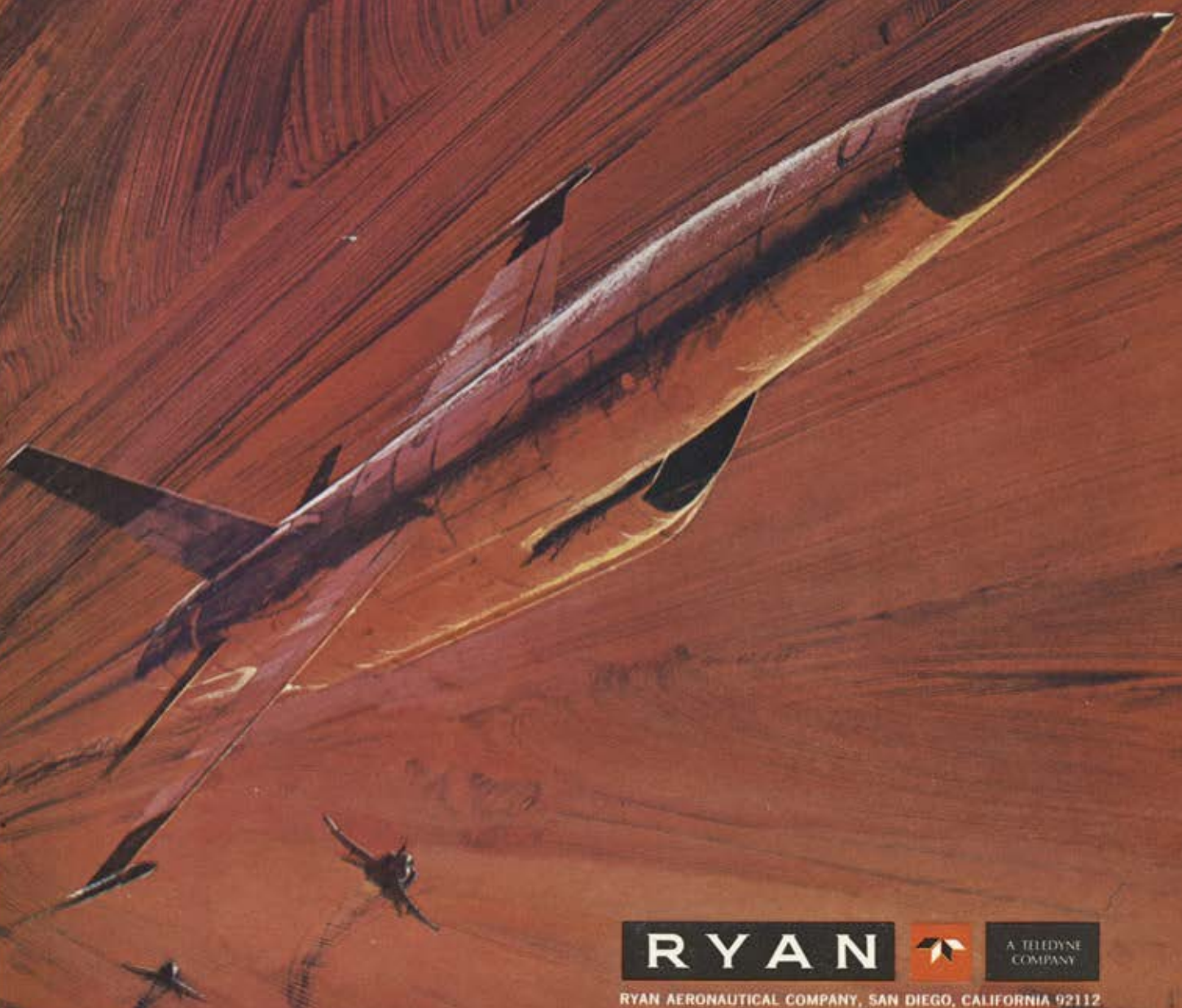
B/G Clayton M. Isaacson, from Cmdr., 35th Air Div., Hancock Field, Syracuse, N. Y., to Vice Cmdr., 1st AF, ADC, Stewart AFB, N. Y. . . . Mr. Adolph S. Jursa, from Supervisory Physicist to Dir., Space Physics Lab., AF Cambridge Research Laboratories, OAR . . . B/G James M. Keck, from DCS/Comptroller, to Asst. DCS/Ops, Hq. SAC, Offutt AFB, Neb. . . . Mr. Stephen P. Moore, from Asst. to Dir. of Supply, DCS/Supply, AFLC, to Asst. to Cmdr., Advanced Logistics Systems Center, AFLC. . . B/G William F. Pitts, from Dep. Dir. to Dir. of Budget, Hq. USAF . . . M/G Louis T. Seith, from Dep. Cmdr., 7th and 13th AF, PACAF, Udorn, Thailand, and C/S, 7th AF, Tan Son Nhut AB, Vietnam, to Cmdr., US Forces, Thailand.

Mr. Harry W. Roberts, from Data Automation Administrator, to Asst. to Cmdr., DSDC, Hq. USAF . . . B/G Henry J. Stehling, from DCS Civil Engineering, ATC, Randolph AFB, Tex., to Dir., Real Property Maintenance Directorate, OASD (Installations and Logistics), Washington, D. C. . . . Dr. Demetrius Zonars, from Research Aerospace Engineer (Fluid and Flight Mechanics), to Chief Scientist, AF Flight Dynamics Lab., AFSC.

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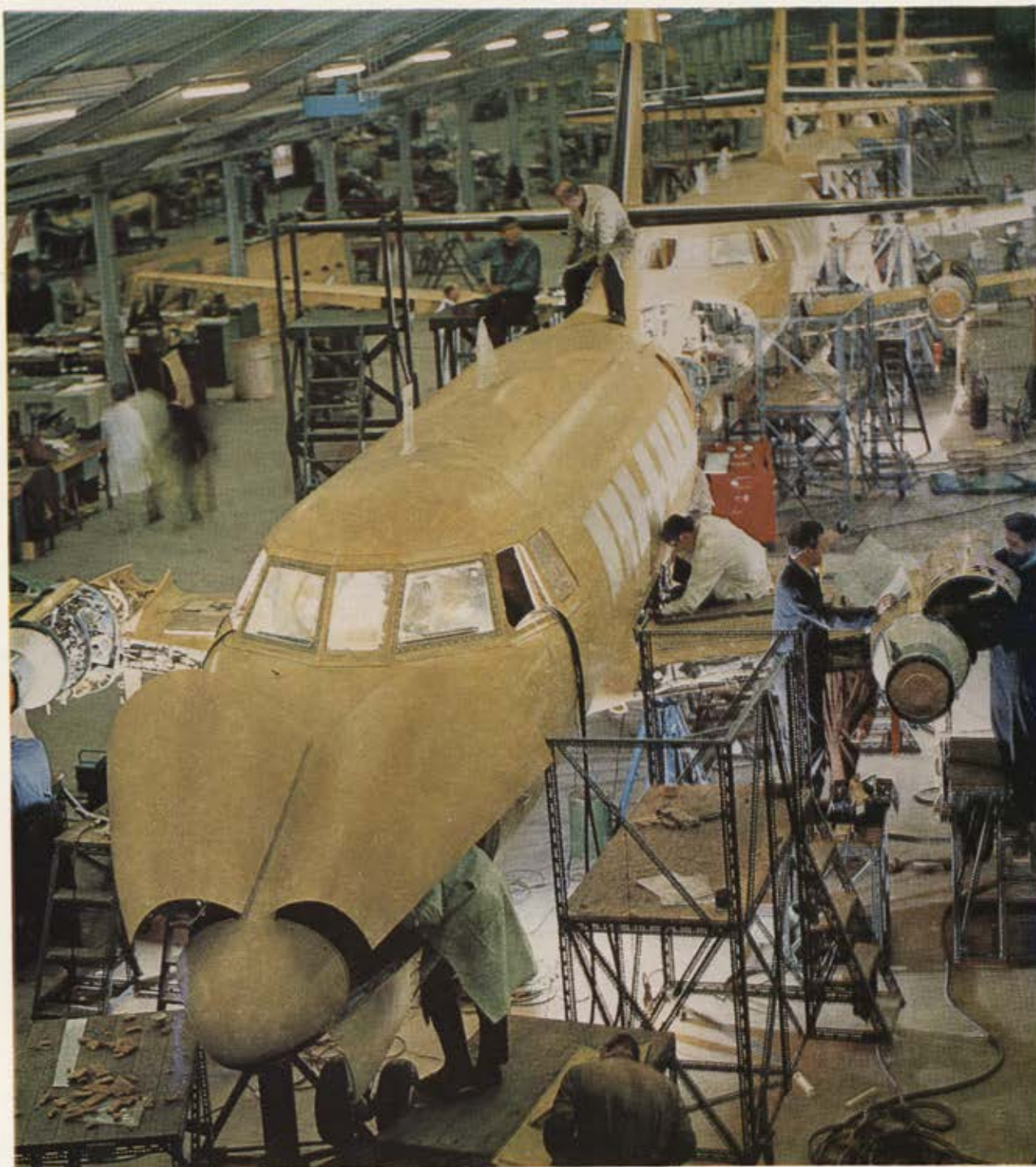
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—Gen. Dwight D. Eisenhower,
Chief of Staff, US Army.
From an address to First Annual Convention,
Air Force Association,
Columbus, Ohio, September 1947



Ike and Hap Arnold during WW II.

Technical progress has been enormous for twenty years, and no letup is as yet in sight. But by 1990 today's systems will be as hopelessly obsolete as those of 1950 are today. With social programs almost certain to claim a large share of future national budgets, and general support for defense outlays waning, the continued rapid advancement of technology will demand a major effort. A vital prerequisite to this is a public made aware of the true relationship of the "military-industrial complex" to national security . . .

Technology in the 1970s: Its Problems and Potential

BY J. S. BUTZ, JR.

Technical Editor, AIR FORCE/SPACE DIGEST

IT'S NOT quite twenty years since the great swing away from disarmament began during the Korean War and advanced technology became truly big business in the United States.

Technical accomplishment during this brief period has been so broad, and has penetrated so far beyond previous experience, that even insiders have difficulty comprehending exactly what has happened. The over-all change in the essentials of military power, however, can be seen readily. Today's weapons and devices of major consequence that did not exist in 1950 include:

- Miniaturized nuclear warheads;
- Large payload intercontinental rockets of the Titan II class;
- Small ICBMs of the Minuteman type, made possible by breakthroughs in solid-propellant rocketry;
- Inertial guidance systems, which have made these rockets extremely accurate and "jam-proof";
- Submarine-launched rockets, also made practical by new developments in solid propellants and inertial guidance;
- Operational supersonic airplanes of many types;
- Jet transports that have revolutionized long-range air movement of troops and supplies;
- Electronic computers able to perform mathematical tasks and control complex operations far beyond the capacity of men and mechanical systems;
- Miniaturized electronics that allow computers and the most sophisticated controls to be carried aboard aircraft and missiles;

• New types of electronically steered radar and a variety of sensors that have extended man's senses to a degree completely unpredicted in 1950;

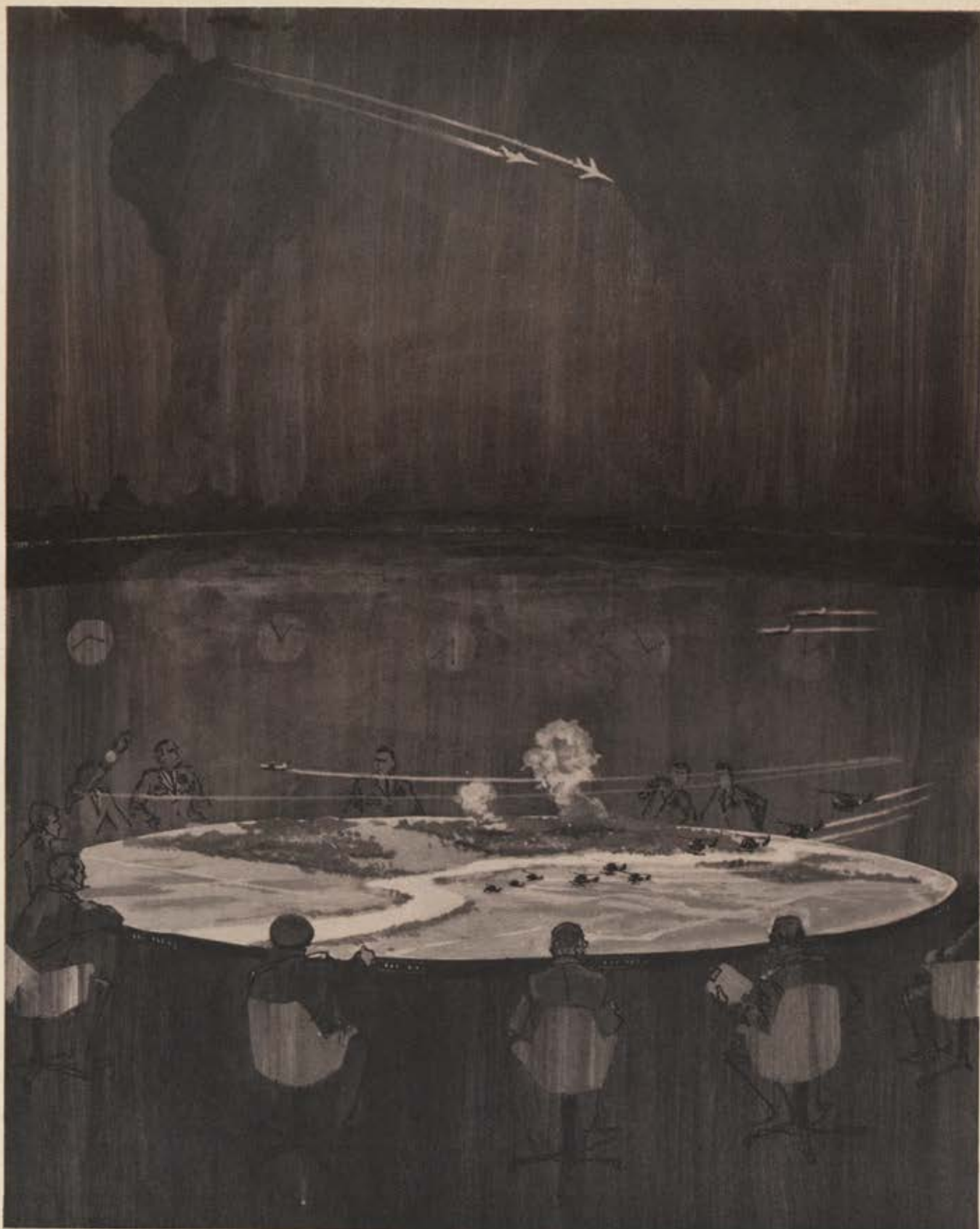
• Worldwide communications on almost an "any-time, real-time" basis, including the use of satellites, allowing Washington to participate in planning and evaluating daily military operations in any part of the world;

• Use of reconnaissance satellites to foster the involuntary termination of the Soviet Union's policy of total secrecy and give US planners a reasonable amount of intelligence information, no matter how hotly it may be disputed at times.

Comparing these systems in operational service today with the armaments of the great powers in 1950 should eliminate any doubts about the military importance of advanced technology during the past two decades. Seemingly, this inventory also would indicate that many organizations and persons, both in the military and in the aerospace industry, had done an excellent job in staging a technical revolution of these proportions.

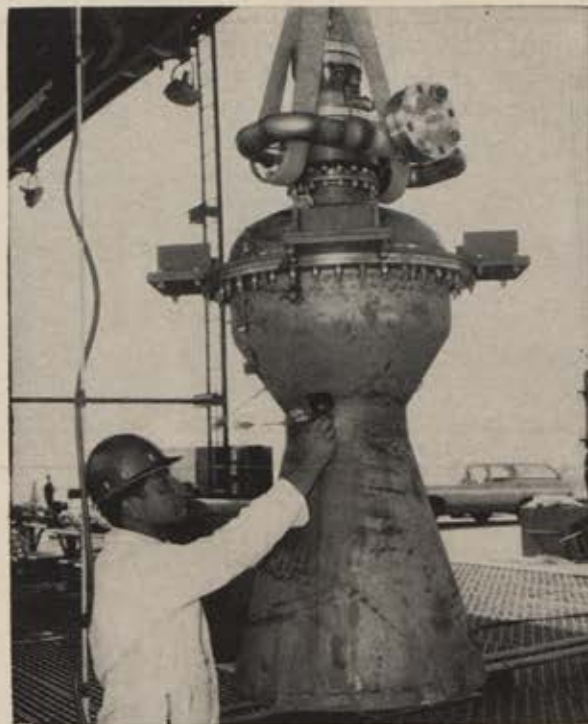
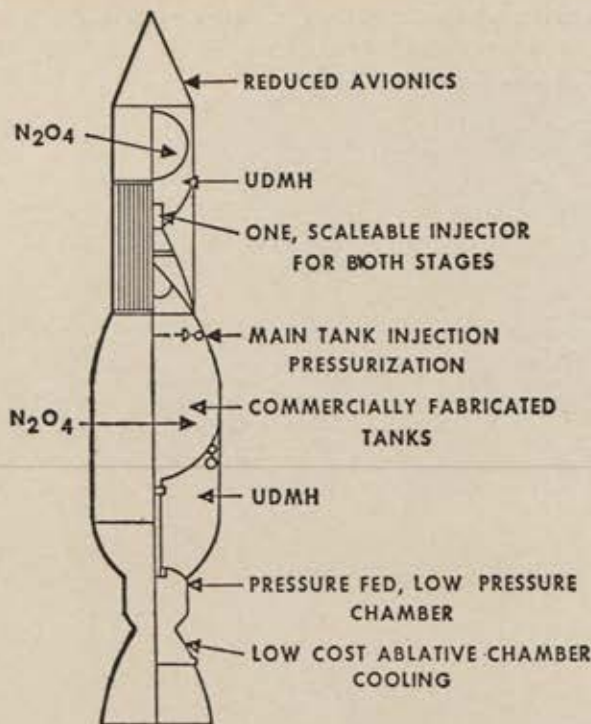
Somehow, though, the message has not got across. Watch almost any TV news program, or read any newspaper or mass-circulation magazine. The furor over the antiballistic missile system has brought criticism of the "military-industrial complex" to an all-time high. It now is fashionable to represent the past fifteen years as a colossal series of multibillion-dollar mistakes, holding up as evidence the numerous weapon

(Continued on page 38)



—ILLUSTRATION BY GORDON PHILLIPS

One of the most dramatic changes of the next decade will be a revolution in display systems brought about through holography, the technique that transforms signals from sensors into detailed three-dimensional displays. In the artist's conception above, a USAF command and control team is observing a combat situation using a display generated by radar and infrared. Submarine commanders will have similar displays from sonar, which will show the bottom contours, and undersea and surface vessels in his area. Researchers also will benefit. Schlieren photographs can be made three dimensional to show complete shock wave system over wind-tunnel models. Laser holographs already have shown the disintegration of propellant drops in rocket-engine combustion on a much slower time scale than ever achieved before. Observers can walk around the display to examine flow conditions in the nozzle and then at the injector face at the front of the engine. The perspective changes during the walk-around.



Sweeping management reform is being widely recommended in the services. One of the most explicit suggestions has come from Donald M. Ross, Acting Director of the Air Force Rocket Propulsion Laboratory. He contends that technology alone can't lower launch costs enough to allow space operations to grow substantially in the 1970s. A management revolution also is needed, according to Mr. Ross, and his suggestions include: (1) limit the military management group directly responsible for monitoring a major development program to six to eight people, in contrast to the Systems Project Offices (SPO) of today which have dozens and sometimes hundreds of members; (2) do not automatically give the prime development contractors the production contract for a new system; let them compete for the work, but "preserve the price advantage that can be obtained through use of highly competitive commercial shops"; (3) disengage government control and reporting requirement progressively; and (4) avoid AF, MIL, and FED specifications. Simplified hardware under test is heavy but inexpensive TRW engine, right, competing with Rocketdyne engine for AF's Big Dumb Booster concept (left).

systems that were dropped from development before entering service, and those that were in service and retired as obsolete without ever having been used.

Even more serious is the charge that every military request for a new project is an effort to keep the military budget fat, and just another unjustified raid on the public treasury.

Somewhere, somehow, new leadership must come forward to turn this tide of criticism and to bring the reform that is needed in the US advanced technology effort. There is a real crisis in the advanced technology business today. Few people will deny that, but, unfortunately, it bears little resemblance to the broad accusations being leveled at the "military-industrial complex."

It is too easy to lay all blame for high costs, technical haste and misjudgment, and failure to meet specifications on self-serving individuals who exert constant pressure for new funds.

The whole arrangement for developing new technology and new systems has serious flaws in it, and the Congress as well as the Department of Defense and industry must share the blame. All three must participate in its reform.

One of the bright spots today is that the current leadership in the Department of Defense appears to be anxious to take corrective action. It is generally admitted that the management deficiencies built up

during the 1960s have reached crisis proportions today.

Dr. John Foster, Director of Defense Research and Engineering, and a holdover from the Johnson/McNamara Administration, has reported, in what he sometimes terms a "confession," that the advanced technology work he heads has slowed down by about fifty percent in the past four years in terms of actual usefulness. He is going to need strong cooperation from the new Administration and Congress to revitalize the program, but so far he has attracted mostly critics looking for examples of mismanagement rather than those who genuinely wish to work out reform.

The military services seem ready to officially recognize a fact long lamented at the working level in research and development. It is that military management has become too top-heavy, too restrictive on the contractor or government agency performing the actual work, too demanding in terms of paperwork and reports on technical progress, and, consequently, responsible for as much as fifty percent of the total costs on many advanced technology efforts.

Joint Army-Navy-Air Force studies are under way on practical methods to junk the bulk of thousands of military specifications and reporting requirements, while retaining fundamental control over advanced technology.

Such internal reform is crucial to the task of rebuilding the advanced technology effort. Difficult as it

is, however, internal reform probably is going to be the easiest part of the job. Popular understanding and support must be obtained. Any effort of this magnitude that can be expected to be funded on a long-term basis by the Congress must be explained and justified to the general public as well as to Administration officials and to congressional committees. To obtain long-term support, it also will be necessary to demonstrate that the program is being run with competence and good sense.

Just how the military establishment and the aerospace industry should go about winning this support over the next fifteen years is far from clear. It would be relatively easy if some overwhelming threat, such as a weapon that would make the ICBM obsolete, were as clearly on today's horizon as was the ICBM in the mid-1950s.

In the long run, however, it is impractical to rely on a weapons-gap, the-Russians-are-coming, approach. Claims of future threats are too easy to argue about. Moreover, they distract attention from the underlying reality of the modern world, the reality that is forced upon us by science and technology. This bedrock truth is that our lives must change. As time goes on, as scientific knowledge and technical know-how continue to mushroom, the changes will come more quickly, and undoubtedly they will be more unpredictable and severe.

The only conceivable method of preparing for a successful future is to be as ready as possible for change by remaining a leader in science and advanced technology.

From the military standpoint the primary objective of the advanced technology effort is not to meet specific threats, but to prevent threats from appearing.

Two Separate Military Forces

National preparedness has become a two-pronged problem. It involves not one, but two, distinctly separate military forces, two sets of weapon systems, two separate organizations in terms of training and doctrine, really two separate worlds. In simplest terms, one can be called "Forces-today," and the other "Forces-tomorrow."

No plan for national security can be successful in maintaining strategic stability and peace unless both sets of forces are kept healthy. If one is mortgaged for any reason—to save money, to achieve a momentary political advantage, or to appease those who don't, or won't, recognize the total defense problem—then the nation must sooner or later be left in a position of inferiority.

To illustrate, the United States would have a bona fide threat on its hands today if advanced technology had been curtailed two decades ago and the judgment made that "Forces-1950," with the primitive hydrogen bomb and the early jet bomber, were considered "ultimate" and able to provide all the striking power conceivably needed.

US Forces-1950 would be impotent against the Soviet Union, armed as it is today with Forces-1970 or basically the inventory of modern weapons listed at the beginning of this article. Russia would have a clear

strategic superiority, able to damage the United States far more than she could expect in return. The deterrent policy would be an empty shell, and the USSR would constitute a threat of the most direct kind.

Looking to the future, there is no indication that the technical revolution is abating. Every type of equipment now in use can be improved substantially. Many experts believe the next steps in increasing performance will be the biggest ever. New materials, new manufacturing techniques, new understanding of the design of precision machinery and lightweight structures are at hand. It all adds up to rapid obsolescence of present military systems.

Russia, by all outward signs, is not abandoning advanced technology and is working hard on her Forces-1985. But no one can prove this with absolute certainty, and answering the question involves intelligence estimates, which leads to widely fluctuating interpretations today.

Speculating on the intentions of the Soviet Union fifteen years in the future, however, is a somewhat pointless exercise for policy-makers and everyone else. Russian leaders themselves don't know what they are going to be capable of in 1985, and it really is a question of what options they are going to prepare for.

The proper policy for the United States is to make Forces-1985 a subject of the coming arms-limitation talks along with Forces-1970. If we can reach effective international agreements on reducing the strength of either force, or limiting their character and weapon inventory, so much the better.

(Continued on following page)



New materials are needed for most systems. Boeing engineer above is working on ceramics for face of radar which can withstand close-by nuclear blast. Samples are heated to 3,500° F. and then their ability to pass radar signals is measured. Ceramic is tougher than granite in impact tests.

Most important of the requirements for following this policy faithfully and completely is to convince the American people, in the simplest possible terms, that a strong advanced technology effort must be maintained. If this effort is left in its present condition, then the nation is flirting with unilateral disarmament. The danger would come in the 1980s, but it would be as certain a danger as that resulting from a large, unilateral reduction of US Forces-1970.

One urgent task of the new Administration, along with the leaders of the military departments and the aerospace industry, is to convince the public that Forces-1970 are not the end of the road. The public must accept the fact that preparing for change is equally important as the strong defense establishment in being today.

Spelling out such a policy may be more unpopular than at any time in the past. First of all, a proper advanced technology effort is going to cost a lot of money and compete for funds with social programs. The basic need is for an open-ended program costing well above \$5 billion per year, that is, more than the present DoD expenditure, with further annual increases to counter inflation. Under the best of circumstances, funding of this magnitude is going to be difficult to get from the Administration and the Congress for a program that has no specific end-product.

The practical problems of gaining approval undoubtedly will be compounded severely by the fact that this open-ended program would be producing prototype hardware for advanced weapons. Some prototypes

would be developed further into operational systems, but a large portion, inevitably, would be dropped. In the current climate it is certain that continual development of advanced weapons would be regarded in some quarters as an attempt to escalate the arms race, and the steady discard of prototypes would be seen as sheer waste.

Over a ten-year period a proper program would leave a far larger residue of discards than was left in the 1960s, because DoD, under Robert McNamara's stewardship, tried to save money by cutting corners with advanced technology. Mr. McNamara believed essentially that analysis had become so sophisticated that much routine hardware proof-testing of new concepts could be bypassed.

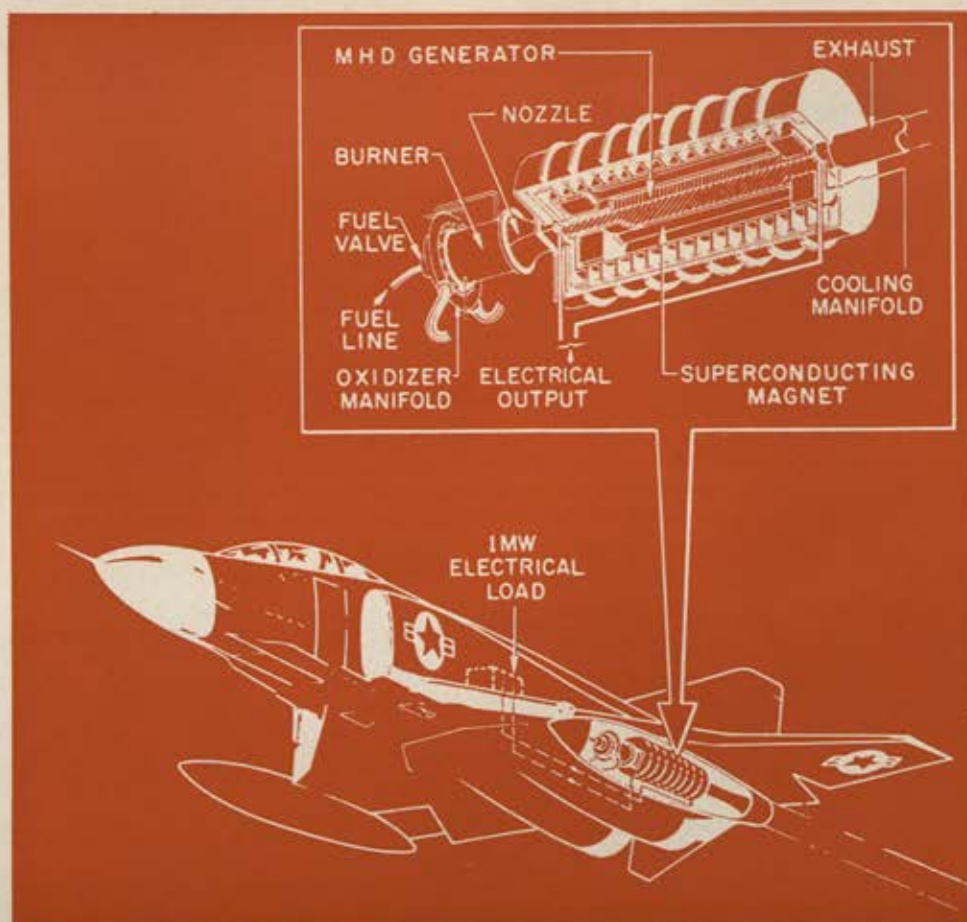
The Steps in Hardware Development

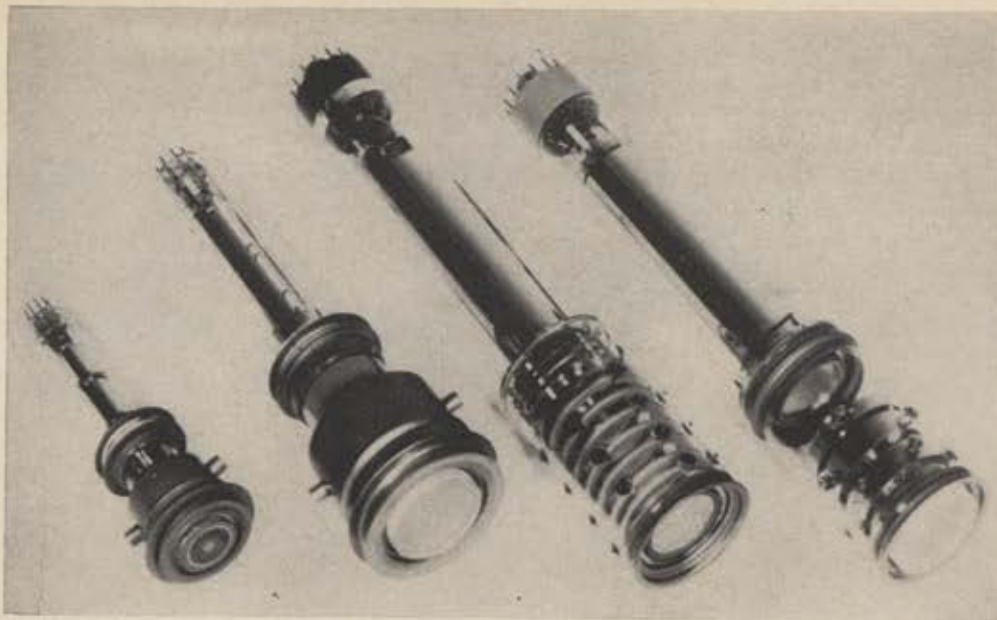
The four generally accepted major steps in hardware development are:

- **Research**—This category is subdivided into basic research usually not related to any end-product, and applied research, most often intended to solve a specific problem. In the latter days of the Johnson Administration, research support from DoD, NASA, and the National Science Foundation dropped so low that serious disruption of work took place in universities, industry, and government laboratories. Repair of the hiatus is still in progress.

- **Exploratory Development**—Sometimes the objective of this stage is "bread-board" testing, with heavy,

Power limitations now restrict the use of truly sophisticated command and control systems in aircraft and space vehicles. The power gap probably will be filled by magneto-hydrodynamic (MHD) generators during the 1970s. Avco Everett Research Laboratory built its first experimental model in 1958. Its current design is capable of delivering one megawatt of power for an airborne C-and-C post for half the weight of a turbo-alternator system. In smaller versions for fighters the MHD system weighs one-third as much as conventional equipment. Very large sizes are possible. AVCO has a 32-megawatt MHD generator under test at the Air Force Arnold Engineering Development Center.





Innovation in electronic systems continues to pick up momentum. A major new market for the 1970s is certain to develop for equipment that allows men to see in the dark and will remove the "cover" of darkness in military and criminal operations. Most major manufacturers are ready for this market. The four low-light-level TV tubes at left are among the inventory of Westinghouse Electric, most of which already is available on an off-the-shelf basis.

cheap, and conservatively designed hardware components, to establish the feasibility of an advanced concept. Sometimes it is proof-of-principle testing, involving a more sophisticated prototype. The X-series of experimental aircraft of the 1950s fits into this category. The modified F-8 fighter NASA will use to test the supercritical wing is from this mold. Exploratory development is the advanced technology phase of most concern to Dr. Foster, for effective support in this area has followed a steady downward trend for more than five years, and with the inflation factor considered, the reduction of effort has been about fifty percent during this period.

• **Engineering Development**—Once a concept has passed through exploratory development, much usually remains to be done before it can be brought into full-scale operational development with a high probability of success. Good answers must be obtained to all major engineering problems faced in designing a complete system so that major changes will not be needed in the operational system after it reaches production. New, more sophisticated, and more expensive prototypes are needed to acquire the necessary design information. However, it is far cheaper to fix mistakes in the prototypes than to make changes along a whole production line.

Considerable controversy always has existed about the amount of work which should be done in this advanced technology phase. In the 1950s it was skipped almost completely in development of the B-47 so that a jet bomber could be rushed into production and into service at the earliest possible date. The result was a near-disaster that was kept under heavy security wraps for years. So much of the design was new, and so many things went wrong, that lines had to be stopped for retooling and the complete operational fleet of more than 300 aircraft grounded for weeks for major changes.

USAF officers familiar with the B-47 program generally believe that hundreds of millions of dollars could have been saved and the fleet would have been operationally acceptable many months, and perhaps years,

sooner if proper engineering development had been conducted.

The lesson was put to good use in the B-52 development which was supported by a strong prototype effort and came very close to its schedule in both time and dollars.

Such lessons can be too easily discounted. The civil leadership in the Pentagon chose to bypass prototype flying in the F-111 program even though it had to achieve some of the highest efficiencies and widest operating ranges ever required in airframe, engine, and engine air-inlet performance. Many experienced R&D officers believe it is the B-47 story over again, and that substantial time and dollars could have been saved through a proper engineering development program.

Most major elements of the antiballistic missile—the phased-array radars, computer-driven controls, and the Spartan and Sprint missiles—have been in this development phase for two years or more. Prototype performance has convinced DoD that the system will work as planned, if produced and deployed. The only important engineering testing still undone apparently involves the Spartan warhead, with a yield of about one megaton and a special design for maximum high-altitude kill effects. Underground verification of its performance is expected this year in Alaska or Nevada.

• **Operational Development**—Costs soar in this final payoff phase of development. Everyone is only too aware that the price tag for development and production of major systems runs to billions of dollars. The total B-52 bill, for example, ran about \$6 billion for fewer than 750 airplanes. Funding for the complete Minuteman program topped \$8 billion.

The difficulty of managing such large programs can hardly be exaggerated, for an error of only ten percent in estimated costs over a period of five years or more can make one look idiotic. In most businesses, this order of estimating accuracy would be welcomed, but in the military it can lead to nasty headlines. If the Minuteman effort, for instance, had gotten out of line by ten percent, the charge would have been that the

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New materials have been critical in aviation since wire bracing, wood, and canvas gave way to sheet aluminum. Improved aluminum alloys, titanium, and beryllium lowered structural weight still further in the 1950s and 1960s. Biggest strides ever are expected with metal/plastic composite materials in the 1970s. First major production involves boron rudder for the F-4 Phantom aircraft. This material shows excellent potential for reducing structural weight by almost one-third.

Air Force had erred by something like \$800 million.

Happily, the Minuteman program was one of the best in meeting time and money estimates. But few programs have done as well, and the batting average in recent years has not improved as might be expected with increased experience. When Mr. McNamara went to the Pentagon in 1961, it was widely predicted that he would bring more businesslike methods to development programs and end major overruns. This was one of his stated objectives.

Examples of Miscalculation

The promised performance never materialized, and the two large programs over which Mr. McNamara exercised unusually close supervision now are pointed to as classic examples of financial miscalculation. One of these projects, the F-111, is up more than one hundred percent over the original estimate, and the other, the C-5, reportedly is up more than fifty percent.

Many old hands at the development business trace a large part of the problem to the extremely long and detailed paper competitions brought to the Pentagon by Mr. McNamara and his assistants, from which they expected so much. Sometimes contractors and the military services were found to be in error in these paper studies, but the Office of the Secretary introduced a problem that proved far more serious.

To stay alive in these paper competitions, it was necessary in each phase to make ever more detailed predictions about hardware performance, production schedules, and costs. Since most of the systems and subsystems important in the competitions had not advanced to the engineering development phase, precious little firm information existed about them.

Most detailed estimates then were simple extrapolations of past data. In a sense Mr. McNamara engaged in a more sophisticated version of "brochuremanship," said to be essential for getting contracts in the Charles

Wilson era. The McNamara version could be called "computermanship." Both were basically the same, however—a sales pitch about what a company and a military service thought they could accomplish.

The most common complaint about Mr. McNamara's method was that the competitions were very long, in the hope of improving the estimates. In practice, this made the competitors push their estimates further and further into the unknown, while everyone, Mr. McNamara included, gradually convinced themselves that such ambitious goals could be achieved without serious trouble.

All the problems certainly can't be attributed to Mr. McNamara, because the Administration and the Congress encouraged the most optimistic predictions, especially low costs. The quickest way to get into trouble with Congress about military contracting still is to take a high bid, even though the high bidder's proposal may be the soundest.

One change that seems certain to come as a result of the problems of the 1960s is a heavier reliance on exploratory and engineering development, with the building and testing of prototypes. Prototypes generally were downgraded under Mr. McNamara's leadership because he felt they were a waste. This view is passé today, as the overrun on the R&D portion of the F-111 program now is some \$700 million. A small fraction of this would have bought several handmade X-models which would have revealed most of the problems involving operational aircraft and would have provided a means of verifying design changes.

Accurate Predictions Are Possible

It is somewhat unnerving today to hear responsible military officers and industry engineers contend it is possible to predict hardware performance and costs to a relatively high accuracy, apparently a majority opinion. They say precise predictions can be made on

almost any program if the contractors, the military, and the Office of the Secretary of Defense refrain from trying to design sophisticated equipment down to the last rivet before development has even begun.

Hopefully, this opinion is correct and these men will have an influence on future policies. The repercussions against the military could be intense if the estimates on major systems continue to be in gross error. Disillusionment with military management already is severe enough.

Even though there are extenuating circumstances, and the OSD should share the criticism, the Air Force is bearing the brunt of it on the F-111. Charles J. V. Murphy, who has never been antiairpower, writes in *Fortune* magazine: "The puzzling fact is that our government has not been managing its airpower very well lately. It is having trouble with the planes it builds. . . . The strange breakdown of the huge F-111 fighter-bomber program has thrown a cloud over the Air Force's competence even to take a difficult design into satisfactory production."

Mr. Murphy's criticism is among the most temperate and considered of the past few months. Other stories and headlines have proclaimed the ABM as the "greatest coup" of the military-industrial complex; the SST as a "give-away" to the aerospace industry; the Sheridan armored vehicle as "another weapon systems failure"; Senators who want to form a "technological backlash" committee speak of "rather heedless" expenditures on military technology; one prominent anti-ABM scientist wants to set up an "anti-RAND" to coun-

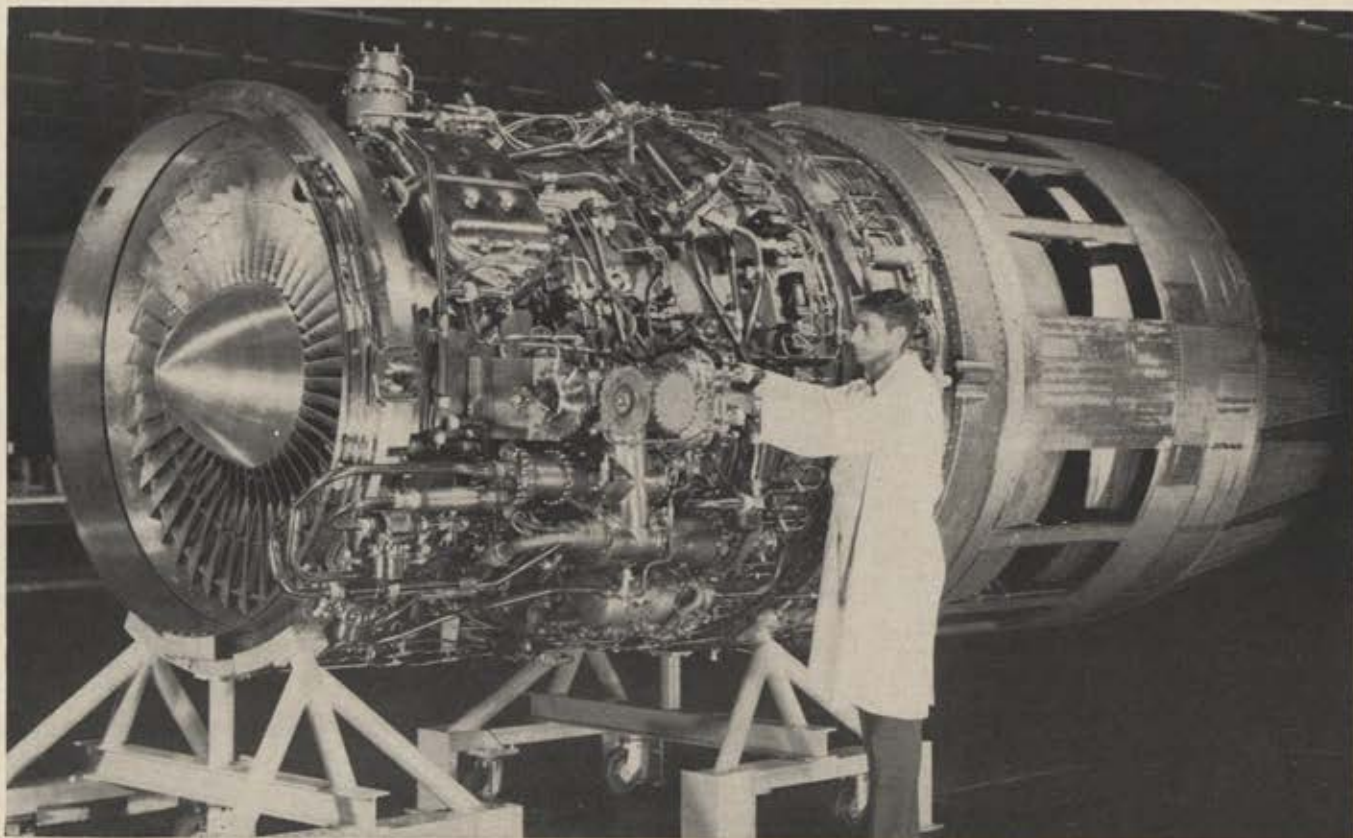
terbalance the support RAND gives to the military; and two Senators went to the Air Force Museum to stand in front of the XB-70 to explain for TV that the ABM probably would end up as "no more than a museum piece like the XB-70."

Clearly, the first priority of the military establishment and the aerospace industry today is to seek public support by reexplaining their purposes, their problems, their methods, and their principles. In the face of the vitriolic attacks now being mounted, the comeback will not be easy. New ways of explaining old truths will be needed, along with new looks at the relationships between the military, the industry, and the public. Advanced military and space technology may be far more important to the nation than is generally accepted.

Civil Importance of Advanced Technology

Advanced technology would receive its biggest boost if it could be proved beyond doubt that US prosperity is largely a result of government-supported R&D programs. Popular support and congressional approval certainly would grow more solid if it were established that advanced technical projects also were the main bridge to the future for the entire economy, and that even if defense projects were stopped they would have to be replaced by something very much like them and equally costly.

Most efforts in the past have failed to convince many
(Continued on following page)



Turbojet engine development has been one of the bright spots in the US advanced technology effort, even though NASA dropped out of the picture for several years and military funding sank to a very low level. Contractors supplemented government contracts and built an impressive series of prototypes of major components and complete engines. The Pratt & Whitney JTF17 afterburning turbopfan still hasn't found operational use, but prototype testing has established its importance.

people that space and defense work had a significant fallout or spinoff into civil industry. Most economists apparently have been reserving judgment on the question until it could be shown precisely that X dollars invested in advanced technology would produce Y dollars of growth in the gross national product.

Such rigid proof still may be many years in the future, but at least three promising ideas, if investigated on a systematic basis, hold promise of demonstrating the indispensable nature of advanced technology.

The first involves a self-evident fact. It is that the physical plant and outside services all major industries need to keep competitive have changed drastically in two decades, and in most of them more than one major reequipment has taken place. Very simply, any company that tried to operate with Factory-1950 against competitors with Factory-1970 would fail.

By using a new and extremely interesting technique, it should be possible to examine the changes that have occurred in industry and determine their origin. This technique of tracing the lineage of technical innovations and establishing the originator of key contributions has been pioneered in two projects. One, called Hindsight, was conducted in DoD. The other, entitled Technology in Retrospect and Critical Events in Science (TRACES), was undertaken by the Illinois Institute of Technology with National Science Foundation support.

The most important revelation of the two studies was that prominent technical people could agree on the source of a given vital contribution. Instead of turning up a murky, uncertain trail of parentage for the machines of today, the studies were able to distinguish clear lines of descent through development, to applied research, and finally to the basic researchers

of past eras, such as Faraday or Edison. The results of these studies were not confused or adulterated by contemporary jealousies.

The Department of Defense is long overdue in pushing this line of inquiry and establishing the exact role its R&D expenditures have played in building modern America, and the rest of the world, since World War II. If an exhaustive examination of these questions had been made and the results given wide circulation, it is probable that a completely different atmosphere would exist on Capitol Hill regarding DoD's advanced technology effort.

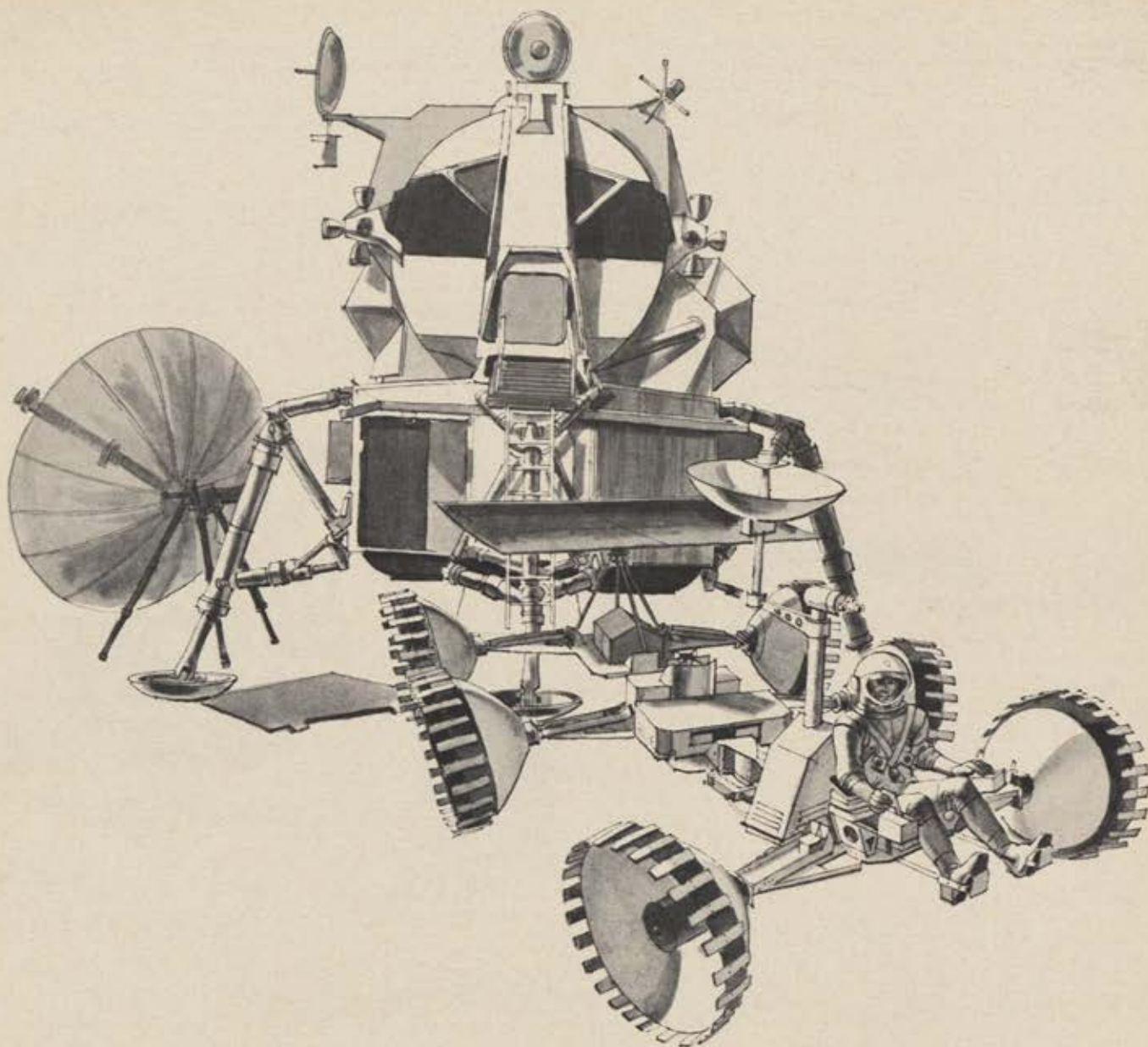
The second idea about the value of military R&D is somewhat intuitive but certainly logical and could be investigated along with the techniques just discussed. Donald F. Hornig, President Johnson's Special Assistant for Science and Technology, put it this way: "I question whether government programs aimed at general development of new technology would be effective in advancing civilian-directed industry. On the other hand, technology . . . aimed at satisfying the exacting requirements of military and space systems—requirements which go well beyond civilian needs and . . . performance goals—is more likely to be applicable."

In other words, there is no real basic difference between military and civilian technology and the over-all requirement for both is to push constantly for higher performance. The common bedrock goals are: (1) lighter, stronger materials more resistant to heat and other extremes of environment; (2) machines that are smaller, lighter, stronger, faster, and more efficient, *i.e.*, go further, use less energy, and/or cost fewer dollars; (3) machines capable of a wider variety of tasks and more precise control; and (4) machines that are more

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More change, and more innovative ferment, is being experienced with high-frequency radiation devices in general, and lasers in particular, than any other area of advanced technology. Laser rangefinders (such as the GE device at right) are in service; communication units will be next. There appears to be no reason for doubting that, sometime in the future, efficiency and power will rise to the level that these devices will be weapons.





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Experimental work indicates that airborne computers will continue to shrink; work capacity will increase. Sperry Rand-Univac model, above, flew for first time on Titan III this year, has 1.8-cubic-foot volume, and performs 125,000 operations to deliver fifty steering commands per second.

reliable and that turn out to have lower lifetime costs.

When progress is made in any one of these areas, it usually is possible to build an improved weapon, or an improved machine that can do well on the civil market. When advances come in two or three areas at once, it often has been possible to produce both revolutionary weapons and commercial machines, opening up completely new military possibilities as well as new product lines.

The point that must be explained convincingly is that DoD for twenty years has paid almost the complete bill for pushing forward the frontiers of technology. There was no alternative to this expenditure or we would have been stuck with Forces-1950, but it also should be appreciated that the US would have inherited Factory-1950 also.

Weight With Experts

A third idea comes from a more scholarly study and should carry considerable weight with experts in economics. Very briefly, this concept holds that, over the long run, technological change has a primary role in promoting economic growth. The other factors traditionally associated with economic growth, such as edu-

cation, capital investment in plant and equipment, increase in the labor force, and modification of institutions to make labor available, are held under this concept to be one-shot devices whose effectiveness is limited. Only technical change, e.g., graduating from vacuum tubes to transistors and then to integrated circuits, is capable of producing growth, which economists define as an increase in the potential level of output.

Robert S. Schultz, an economist with the Union Camp Corp. of New York, apparently was the first to systematically study economic growth and to reach this conclusion. Explaining the study in the *Harvard Business Review*, he was concerned over the "high degree of imprecision" existing today about the causes of economic growth. He said, "The great importance of technological change is, of course, widely recognized, but most economists seem to regard it simply as one among many factors, or to take its primacy for granted."

If Mr. Schultz and Dr. Hornig are correct, we can reach three main conclusions.

First, military technology programs have pushed the performance of machinery to higher levels, produced more new types of machines, and created far more technological change than any other source in the past twenty years.

Second, this military technology has been the fundamental impetus to US economic growth, and the creation of new jobs and new industry.

Third, national policy-makers either haven't recognized this or haven't chosen to spell it out and take official notice of it. In fact, during the 1960s they disregarded it so completely that the result was reduced military technology programs.

The government is overdue in assigning a healthy task force of scholars and impartial experts in verifying or disproving these concepts. It still may be possible to stop a more divisive split in popular opinion, before the competition for funds between military and social programs becomes so emotional that reason is impossible. It is close to that right now.

Great Britain, with its economic troubles, stands today as an example of what can happen when a nation opts for social programs at the cost of denuding its advanced technology industry. Her problems undoubtedly go well beyond this one cause, but US policy-makers today need to know just how much advanced technology can contribute in economic growth, new jobs, and the alleviation of social and economic inequities in our society.

It is generally understood and agreed on in the United States that heavy spending will be necessary for rehabilitation of the cities and to give the disadvantaged a proper start. However, everyone, including the leaders of social reform, also must understand if their demands for cuts in advanced technology support could kill the goose before it has produced a golden egg for everyone.

The Department of Defense has no alternative but to educate itself thoroughly on this complete issue. If its advanced technology effort can be justified on a basis other than pure weapon necessity, the entire military program of the 1970s will have a better chance of popular and governmental support.—END

Tactical navigation satellites . . . Satellite-to-satellite data relay . . . Improved missile guidance . . . Improved boosters . . . Space rescue . . . Spaceborne power sources . . . Missile survivability . . . An advanced ICBM . . . Blast simulation . . . Space antennas . . . Cryogenic-speeded data-processing . . . These are among the major advanced technology efforts under way at . . .

Systems Command's SAMSO

USAF's Missile-Space R&D Center Looks Ahead

BY IRVING STONE

West Coast Editor, AIR FORCE/SPACE DIGEST

THE prospect for accelerating advanced technology for aerospace systems and subsystems looks bright at the Air Force's Space and Missile Systems Organization (SAMSO) for the remaining portion of Fiscal 1969 and for Fiscal 1970. Fiscal 1970 funds for SAMSO's advanced technology efforts haven't been released yet, but the organization has gotten the go-ahead, and work statements for a broad band of key efforts have been issued or are being prepared.

One of these key efforts will be directed at pushing the potential of a high-precision satellite, commonly known as the tactical navigation satellite (*see AF/SD, April '68, p. 174, and July '68, p. 92*). The navigation satellite is projected to have triservice application and afford a quick precision-position fix for high-speed military aircraft and for ships and ground forces.

SAMSO is coordinating this effort with the Tactical Air Command, Strategic Air Command, Aerospace Defense Command, Military Airlift Command, Electronic Systems Division of AFSC, the Army, the Navy, the Marines, and various government laboratories. This coordination should shovel large blocks of technology into aircraft efforts by the mid-1970s. And the very high accuracy of the navigation satellite is expected to provide more effective operational roles for high-speed aircraft, helicopters, forward controller aircraft, military transports, paratroop operations, ground forces, and ships.

Three studies relating to the navigation satellite are programmed to be initiated this year:

- First effort will involve a demonstration using a bread-board receiver in a satellite to explore the frequency to be used for the navigation satellite, the ionospheric attenuation, signal processing, and other technical considerations necessary for the engineering of the receiver for adaption to the needs of eight specific users, including the high-speed aircraft, foot soldiers, jeeps, and surface ships.

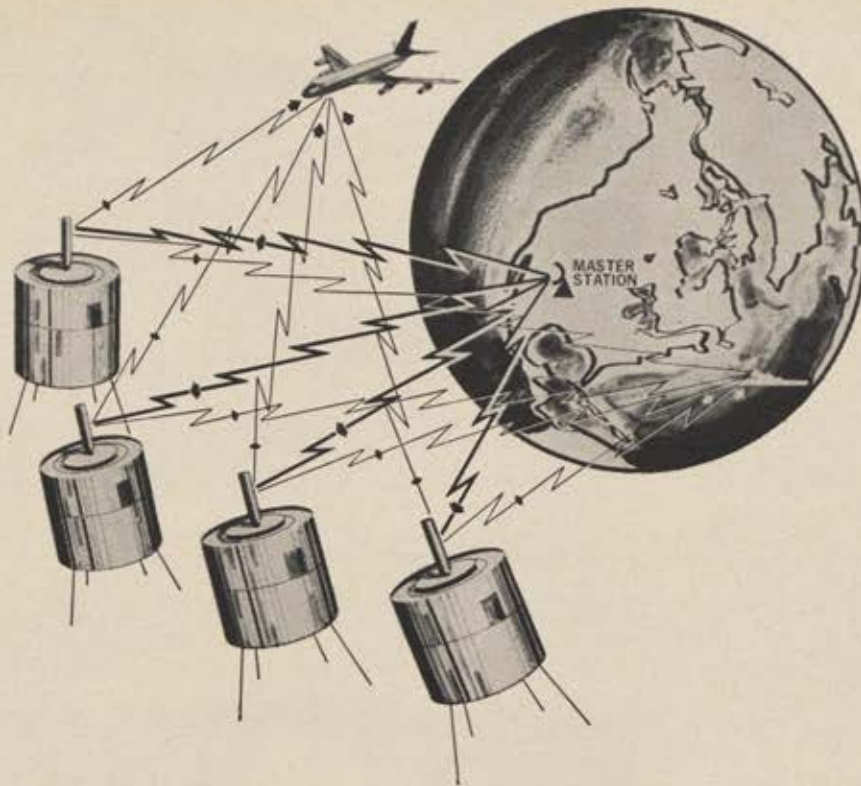
- Second effort would be an analysis of a method to adapt the navigation satellite as a landing aid to facilitate zero-zero landings for aircraft.

- Third study would explore how the navigation satellite could complement the specific operational role of an aircraft carrier.

Preliminary design studies for the navigation satellite were completed only last January by Hughes and TRW Systems. One, or possibly both, of these competitors is expected to be selected within the next month to conduct the follow-on demonstration effort with the bread-board receiver. The other two tasks would follow the demonstration.

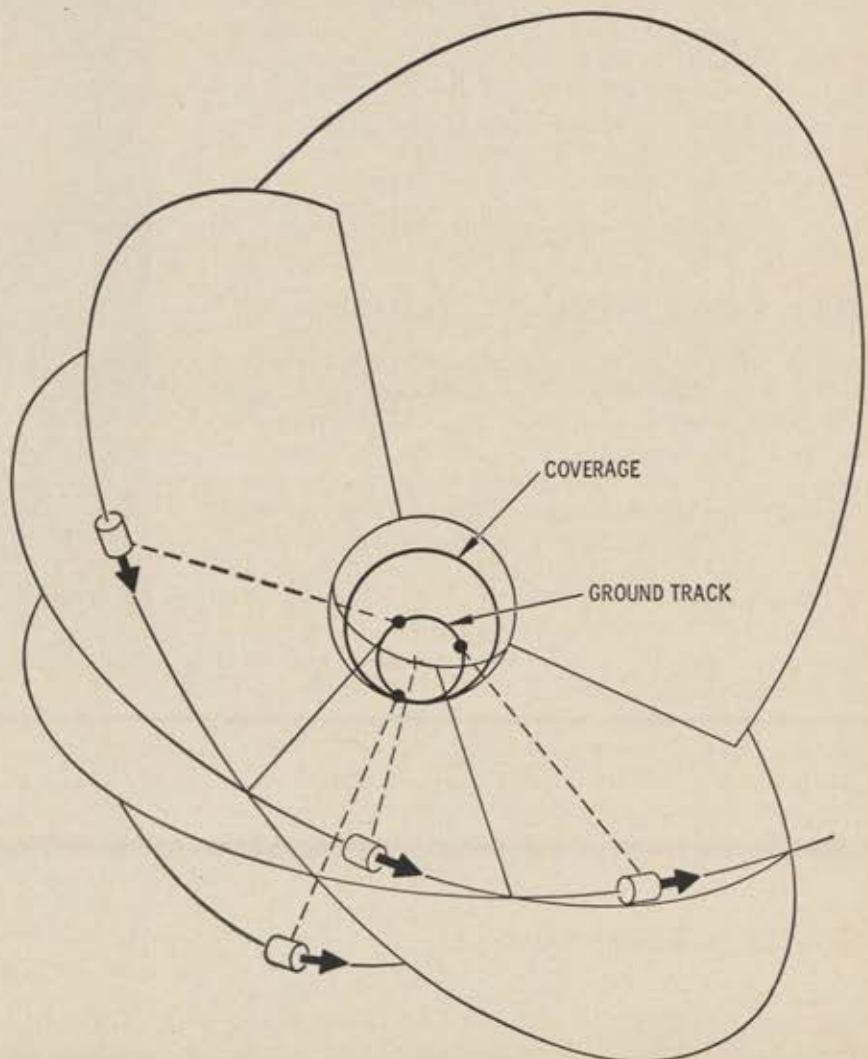
SAMSO's Director of Development Plans, Col. F. X. Kane, anticipates additional refinement in aircraft design and operation as a result of the application of satellite technology to avionics—smaller sizes, lighter weight, lower power requirements, and higher reliability.

(Continued on page 50)



This schematic drawing shows how a single constellation of navigation satellites, made up of one equatorial synchronous geostationary satellite and three inclined-synchronous-orbit satellites, might be used to provide a navigational reference for aircraft and ships. A signal would be transmitted from a master ground station. Each satellite would, in turn, relay the signal to an aircraft or ship as a basic time-reference signal. The user's receiver would determine the time difference between arriving signals and provide position with respect to the position of the satellites. To convert the time difference to geographical position, the orbital position of each of the satellites would also be transmitted. Computerized interpretation of this data would provide a position, altitude, and velocity report and pinpoint user's local position with high accuracy.

These circles and representations of orbital planes show how a group of synchronous satellites would provide navigational reference points of position, altitude, and velocity with great accuracy. Largest of the three circles in the center shows outline of earth's sphere. Smaller center circle, marked "coverage," shows area of antenna coverage provided by the constellation of one geostationary satellite and three inclined-synchronous-orbit satellites. Smallest circle represents ground-track movement of orbiting satellites as seen by observer standing at one spot on equator, with the "x" symbol representing the geostationary satellite, and the solid black dots representing the movement of the three slave satellites in approximately thirty-degree inclined orbits phased 120 degrees apart.



ity. He sees a large measure of this technical trans- fusion stemming from the navigation satellite program.

Relay Satellite in Synchronous Orbit

Another large interest at SAMSO is the data-relay satellite, a concept that also has been known as satellite-control satellite (*see AF/SD, March '68, p. 105*). Aim would be to develop satellite-to-satellite links as, for example, a communications network that would not have to depend on overseas ground stations. Orbiting at synchronous altitude (19,400 nautical miles), the space relay satellite would interrogate other satellites in low orbit and transmit to the continental US in real time. SAMSO is analyzing the avionics that may be required for this application.

One facet is that the satellite would transmit very large amounts of data. Hence, a key consideration of the analysis would be to determine if the data should be processed on board the satellite, thus reducing the transmission load, or whether the satellite transmitting system should be as large as required and to perform the data-processing on the ground. In connection with this problem of data management, SAMSO planners are looking at computers for the satellite and for use on the ground.

Also under consideration is the factor of increasing automation to have the computer do the bulk of the readout or discrimination to lessen the load on the attendant or an observer.

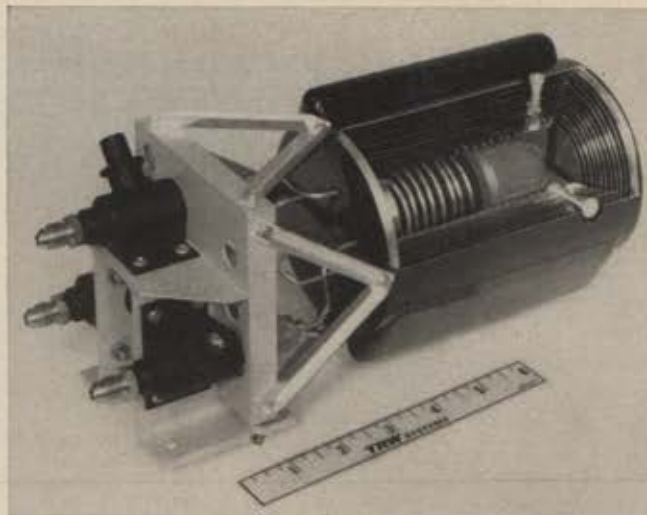
Use of lasers is considered to offer very attractive potential as communication links either for the inter-satellite mode or between ground and satellite. However, the consensus is that it is still too early to fund this type of laser effort for advanced development, but SAMSO probably will maintain its interest in exploratory development for this application.

High-Reliability Missile Guidance

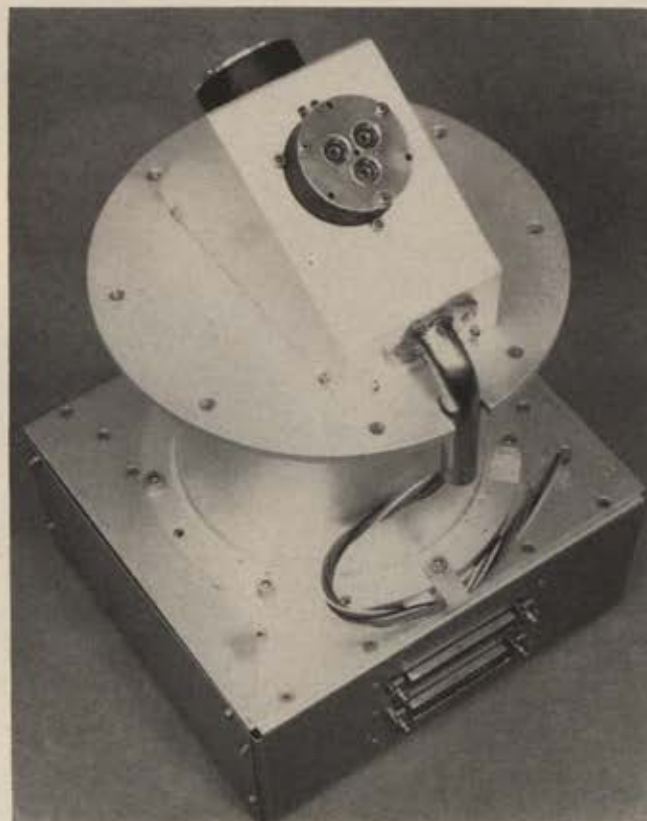
The area of space guidance technology has been under continuing analysis and evaluation at SAMSO, with goals targeted for more accurate pointing and position determination. But missile guidance technology is one of the top priorities at SAMSO. One of the areas of emphasis is on increased reliability. SAMSO planners are interested in determining how to apply gyros, accelerometers, and other devices recently developed at Massachusetts Institute of Technology, and may fund the development of an advanced guidance system to incorporate these instruments. Expectation is that tens of thousands of hours of operation could be realized, in effect solving the reliability problem. And much greater accuracy is expected than current developments can afford. Allocation of SAMSO funding leading to this guidance development is tagged at about \$10-\$12 million out of Fiscal 1969 money, and about twice that amount from Fiscal 1970 funds.

New Payload-Bus Studied

The advanced guidance system would be part of a projected powered vehicle or bus designated the Post Boost System (PBS), earlier tagged Post Boost Vehicle-



Space and Missile Systems Organization is studying the problem of power sources for future-generation spacecraft. At top is one approach, a decomposed-ammonia radioisotope thruster. At bottom is a colloid microthruster. Both systems have been explored, and experimental models have been built and tested in programs funded by Air Force laboratories as part of the search for advanced technology.



X (PBV-X), which would be adaptable to whatever advanced intercontinental ballistic missile is authorized for deployment in new hard-rock silos. As a payload hauler, it's likely that the PBS would accommodate multiple independently targetable reentry vehicles (MIRV), which conceivably could be developed for individual maneuverability, considering the lead time likely to be involved.

Bids were issued on March 20, 1969, by SAMSO to the aerospace industry to submit proposals in a competition for a preliminary design for the PBS. This

initial level of effort will include the analysis of various missions, tradeoffs of size, weight, and other critical characteristics, and finally the preliminary design of the vehicle. This initial conceptual approach may extend over a period of two years.

Space Escape Modes Analyzed

Study of emergency escape from space again is being advanced by SAMSO. An effort for preliminary design work on a space escape system was initiated recently (March 14) with the issuance to industry of requests for proposals. The study will extend for nine months, will be funded for about \$200,000, and would be oriented to examine emergency escape from a space-station logistics ferry. In a large space station, if the emergency doesn't result in a catastrophic failure, it would appear possible to cope with the situation to a large degree because of space-station size and compartmentalization, and the presence of a logistics ferry which always would be docked on-station.

However, in a logistics ferry not docked at the space station, an emergency probably would require use of a "bailout" vehicle because of lack of compartmentalization in the ferry. This bailout operation might involve a capsule to remain in orbit to await rescue by a ground-launched vehicle, or by a reentry capsule. Since it would have to accommodate the ferry's crew, which might be sizable, the reentry capsule would require a large size and considerably more complexity than the simple stripped-down "bathtub capsule" concept initially envisioned for space escape (see *AF/SD*, Oct. '68, p. 74), and be equipped with guidance and communications system and life-support equipment for orbital delay to ensure the desired landing location on earth.

Power Sources for Satellites

Small power-source technology for specific application to next-generation spacecraft is being promoted by SAMSO for functions of station-keeping in orbit, attitude control, and compensating for drag loss. The effort is targeted toward the development of a decomposed ammonia radioisotope thruster (DART) and a colloid microthruster, which previously have been analyzed in exploratory work by TRW Systems (see *AF/SD*, Jan. '69, p. 93) for USAF's Rocket Propulsion Laboratory and the Aero-Propulsion Laboratory, respectively.

SAMSO's effort likely will extend into 1970 and will be oriented to achieve smaller sizes, lighter weights, and long endurance—about five to seven years in orbit.

In a somewhat related effort, SAMSO also is about to examine the entire subject of basic space-power supplies for spacecraft as distinguished from propulsion. This effort may be conducted in conjunction with the National Aeronautics and Space Administration and is expected to involve the comparative analysis of nuclear power sources, solar panels, and advanced-technology batteries.

Industry members feel that in the immediate future power supplies of kilowatt capacity will be required and that this might be accomplished economically

with the use of unfurlable (roll-out) solar arrays, which are not yet operational in space. However, some basic designs already call for kilowatts of power. These arrays would require very thin solar cells, about the thickness of paint. Cadmium sulfide cells may be indicated for this application with the ability to be rolled without fracturing. Cadmium sulfide cells have been built with 3.3 percent efficiency, compared with about ten to twelve percent for the conventional silicon cell, industry proponents contend. But if the efficiency of the cadmium sulfide cells can be raised to about five percent, they would be competitive, on unfurlable arrays, with the flat plate silicon type, affording an equivalent amount of power for the same weight, it is contended.

Industry members claim that designers are reluctant to go to the larger, knee-joint-type, flat-plate silicon-cell array because of weight, deployment complication, and center-of-gravity problems.

Hardness for Survivability

Hardening of the in-flight portion of missiles is another prime area of interest at SAMSO. The general approach is that it is desirable to increase in-flight hardness but the degree of hardness required has not yet been settled.

SAMSO is examining three general areas relating to hardness requirements. These include the "fratricide" aspect—how Sentinel antiballistic missile intercept detonations could affect US ballistic missiles launched through these blasts. A second area is concerned with the hardness required for US ballistic missiles to be launched safely after enemy attack. And a third area is related to hardness required to penetrate enemy defenses. In every case, it would be a tradeoff of hardness vs. weight. Practically, with booster limitations, it could resolve itself to the tradeoff of allocating weight to hardness or throw-weight (payload capability).

In general, reentry vehicles are easier to harden than satellites because they don't encompass the array of sophisticated avionics, and the missile's heat shield is an element of partial resistance.

One approach to promote satellite resistance to nuclear blast might be to have one satellite operational, plus one or more "dark"—quiet, but operable—counterparts all separated by a few hundred miles. This deployment mode would require the hostile force to kill all of these satellites simultaneously.

Advanced ICBM Decision Ahead

The decision whether to build an advanced ICBM to complement the hard-rock-silo program will be made this year, following an in-house SAMSO evaluation of the alternatives available for strategic missile force improvement. If the missile is sanctioned, a preliminary design study may be funded for approximately \$10 million.

An advanced ICBM, in order to be justified, would have to incorporate a much greater payload capability—perhaps two to three times—than Minuteman III.

(Continued on following page)

With this improved capacity, the advanced missile could accommodate more hardening, and conceivably the additional weight introduced by a maneuvering capability for each of the individual reentry vehicles if these should be carried by the bus. Designing and developing these maneuverable reentry vehicles would just be an engineering problem.

The advanced ICBM undoubtedly will be a solid-propellant vehicle. Sizes from ninety inches to 120 inches in diameter have been considered. Presumably a new hard-rock silo could accommodate a 156-inch-diameter missile, but it isn't likely that a missile so large would be needed.

Hard-Rock Deployment

The hard-rock-silo program, projected to provide superhard holes to house the advanced intercontinental ballistic missile and, in the interim, the Minuteman III, took a big leap ahead earlier this year with the submission to SAMSO of technical proposals (February 17) and cost estimates (March 3) for a design study. Seven architect-engineering companies competed, and the proposals are now being evaluated.

The silo contemplated in the design study (*see AF/SD, June '68, p. 53*) should emerge as a prototype configuration. This approach probably would be followed because of the large number of tradeoffs and solutions involved to arrive at an optimum hard-rock-basing scheme within projected funding limits. Also, all the advanced technology required for design would be explored for incorporation into the prototype silo. It would follow that actual work on the hard-rock-silo construction for an operational deployment may be at least three years away. It isn't likely that as many of the hard-rock operational units would be built as there are Minuteman ICBM sites, considering the expense involved in matching the latter number—approximately 1,000. Instead, hard-rock sites probably will combine the greater hardness—perhaps ten to fifteen times that of Minuteman—with greater dispersal, to promote survivability and retaliatory capability.

The technology required for the actual construction of the hard-rock emplacement probably won't involve any sizable jump from that required for the existing Minuteman holes and their command and control centers. But all hard-rock-silo interfaces could be critical items, involving the application of advanced technology, because best blast-resistance would dictate that the entire silo structure should react to shock as a single mass. Thus, interfaces created by any electrical lines or ducting could be critical links.

And shock-isolating schemes for the missile and for silo and command and control equipment probably will require refinement involving advanced technology.

Silo Testing Task

One big job associated with the hard-rock-silo program would appear to be testing and the extrapolation of test data to approximate the effects of a nuclear blast that could be generated by a hostile missile impacting close enough to the target to threaten survival

of the silo. No silo, regardless of feasible hardness, is expected to withstand a direct nuclear hit.

When above-ground nuclear testing was permitted some years ago, there were no facilities of the hardness envisioned for the hard-rock-silo emplacements. And with the current ban on above-surface nuclear testing, it would seem clear that some blast simulation technique would have to be employed to wrest advanced technology answers from hard subscale structures and, probably, the prototype hard-rock silo itself. It's logical that some existing Minuteman silos also would be used in high-powered explosion tests for the extrapolation process.

The blast simulation could involve detonation above and at controlled distances from the test structure for cratering, damage, and seismic effects. Nuclear effects such as heat and electromagnetics could be read into the test analysis.

The use of remote sensors carried in aircraft for overflying areas to identify potential hard-rock sites for silos probably won't be employed in early stages of the site-selection effort. Millions of square miles of potential areas could be involved, sensors might require additional refinement and proving for the task, and precise plans would have to be formulated for selection of overflight areas coupled with detailed flight routines. Some exploratory flights already have been conducted.

There's a possibility that a study could be initiated to examine the feasibility of using abandoned mines in hard rock as potential sites for basing advanced ICBMs. Some of these mines apparently could provide deep, roomy excavations which could accommodate the necessary environmental control equipment for large solid-propellant missiles operationally poised for very long periods of time. If an effort such as this were funded by SAMSO, conceivably it could become part of the hard-rock-silo program.

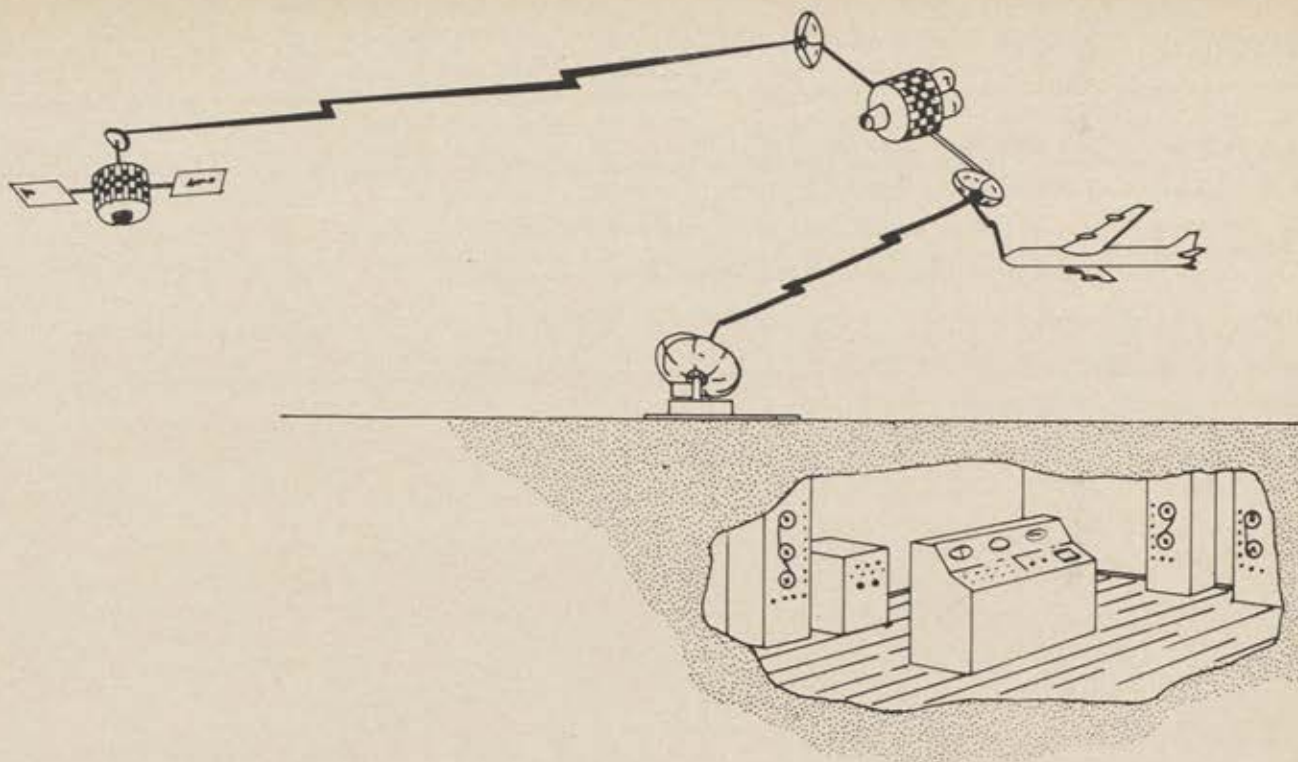
Slow Liftout from Silo

The self-eject technique (*see AF/SD, June '68, p. 55*), which has wavered between support and indifference for a long time, again has been tagged by SAMSO for investigation of advanced technology for boosting advanced ICBMs from silos. The technique would involve the use of a slow, progressively increasing acceleration for missile liftout, made possible with a special end-grain. The regular grain of the missile's first stage would be fully burning after the missile had cleared the silo top by a reasonable distance.

Purpose of this controlled technique is to eliminate hazards associated with high gas pressure, heat, and sound waves which would be encountered in conventional hot launches and which could prove destructive to the missile or its avionics.

Use of trapped gases below the missile in the self-eject mode to attain a feasible exit velocity for the missile might require burning only about one-twentieth the amount of propellant that normally would be consumed by a conventional hot launch. This could be translated into a considerable weight saving in the missiles.

Lockheed Missiles and Space Co. will conduct the



Spaceborne communications network could enhance military operations. This schematic shows data-relay satellite concept under consideration at SAMSO. Synchronous-orbit relay satellite would receive communications from other operational satellites and would transmit message to ground stations in the continental United States and to airborne military aircraft.

new self-eject technology effort for SAMSO and is expected to provide more refined data than has been obtained in previous trials over the past few years. These have involved subscale solid-propellant motors and also large solid motors in tethered ejects.

Large Antenna Technology

Advanced technology efforts in the next few years are expected to be focused on the development of larger antennas for spacecraft. The larger the antenna, the narrower the beam can be. The ultimate would be a "zero beam"—a parallel-sided beam—but this is considered impossible to attain.

With the size of antennas projected for communications satellites which should be operational within the next few years, it will be possible to direct a narrow beam to a specific area, rather than cover a vast portion of the earth. The narrow-beam antenna for Communications Satellite Corp.'s future Intelsat-4 to be built by Hughes Aircraft Co. and the Air Force's Defense Satellite Communication System (DSCS), now known as the Military Operational Satellite System (MOSS), to be built by TRW, may incorporate paraboloid-dish antennas as large as twelve feet in diameter. MOSS, for example, will incorporate two narrow-beam antennas having beam widths of two or three degrees (see *AF/SD*, Oct. '68, p. 86). This would compare with seventeen to twenty degrees for earth coverage antennas from the satellite's synchronous altitude (19,400 nautical miles).

More advanced technology is envisioned by aerospace industry engineers for the development of narrow beam antenna dishes on spacecraft in deep space,

because even a narrow beam angle would subtend an excessive area at earth, resulting in a waste of radiated energy. The antenna would have to be sized to fit in the shroud of the boost vehicle and unfold into a parabolic configuration having sufficient surface-precision to minimize signal noise generated by surface roughness.

Data-Processing Speedup

In the field of data-processing—so vital to aerospace operations—new advances appear on the horizon in the application of cryogenics, industry members feel. Tapping of memory banks to retrieve information which may bear on a specific problem is considered slow. Increasing the speed of sequencing in searching various sets of memory data could save considerable time and effort. One way to accomplish this is seen in the use of cryogenic cooling of computers to bring the circuits close to absolute zero, where resistance to current would disappear.

Thus, the memory banks themselves would no longer be just static magnetic fields but, instead, would be circuits of currents. If a problem were introduced, instead of sequencing through the individual memory banks to determine if they bear on the problem, the memory banks themselves would become part of the problem-solving process instantaneously, because they would be tapped and feed their inputs simultaneously.

Industry members feel this type of operation may be achieved within five to ten years. The principle of cryogenic computers has been demonstrated in the laboratory, but the economic factors associated with cryogenics appear to be a big factor.—END

Three-quarters of the Defense Department budget is spent on the provision of all the supplies needed by men in combat. The current Air Force mission, which is to meet requirements of the unified and specified commands, forces us to view USAF as a logistic system. The technology that has the biggest impact on this job is the development and utilization of memory machines to keep the records, as . . .

Computers Feed the War Front

BY CLAUDE WITZE

Senior Editor, AIR FORCE/SPACE DIGEST



Palletized cargo on flatbed is ready for loading aboard Military Airlift Command plane. Destination is Vietnam.

IF THERE is any word in common military usage that is confounding because of its uncertain applications, it is *logistics*. Any attempt to examine the impact of technology on logistics leads down a road bordered by ditches full of confusion and complexity.

The Department of Defense says that almost three-quarters of its budget is spent for logistics. But the Department's definition is broad, covering "research and development and extending through procurement, production, construction of facilities, supply, maintenance, and so forth, and ending with the disposal of surplus materiel and facilities." That covers most of the activity of the Army, Navy, and Air Force, outside of paying and training the personnel and paying for what they consume in combat.

To the service commanders, including those in the Air Force, the matter is a little more limited. It is getting there fustest with the mostest, or avoiding the ancient complaint that what the fighting man needs is not in the right place at the right time. This was illustrated a few years ago in Vietnam when there were rumblings of an ammunition shortage. A high USAF official who visited forward air bases found there were units with plenty of bombs, but lacking fuzes. Others had quantities of fuzes on hand, but a seriously inadequate supply of bombs.

Essays have been written in attempts to define logis-



Here are acres of cargo, headed for destinations in the Pacific. The scene is at Travis AFB in California, busiest MAC terminal for shipment of war materiel. In July of last year more than 12,000 tons were lifted from this field, setting record for MAC's 1501st Air Transport Wing (Heavy).

tics, with references to historic military terms. The French had *le Major Général des Logis* and the Germans *Der General Quartier Meister*, these papers tell us, but things have changed. USAF has the Air Force Logistics Command, a Deputy Chief of Staff for Systems and Logistics, and, on the civilian side, an Assistant Secretary for Installations and Logistics. These titles indicate that USAF, in its daily job, looks upon logistics as the creation and support of combat forces and weapons.

The greater truth remains, however, that "the current Air Force mission is to provide trained and equipped combat forces to the unified commands," as the mission was defined in a recent paper in the *Air University Review*. The author went on to point out that "our over-all mission is primarily logistical, and it provides the basic justification for viewing the Air Force as a logistic system."

This emphasis on the unified commands is one of the realities that led the Joint Chiefs of Staff, during the regime of Robert S. McNamara as Defense Secretary, to set up an office for a Special Assistant for Strategic Mobility. The interest of this office is centered on the transportation aspects of logistics and the technologies that will contribute to strategic mobility when we need it.

If there is any single technological development that has had maximum impact on the Air Force's logistic effort, it is the computer. The US government currently owns and operates about 3,000 computers. Seventy percent of them belong to the Defense Department, and more than forty percent of these belong to the Air Force. The USAF total is about 900.

About a year ago, in his presentation to Congress on the Fiscal 1969 budget, Lt. Gen. Robert G. Ruegg, Deputy Chief of Staff, Systems and Logistics, praised the performance of his logistics system in Southeast Asia. He said it "not only met all requirements of this test, but continued to improve its capability in all areas."

The major element of this capability, the General said, was the increased application of data automation. Base-level supply computers, in 1969, have been installed at almost 150 USAF bases, domestic and overseas, providing "an automated network that literally has revolutionized our supply records system." USAF today can record, report, and account for supply stocks,

transaction by transaction, on more than 70,000 items in its inventory.

General Ruegg said the USAF goal is to build "the most responsive logistics system that the state of the art can provide." He explained what this means in terms of money, a critical item, in an appearance before the House Subcommittee on Defense Appropriations:

"As our weapons grow in ability and complexity, their cost and the cost of individual support items have been steadily increasing. At the same time, however, we have been able to reduce our inventory of spare parts.

"For example, in 1958, we had \$9 billion of spares to support \$25.6 billion in weapons and supporting systems. Today, we have \$8.2 billion of spares to support \$39.3 billion in weapons and systems. This is a ten percent reduction in inventory while the investment in systems grew by fifty-three percent.

"Thus, the spares ratio to in-use equipment has been reduced by forty-two percent. Tools significant in accomplishing this were assured communications and automated data-processing equipment, as well as rapid repair and airlift."

General Ruegg's office looks to the future through an Office for Logistics Planning, headed by Maj. Gen. Andrew S. Low. Here the planning emphasizes the logistics requirement as one that must be built into each weapon system, starting with the research and development. Again, computers come into the picture, for it is only with these machines that USAF can simulate the problems it will encounter when operations get under way.

Key computers in this effort are located at Wright-Patterson AFB, in Ohio. At the Advanced Logistics System Center, where the computer setup is preparing to move into the third generation of machinery by 1972, the men in charge say they have the most interesting and challenging job in today's Air Force. Their computer operation, with more than 5,000 people required to run it, is the largest of its type in the world. The purpose is to provide the Air Force Logistics Command with complete and instant information on all resources. In short, AFLC must and does know the location and status of all USAF equipment and spares.

There also is a Logistics Simulation Center, de-

(Continued on following page)

MAC provides airlift to Southeast Asia for all branches of the armed forces. Here the Army gets fast transportation from Travis AFB for a mobile missile unit. Returning planes are rigged with stretchers to evacuate wounded, contributing to high rate of recovery for men hurt in the war.



scribed as "an in-house organization to help span the gap between logistics research and logistics operations." The simulator can follow an aircraft engine, for example, through the cycles of its entire life. An engine can be in service, out of commission, under repair, on the shelf, or reinstalled. Then, there are variables, such as the nature of failures, the complexity of repairs, spare parts availability, communications, shipping time, and the time consumed by repair itself. If USAF knows enough about these things and their interrelationship, it is possible to cut down on inventory. Engines are an expensive item, and each one that can be eliminated from the logistic pipeline represents a substantial saving.

This simulator also made possible the decision to eliminate any on-the-shelf stock of the costly guidance and control package for the Minuteman missile. For the Minuteman I these systems cost about \$200,000 and for Minuteman II about \$535,000. The simulator model showed how to speed up movement of these units from the silo to the repair facility and return.

The logistics planners today are paying special attention to certain areas where technological advances have paid off in the recent past and promise greater strides in the future. For example:

- **Cargo handling.** The Lockheed 463L system, already in operation in such terminals as Travis AFB in California and McGuire AFB in New Jersey, is an automated cargo-loading system that has been speeding the shipment of supplies both to Europe and Southeast Asia. A more advanced system, the L-500, is under development for the C-5.

- **Comsat relay.** Satellite communications that will speed and improve the transfer of logistic information from forward base computers to AFLC and Air Materiel Area computers. The computers, it is said, soon "will talk to each other."

- **AUTODIN.** This is an acronym for Automatic Digital Information systems. They will provide an improved link between overseas bases and the ZI.

- **AFRAM.** The Air Force Recoverable Assembly Management system. First phase of this concept is

under development. It will be a new spares management system providing worldwide "visibility" of assets.

- **The C-5A transport system.** It is expected to have greater impact on USAF airlift capability than any other item in the immediate future.

The C-5A will, of course, be operated by the Military Airlift Command, with headquarters at Scott AFB in Illinois. Here, again, is a command with vital new applications for computer sciences, and a command that is looking to the future. Computer technology makes it possible for MAC to study the airlift problems ahead, simulate the requirements, and decide how the system should be set up.

"If the job is done right, and only the computer can do it, we can save billions," says one authority at Scott AFB. He added that the elimination of paper shuffling, the substitution of punched cards for hand-written invoices and bills of lading, has done more than speed the process, save on manpower, and eliminate the tedium of the job. It has cut out thousands of human errors.

To anyone who examines the logistics problem, with the usual focus on supply and maintenance, it is clear that coordination between far-flung and divergent contributors is essential to logistic success. The Defense Department recognized this with new impact during the years that Robert S. McNamara was trying to tighten up on management. It also was the time when the cost factor got more emphasis, and Mr. McNamara's accountants were not long in discovering that in the life cycle of a weapon system, the cost of support is about ten times the cost of acquisition.

Hence, there was a new Pentagon commandment: "Thou shalt have integrated logistics." There was a trial run in 1964 on the Minuteman program, when the Logistics Management Institute, a nonprofit contractor, was hired to define the logistic requirements. The result was successful, and LMI came out with a new assignment: to prepare an "Integrated Logistics Support Planning Guide" for all the armed forces.

Col. Gerald Holsclaw, a USAF officer attached to the project, has stated the basic approach:



Computers have become a necessity at the front in this war are used at USAF bases to help keep logistics lines operating. Here, a new computer unit arrives for action.



Tactical Air Command is preparing a new concept that will permit fast deployment to "bare base," equipped in advance only with runway and water. This is a collapsible shelter.

"Management integration of logistic support elements into the systems engineering management process should start at the beginning of concept formulation for a weapon system or piece of equipment.

"Support management continues through the contract definition, development, and production phases of the equipment life cycle.

"Unlike other elements of systems engineering management, which usually terminate with acquisition of the equipment by the using commands, the support management task continues on during operation, with emphasis then on performance instead of planning."

Why is the guide on logistic support planning necessary?

Colonel Holsclaw replies:

"Because conflicts within the logistics disciplines themselves often are settled for the lowest apparent cost, without consideration of the future effects on equipment availability or support costs. With notable exceptions in each service, development plans usually ignore or scatter logistic requirements. We react to, rather than plan for, support requirements. The results are cost overruns and program delays."

Specifically, there are examples of competitive proposals with wide variance in the estimated costs for system development. The lowest development cost may result in the highest support cost. The highest proposed development cost may promise the lowest expenditure each year for support. The choice, for an Air Force procurement officer with a congressional committee staff looking over his shoulder, can be excruciating.

Complexity of the logistics problem is illustrated by the Logistics Support Planning Guide. This "road map" actually contains nothing new, but its effort to "integrate" what is done forces a division of logistic activity into these basic elements:

- Maintainability and reliability.
- Maintenance planning.
- Support and test equipment.
- Supply support.
- Transportation and handling.

- Technical data.
- Facilities.
- Personnel and training.
- Funding.
- Management data.

This textbook, or manual, now is in the hands of all the armed services and provides a collection of material that will help them get the right men and equipment in the right place at the right time.

At the highest level, the office of the Joint Chiefs of Staff, there is a Director (J-4) for Logistics. For the past few years, there also has been a Special Assistant for Strategic Mobility, deeply concerned with the impact of technology on transportation. It is another office that puts heavy stress on the use of computers to study the possibilities in management, vehicles, cargo delivery, and handling. It is concerned, of course, with the movement of materiel over the land and sea, as well as in the air.

This office leans heavily on computer models to control and direct the flow of men and support. It also studies carefully other technological advances that have a bearing on the problem of strategic mobility. This includes everything from modern aircraft, such as the C-5A and tomorrow's civilian planes, to containerization, special ships and shipbuilding techniques, helicopters, ground-effects machines, and the Light Intratheater Transport (LIT). Around the corner, for future exploitation, is the air-transportable dock—the Lockheed 410A—which can be put together at an austere base in eight hours to offload the C-5A transport. There is a deployable aerial port system, an aerial tramway for ship-to-shore cargo movement, and an improved parachute delivery system.

The nature of war being what it is today—the Air Force says elsewhere in this issue that a massive nuclear attack on the United States is the *least* likely conflict—the pressure is on to be ready for anything. In the face of this kind of threat, logistics takes on new stature.

No man has forgotten the legend of the military mount that lacked a nail in his shoe.—END.

Advanced Technology Almanac

Across the country and around the world, advanced technology is "the name of the game" at Air Force research and development installations. Here is a specially compiled guide to Air Force Systems Command and Office of Aerospace Research centers where missions range from "far-out" research to the everyday space-age business of testing missiles over the open sea . . .

A Guide to Air Force Technology Bases

Air Force Systems Command, headquartered at Andrews AFB, Md., and commanded by Gen. James Ferguson, as the leading research and development command of the Air Force, operates functional divisions and a number of high-technology centers and laboratories around the country. Following is a descriptive listing of these organizations and facilities; an accompanying map is on page 60.

Air Force Systems Command Divisions

Foreign Technology Division (FTD), Wright-Patterson AFB, Ohio—Gathers, evaluates, analyzes, and disseminates foreign scientific and technological information. Most modern techniques, including machine translation, are used to help produce finished intelligence studies on foreign aerospace and allied systems for distribution within the Department of Defense.

Aerospace Medical Division (AMD), Brooks AFB, Tex.—Air Force's center for aerospace medical research and training. Site of USAF School of Aerospace Medicine, which provides bioastronautics support to NASA and the Air Force as well as training for USAF, Army, Navy, allied physicians and nurses, and dental and other health professionals. AMD operates Wilford Hall USAF Hospital, the USAF Epidemiological Laboratory, the 6750th Personnel Research Laboratory, all at Lackland AFB; the 6750th Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio; and the 6571st Aeromedical Research Laboratory, Holloman AFB, N. M. (see map for sites).

Aeronautical Systems Division (ASD), Wright-Patterson AFB, Ohio—Air Force Systems Command's management control point for development and acquisition of aeronautical systems and related equipment, covering the broad spectrum of system, subsystem, and equipment management as well as systems engineering and advanced planning for existing and experimental aircraft. ASD also manages Systems Command's efforts to upgrade USAF capabilities in limited war/special air warfare operations.

Electronic Systems Division (ESD), L. G. Hanscom Field, Mass.—Develops, acquires, installs, tests Air Force

electronic command, control, and communication systems for operational tasks ranging from warning against surprise attack to space-tracking of objects in orbit. A regular working partner of ESD, located nearby, is the MITRE Corp., a not-for-profit USAF-sponsored systems-engineering firm.

Space and Missile Systems Organization (SAMSO), Los Angeles AF Station, Calif.—Management agency for most Air Force ballistic missile and space systems, responsible for advanced planning, research, development, testing, and deployment of the USAF ICBM force. SAMSO's missile management elements are at Norton AFB, Calif. SAMSO has test facilities at USAF's Eastern and Western Test Ranges and in Utah, and a worldwide satellite-tracking network at Sunnyvale, Calif. SAMSO is aided by the near-



Commanding AF Systems Command, USAF's leading military research, development arm, is Gen. James Ferguson.

by Aerospace Corp., an Air Force-sponsored not-for-profit systems-engineering firm.

Air Force Contract Management Division (AFCMD), Los Angeles, Calif.—Provides Defense Department-wide management of contracts with industry through Air Force Plant Representative Offices and Test Site Offices across the country. Among the Division's responsibilities: Ascertaining ability of potential contractors to fulfill contracts, management of contracts after award, assistance to contractors, approval of purchasing and accounting systems, acceptance tests, ensurance of schedules, payment of contractors, on-the-scene representation for DoD and NASA.

National Range Division (NRD), Andrews AFB, Md.—Manages from Andrews, the:

Air Force Eastern Test Range (AFETR), Patrick AFB, Fla.—Flight tests, for Department of Defense and NASA, missile and space hardware over the Atlantic Ocean and on into the Indian Ocean. Launch site is at Cape Kennedy Air Force Station. Downrange tracking and data-gathering sites are located on sites ranging from Grand Bahama to near Pretoria in South Africa.

Air Force Western Test Range (AFWTR), Vandenberg AFB, Calif.—Western Test Range specializes in polar-orbit launches, also supports operational training for Strategic Air Command missile crews. A wide range of Air Force missile and space hardware lifts off from Western Test Range. WTR will be site for Air Force Manned Orbiting Laboratory launches. Tracking and data-gathering sites spot the Pacific as far off as Midway Island.

Air Force Systems Command Centers

Air Force Flight Test Center (AFFTC), Edwards AFB, Calif.—Home of Air Force's Aerospace Research Pilot School, only training facility of its kind in the free world and prime center of experimental and acceptance flight testing for aircraft and aerospace craft entering Air Force and other military service inventories. Has 15,000-foot runway supplemented by dry lakebeds with natural runways up to thirteen miles long.

Air Force Missile Development Center (AFMDC), Holoman AFB, N. M.—Directs research and development of air-to-air missiles and drones, performs missile reentry research, focal point for DoD guidance system testing, conducts tests of aircraft reconnaissance systems, has nation's longest (seven miles), high-speed test track, which tests missile configurations, aircraft ejection systems, and guidance systems; also has a radar target scatter site which collects radar "signatures" reflected from weapon systems, nose cones, decoys, and aerospace craft.

Air Force Special Weapons Center (AFSWC), Kirtland AFB, N. M.—AFSC focal point for nuclear survivability assessment. Analyzes and tests missile and aeronautical systems for their ability to withstand effects of nuclear blast. Operates wide range of experimental equipment including large X-ray machines, portable electromagnetic pulse generators, a shock test facility using buried explosives. Has its own electronics fabrication laboratory, where devices for measuring simulations are designed and developed. Center also operates NC-135 "flying labs" which would help measure effects of atmospheric testing, if such testing were resumed. Provides aerial support of underground nuclear testing, operates large environmental test and engineering laboratory.

Armament Development and Test Center (ADTC), Eglin AFB, Fla.—Principal Air Force center for development, test, acquisition of conventional munitions, including aircraft systems, guns, bombs, rockets, targets and drones, radars, airborne electronic countermeasures equipment. Eight test ranges, eight auxiliary airfields, and the Eglin



OAR, led by Brig. Gen. Leo A. Kiley, has a sizable "in-house" research effort as well as large contract program.

Gulf Test Range, which covers 45,000 square miles. All-environmental testing possible through use of Climatic Laboratory. On site are AF Armaments Laboratory (*see below*), as well as Tactical Air Command's Special Operations Force, Tactical Air Warfare Center, and 33d Tac Fighter Wing, Military Airlift Command's 48th Aerospace Rescue and Recovery Squadron (Training); and US Army Rangers.

Arnold Engineering Development Center (AEDC), Arnold AFS, Tenn.—Major national facility for simulation tests of aerospace systems. Equipped with high-performance wind tunnels, high-altitude propulsion system test cells, and space-environmental chambers in which large or full-scale models of aircraft, missiles, satellites, and space vehicles can be tested under conditions simulating a very broad range of flight environments. Supports virtually all priority Air Force aerospace projects as well as NASA, Army, and Navy programs.

AFSC's Director of Laboratories

Air Force Laboratories, described below by technical domain, are under technical management and guidance of the Director of Laboratories, Brig. Gen. Raymond Gilbert, Hq. Air Force Systems Command, Andrews AFB, Md.

Air Force Aero-Propulsion Laboratory, Wright-Patterson AFB, Ohio—Turbine engine propulsion—Ramjets—Electric and other advanced forms of propulsion—Fuels, lubrication—Aerospace support techniques.

Air Force Avionics Laboratory, Wright-Patterson AFB, Ohio—Electromagnetic vehicle environment—Camouflage and antennas—Electromagnetic warfare—Navigation, guidance, fire control—Air- and spaceborne reconnaissance, surveillance, and communications—Bionics, lasers, and molecular electronics.

Air Force Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio—Flight structures—Flight mechanics—Flight control—Vehicular dynamics—Aerospace vehicle equipment—Nonnuclear survivability technology.

Air Force Materials Laboratory, Wright-Patterson AFB, Ohio—Structural materials—Environmental-resistant materials—Seals and sealants—Materials for electromagnetic application—Materials for energy conversion, storage and transfer—Manufacturing techniques.

Air Force Armament Laboratory, Eglin AFB, Fla.—Nonnuclear munitions—Chemical and biological munitions and defense—Nonnuclear aerospace weapons and effects tests and simulations.

Air Force Rocket Propulsion Laboratory, Edwards AFB, (Continued on page 62)

AFSC Test Groups and Management Offices

(figures show number of installations)

Alaska	(2)	Japan	(3)
Canada	(1)	Kwajalein	(1)
England	(5)	Okinawa	(1)
Formosa	(2)	Panama	(2)
Germany	(17)	Philippines	(2)
Greece	(1)	Seychelles Islands	(1)
Guam	(2)	South Vietnam	(1)
Hawaii	(3)	Spain	(1)
Italy	(5)	Turkey	(1)

GUIDE TO USAF'S ADVANCED

Air Force Academy, Colo.

OAR's Frank J. Seiler Research Laboratory (FJSRL)

Edwards AFB, Calif.

AFSC's AF Flight Test Center (AFFTC)

AFSC DOL's AF Rocket Propulsion Laboratory

Vandenberg AFB, Calif.

AFSC's AF Western Test Range (AFWTR)

OAR's Vandenberg Field Office of Aerospace Research (VFOAR)

Los Angeles AFS, Calif.

AFSC's Space and Missile Systems Organization (SAMSO)

Los Angeles, Calif.

AFSC's AF Contract Management Division (AFCMD)

OAR's Los Angeles Office of Aerospace Research (LOOAR)

Kirtland AFB, N. M.

AFSC's AF Special Weapons Center (AFSWC)

AFSC DOL's AF Weapons Laboratory

Holloman AFB, N. M.

AFSC's AF Missile Development Center (AFMDC)

AFSC AMD's 6571st Aeromedical Research Laboratory

OAR's Office of Research Analyses (ORA)

Western Test Range Tracking and Data-Gathering Sites

Pillar Point, Calif.
Hawaii
Eniwetok

TECHNOLOGY CENTERS

Office of Aerospace Research Overseas Field Liaison Offices

Rio de Janeiro, Brazil
Latin American Office of Aerospace Research (LAOAR)

Brussels, Belgium
European Office of Aerospace Research (EOAR)

Wright-Patterson AFB, Ohio

AFSC's Aeronautical Systems Division (ASD)
AFSC's Foreign Technology Division (FTD)
AFSC DOL's AF Aero-Propulsion Laboratory
AFSC DOL's AF Avionics Laboratory
AFSC DOL's AF Flight Dynamics Laboratory
AFSC DOL's AF Materials Laboratory
AFSC AMD's 6570th Aerospace Medical Research Laboratory
OAR's Aerospace Research Laboratories (ARL)

Griffiss AFB, N. Y.

AFSC DOL's Rome Air Development Center (RADC)

L. G. Hanscom Field, Mass.

AFSC's Electronic Systems Division (ESD)
OAR's AF Cambridge Research Laboratories (AFCRL)

Andrews AFB, Md.

Hq. Air Force Systems Command (AFSC)
AFSC's Director of Laboratories (DOL)
AFSC's National Range Division (NRD)

Arlington, Va.

Hq. Office of Aerospace Research (OAR)
OAR's AF Office of Scientific Research (AFOSR)

Arnold AFS, Tenn.

AFSC's Arnold Engineering Development Center (AEDC)

Patrick AFB, Fla.

AFSC's AF Eastern Test Range (AFETR)
OAR's Patrick Field Office of Aerospace Research (PFOAR)

Eglin AFB, Fla.

AFSC's Armament Development and Test Center (ADTC)
AFSC DOL's AF Armament Laboratory

Brooks AFB, Tex.

AFSC's Aerospace Medical Division (AMD)
AFSC AMD's USAF School of Aerospace Medicine
AFSC DOL's AF Human Resources Laboratory

Lackland AFB, Tex.

AFSC AMD's USAF Epidemiological Laboratory
AFSC AMD's Wilford Hall USAF Hospital

Eastern Test Range Tracking and Data-Gathering Sites

Grand Bahama
Eleuthera
San Salvador
Grand Turk
Antigua

Trinidad
Fernando
Recife
Ascension
Pretoria, South Africa

AFSC SCIENTIFIC AND TECHNICAL LIAISON OFFICES

In addition to Air Force Systems Command organizations listed in the accompanying article, the command has twenty-five scientific and technical liaison offices (STLOs) organized to serve geographical areas and to work with the Army, the Navy, the National Aeronautics and Space Administration, the university community, and European organizations. A listing of these offices follows:

GEOGRAPHIC AREA

AFSC STLO (SCTL-1)
Waltham Federal Center
424 Trapelo Rd.
Waltham, Mass. 02154

AFSC STLO (SCTL-2)
O'Hare Office Center
3166 Des Plaines Ave.
Des Plaines, Ill. 60018

AFSC STLO (SCTL-3)
227 Federal Office Building
1240 E. 9th St.
Cleveland, Ohio 44199

AFSC STLO (SCTL-4)
500 S. Ervay St.
Dallas, Tex. 75201

AFSC STLO (SCTL-5)
26 Federal Plaza
New York, N. Y. 10007

AFSC STLO (SCTL-6)
363 S. Taaffe Ave.
Suite 104
Sunnyvale, Calif. 94086

AFSC STLO (SCTL-7)
c/o The Boeing Co.
Seattle, Wash. 98124

AFSC STLO (SCTL-8)
MacKenzie Building
36 Adelaide St. East
Suite 1101
Toronto, Ontario, Canada 00100

AFSC STLO (SCTL-9)
Dept. of the Navy, Munitions Bldg.
Washington, D. C. 20360

AFSC STLO (SCTL-10)
AF Unit Post Office
Los Angeles, Calif. 90045

ARMY LIAISON

AFSC STLO (SCTL-11)
Building 390
Aberdeen Proving Ground, Md. 21005

AFSC STLO (SCTL-12)
Building 5101
Edgewood Arsenal, Md. 21005

AFSC STLO (SCTL-14)
US Army Electronics R&D Lab
Ft. Monmouth, N. J. 07703

AFSC STLO (SCTL-15)
Hq. Army Munitions Command
Dover, N. J. 07801

AFSC STLO (SCTL-13)
P. O. Drawer 942
APO New York 09827

NAVY LIAISON

AFSC STLO (SCTL-16)
US Naval Air Development Center
Johnsonville, Warminster, Pa. 18974

AFSC STLO (SCTL-17)
Naval Missile Center, P. O. Box 3
Point Mugu, Calif. 93041

AFSC STLO (SCTL-18)
Code 143, Naval Weapons Center
China Lake, Calif. 93555

AFSC STLO (SCTL-19)
Naval Research Laboratory
Washington, D. C. 20390

NASA LIAISON

AFSC STLO (SCTL-20)
Ames Research Center (NASA)
Moffett Field, Calif. 94035

AFSC STLO (SCTL-21)
Langley Research Center (NASA)
Langley AFB, Va. 23365

AFSC STLO (SCTL-22)
Manned Spacecraft Center (NASA)
Houston, Tex. 77058

AFSC STLO (SCTL-23)
Lewis Research Center (NASA)
21000 Brookpark Rd.
Cleveland, Ohio 44135

UNIVERSITY LIAISON

AFSC STLO (SCTL-24)
Massachusetts Institute of Technology
68 Albany St.
Cambridge, Mass. 02139

EUROPEAN OFFICE LIAISON

AFSC STLO (SCTL-25)
P. O. Box 340
APO New York 09080

Calif.—Rocket technology—Liquid and solid rockets—Nuclear rockets—Solid-rocket hardware and motor development—Thermodynamics—Rocket test instrumentation and altitude testing techniques.

Air Force Weapons Laboratory, Kirtland AFB, N. M.—Nuclear-weapon effect studies—Nuclear weapon components—Advanced weapon technology—Radiation hazard studies—Nuclear warfare analysis—Civil engineering.

Air Force Human Resources Laboratory, Brooks AFB, Tex.—Personnel selection—Motivation—Training—Retention—Education—Training equipment—Career development.

Rome Air Development Center (RADC), Griffiss AFB, N. Y.—Electromagnetic intelligence technology—Electromagnetic reliability and compatibility—Electromagnetic transmission and reception—Ground-based surveillance—Ground communications—Information display and data-processing.

Office of Aerospace Research

The Office of Aerospace Research (OAR), headquartered in Arlington, Va., and commanded by Brig. Gen. Leo A. Kiley, conducts research in its own laboratories and sponsors a broad program of contract research at universities and other organizations. Research, in OAR terms, includes efforts in the physical, engineering, environmental, and life sciences which have broad applications to Air Force technology.

OAR Laboratories and Field Offices are as follows:

Air Force Cambridge Research Laboratories (AFCRL), L. G. Hanscom Field, Mass.—Environmental sciences—Physical sciences, with emphasis on radio physics, gaseous and plasma physics—Solid-state electronics—Mathematics—Engineering sciences, with emphasis on energy conversion.

Air Force Office of Scientific Research (AFOSR), Arlington, Va.—Sponsors broad program of fundamental research through more than 1,200 grants and contracts with some 200 colleges, universities, and research organizations in the US and abroad—Research areas include nuclear and general physics, chemistry, mathematics, mechanics, electronics, energy conversion, astronomy, astrophysics, behavioral, biological, and information sciences.

Aerospace Research Laboratories (ARL), Wright-Patterson AFB, Ohio—Physical, engineering sciences—Solid-state physics—General chemistry—Physical chemistry—Fluid dynamics—Fluid mechanics—Theoretical and applied mathematics—Mechanics of solids and energetics.

Frank J. Seiler Research Laboratory (FJSRL), US Air Force Academy, Colo.—Physical and engineering sciences, primarily general chemistry, physical chemistry, fluid dynamics, flight mechanics, and mathematics.

Office of Research Analyses (ORA), Holloman AFB, N. M.—Evaluative studies of proposed Air Force systems—Analysis of Air Force research opportunities—Identification of future Air Force missions.

European Office of Aerospace Research (EOAR), Brussels, Belgium—Administers OAR research contracts and grants in Europe, the Near East, Africa.

Latin American Office of Aerospace Research (LAOAR), Rio de Janeiro, Brazil—Administers OAR contract research in South America.

Patrick Field Office of Aerospace Research (PFOAR), Patrick AFB, Fla.—Liaison among scientists, launch teams, and contractors for installation of small scientific-experimental payloads aboard space boosters.

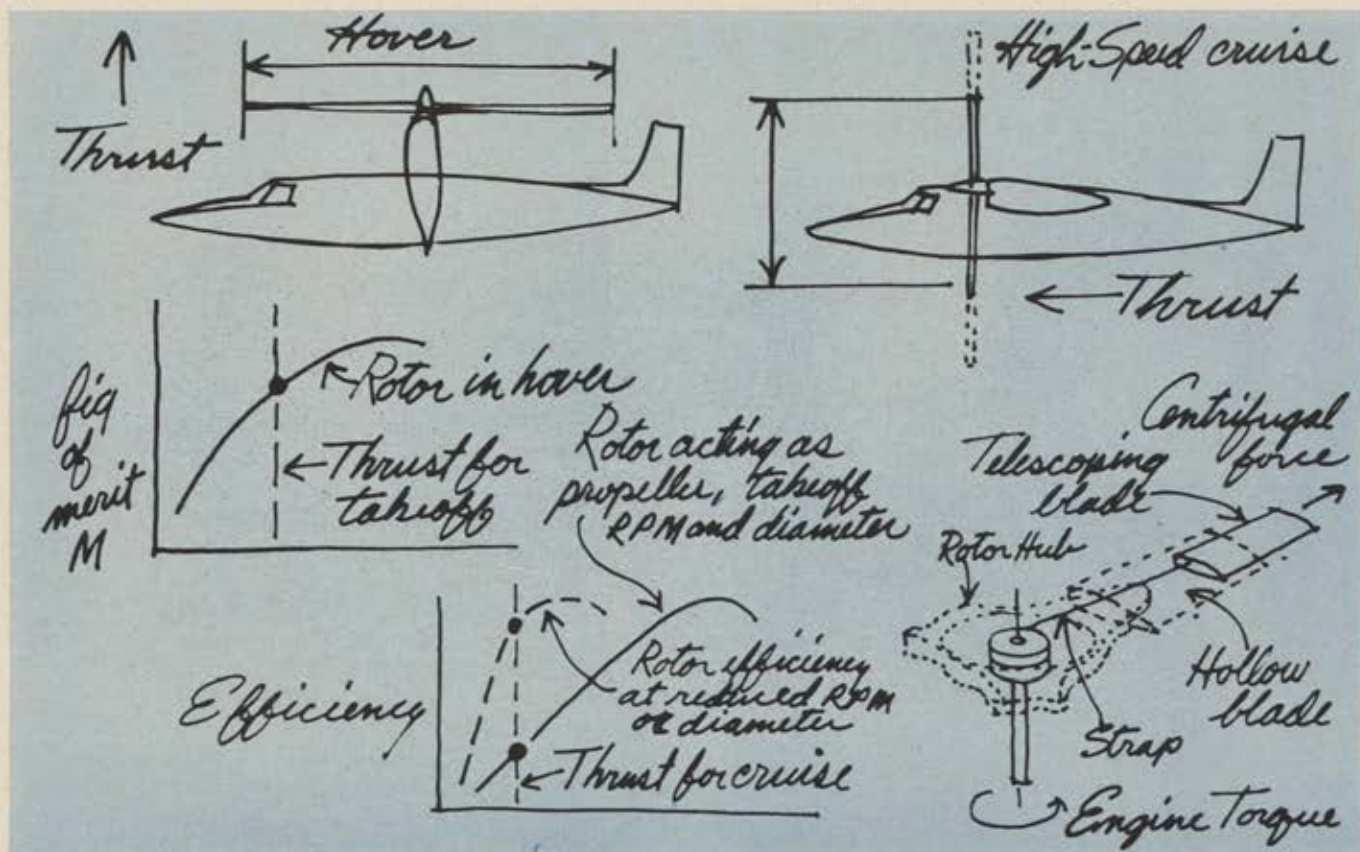
Vandenberg Field Office of Aerospace Research (VFOAR), Vandenberg AFB, Calif.—Same mission as above, for West Coast launches.

Los Angeles Office of Aerospace Research (LAOAR), Los Angeles, Calif.—Same mission as above. —W. L.

BELL'S VARIABLE DIAMETER ROTOR

In test today for the next generation VTOL transport is Bell's variable-diameter rotor system — full rotor diameter for vertical

takeoff and landing, reduced diameter for high-speed airplane flight (gives maximum efficiency in both flight regimes).



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Blade area and tip speed reduced 40% for major reduction in rotor profile power ... Rotor efficiency increased ... Engine continues to run at most economical RPM



BELL HELICOPTER

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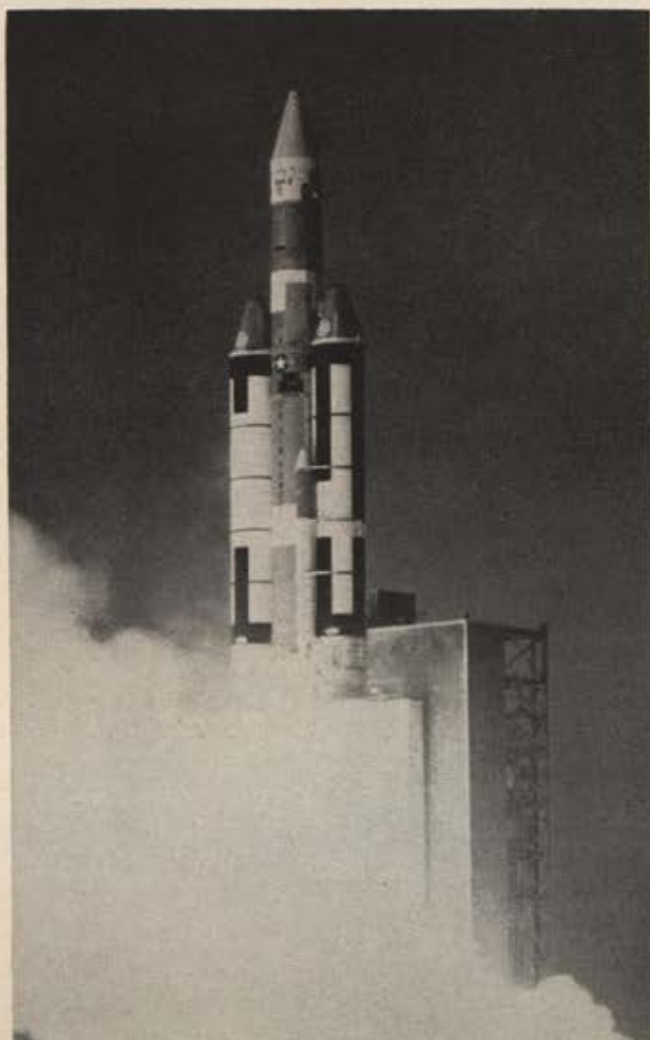
Advanced Technology Almanac

Advanced technology, which has helped build a formidable array of weapon and space systems to meet the challenges of the military and political environment, can also help mightily to alleviate social problems. But commitment—on the community level—is vital if we are going to make any progress . . .

Toward a Humane Technology

BY WILLIAM LEAVITT

Senior Editor/Science and Education



Technology, stirred by international conflict, has helped create a missile arsenal. But it is no simple matter to put technology to work in the more complex social sector.

WHAT lessons can the nonmilitary, nonaerospace world learn from the fantastic technological revolution, the "techsplosion" of the past thirty years, that has so radically reshaped the international military-political environment? Can the social ills of the civilian world, the pollution, the congestion, the inequitable distribution of the world's goods and services, the shortcomings of education, to list but a few, be alleviated by showering on "public problems" the same flood of energy and money that has so richly watered the soil of advanced military and space technology?

Along with the central problem of peace or war, this is the most important question of our time. Indeed, science and technology are such powerful forces in the modern world that, depending on one's outlook, their seemingly inexorable advance portends doom to some and to others presages systematized utopias in which no man, woman, or child will go hungry or without decent shelter or a useful education.

For the optimists, technology is indispensable to social progress, so much so that they often make automatic and naïve assumptions that it can produce miracles. As scientist-editor Philip Abelson wrote in *Science* recently: "When people witness accomplishments such as Apollo-8 and Apollo-9, they are impressed with the power of American technology. They are inclined to say, 'If we can do that, we can do anything.' They are also inclined to believe that we can do everything—that given the goal and the money, technology can be bent to the accomplishment of any and all tasks. This is not true. Technology cannot rescue society from unlimited folly—a long-continued population explosion, for example."

For the pessimists, an increasing number of whom are guilt-ridden scientists and technologists who have come to believe that the existence of the weapons they have helped build is a contributing factor rather than



Astronaut Russell Schweickart puts in some time in space during the Apollo-9 mission. It is easier to go to the moon, no matter how difficult the engineering required may be, than to find political consensus on how best to attack social problems that plague our society. The decision-making structure that conceived the missile program and the Apollo program was centralized. This is not the case on the social side. The application of technology to nonmilitary, nonspace problems must be community-oriented.

a deterrent to general war, the "techsplosion" seems so dangerous that they are loudly calling for a kind of moratorium on technology, particularly in military research and development.

As is the case with most profound issues, the truth lies somewhere in between. There is no denying that from a physical point of view, the world is theoretically a more dangerous place than it was before the advent of the super-weapons. But as physicist Alvin Weinberg has pointed out, the very existence of the weapons has done much to *prevent* the outbreak of general wars, thereby offering what Weinberg calls a "technological fix" in the field of international conflict.

At the same time, it is also true that the *ill uses* of technology, rather than technology itself, have exacerbated the wide range of social problems that plague our country and society in general. In our advanced society, our automobiles, which give us personal mobility undreamed of in simpler times, now foul the air, clog the expensive roads we have built for them, and cruelly displace many helpless people in the path of those roads. Medical advances keep us alive longer but we have found no really sensible and humanitarian way to make our later years useful. We tend simply to discard our older people as burdens. We can fly to Europe in six hours, and soon in less than three, but getting to the airport is almost as hard as crossing the plains in the pioneer days of the West. Our schools, in some places on the threshold of major technological innovation, still condemn millions of youngsters to years of incompetent and irrelevant instruction in prison-like environments.

The list is endless and the pileup of social disasters is formidable enough to have persuaded increasing numbers of people, particularly young people, to demand a stoppage of technology. Some even call for a return to the pastoral life. "Metal is the enemy," proclaims Timothy Leary, guru of LSD.

"Critics," as Abelson points out, "see that affluence has a seamy side—pollution and the like. And so they criticize, and rightly so. However, being human, some do not stop with constructive criticism. They go far

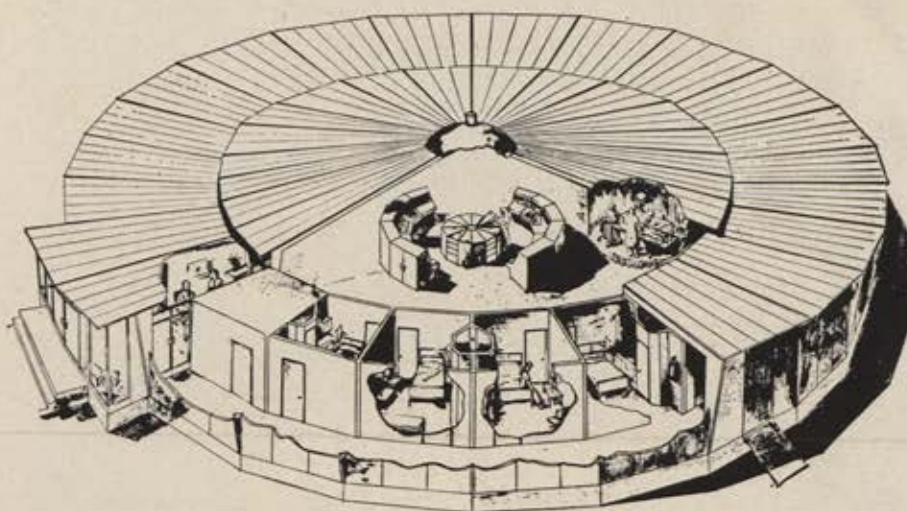
beyond that, asserting that technology is the source of most of our present social problems.

"Perhaps it is," Abelson adds, "but who wants the standard of living and the pestilence of the Middle Ages?"

This is the point. Just as technology has been and continues to be, despite its high cost, the *sine qua non* of national safety and the deterrence of general war, so it is also indispensable to the solution of social problems. The question is not whether but how. If there is any lesson to be learned from the great successes of military and aerospace technology, it is that *specific purposes* of technology need to be defined and that, once defined, the willingness to make the investment must be assured. In the worlds of military and space technology, these purposes, argued in both secret and public councils, have been spelled out. On the military side, at the highest levels, on a national scale, a threat has been recognized and technology has been enlisted and funded to meet it. This is not to say that the execution has been perfect. It is rather to assert that having a pretty clear idea of what you need to do and therefore *have* to do is the most effective way of putting science and technology to work for whatever purpose. It is important to point out, in this connection, that contrary to the charges of an increasing army of well-intentioned but misinformed—and sometimes even intellectually dishonest critics—it was the international military-political environment that created the so-called military-industrial complex that built the weapons, not the other way around. Also, contrary to the charges of many critics, it was not the search for profits, in the conventional sense, that built the "complex." It was, rather, the government's demand for the ultimate profit, the safety of the country in a very dangerous world, that spurred aerospace technological advance. From these facts there emerges a further lesson, the prime lesson, to be drawn as to the question of how technology can be most intelligently and fruitfully enlisted in the solution of public problems.

(Continued on following page)

That technology can make contributions to the solution of public problems is clear—if the decision to use it is made. This is one of many current examples, an artist's conception of a circular health facility to be built by Avco Corp.'s Aerostructures Division in association with Meharry Medical College, Nashville, Tenn. Sketch shows outer ring of patients' rooms and an operating room. Modular aluminum structure reduces the facility's costs.



World War II and its cold-war aftermath provided a dangerous challenge which demanded and got a technological response. Out of the response emerged the array of modern hardware and software and systems management that have combined to make the United States the most powerful nation in human history. For our preeminence, a status that is as often a headache as it is a comfort, we have really to thank, if one can use that expression in such connections Hitler, and later, Stalin.

In the everyday world of burgeoning social disaster, we now face the same species of challenge. The real answer to the question of what technology can do for us by way of helping solve social problems lies not in technology itself but rather in how willing we are to make the same kind of commitment that was earlier made in the sphere of national security and more lately in the field of space.

The full-scale commitment of technology to the solution, or at least significant amelioration, of social problems will be far more difficult, for a number of reasons. For one thing, as wiser heads than ours have suggested, both the scope of social problems and the political structure that deals—or fails to deal—with them are vastly different from what exists in the military or space-technology environment. The decisions to invest in technology for national security and space advance were made centrally, by the Executive with the approval and support of Congress.

And, too, the technological solutions to military and space problems have primarily been narrowly focused engineering tasks.

This is another way of saying that it really is easier to go to the moon or build a missile arsenal than it is to agree on what is a proper transportation policy, or how our schools should be improved, or what is the best solution to environmental pollution, let alone to convince a majority of the population that it is in their own interest to demand political concentration on these tasks and government's enlistment of technology to get them done. The decision-making structure on the public-problem side is fragmented. There are thousands of jurisdictions involved and endless clashes of interest.

But reciting the difficulties of applying advanced technology to the alleviation of social problems should not be an excuse for inaction. Edmund Burke, the great English statesman, once remarked that all that is necessary for evil to triumph is for good men to do nothing.

In the short and the long runs, assuming some measure of political consensus, technology *can* be put to work on social problems. But, contrary to the highly centralized arrangements and decision-making that have featured the military and space programs, the job is probably going to have to be done on a rather decentralized basis. This is not to say that the federal government will not be heavily involved in terms of funding and guidance. It is rather to suggest that, on the civilian side, applying technology to the amelioration of pressing problems can most effectively be done on a community scale, in thousands of different communities at the same time. We live in a politically fragmented society and, despite the calls for vast overviews and regional planning, the political realities suggest that if a city, big or small, wants to effect change, to unclog its transit, or upgrade its schools, or clean its air, the *existing governmental structure*, backed by public pressure, and supported by local business, is going to have to make the commitment and do the job. There are major opportunities here to create working experimental models, in any number of spheres, of systems using advanced technology. Business can play a special and crucial role in the creation of such technology-rich models, not only by supporting change and the humanitarian and intelligent application of such technology, but also, in its own interest, by investing its own technological skills and funds in their creation. A case in point: A high-technology firm located in a city strangling in commuter congestion could offer to design for the city concerned an experimental high-speed transit system and at the same time show its seriousness by offering to help fund the system.

At first glance, this might seem like business interference in public business or to some businessmen even a "giveaway" of shareholders' money. But looked at more closely, such an approach can and should be

(Continued on page 71)

An Aerospace
Capabilities
Report on
Beech Aircraft
Corporation



The Beechcraft U-8F



The Beechcraft NU-8F

BEECH MILITARY AIRCRAFT

...a story of growth

The Beech family of Utility and Indirect Support Aircraft was developed to meet the Department of Defense policy requirements for commonality in procurement. These aircraft are true tri-service vehicles with versatility and growth potential to meet the varied requirements of the individual services.

Beech has built more aircraft in this size class than any other manufacturer in the world. Its production facilities, along with a continuing research and development program for improvements, keep Beech Aircraft Corporation in its position of leadership.

The Beechcraft U-21A





This Beechcraft NU-8F Indirect Support Transport has served the U. S. Army since 1964. Its 2,000 pounds cargo capacity in a total interior volume of 423 cubic feet is quickly converted from cargo carrier to medical evacuation transport...to troop transport...to administrative carrier. The Beechcraft NU-8F meets higher-than-normal standards for strength, versatility and performance. Evolved from the Beechcraft U-8F which has established an exceptional 8-year service record, the NU-8F is powered by two Pratt & Whitney PT6A-6 turboprop engines rated at 550 shaft horsepower each. Cruise range is 1280 nm at a cruise speed of over 200 knots.



This Beechcraft King Air, designated VC-6A, is a member of MATS' Special Air Missions (SAM) fleet. It is, in essence, a pressurized NU-8F. After its first year of service experience the VC-6A received a ready rating of 95%, and had a record of 100% mission completion. Over 300 King Airs have been delivered to owners throughout the free world since it was certified in 1964. The King Air is powered by two Pratt & Whitney PT6A-20 turboprop engines. Full pressurization, plus turboprop-quiet sound level, combine with the best utilization features of the other members of the U-8 family.

Beech Military Aircraft keep pace with joint service requirements

Low direct operating cost is the key to the Beechcraft twin turboprop's economic advantage. Low-cost fuel, very low oil consumption and low maintenance costs account for considerable savings.

High ready rate has become commonplace, proved by succeeding generations of Beech Military Aircraft—in the Department of Defense inventory since 1953. Non-military versions of these Beechcrafts—the Queen Air and King Air—have been chosen by several state governments, foreign governments, United States government agencies, airlines and hundreds of companies to fulfill business, commercial and administrative assignments.

A single pilot can fly these Beechcrafts efficiently, yet each has ample room for a crew of two on the separate flight deck. Transition of piston engine pilots to the turboprop Beechcraft is easy.

Another time-and-money saving benefit of these Beech Utility and Indirect Support aircraft is "parts and service commonality". Beech's world-wide service organization maintains parts supplies for any Beechcraft, and is staffed by men especially trained for Beechcraft service. Logistic requirements are reduced.

A continuous research and development program has enabled Beech to pioneer many advancements and new performance capabilities for single and twin-engine aircraft. The King Air C is an example of the growth capability engineered into all Beechcrafts.



Short, rough field operation is a special capability of the Beech family of Indirect Support and Utility aircraft. The Beechcraft U-21A, shown in action here, adds an extra element of speed and mobility to troop deployment.



Big, roomy interiors are extremely flexible for adaptation to a wide variety of missions. In a minimum time this high-density staff transport can be transformed into a high-density troop transport...to aerial ambulance service...to high priority cargo carrier.



All-weather operation with full instrumentation is available on all Beech military aircraft. Engine and surface de-icing systems are standard. This is a U-21A panel.



This is the versatile Beechcraft 99, now in production as a part of the Beech planned program of product growth. Powered by two Pratt & Whitney PT6A—20 reverse flow, free turbine engines, it will carry pilot and 16 passengers in comfort—will cruise over 200 knots. The spacious interior is readily adaptable in the field for high-density seating, cargo, air ambulance, or executive transport use. Off-the-shelf availability combines with big payload and turboprop economy for modest original investment, excellent utility and low operating cost. The Beechcraft 99 has built-in growth potential to match tri-service Utility, Indirect Support and Air Attache requirements of the future.



Proved and in production, the Beechcraft U-21A series aircraft rolls steadily off the production line for on-time, "off-the-shelf" delivery. The army has ordered 129 of these turboprop utility aircraft that will carry six staff members or ten combat-ready troops. In addition, it has exceptional adaptability to meet cargo and medical evacuation duties.

The Beechcraft T-42A
won a 2-year Army
evaluation...then
joined the famed
T-34 Mentor
in winning friends

The Beechcraft T-42A has already established an enviable record at Ft. Rucker. Its fast take-off, climb-out and speed to the training area have increased its value as a trainer.



The Army knew what it was getting when the first T-42A (above) was delivered to Ft. Rucker in 1965. It had already been flown for two years of competitive evaluation—and won. So the 90% ready rate obtained from the 63 T-42A twin-engine instrument and transition trainers now in service surprised no one. It is an off-the-shelf item at Beech, where its non-military counterpart, the B55 Baron, is a solid favorite with the business flying community.

Many veteran pilots of the U.S. Navy and the U.S. Air Force, received primary training in the Beechcraft Mentor (left). Its durability, dependability and safety records mark it as one of the world's most outstanding trainers.

Eleven other nations have joined the

U.S. Military in recognizing the exceptional performance of this Beechcraft. Pilots of the following countries receive their primary training in the T-34:

Argentina	El Salvador	Spain
Canada	Japan	Venezuela
Chile	Turkey	Philippines
Colombia	Mexico	Portugal

Beech has a 27-year record of service to the Military

As a dependable, on-time supplier of aircraft and related products, missile target systems, prime contractor and sub-contractor, R & D and testing programs, Beech Aircraft Corporation has served the military, NASA and other aerospace associated agencies and companies for over a quarter of a century.



U. S. Army Air Corps UC-43



U. S. Navy SNB-5



U. S. Air Force AT-11



Beechcraft XA-38



U. S. Air Force C-45

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For full information about how you may take advantage of Beech's experience in systems management and proven capabilities in designing, developing, manufacturing and testing of components for aviation and aerospace projects, write, wire or phone Contract Administration, or Aerospace Marketing, Beech Aircraft Corporation, Wichita, Kansas 67201, U.S.A.

viewed really as an investment in the company's future, in terms of its position in the community in which it is located and also in terms of future business.

Some time ago, this writer visited the vast plants of one of the nation's leading aerospace firms. Walking in to the offices from one of the huge parking lots, we were told that the company parking lots took almost as much space as the working areas of the plants themselves and that when jobs were plentiful, some employees would determine whether they'd work in a particular plant building on the basis of how far they would have to walk from their cars to the building. Ironically, the company in question, one of the most technologically oriented in the world, finds itself at the mercy of another and far less sophisticated technology—automobiles—that has been allowed to grow like Topsy and reach what strategic planners like to call "counterproductiveness."

Yet if the aerospace company in that location made a policy decision to create in cooperation with the city a new and workable high-technology transit system—even on a small scale to start—the chances are that it would not only improve the effectiveness of company operations, and allow more economical and profitable use of vast acreage now used for auto parking, but also would probably, once the achievement was publicized, bring officials from all over the country to its doors, all asking if that same company would help them design and create a transit system for *their* communities.

This decentralized approach—communities "doing their own thing," so to speak—could have a major cumulative effect around the country. There are numerous possibilities. In public education, there are no logical reasons why the public authorities, backed by



—Photo by Robert de Gast, Magnum

Our schools are in deep trouble, and technology, along with innovative teaching techniques, can do much to improve them. But the demand for real change must come from the community, school by school, city by city, region by region.

parents, and working with industry on the local level, could not devise year-round work-study programs starting at the secondary school level. Industry could help not only by providing trainee jobs to high schoolers which the youngsters could fill during alternate semesters throughout the year, but also by loaning instructors for the regular curriculum.

By such means, relevance could be built into curricula, a quality often lacking these days. Kids would be exposed to the real world of work, have an opportunity to earn while usefully learning, and in an important sense attain a respected place in the community as learners, contributors, and participants, something they are demanding already. They would perhaps be less inclined to "drop out" actually or emotionally and they might well lose their enthusiasm for the commercialized "youth cult" in which they are so deeply entrapped today.

The concept of decentralized, community-oriented technological attack on social problems is crucial to some hope of success. Society today is in many ways reaching a kind of critical mass. People, young and old, politically oriented or apathetic, are all coping with a mass society's most dangerous problem: scale.

This is why there is one very important lesson or technique that should *not* be carried over from the achievements of the military and space buildup of the past several years. We should not worship at the shrine of large-scale systems planning, except for projects that are primarily physical, such as water management or power generation or the creation of intelligently planned transport "patterns" that are really a collection of intelligently linkable individual community systems.

We should be very wary of the planner from out of town who has not really been exposed to the realities and peculiarities of each of our communities, but who is eager to "plan" for us on a grand scale.

Technology, humanely conceived and used as a tool by the people whom it will serve, can help reverse the tide of apathy and the sense of despair that overwhelms us—but only if it is put to work in such a way as to convince the people it affects that it is their servant and not their master.—END



This is a Sylvania-developed system by which hand-printed messages can be read automatically by computers, part of the technological revolution that could alleviate public problems, just as it has vastly altered the aerospace world.

The inadequacy and obsolescence of sophisticated test facilities, the prerequisite springboard for future state-of-the-art advances, are jeopardizing the technological posture of the United States at a time when Soviet efforts in this seedbed area of technology appear to intensify. The need for new, energetic approaches to the planning and development of this national resource, along with an analysis of the benefits of flexibility in contract and acquisition policies, and the call for greater boldness and vision in R&D, are among the areas focused on by Gen. James Ferguson, Commander of the Air Force Systems Command, in . . .

A Hard Look at the US Technological Posture

BY EDGAR E. ULSAMER

Associate Editor, AIR FORCE/SPACE DIGEST

AMONG paramount Air Force technology requirements are comprehensive upgrading of test facilities, which are "stretched to the breaking point at present," an infusion of about \$300 million in advanced development work across the R&D spectrum, more modification of existing weapon systems, a hypersonic follow-on to the X-series of test aircraft, and "greater technological togetherness" of all sectors of government.

These views were expressed recently to AIR FORCE/SPACE DIGEST by the Commander of the Air Force Systems Command, Gen. James Ferguson, and some of his principal staff officers.

Rating the national technology posture as "not as good as it should be or could be," General Ferguson said a recent Air Force study of specific areas of laboratory-type technology in need of intensified exploration showed that "\$300 million is the sum total—

certainly not a staggering amount and only a fraction of what it costs to fight the war in Vietnam for a week—of all the items that we consider productive and worthy of effort, over and above what we are accoring them now."

The Achilles' heel of the US technology effort, in the view of AFSC, however, is the inadequate condition of US test facilities—a matter of concern not merely to the Air Force but to all components of the Department of Defense, as well as NASA, other government agencies, and industry.

In this area "we are literally stretched to the breaking point. We are using facilities that go back to Peenemünde [the German World War II missile center]. We had to put protective barriers around some of the compressors so that if they disintegrate, they won't injure everybody in the vicinity," General Ferguson explained.

The current test-facility crisis centers on large and costly aerospace facilities involving test ranges, scientific laboratories, space chambers, wind tunnels, shock tubes, instrumented aircraft, computerized analysis, advanced reentry vehicle test tools, and synthetic battleground test capabilities. Planning and constructing such facilities involve a five- to ten-year lead time. These facilities are the incubators and the ultimate pacing factor of future technological advance, according to General Ferguson, and should be viewed by the government as "capital investment" to assure this country's "continued ability to operate profitably and compete effectively."

What is needed, in General Ferguson's view, is the same kind of vision and boldness as the late Dr. Theodore von Kármán displayed in 1945 when he campaigned for a Mach 3 wind tunnel and associated test



Gen. James Ferguson assumed command of the Air Force Systems Command in 1966, after having served previously for five years as DCS/Research and Development at Hq. USAF.

facilities, which turned out to be the very foundations of today's technology but which were derided at the time by the sceptics as extravagant and unnecessary.

"We need the willingness to support technology by exploring the unknown, to build something that isn't necessarily in direct support of an approved program. We need to do this not only for the sake of progress but because there are other people in this world who are doing just that. The probability is great that they eventually will force a breakthrough of immense usefulness . . . and we will have to cope with the full lead time to catch up," General Ferguson said.

The need for improved and modernized test facilities, to a large measure, hinges on cost considerations. The inability to test the C-5's engine, the TF39, in that portion of its performance envelope ranging from sea level to 5,000 feet because existing wind tunnels were inadequate for the massive airflow requirement, made it necessary to use a modified B-52. This was not only costly but also disadvantageous because a much greater volume of data can be accumulated in a single hour of test cell operation than is generated by days of flight testing. (Similar test restrictions apply to the General Electric GE4 engine, slated to power the SST.)

The lack of adequate wind-tunnel facilities to test up to Mach 24, for instance, escalates costs of hardware like the Advanced Ballistic Reentry System (ABRES). In place of relatively inexpensive ground simulation, actual test firings are required during the preliminary phase of the program.

The absence of wind tunnels capable of testing V/STOL aircraft in all modes of operation, in the view of General Ferguson, explains in part why fifty-five different prototypes were built in the past few years, "all without sufficient success to justify production." A similar condition prevails with regard to WS-120, the proposed advanced ICBM, which is complicated by the absence of adequate rocket test cells.

Savings achieved by shortchanging the test facilities program may well prove penny-wise and pound-foolish. The Air Force believes, for instance, that the absence of advanced dynamic simulation facilities to test landing gears extracts a price substantially higher than the cost of building such an installation.

The Problem of National Test Facilities

A number of special circumstances complicate, as well as intensify, the problem of national test facilities, according to General Ferguson. There are indications that Soviet efforts in developing sophisticated test facilities are progressing rapidly. The implication is, as he told the Preparedness Investigating Subcommittee of the House Armed Services Committee, that "the Soviets intend to develop new systems advanced enough to require these facilities . . . by itself a provocative realization." He added, "We must also recognize that Soviet development-to-development lead time will be effectively shortened, [for] facilities in their economy as in ours are long lead-time items, indispensable to the timely development of new systems."

He urged, therefore, an "imaginative, comprehensive, long-range plan for the design, development, and

acquisition of those facilities that will be needed to provide the critical simulation environments, dimensions, and time durations for future systems. I feel such a plan is needed, just as surely as such facilities will be needed, and it must be national in scope."

"It occurs to me that when the nation has to spend \$50 million or more per facility [about \$100 million for a wind tunnel to test engines of up to 60,000 pounds of thrust], then we should have a plan that spells out in order of priorities where and how the nation should allocate these funds," General Ferguson said. He added that an integrated facilities program should be formulated on an interagency basis to reflect the government-wide utility and national resource character of advanced test facilities. AFSC presently administers test facilities and laboratories representing a capital investment of \$1.5 billion. Total DoD facilities are valued at \$2.2 billion, while the government-wide total represents an \$11.2 billion investment.

General Ferguson advocated expansion of the concept of "technological togetherness" to include the aerospace industry in the sharing and development of test facilities. Without questioning industry's need for, and right to have, test facilities of its own, or proposing that "we should confine ourselves to just

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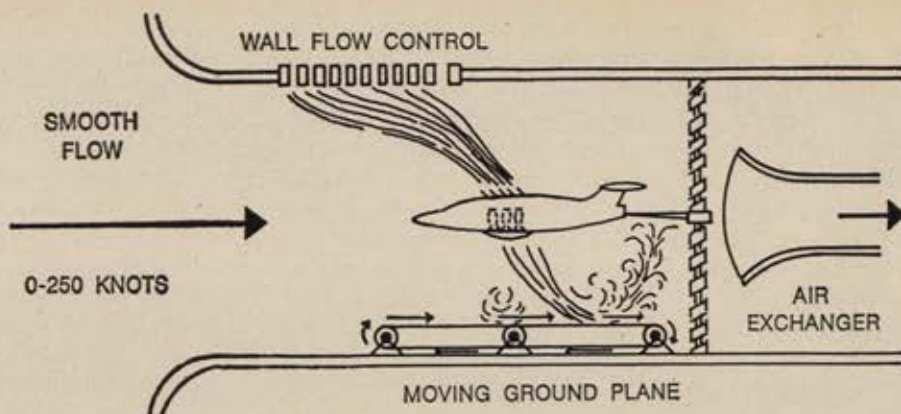
General Ferguson on the F-14 and F-15

In response to the question of whether or not rumors concerning an either-or situation involving the F-14 and the F-15 had any basis in fact, General Ferguson replied:

"The F-14A and F-15, as approved, are designed to perform different missions. The F-14A is an aircraft with a primary mission of fleet air defense and a secondary capability to perform other fighter roles. Major considerations in performing the F-14's primary mission are crew size, armament (Phoenix missile system), payload radius, and combat loiter time; and the aircraft characteristics needed to obtain that performance. In addition, carrier operations impose significant airframe design requirements (e.g., spotting factor, catapult launch, landing arrest, and carrier approach speed) on a naval fighter aircraft. On the other hand, the F-15 is designed as a single-place air-superiority aircraft with a capability of countering the complete threat spectrum of tactical aircraft in the dog-fight maneuvering arena. The F-15 design has been optimized to have superior maneuvering performance in the subsonic and low supersonic portion of the flight envelope—an area where our past experience has shown that aerial combat always occurs. Design emphasis has been placed on energy maneuverability, high rate of climb, high rate of turn and rapid acceleration and the aircraft characteristics (high thrust-to-weight ratio, low wing loading, low gross weight) necessary to obtain that performance. The high levels of performance required in the F-15 will demand careful configuration control to ensure that every ounce of unnecessary weight is prevented from finding its way into the aircraft design.

"Finally, a joint study by the Air Force and the Navy on the F-X/VFAX disclosed that while the potential for some 'commonality' did exist in the engines and avionics subsystems, the two services need different airframes to accomplish their individual missions."

V/STOL development efforts, in the view of General Ferguson, are hampered by the lack of wind-tunnel facilities big enough or sophisticated enough for testing system-size powered models in the transition from vertical to horizontal flight. Facility capable of furnishing the elements indicated in this chart is considered a vital requirement by AFSC and industry for future V/STOL research and development programs.



one facility of a kind in the nation," he suggested that "maybe we have gone too far in building separate facilities [in industry], for in the final analysis it is the government which directly or indirectly pays for them."

He, therefore, proposed that more government facilities be made available at adequate rates to industry, a practice already in effect with regard to some AFSC installations which are industrially funded.

"I can't see any other way of providing these massive facilities which have a primary defense orientation but also furnish invaluable service for the civilian sector," he said. "If you had to test, say, a 100,000-pound-of-thrust jet engine for a future commercial jet transport under ambient conditions," General Ferguson said, "the task would be colossal for industry to undertake on its own."

"Yet, if the company with such a need were to participate in extending our facility at [the Arnold Engineering Development Center in] Tullahoma, Tenn., I would think that we have a situation that is very much in the national interest. We have a precedent of sorts—although not with the private sector—because NASA paid \$4 million toward extending the AEDC wind tunnel to test the upper stages of Saturn, with the result that both its own and the Air Force's capabilities are enhanced."

Other AFSC test facilities which also were used for non-DoD purposes are, in General Ferguson's words:

- The 15,000-foot instrumented runway and excellent weight and balance facility at Edwards AFB, Calif., have been made available in support of the DC-8, DC-9, 727, and 737 jetliner certifications.
- At the Inhalation Exposure Facility of our Aero-Med Laboratory, technicians are studying the implications of long-term exposure to common chemicals threatening pollution to the atmosphere. The findings of these studies will be applied to the federal standards being set for "clean air."
- That same lab's Bio-Acoustic Research Facility is measuring possible effects of the sonic boom on communities, and collaborating with other federal agencies in auto crash research.
- And at the Cape, Air Force tracking equipment has been used to track commercial communication satellites from launch to orbit.

General Ferguson stressed that parochialism has no

place in orchestrating a national test facilities program, and that management of a given government facility should be exercised by the primary using agency. "This approach works well between us and NASA. For instance, NASA ran tests for the Air Force on the F-X effort; is now testing the F-111 in Sunnyvale, [Calif.]; and will be working with us on the F-15. NASA, of course, was also involved in the C-5 program, and will be in the F-12 effort," he said. As far as DoD's plans for test facilities are concerned, an *ad hoc* committee representing the three services is currently preparing a list of specific requirements for the 1970s.

The Need for Pooling Technology

Pooling of technology on a nationwide basis as a means of streamlining and also reducing costs in the R&D area was stressed by General Ferguson. The Air Force and NASA, the General pointed out, have held intensive discussions on "where we go from here, in space, for instance. . . . We expect to distill our common goals, determine what technologies are needed to achieve them, and decide on who has the best capability to undertake individual jobs." Among these goals, he said, "is the key to the future in space, the ability to shuttle back and forth between the ground and orbiting space vehicles, which requires exploration of new reentry methods and new hypersonic vehicles."

General Ferguson explained that in addition to the HL-10 and X-24 subsonic lifting-body vehicles currently under test, there is the need to develop hypersonic vehicles in the form of a new family of X-series aircraft. "Perhaps we don't need as many as we had before, but there is a categorical need for a follow-on effort to the X-15 beyond the small, inexpensive proposal that we have submitted jointly with NASA. But we should launch such an effort to explore the hypersonic performance envelope, even if it isn't tied to a specific program but rather as an insurance policy against technological surprise."

Intensified cooperation, he said, should also extend to such agencies as the Department of Transportation and its Federal Aviation Administration. General Ferguson said he planned to discuss with FAA Administrator John H. Shaffer the civilian potential of a number of Air Force projects, such as the long-term prom-

ise and "great national importance of the communications-navigation identification [CNI] project." Both military and commercial aircraft are overburdened at present, General Ferguson explained, with the "black boxes" which perform the CNI functions. The Air Force CNI system concept envisions a combination of satellites and ground computers with only one black box, weighing about fifty pounds and miniaturized into one cubic foot of space aboard each aircraft.

Aircraft incorporating this kind of equipment "could be under continuous air traffic control, and could, in all weather, without recourse to conventional ground and air navigation, determine their absolute position within 600 feet," an obvious boon to both military and commercial airspace utilization. Other promising technology areas with a civilian spinoff potential include heads-up displays, advances in electro-optical systems, and lightweight instrument landing systems (ILS).

General Ferguson said he felt that there are opportunities for "joint ventures" such as examining and treating the Air Force's Light Intratheater Transport (LIT) project "right from the outset in the light of both its military and civilian utility" (see *AF/SD, July '68, "LIT—Flexible Airlift for the Front Lines"*). Because of the LIT's proposed size, range, speed, and payload—which coincide closely with the commercial requirement—General Ferguson said, "I think both the military and the civilian applications can be worked out without compromise to either side. This, of course, doesn't mean that the military aircraft should be built to civilian specifications or vice versa. But perhaps it might be possible to build a military fuselage and civilian fuselage, or different wings."

The very least that suggests itself in terms of commonality, he added, is "a joint program involving the prototype from which either side can evolve its own final design." This, he said, applies also to the avionics system. "Obviously, LIT illustrates the opportunity for joint approaches and the concomitant substantial economies that could be realized," he said. "Without attempting to express a new national philosophy," he continued, "it seems to me that we could share in the funding" of such an effort. The Department of Transportation, General Ferguson suggested, might well be the agency to arrange the civilian aspect of the program, while DoD could be charged with "working out the military side of the bargain." He pointed out that the airline industry has already proved its willingness to advance money toward development of an aircraft deemed necessary. This has occurred in the US SST program, which is in part funded by the airlines.

Flexible Design and Development Concepts

Historically, there has been a tendency toward stereotype, or, as Dr. John Foster, Director of Defense Research and Engineering, put it, "procrustean rather than innovative" approaches to the design, development, and procurement of sophisticated weapon systems. In General Ferguson's view, the inherent problem has been one of pendulum swings from the extremes of full hardware development on the one hand

to all paper studies on the other. "Neither is necessarily a correct approach. The idea is to stop the pendulum somewhere halfway," he said, with the result that AFSC advocates in certain instances a concept formulation combined with hardware development or "competition with hardware" policies.

"The approach, of course, must vary depending on what it is you want to undertake, but there are a number of programs about to be launched that are amenable to the prototype approach," he said. Systems Command feels that these projects require carrying the development beyond the paper study to the point of proving out critical components, a combination of components, a new technology, a new material, or an entire system, General Ferguson pointed out.

"It is no more than good business to make sure that the \$5 billion or \$10 billion you spend on a major weapon system results in a product that gives you the longest life and the greatest productivity. This means taking a modicum of risk and making a moderate investment early in the program to assure that what you will produce at many times the cost and effort of the R&D phase will do what you want it to do, in a manner you want it to, and at a price you are willing to pay," General Ferguson emphasized.

He pointed out that SCAD (the subsonic cruise attack decoy) lends itself "to full prototype flyoff involving two or more contractors." The Light Intratheater Transport, he said, is also being examined with an eye toward the prototype approach, especially with regard to such sophisticated techniques as "stowed-rotor technology where we might want to test out several individual designs."

General Ferguson and his staff experts rated the temptation of dogmatic approaches and the "blind adherence" to one form of contracting and acquisition as the principal pitfall of the national R&D effort. The tendency to seek "panaceas" has encouraged total negation of "whatever previous approach you might have taken. As you eliminate what you consider a faulty element of your tactics, you are apt to discard all the good points along with it," one AFSC staff officer stressed.

The emergence of the initial-development concept as a prudent approach in certain cases, therefore, should not sound the death knell for total package procurement or any other technique. Nevertheless, General Ferguson feels that during the past eight years too much preference has been given the "paper-study" approach. "If you analyze the total costs of an intricate system, premised on a data base that is not validated, and compare them with one where you have proved out the more demanding hardware aspects, more often than not you will discover that the latter is the cheaper and more efficient route to go," General Ferguson said.

"In the long run, it generally costs less to go slow in the initial program phase by uncovering technical difficulties, by solving them, and by eliminating the need to make changes downstream in the program when the price for change is much higher," he said. The political advantage of the study approach, of course, is that the initial costs are low and easily defensible in terms of fiscal policy.

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General Ferguson cautioned that "we can't go back to the approaches used in the past when we were able to build, either in prototype or production form, thirty-three different fighter airplanes within a decade. The complexity and cost of modern systems make this impossible. But we must get back to a level [of hardware activity] where we can keep the irreplaceable design teams alive. We must intensify efforts to modify the current family of systems, especially aircraft, and periodically produce something that is clearly a step beyond what we have in service today," General Ferguson said.

General Ferguson emphasized that the French aircraft industry has shown exceptional resourcefulness and ingenuity in using modification of existing aircraft as a means to beget "whole families of aircraft, something on the order of what the US automobile industry has also been able to do."

Dassault, he said, "very cleverly parlayed" the original Mirage prototype into a nuclear bomber, a VTOL fighter, and a number of aircraft, by altering engine arrangements, using different wings, including variable sweep, while retaining a cohesive "family resemblance" in all of them.

"Whenever they had a system that was proved out, they didn't start from scratch but used it in the next model, often simply scaling to the new requirements. The French now have a range of aircraft that enables

them to sell one type of plane to the Israelis, another one to the Peruvians, and a supersonic swing-wing version to the Japanese, all traceable to one prototype that has been incrementally improved and carried forward for over a decade," he said.

The United States, by contrast, General Ferguson said, has done "very little with modification as a means to add to our inventory or our store of knowledge. . . . With hindsight, it would seem that we should have done what the Russians did, such as experimenting with swinging just the outboard half of a variable-sweep wing. We also might be further along if we had prototyped existing aircraft for more intensified work on variable camber, of the type which we plan to incorporate in the F-15," he said.

The C-5—Misunderstood and Maligned

While not a categorical advocate of the total-package procurement concept, General Ferguson defends the performance of this approach in regard to the C-5 Galaxy without reservation and "without need for being protective or defensive about it. . . . Anything we have done in conjunction with this program," he stressed, "we are perfectly willing to go over step by step with any responsible group. The C-5 program is both very much misunderstood and maligned."

From the very outset, the AFSC Commander stressed, the contract defined clearly through a specific formula that the government would make accommodations deemed necessary in conjunction with inflation, increased prices on the subcontractor level, competitive factors involving the suppliers as induced by the Vietnam requirements, and high engineering risks. "Therefore, we provided for a contract step between production run A and run B [first and second half of a total initial buy of 120 aircraft] to look at our experience, our real costs in engineering man-hours, and what really happened in the country as far as inflation is concerned and compare them to our original forecasts," he said.

While this phase has not yet been reached, the actual cost increase, over and above the increase induced by inflation and covered by the inflation clause, "is about ten percent above our forecast, and not 200 percent as claimed" in Congress and by the press, he pointed out.

In conjunction with the six-month slippage of the C-5 program (*see AF/SD, April '69, "Such a Nimble Giant"*), he said there has been a general overemphasis of "the sanctity of the IOC [Initial Operational Capability]" not just concerning the C-5, but other weapon systems as well. "It is much more important to create something that is reliable and based on solid engineering design before you commit yourself, and have something proved and useful when it does get into the inventory, than to meet a deadline set several years ago," he said.

General Ferguson made clear that the Air Force plans to continue to stress the utility and capability of the system to be acquired in all its procurement efforts, in conjunction with hard looks at IOC. "That way," the Commander of Air Force Systems Command said, "you are ahead in all respects."—END

US Congress on Pooling Test Facilities

A recent report of the Subcommittee on Science, Research, and Development of the Committee on Science and Astronautics, US House of Representatives, underscored General Ferguson's advocacy of pooling of test facilities and research programs on a government-wide basis. The Subcommittee's report stated, in part:

"The federal government has more than 100 laboratories of substantial size that represent a cumulative investment over the past decade of more than \$7 billion. Yet within the Executive Branch today there is no office or official who has information about the capabilities, the special proficiencies, and the unique equipment and facilities of these national assets. Some departments, notably the Department of Defense, have established information systems of one kind or another for this purpose. But these systems vary in content and utility of information. At present a new agency, such as Housing and Urban Development, which needs research and development, must canvass each department and agency separately if it wishes to find out what help might be available.

"The principle that an organization should know what its resources are seems so well established within the private sector that it seems strange to have to emphasize it for the public sector. Yet the subcommittee in exploring the question of information about government laboratories ran into a negative attitude about information to assist interagency use of government laboratories. Scientists and engineers who emphasize the necessity for systems to inform them about on-going research and development, and to retrieve for them the results of past work, take a dim view of systems to provide information about the human and material resources of government laboratories."

Report from Houston

In defining the Air Force mission in terms of future national objectives, its planners must contend with a complex and fluctuating set of factors, ranging from advances in weapon technology to the shifting political situations of the world's powers. The following is an assessment of the most significant of those factors and was presented as a symposium entitled "The Air Force Looks to the Future," held at the AFA Convention in Houston, March 21 . . .

The Air Force Blueprints Its Future

THE AIR FORCE is glad to have this opportunity to review some of the major factors that undoubtedly will have an important influence on its role and composition in the future. As always, the question of what we do and along what lines we develop is determined primarily by our basic national objective. That objective in essence is to protect the security and the values of our nation and to help create a world environment in which other free nations can survive and prosper.

In shaping the Air Force mission and designing the appropriate aerospace systems, we're also concerned with a number of more dynamic and less stable factors. These include the character and magnitude of the direct military threat and the projection of politico-military trends in the world environment.

Further, we must continuously examine and refine our concepts of deterrence to ensure their continued validity in the face of changing conditions. In our treatment of this subject, we'll attempt to illustrate the need for one conceptual change of particular importance. This adjustment would call for an addition to our strategic forces which are maintained in a relatively static posture to deter a massive nuclear attack. We'll indicate that beyond that capability for assured destruction of the enemy as a viable nation-state, we require a more flexible posture of operative deterrence. Such a posture would improve our capability for selective retaliation against a limited nuclear attack and would also provide a more credible backup for operations against an aggressor at the conventional level.

All of these topics will be covered to provide you with the rationale for the direction and pace of our technological effort. By viewing our technological effort in this context, we believe that you will appreciate more fully the dividends that we will realize through acquiring the advanced aerospace systems now in prospect. We also believe that against this background you

can better perceive the dimensions of the Air Force's future role as a member of the defense team.

The Direct Military Threat

Turning to the threat confronting our country now and for the foreseeable future, any survey of that factor must be based on four realities in the present world arena:

First, the Soviet Union is improving its strategic offensive and defensive forces, while also improving its general-purpose forces;

Second, Communist China continues to improve its conventional capability while striving to emerge as a nuclear power;

Third, the Soviet Union and Communist China, despite differences between them, both continue to support insurgency; and

Fourth, the Soviet Union and Communist China are each seeking to improve their position relative to the United States and to each other in the world balance of power.

Let's take a brief look at each of these trends.

Soviet Aerospace Forces

The Soviet Union is, and will remain for some time to come, the basic aerospace threat to the United States. The substantial threat which Soviet aerospace forces have posed ever since World War II is being enhanced through increases in their military budget. These increases are being put into the deployment of offensive and defensive weapons and into a major military research and development program that will shape the Soviet aerospace forces of the future.

What are the current trends in Soviet aerospace forces? First, the strategic offensive forces.

The large increase in deployment of hardened, land-
(Continued on following page)

Self-propelled Soviet rockets being unloaded from AN-22. The Soviet Union continues to improve its strategic offensive and defensive forces, while also improving its general-purpose forces. The Secretary of Defense noted in February that the Soviets had been spending "a little more than \$3.50 for each \$1" the US had spent for strategic defensive weapons.

—Novosti Press Agency



based ICBMs has been the most significant development of the past year. By the end of 1969 the Soviets will have deployed more than 1,000 ICBMs, raising their total land-based ICBM force to about the same number as that of the United States. Even if this deployment rate levels off, we expect continuing improvements in the quality of the Soviet force.

As an example, we believe the Soviets have started deployment of a new ICBM—their first solid-fuel intercontinental missile.

A new and different threat is being posed by a weapon they are now developing. It is either a fractional orbit bombardment system (FOBS) or a depressed-trajectory ICBM. When or in what configuration it will be deployed is still uncertain.

In submarine-launched missilery, two significant events have occurred in the past year. The first of a new class of nuclear-powered ballistic missile submarines became operational, and a new submerged-launch ballistic missile was tested to a range of about 1,500 nautical miles. These two developments add a significant new dimension to the Soviet strategic offensive capabilities.

In manned bombers and shorter range missiles, there were no major changes in the past year. The Soviets have around 700 medium- and intermediate-range missile launchers, some of them hardened. Evidence is accumulating that solid-fuel missiles are being developed for these ranges. We expect them to modernize this force by providing mobile launchers and through additional hardening of fixed sites.

The long-range manned bomber force continues at about 150, not counting those now configured as tankers, and more than 700 medium bombers. Modest production of supersonic medium bombers is going forward, and a new, faster medium bomber is a possibility. The Soviets have the option to equip these aircraft with improved air-to-surface missiles and to produce a new heavy bomber to succeed this Bear.

Now a few words on Soviet strategic defensive forces. The Secretary of Defense noted [in February] that the

Soviets had been spending "a little more than \$3.50 for each \$1" the United States had spent for strategic defensive weapons. At the moment, Moscow is the only city in the world with an operational antiballistic missile (ABM) defense, and there is no dispute within the intelligence community on this point. This Galosh system at Moscow is believed to have serious limitations, but barring a strategic arms-control agreement it can be assumed that the Soviets will have deployed some sort of ABM system around their major cities by the mid-1970s.

Improvements in their surface-to-air missile defenses are also continuing. In addition to the widely deployed SA-2 system, which uses the Guideline missile, there is the new Tallinn system. We believe this system is designed to have a capability against fast, high-flying aerodynamic vehicles rather than ballistic missiles—although the last is a possibility that cannot be excluded. Tallinn deployment is continuing.

For defense against manned aircraft, the Soviets are in the middle of a major refitting of their strategic interceptor force. You may recall that, in July 1967, they exhibited seven new fighter aircraft for the first time. A force reduction has phased out some of the older fighters like the MIG-17s and MIG-19s, but this quantitative reduction has been more than offset by the introduction of new all-weather fighters such as Flagon-A. All these are equipped with longer range missiles and improved radar. Still to come is the Foxbat—which has not yet entered operational service—but is expected to be a Mach 3 interceptor.

In addition to steadily improving their strategic forces, the Soviets have maintained huge general-purpose forces ever since World War II. Their tactical aviation has several thousand aircraft equipped for both air defense of the forward area and for support of Communist ground forces. Facing the NATO area are large numbers of Soviet tactical aircraft permanently based in the Eastern European countries as part of the Warsaw Pact forces. The lightning invasion of
(Continued on page 81)

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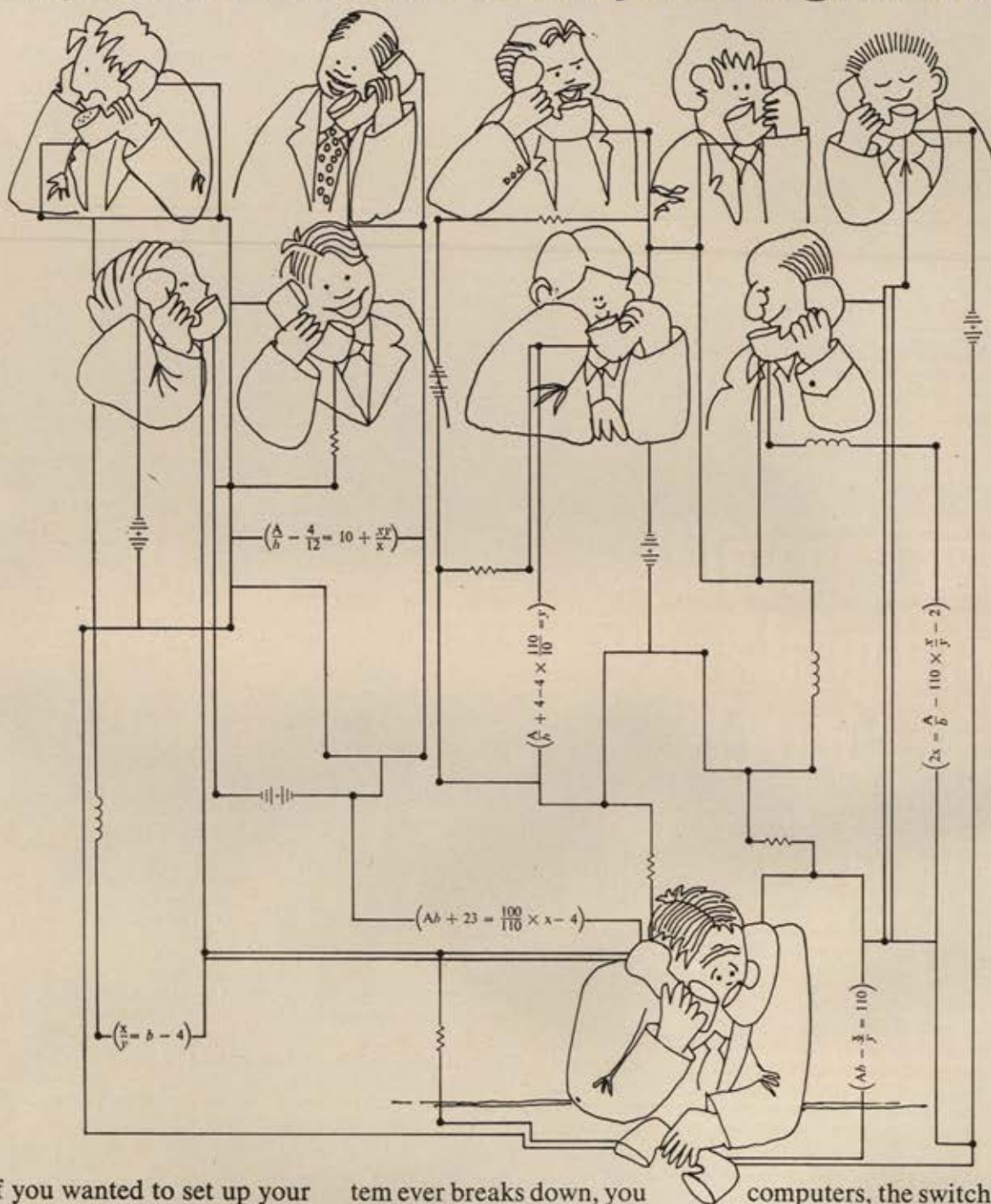
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Czechoslovakia last summer offered dramatic proof of the readiness and proficiency of the general-purpose forces. And the policy statement issued later by the Kremlin that such forces would be used wherever the cohesion of the Communist Alliance was thought to be threatened poses new considerations for NATO and US planners.

Communist China

For some years a major concern for stability in Asia has been Communist China with its announced objective of fomenting revolution abroad, its huge ground forces, and its large, though obsolescent, air forces. In spite of the turmoil of the Cultural Revolution, which has taken its toll of attempts to modernize China's military forces, improvements have been made, especially in the Air Force and the Navy.

But the most significant strategic factor has been China's progress toward becoming a nuclear power. China has now had eight nuclear tests. Two of them have been airdropped three-megaton devices. A guided-missile, low-yield nuclear-warhead combination has also been tested. We estimated last year that the Chicomso could soon have an operational medium-range ballistic missile with a range of 700 to 1,000 nautical miles and could have a modest operational force of these by the mid-1970s.

As to an ICBM, we believe the Chinese will not have an initial operating capability with this weapon until 1972 at the earliest. If internal political and economic stability is reestablished soon, China can probably generate enough resources to support a moderate and growing ICBM deployment by the mid-1970s.

Wars of 'National Liberation'

Looking next at the record of support which the major Communist powers have provided for insurgency, we find that since World War II there have been more than 100 internationally significant conflicts. Only about a dozen of these were in the conventional-war category. At least ninety were insurgencies, of which more than half were definitely Communist-supported. As examples of conventional-war situations, neither the North Korean invasion of South Korea in 1950, nor the present conflict in Southeast Asia could have occurred without major support from the Soviet Union and Communist China, both before and after the shooting started.

Public pronouncements from both the Soviet and Chinese governments reflect continued support for wars of "national liberation." The pattern of military and other aid supports this intent for the foreseeable future. As far as we know, the Soviets have yet to deny a request for military assistance. If there has been any change in approach, it has been one of increasing discrimination and concentration in choosing recipients of large-scale economic aid. Whereas both countries spread their efforts thinly all over the world in the 1950s and early 1960s, in the last few years the Soviets have concentrated on the Middle East, the Chinese on Asia. It seems less than realistic to expect any reduction in this large, well-established effort to generate conflict and insurgency. In assessing still another aspect of the threat—that is, the effort of the major Com-

munist powers to expand their influence—we can see the possibility of an unfavorable shift in the world balance of power, which is always delicate.

The complex of Soviet initiatives in the Middle East is the most obvious example of this. Military and economic aid over some years has made the Soviets the principal suppliers of military equipment and economic aid in the area. Building recently on this base of influence and obligations, the Soviets have moved major new naval forces of their own into the central Mediterranean. Their further exploitation of this carefully developed power base can be expected.

Less overt have been the Communist Chinese efforts in Southeast Asia. Using the Vietnam War as both a base and a cover, the Chinese have provided substantial encouragement to insurgent groups in countries neighboring on Vietnam. Even if the Vietnam War ends soon, continued unrest in that area seems likely.

The bases for such regional infiltration and subversion campaigns are military power and the future obligations created by the equipping of military forces. Today, ten non-Communist nations have air forces completely equipped with Soviet-made weapon systems. And ten other countries have Soviet aircraft as part of their combat equipment.

This assessment of the direct military threat, represented by the improving posture of the major Communist powers throughout the spectrum of conflict, leads us next to an examination of projected politico-military trends.

Politico-Military Trends

This topic has special importance because the future world environment is directly related to the strategies and systems which the Air Force will have to employ as an instrument of national policy. This is true not only because the selection of new weapons is based on an assessment of the future, but also because these same weapons, when selected, will determine in some degree the direction of future national policy and strategy.

We see the world ahead of us as a complex and dynamic arena where technological, sociological, economic, and political factors constantly interact. Some of these factors can be identified as: the decline of the two-power international system; nuclear proliferation; competition for resources; increased trade competition; growth and spread of technology; and resurgent nationalism.

Let us take a closer look at a few of these developments.

The two-power world of the past is giving way to a more complex, polycentric world of several power centers. But the United States and the USSR remain in confrontation. However, the voluntary polarization of other states about one or the other of these two superpowers is declining—and, in some cases, dramatically.

Along with the growing number of power centers, there will be adjustments within major alliance systems which are dominated by either of the two superpowers. There are many who feel that ten to fifteen years from

(Continued on following page)

now the United States and the Soviet Union, as a result of this already apparent trend, will have lost a large share of their former power to influence nations within their respective alliance systems. The recent invasion of Czechoslovakia is an example of Soviet reaction to this trend.

A world of multiple-power centers, marked also by resurgent nationalism and a general decline in the cohesiveness of alliances, could generate pressures for the spreading of nuclear weapons, suggesting the importance of measures such as the nuclear nonproliferation treaty.

Also there can be little doubt that population growth, along with the spread of technology and the surge of nationalism, will continue to serve as destabilizing and conflict-producing elements in the developing areas of the world.

This brief analysis of threats and trends suggests a number of questions that have to be examined in detail. Their answers will have great importance in shaping the Air Force in the future. For example:

- What would be the nature of a war in the future?
- What kinds of wars can we expect to occur?
- How would these wars start?
- What capabilities are needed to deter such wars or to fight them?
- Can the same capabilities that deter them also be used to fight them?
- And, finally, what kind of force gives us political leverage in different situations?

Our examination of these questions has identified some key issues relating to strategic concepts that have great importance for the Air Force and the country:

First, the passage of time and the dynamics of our environment may change certain strategies that now are the principal themes in defense policy literature.

And, second, we know that accepted strategic concepts can determine, in a very practical sense, what the Air Force will become. This is brought home most clearly in the world of defense budgeting where the idea comes first, and only after the strategic or weapon system concept has been accepted, will the best mix of forces be developed and ultimately procured.

We cannot overemphasize the necessity for tailoring our forces to deal effectively with the wide diversity of conflict situations in which the United States might become involved. The most widely held views on this subject now imply that a US-Soviet war must be equated with massive exchanges of thermonuclear weapons. This prospect, though admittedly the most crucial, is only one of many possibilities and is probably the least likely.

The Refinement of Strategic Concepts

Although this view of warfare has varied implications affecting the design of appropriate military force structures, it nevertheless is entirely consistent with continued emphasis on deterrence as our critical objective. So we have to consider whether our force structure that supports this strategy of deterrence is in tune with changing times. More specifically, we must consider how the relatively static posture of our strategic forces for deterring massive nuclear attack can

best be realistically adapted to meet the full range of possible conflicts.

Our nation has lived now for almost twenty years with a particular concept of deterrence—it is firmly entrenched in our thinking. Yet the relative power relationships between the United States and the Soviet Union have changed greatly. We have moved from an American nuclear monopoly to the point where both of us now have significant strategic nuclear forces, each presently capable of surviving a massive first strike by the other. Hence, the present deterrence relationship underscores a need for increased understanding of what is required for strategic sufficiency.

In short, a wholly new basis for a reasonably peaceful coexistence of these two major powers emerges from this recognition that the deterrence equation has changed significantly in the past two decades.

Let us now consider the adequacy of the current basic concept of strategic deterrence as being designed primarily for ultimate response to a massive attack. We can begin by evaluating the two components of this concept: assured destruction and damage limitation. These are the criteria against which our strategic capability needs are now being determined. Let us start with a review of these two elements of deterrence.

Assured-Destruction Concept

The assured-destruction concept assumes that even after the most successful Soviet attack against the US, if we can destroy some substantial part of the Soviet population and industrial resources, the Soviets will be deterred from launching such an attack. The damage-limitation concept recognizes that, should our deterrence fail, we must have the ability through offensive and defensive means to reduce the damage we would have to sustain. During recent years, there has been a tendency to view assured destruction as the principal component of deterrence.

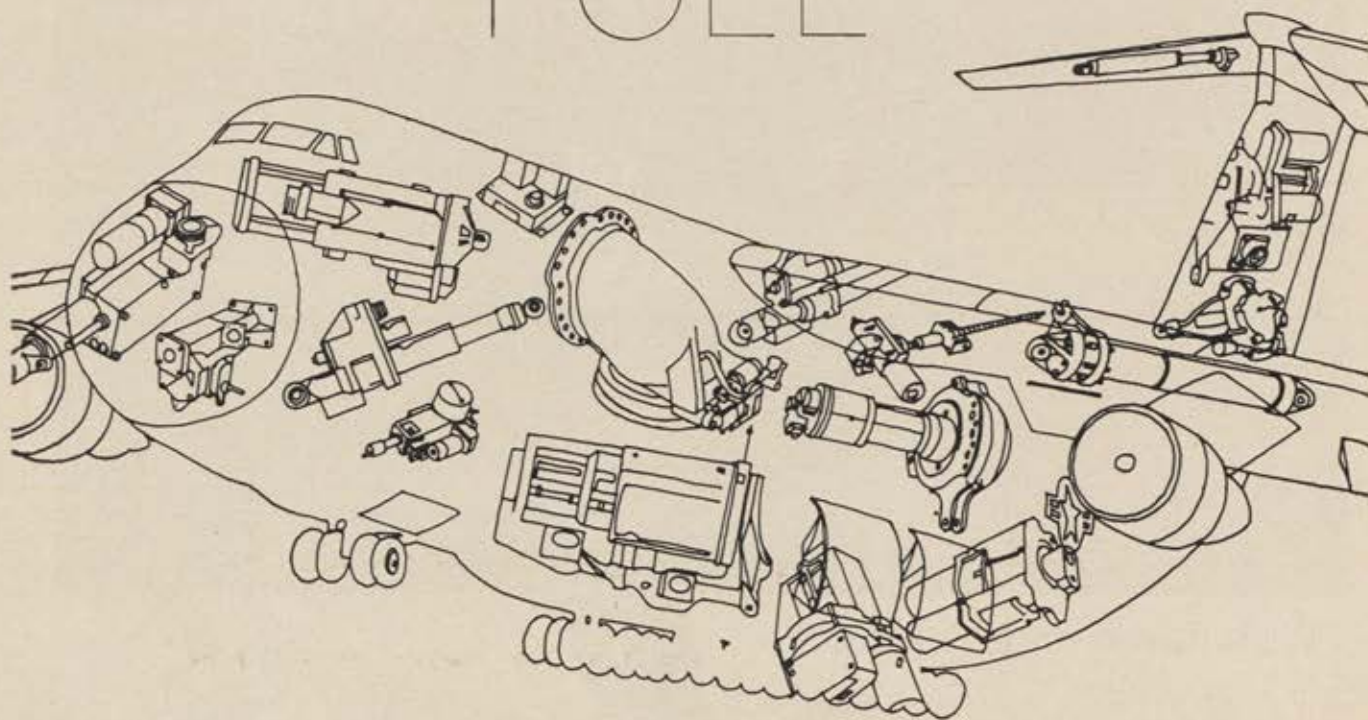
While the assured-destruction concept remains entirely valid as the fundamental basis for our deterrent strategy, it also warrants continuing study. The concept and its application must be adjusted to accommodate certain realities: (1) It is a concept that depends on our perception of Soviet values; (2) it downplays the significance of relative US-Soviet capabilities for assured destruction; and (3) it obscures our requirement for more flexible and versatile strategic forces that can function as an operative deterrent.

Perhaps these statements require some demonstration to make them more specific. For example, it is highly possible that the assured-destruction concept is too dependent upon our estimate of how other people think and of the standards and values they believe in. We, therefore, cannot be certain that any given percentage of guaranteed destruction will unquestionably deter the enemy from offensive action.

Should a situation develop in which the US and the Soviet Union have roughly comparable strategic forces, we might do well to expect a marked increase in their willingness to be aggressive. These reasons outline a clear requirement for new emphasis on capabilities for operative deterrence at less than the ultimate level of nuclear conflict.

(Continued on page 85)

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Concept of Operative Deterrence

Now let me discuss some of the reasoning behind this concept of operative deterrence. A posture oriented primarily toward assured destruction seems best designed to deter an opponent from attacking on a massive scale. It is nonetheless true, however, that our willingness to use this force in retaliation against aggression not involving strikes on the United States has been placed in question. Therefore, the purpose of operative deterrence is to lend added credibility to our commitment, thus more effectively discouraging lesser attacks. Failing that, this posture would enable us to influence an opponent's decisions in a direction that is favorable to our interests.

For example, in the Cuban missile crisis we got the Russians to stop an undesirable action—that of shipping missiles to Cuba. That was operative deterrence. We got them to take an action we desired—that of removing the missiles. That was also operative deterrence. At the same time, with our capability for assured destruction, we deterred the Soviets from taking such drastic actions as the seizure of Berlin or nuclear attack on the US.

The Process of Mission Analysis

From this analysis of the mission, we see that capabilities for operative deterrence are those required to bring a crisis to an acceptable end before it becomes large-scale conflict. When confronted with military threats at levels below the ultimate, our national decision-makers require the maximum degree of flexibility for selective and controlled response which is best afforded by a variety of force options. These military capabilities must be politically relevant and usable in order to influence the opponent to accept reasonable terms.

Generally, such forces will require qualitative improvements over those designed primarily for deterrence of massive attack. For example, they will need a more accurate munitions-delivery system and a greater capacity for flexibility and responsiveness to a changing military situation. In reality, these forces must deal with a different order of enemy values from those addressed by forces for assured destruction—values which are not necessarily associated with the issue of national survival.

Of course, the essential changes in our forces for operative deterrence at the strategic level go beyond the improvement of weapons and delivery systems. They must also include improvements in planning, in command and control, in communications and surveillance, and in systems for communicating our intentions to the enemy. And such a concept also implies that we need to deny coercive opportunities to an enemy by eliminating gaps in our operational capability across the full range of conflict.

These considerations bring into clear focus the reasons why, in designing our strategic forces, we must also use the yardstick of their effectiveness in the role of operative deterrence rather than the role of assured destruction alone.

Thus far, we have dealt almost exclusively with

strategic forces and concepts. This emphasis does not reflect the likelihood of nuclear conflict. Instead, it merely highlights the fact that the consequences of a US-Soviet war at the nuclear level are so great that they must be given priority.

An additional conflict possibility that must be considered is war with a lesser nuclear power—that is, one which is not powerful enough to threaten our survival. Even so, such a nation could inflict grave damage by virtue of the immense destructive potential of even one nuclear weapon, however crudely made or delivered. Perhaps the most likely opponent of the United States in this category is Communist China. But this threat could become more complicated with any further proliferation of nuclear weapons. This would be true in the case of both the technically advanced and less advanced nuclear powers and would demand concepts and forces for dealing with the numerous contingencies inherent in that situation. We must understand that the possibility of war with lesser nuclear powers requires force employment concepts tailored to the unique characteristics of such a conflict and that these concepts differ significantly from those for responding to the Soviet threat.

War With Minor Powers

But it is also possible that the United States might be tested in war with minor powers—states not possessing a nuclear capability. Let us consider how operative deterrence applies to such a conflict.

The primary objective in a war against a minor power would be the attainment of the particular political ends which prompted entry. In other words, "winning" will mean achieving these specific objectives. This may not require the total defeat or destruction of the opponent. But it will usually require convincing him that his total defeat is a clear possibility unless he comes to terms. Such wars with lesser powers will probably be difficult to manage because of the direct or indirect involvement of another great power or because the degree of our national commitment may be less than that of the enemy.

A prime consideration in such a conflict is how airpower can be used to influence enemy leadership. The enemy may not agree or understand that our objectives are limited. To him the survival of his nation or central values may appear in jeopardy. Our target selection must then serve both to carry out the military campaign and to communicate the nature of our policy.

Operations Under Restraint

Probably the most challenging problem we must face in a war with a minor power lies in devising methods of conducting effective military operations under constraints. The development of these capabilities requires us to exploit advanced technology on the same scale as that demanded for wars at a higher level. Actual military operations will have to take into account a variety of factors: the enemy and his allies; friendly forces in the field; indigenous populations; and the international community. This wide variety of military and psychological factors will complicate the employment of force in such wars.

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Some conflicts with lesser powers may be fought on checkerboard battlefields where friendly, neutral, and enemy personnel, equipment, and property may be closely intermingled. As populations and urban areas increase, this problem will become more pressing and will increase the importance of accuracy in air-to-ground firepower.

And the denial of strategic points—airfields, ports, transportation centers, and choke points—and of political centers, could become an important task for airpower, especially when the areas to be controlled are at great distances from friendly base areas or supporting surface forces.

In conflicts with lesser powers, the United States will usually have superior air forces in the combat zone. The psychological effect of that superiority may be to deter enemy air operations out of a fear of being destroyed. More likely, the enemy will employ his air force selectively. He will try to inhibit performance of our missions while generally refusing to accept battle, except under conditions of clear advantage, and will exploit any sanctuary to overcome his inferiority. This demands that our tactics and weapons not be designed solely for ideal or "classical" military situations, but must be adaptable and effective against sanctuary-based opponents as well.

Now that we have sampled the conceptual phase, let us move from ideas toward actual military systems, translating trends in the world environment, and the strategic concepts and functional tasks we have described, into specific capabilities—capabilities that must be provided by systems yet to be developed. Our next step, then, is to determine in detail the parameters of specific technological and operational needs.

The Use of Advanced Technology

Today's technology offers us the means to plan ahead for the weapons of the 1970s and even the early 1980s. We can look at our new and advancing technologies and see the indicators of the next generation of aircraft and missile systems. In the planning and developing process, we can put the technology factors of propulsion, materials and structures, and avionics into new aircraft and missile systems that will meet the demands of the '70s.

Let us now look at some examples of the systems that our concepts, strategies, and technology are providing:

AMSA

Let us use the AMSA—advanced manned strategic aircraft—as an example of how the strategic concept manifests itself in the structure of forces. In the past, we have not been successful in justifying AMSA despite its projected superiority over our current bombers, because the criterion of measurement—assured-destruction fatalities—indicated that our missile force and existing bombers can do the job deemed necessary. But, as we noted earlier, there is strong evidence that the assured-destruction criterion alone is insufficient for determining a force structure requirement. It thus appears that a manned aircraft force that includes the AMSA would provide our national leader-

ship with greatly increased options for highly controlled responses in future crises.

Virtually the entire spectrum of technology will be used to fashion AMSA, a system that can also vastly improve our capabilities for conventional conflict. We envision it to be an aircraft with outstanding performance capabilities and have tapped our technology for new engines, new materials, and new avionics. In the engine area, we have progressed to the point that we can design an engine to be very efficient at high and low altitudes, and at supersonic and subsonic speeds. Further, we can do this with engines that are smaller, lighter, and have greater fuel economy.

In the materials area, we can take new approaches to aircraft structures—approaches that allow us to tailor the aircraft to the otherwise destructive demands of high-speed, low-altitude flight. And, we can do this without paying an exorbitant weight penalty. At the same time, we can concentrate on what is called volumetric efficiency—that is, we can design a relatively small and light airplane with a tremendous payload. And when it comes to avionics, present systems are just scratching the surface of what we have in store for an advanced bomber.

Extensive engineering work is now on contract for airframe, avionics, and propulsion systems. This will bring us to the point of fabrication by 1972 or 1973, at which time we should have an even clearer picture of the late 1970 and early 1980 threat in which AMSA will need to function.

New Generation of Missiles

Because of new technology we are also on the threshold of a new generation of missiles and decoys for the manned bombers. A major step forward in increasing our manned strategic bomber capability is the short-range attack missile (SRAM). This air-to-surface missile is well along in its development cycle and should provide us with a relatively small and accurate standoff missile to attack either primary targets or terminal defense. With this weapon, we see a new lease on life for the B-52Gs and -Hs. They will be able to carry large numbers of these missiles to attack enemy surface-to-air missiles as well as other threats to the attacking force. The SRAM will also provide the primary strike capability for the FB-111 as it gradually replaces some of the older B-52s.

Another airborne missile program is the development of the subsonic cruise armed decoy (SCAD). The breakthrough being sought in its development is a new lightweight, high-efficiency engine, more effective than anything available today. With it, SCAD will serve as a decoy with characteristics identical to the penetrating bomber. Our bomber force could carry these missiles in fairly large numbers.

We also believe that our new technologies should be used to develop a new strategic missile for our ICBM force of the future. If the ICBM is to be regarded as the primary vehicle for the assured-destruction task, then a high degree of assurance that these weapon systems can survive an initial attack is vital, especially in view of the growing numbers of accurate Soviet strategic rockets.

(Continued on page 88)

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companies or people.**

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health services,
life saving and
blood banks.**



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The Minuteman III, the latest in the Minuteman family, is presently in development. It is designed to have an increased payload and to carry the latest re-entry vehicles. The first successful launch was made last August.

We have also undertaken comprehensive studies and technology programs for a more advanced strategic missile system. This advanced ICBM would have a greater throw-weight than the Minuteman III, as well as greater range and accuracy.

Concurrently, we are proceeding with the "Hard-Rock" Silo program. These facilities are being designed to accept Minuteman III as well as to accommodate the Advanced ICBM later. Along with these programs we are exploring reentry vehicle technology.

Strategic Defensive Systems

New technology is also available and in sight to improve our strategic defenses. Because we feel the need for an improved capability in the future, we are proposing a system comprised of over-the-horizon radar (OTH), an airborne warning and control system (AWACS), and the F-12.

AWACS has the obvious advantage of improved survivability and will provide the capability to control a mix of the F-12 and F-106. It will work in conjunction with a ground-based OTH system to detect penetrating aircraft. The AWACS will also have a tactical application for control of our forces in any part of the world.

Airlift

In the airlift area, we are concerned both with inter-theater and in-theater airlift.

Our intertheater airlift is qualitatively in good shape. As you may know, the C-141 is carrying massive quantities of supplies to Southeast Asia (SEA).

On return flights, the C-141 carries patients. It provides the capability to get the wounded from the battlefield and to the United States in twelve hours or less. We are also working on technologies to further improve in-flight medical aid.

The first operational C-5A will be delivered late this year. It is designed to carry most outsize Army equipment and has such features as high flotation landing gear and relatively short takeoff distances so that it can operate from primitive landing strips. New technologies in the materials and propulsion areas, for example, could lead to a still more advanced cargo aircraft in the future.

The picture in the in-theater airlift area is a little different.

The Air Force has an urgent need to modernize the tactical airlift forces. Many aircraft now in our inventory, because of their age and the acceleration of the aging caused by their use in Vietnam, may soon be uneconomical to continue in active service.

Light Intratheater Transport

Our Tactical Forces have stated a requirement for a new light intratheater transport with a vertical takeoff and landing capability. This system, known as the LIT, would replace the C-7 and C-123 aircraft and augment the C-130. It would have sufficient payload

capacity to accommodate the vehicular and resupply requirements of the ground forces. The short field and possibly vertical takeoff and landing capability will provide maximum flexibility and permit operations from unimproved airfields in austere forward areas.

Our concept formulation study has shown that the LIT could have some significant advantages. A vertical capability could provide flexibility and permit use of the aircraft for other missions such as rescue, if required. Optimized STOL performance would enable the aircraft to use a large percentage of runways available throughout the world. A STOL mode would permit a larger payload than a vertical mode. This would make the LIT a very attractive aircraft from an operational standpoint. Even in the vertical mode, however, the aircraft would be able to carry essential pieces of Army combat equipment.

Let us now switch our focus to tactical weapon systems. We find that in the past the Air Force has sought aircraft that could individually perform a variety of tasks but were generally oriented toward higher levels of warfare. However, our concepts of the future, which we have just covered along with our actual experience, would indicate that the predominant use of tactical forces will be in confrontations with lesser powers—requiring specialized applications of airpower. Therefore, we advocate that our tactical fighter force be a balanced one, consisting of a family of weapon systems wherein each system is designed to do one mission extremely well, and one or more other missions credibly well.

F-15

Thus the Air Force is moving rapidly to develop a vastly better air-superiority fighter—capable of winning the upper hand in any kind of dogfight. This fighter is, of course, our F-15.

The fixed-wing F-15 was designed from the beginning as a single-seat fighter for air-to-air combat. It will provide excellent performance in climb and acceleration, and it will have the ability to retain altitude and airspeed while maneuvering.

By way of armament, the F-15 will carry a variety of new weapons tailored to the dogfight environment. It will definitely have a gun, and it may be a new 25-mm gun. In addition to the gun, we are developing a new short-range missile for use with the F-15. This new missile would be able to take up where the gun leaves off, and it would have the added advantage of high-maneuver capability. And to fill out the armament spectrum, the F-15 should also be able to carry longer range missiles as well.

Progress is being made in the program. We have selected three contractors to proceed with contract definition for the F-15. Under current schedules, selection of a contractor to develop and produce the F-15 is expected to be made in 1969. The radar and engines are already in advanced stages of development. Our plans are to have the F-15 flying by 1972, and we expect it to be operational in the mid-1970s.

A-X for Close Support

For the specialized task of close air support we are considering a specifically tailored, relatively inexpen-

sive airplane—the A-X. The technology and most of the equipment for this airplane would be “off-the-shelf,” although we are looking to advanced technology for better protection against antiaircraft weapons. As we see it now, the A-X would be a subsonic twin-turboprop fighter with such features as heavy armor, large payload, and short takeoff and landing capability. The advantage of such an aircraft is that it would be able to hit the enemy accurately, and then fly off at about 400 knots. It would be an economical aircraft that could accurately and consistently place ordnance “on target,” and survive. The A-X would, in effect, combine the technology of three wars into what we think would be an outstanding close-in aircraft.

Applications in Southeast Asia

Our research and development is also providing expeditious technical assistance for Southeast Asia. One example of this is Shedlight. This is an effort to deny the enemy the benefit of the cover of night. We find that about eighty percent of the enemy troop movements and resupply is carried out under the cover of darkness. At the same time, our nighttime interdiction effectiveness is significantly less than our daytime effectiveness.

So we have been developing low-light-level TV/computer/laser pod systems that will effectively spot enemy movements at night. This will greatly improve nighttime operations.

Gunship II, another Southeast Asia program, has been developed to augment the AC-47 Gunships. As you know, the AC-47 has been doing a magnificent job and has proved the feasibility of the side-firing gunship concept. On the basis of this success, C-130s and C-119s have been modified to carry improved armaments and a wide range of detection and sensing equipment.

This is just a brief survey of our efforts in support of Vietnam. There are many other such development programs—programs which look for technical solutions to meet the immediate as well as future needs.

USAF in Space

Let us now look briefly at some examples of the kinds of space programs which support the Air Force mission for global command and tactical communications, surveillance, space defense, and man in space.

The Manned Orbiting Laboratory (MOL) is a major program aimed at evaluating the utility of military man in space. It is evident that we need to identify more clearly those tasks in space for which man is uniquely qualified.

We expect the MOL to orbit two men for periods of about one month. The first mission could be as early as mid-1971.

One of our prime programs for space-based communications is the Defense Satellite Communications System. This is a point-to-point repeater satellite system, the possible uses of which are probably apparent to you. At the present time we have twenty-two satellites operating in equatorial orbit, with additional satellites programmed. We have been developing this system for the Defense Communications Agency.

We are also developing the satellites for the Tactical



Artist's conception of USAF's Airborne Warning and Control System. AWACS is designed for a dual-purpose role as both an air defense and tactical flying command post.

Satellite Communications System. This program will demonstrate the concept of communications by satellite between mobile users—such as aircraft, ships, jeeps, and troops with manpack radios. It is coming along well—the first satellite was launched [in February].

The technology base of today will not long be sufficient for the future—it must be dynamic and always advancing. There are currently many opportunities that have surfaced and are finding application in our defense work. Among the more recent examples we would include the laser, boron fibers, and oxide dispersed filaments, low-light-level television, and the basic principles leading to over-the-horizon radar.

The real task is to identify the potential applications of some of our basic research programs. We are now finding, for example, that boron fibers and nickel dispersed oxides may greatly contribute to the development of more efficient airframes and engines, making possible truly major advances.

Science and technology will never reach a plateau. We must continue to have a stockpile of knowledge, and we must continue to have a dynamic research and development program that looks to new technological horizons to ensure our national security.

Summary

We have considered five major factors that will determine in large measure the makeup and the mission of the future Air Force. These factors are: the direct military threat; the politico-military trends in the world environment; the refinement of strategic concepts; the process of mission analysis as a basis for defining the specific capabilities that we require; and the technological opportunities for obtaining superior equipment. Again it should be emphasized that an updating of our concepts has pointed up the need for a strategy of operative deterrence to eliminate operational gaps and address the full range of threats.

Over-all, we have seen that the versatility and flexibility of modern aerospace systems will make the Air Force of the future a uniquely effective instrument in the support of our national goals.—END





Tough machine for a tough war.

What happens when a Light Observation Helicopter has to get right down in the trees to root out Charlie?

When it often has to slug its way out of a tight corner?

When it's loaded with wounded GIs, extra guns, extra ammo, assorted field gear . . . pushed to maximum performance day after day?

When the LOH in question is the Army's Hughes-built OH-6A Cayuse, it inspires raves like these from the men who fly it:

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It's the kind of machine the men who fly it deserve. The Cayuse — world's most proven light turbine helicopter — made by Hughes Tool Company, Culver City, California.

Hughes Helicopters

Report from Houston

Held in the afterglow of the brilliant space feats of Apollo-8 and Apollo-9, and with the Manned Spacecraft Center as its backdrop, the 1969 National Convention of the Air Force Association featured a marked orientation toward close and productive cooperation between the Air Force and the National Aeronautics and Space Administration and an intensified national R&D effort. Attended by more than 2,500 aerospace leaders, the Convention ranked as a unique . . .

Showcase of the Breadth and Depth of Aerospace

BY EDGAR E. ULSAMER

Associate Editor, AIR FORCE/SPACE DIGEST

THE Air Force Association's 1969 National Convention, held in Houston, Tex., March 18-21, focused on US aerospace power as a broad-gauged national resource, and accented and strengthened the intimate cooperation between USAF and NASA. The range, scope, and variety of its programming easily made the Houston event the most productive Convention in AFA's history.

Recurring in various forms throughout the symposia, speeches, and discussions at the Convention, and highlighted by the Association's unanimously adopted Statement of Policy, was one central theme: The transcending impact of the national aerospace effort on society, which suggests broad and flexible policies and attitudes, rather than a single-purpose approach in the fields of missions and R&D. As a corollary, the changing role of the military in relation to civilian authority and society in general received close scrutiny.

Secretary of the Air Force Dr. Robert C. Seamans, Jr., in a climactic Convention address, reflected the breadth of the national aerospace effort when he said, "There are many contributors to national security, and success demands close cooperation. This Convention, this bringing together of agencies, groups, and individuals, with disparate tasks and one common goal, can achieve the necessary partnership."

Three ranking participants in the Convention programs, Secretary Seamans, NASA Administrator Dr. Thomas O. Paine, and USAF Chief of Staff Gen. J. P. McConnell, stressed the pivotal role played by AFA in its twenty-three-year history of fostering and catalyzing national security and aerospace progress.

Dr. Paine termed the Air Force Association "an essential element in our democratic system [which provides] the American people with informed judgments on

the important and complex issues facing the country."

Secretary Seamans, himself an AFA member, acknowledged that "with military technology and military forces changing drastically in short periods of time, this Association [AFA] performs a vital service in stimulating discussion about national security problems and publicizing the Air Force role in national defense."

General McConnell made this statement: "As I approach the end of my tenure as Chief of Staff of the Air Force, I want to express my sincere appreciation to you, the leaders and members of AFA, for the unstinting support you have given to the cause of airpower, to the Air Force, and to me personally. . . . I



Luncheon for the Air Force Chief of Staff was the occasion for presentation, by President Robert W. Smart, of the David C. Schilling Trophy, one of AFA's highest awards, to USAF Capt. Albert R. Kaiser of the 6594th Test Group.

salute AFA for a job well done, a job that serves the best interests of the nation."

The NASA-DoD-USAF Cooperation

The locale of the Convention—Houston, home of the Manned Spacecraft Center and the astronauts—gave impetus to extensive examination of the NASA-DoD-USAF aerospace partnership and the need for even closer coordination of future efforts. Both the Air Force and the NASA speakers stressed and illuminated the requirement to conduct manned operations by both agencies, especially USAF's Manned Orbiting Laboratory (MOL) program and NASA's manned space-station program.

Secretary Seamans, a former NASA Deputy Administrator, stressed the "distinct need to continue with manned space operations under both military and non-military auspices." Conceding that the underlying space technology is similar, he stressed the experiments planned for the Manned Orbiting Laboratory, which has a national security orientation, and the Apollo Applications Program, which is scientific in nature, involve "no unnecessary duplication."

"These activities require different equipment, different orbits, and different timing. I believe any attempt to combine the two programs would jeopardize the returns to each agency and would ultimately increase the cost," Secretary Seamans said.

NASA Administrator Dr. Paine discussed his agency's plans for establishing permanent space stations in earth orbit that can "evolve and grow by adding modules over a period of many years . . . as the next great leap forward in the development of aerospace technology," and their relevance to the future needs of the Air Force.

This program, he said, "should not be considered only from the narrow standpoint of specific operational systems requirements that can clearly be established as necessary today. The lead times are too great. The uncertainties of the future world situation and the precise nature of future defense needs are also too great."

The requirement, therefore, is to consider "what our long-term national security posture would be ten or fifteen years from now, if by then the United States has developed a space-station capability and the logistics or space-shuttle system necessary to utilize it, and compare this posture to what it might be if we do not then have the capability" while the Soviet Union might have such a system in operation, he said.

MOL, on the other hand, Dr. Paine said, is a program of "enormous importance to the security of this nation." While it draws "very heavily" on technologies developed by NASA, Dr. Paine said it is not "a duplicative program. It is not an overlapping program. We have great admiration for the way the Air Force is handling the task." The complementary, rather than competitive, character of USAF's and NASA's manned space programs is the linchpin of current intragovernmental discussions, on the basis of which NASA, the Air Force, the Department of Defense (both represented by Secretary Seamans), the White House Science Adviser Dr. Lee DuBridge, and Vice Presi-



Secretary of the Air Force Dr. Robert C. Seamans, Jr., an AFA member, at a luncheon in his honor, called attention to the importance of AFA in relation to national defense.

dent Spiro Agnew will submit to the President on September 1 specific recommendations concerning what "the future base and direction of the over-all national space program should be," he said.

"We hope," Dr. Paine said, "to configure a national program for the development of permanent space stations and a logistic support system in a way that will not only serve the needs and goals of the civilian space program, but [one that] will be capable of supporting future defense research and development require-

(Continued on following page)

THE WHITE HOUSE
WASHINGTON
March 12, 1969

Dear Mr. Smart:

As your fellow citizen and as Commander in Chief of the Armed Forces, I convey my warm greetings and best wishes for a successful and productive meeting to all of you in attendance at the 23d annual convention of the Air Force Association. Over the years, no national organization has contributed more to public understanding of the key role of aerospace power in the defense of freedom around the globe.

I share your concern about the problems of national security in these troubled times and welcome your support and cooperation in seeking workable solutions for them. The Air Force Association represents a pool of talent and experience which will, I am sure, continue to make great contributions in this area of national concern. I am especially impressed by the work being done by your Aerospace Education Foundation toward improving the quality of our nation's schools. It represents a breadth and depth of perception of which you all can be proud.

It is particularly appropriate that in this year of extraordinary space progress you have chosen to convene in Houston, site of the National Aeronautics and Space Administration's Manned Spacecraft Center. I hope that during your meeting many of you will have the opportunity to visit the center and view the work under way there to advance aerospace technology.

Again, my warm wishes for a most successful meeting.

Sincerely,
/s/ RICHARD NIXON

Mr. Robert Smart
Air Force Association
1750 Pennsylvania Avenue
Washington, D. C. 20006



The Chief Counsel of the Committee on Armed Services of the US House of Representatives, John R. Blandford, moderated an illuminating seminar on "The Air Force Looks to the Future," which consisted of a formal, illustrated presentation of future USAF requirements as well as panel discussion involving Lt. Gen. Glen W. Martin, DCS/Plans and Operations; Lt. Gen. Robert G. Ruegg, DCS/Systems and Logistics; and Lt. Gen. Marvin L. McNickle, DCS/R&D.

ments. . . . Much of the equipment and experience in the civilian program would be directly applicable to defense requirements when needed, and costs and lead times for additional development would be limited to specialized equipment or modules."

This progression, he said, follows closely the way "in which NASA Gemini hardware and experience are being used so effectively in the MOL program. We envision a common NASA-DoD logistics vehicle and launch complex. We both need a reliable, easy, and comparatively inexpensive way to get in and out of space. Between us, last year we launched a payload into orbit every five days. Here is a common requirement that we can work toward together."

The theme of increasingly close cooperation between the Air Force and NASA was stressed equally by Dr. Seamans who said, "There is a framework of formal and informal channels and joint organizations to ensure a maximum interchange of men, ideas, technology, and hardware. There is extensive cooperation, on a daily basis, in research, exploratory development, aerospace medicine, test programs, and the use of operational support facilities." Dr. Seamans mentioned that "there is a great deal more joint work to be done, for example, in developing and establishing an economic, efficient, and frequent resupply for future manned space stations."

As for cooperation between NASA and USAF in aeronautics, NASA Administrator Dr. Paine urged intensified joint efforts in such areas as the supercritical wing, which is now entering flight stage at the Edwards AFB, Calif., Flight Research Center (see "There's No Substitute for Flight-Testing," by J. S. Butz, AF/SD, Feb. '69, p. 36), V/STOL and STOL research, new materials, and propulsion avionics. The NASA Administrator stressed that the supercritical wing was "perhaps one of the most exciting developments" to come out of the NASA research effort and that initial results were "extremely promising." (The supercritical wing is under consideration for AMSA and may also be incorporated into the F-15 by the airframe competitors.)

Reflecting similar thoughts by the Air Force, Dr. Paine saw the need for a "new look at the desirability

of increased prototype testing. The Russians are using this very successfully, as we used to during World War II. Perhaps we should now be building entirely new airframes and engines as proof-of-concept demonstrations. We, in concert with the Air Force, must use every worthwhile means at our command to maintain American aeronautical preeminence." (The text of Dr. Paine's remarks begins on page 107.)

Change—A Way of Aerospace Life

The expanding horizons of the military in particular, and the aerospace community in general, were highlighted throughout the Convention. General McConnell, who directed his principal Convention speech toward the forthcoming end of his tenure as Chief of Staff of the Air Force, delved into the changes in the relationship between the military and civilian sectors of society that occurred during his career.

The tremendous destructiveness of nuclear weapons, combined with rapid delivery capabilities, have "brought about a profound change in the sometimes



Maj. Gen. William Garland, SAFOI Director, was presented AFA Citation of Honor "for enhancing public understanding of the Air Force mission" by Board Chairman Jess Larson at luncheon honoring the Secretary of the Air Force.

fatalistic attitude toward war as an undesirable but effective alternative to political action of the past," he said. The doctrine that war is a "continuation of politics by other means," as stated by nineteenth-century German General von Clausewitz, is no longer true for the United States, General McConnell said. "War is no longer undertaken independently of other national in-

struments as a continuation of politics, in the sense of von Clausewitz," according to General McConnell, but "rather, it is the measured and sophisticated use of military power in support of political objectives."

This precept, according to General McConnell, requires that the civilian leadership be thoroughly con-
(Continued on following page)

AWARDS AT THE 1969 AIR FORCE ASSOCIATION NATIONAL CONVENTION

AIRPOWER AWARDS

H. H. Arnold Trophy—To Col. Frank Borman, USAF; Capt. James Lovell, USN; and Lt. Col. William Anders, USAF, NASA Manned Spacecraft Center, Houston, Tex., for the historic Apollo-8 spaceflight.

David C. Schilling Trophy—To Capt. Albert R. Kaiser, 6593d Test Squadron (Special), 6594th Test Group, Hickam AFB, Hawaii, for outstanding contribution to the Air Force and the nation for superb airmanship in the aerial recovery of capsules ejected from satellite systems of Air Force research and development programs.

Theodore von Kármán Trophy—To Lt. Col. Harry F. Rizzo, Air Force Weapons Laboratory (AFSC), Kirtland AFB, N. M., for outstanding contribution to the Air Force and the nation in directing nuclear weapons effects research.

Gill Robb Wilson Trophy—To Dr. Edward Welsh, Immediate Past Executive Secretary, National Aeronautics and Space Council, Washington, D. C., for effective articulation of the role of aerospace in modern society.

AIR FORCE ASSOCIATION CITATIONS OF HONOR

Lt. Col. John R. Boyd, Office, Operational Requirements and Development Plans, The Pentagon, Washington, D. C., for pioneering development of air-to-air fighter tactics leading to greater combat capability and improvements in aircraft design.

Maj. Charles Coogan, Directorate of Materiel Management, Hq. Sacramento AMA (AFLC), McClellan AFB, Calif., for development of a system to electronically record on-board radar-scope data, thus improving the combat capability of fighter aircraft.

Maj. Gen. William Garland, Director of Information, Office, Secretary of the Air Force, Washington, D. C., for distinguished leadership in enhancing public understanding of the Air Force mission during a particularly complex and challenging period in the history of military airpower.

Maj. Delbert Jacobs, 4538th Fighter Weapons Squadron (TAC), Nellis AFB, Nev., for initiating and directing development of an electro-optical system for improving significantly the combat effectiveness of fighter aircraft through advanced air-to-air recognition techniques.

Maj. William J. Knight, Air Force Flight Test Center (AFSC), Edwards AFB, Calif., for outstanding contribution in the field of aeronautical research by piloting the X-15 aircraft to a speed of 4,534 mph, the fastest winged flight ever achieved by man.

1st Lt. George B. Pajer, 3535th Air Base Group (ATC), Mather AFB, Calif., for managerial leadership, professional skill, administrative perfection, and outstanding service in all phases of personnel affairs and career control.

Lt. Gen. Samuel C. Phillips, Apollo Program Director, NASA, Washington, D. C., for distinguished leadership and outstanding management in directing the Apollo program to unprecedented achievements in spaceflight.

Maj. Charles M. Summers, Air Command and Staff College (AU), Maxwell AFB, Ala., for repeated demonstrations of leadership, courage, and skill of the highest order during 223 combat missions as a fighter pilot over North and South Vietnam.

Lt. Col. Louis W. Weber, Commander, 453d Combat Crew Training, Special Operations Wing (TAC), England AFB, La., for brilliant leadership in organizing, training, and deploying the squadron that proved in combat the effectiveness of the A-37 as a strike aircraft.

Aerospace Rescue and Recovery Service (MAC), Scott AFB, Ill., for repeated and often hazardous mercy missions, around the clock and around the globe, which give living proof to their motto: "That others may live."

7th Aerial Port Squadron (PACAF), Naha AB, Okinawa, for skillful movement of people and cargo in Southeast Asia, including specialized methods vital to aerial resupply during the siege of Khe Sanh.

57th Fighter Interceptor Squadron (ADC), Keflavik, Iceland, for repeated aerial interceptions and close-range visual identification of potentially hostile aircraft over the North Atlantic under complex and hazardous flying conditions.

804th Security Police Squadron (SAC), Grand Forks AFB, N. D., for professionalism of the highest order achieved through aggressive supervision and training and motivated pride in performance by a unit composed primarily of first-term airmen.

SPECIAL CITATIONS

SSgt. Henry C. Kirk, III, Pararescue Instructor, MAC, Eglin AFB, Fla., named "Distinguished Young Airman of the Year as USAF Outstanding Reenlistee."

Maj. Gen. Robert McCutcheon, Commander, Ogden AMA (AFLC), Hill AFB, Utah, for energetic and outstanding support in behalf of Local and State AFA Units, and dedication to objectives that significantly contributed to the Utah State Organization's being named "AFA Unit of the Year" for 1968.

Maj. Gen. Frank Rouse, Commander, San Antonio AMA (AFLC), Kelly AFB, Tex., for energetic support and efforts in behalf of Local, State, and Regional AFA Units and his inspired cooperation and direction in achieving AFA objectives, which have contributed immeasurably to advancement of aerospace ideals.

Maj. Thomas Seebode, Hq. Tactical Air Command, Langley AFB, Va., for appearances before Local, State, and National AFA Units, and for unselfish dedication to the Air Force and AFA as Chairman of its Junior Officer Advisory Council.

Capt. William Turk, Squadron Officers School, Air University, Maxwell AFB, Ala., for efforts as USAF Assistant Project Officer and USAF Project Officer for many AFA national events, contributing staunch perseverance and unflagging attention to detail.

Lewis E. Turner, Deputy Assistant Secretary (Installations), Office, Secretary of the Air Force, Washington, D. C., for service to USAF, active and Reserve, in timely provisioning of facilities to support mission requirements of a rapidly changing military force.

EARL T. RICKS MEMORIAL TROPHY

Maj. Melvin G. Yen, 154th Fighter Group, Hawaiian ANG, Hickam AFB, Hawaii, for successfully mastering an in-flight emergency.

AIR NATIONAL GUARD UNIT TROPHY

133d Military Airlift Group, Minneapolis-St. Paul International Airport, St. Paul, Minn., named "Outstanding Air National Guard Unit of the Year."

AIR RESERVE UNIT TROPHY

440th Tactical Airlift Wing, Milwaukee, Wis., named "Outstanding Air Force Reserve Unit of the Year."

PRESIDENT'S TROPHY FOR THE AIR FORCE RESERVE

758th Military Airlift Squadron, Pittsburgh, Pa., named "Outstanding Air Reserve Flight Crew of the Year."

The Air Force Association's highest award, the H. H. Arnold Trophy, was presented by President Robert W. Smart to the three crew members of Apollo-8, with AFA Board Chairman Jess Larson, Secretary Seamans, and Gen. J. P. McConnell looking on. Colonel Borman is standing at the extreme left while Lieutenant Colonel Anders and Captain Lovell view trophy held by Mr. Smart.



versant with the nature and capabilities of the military force available to them, and that military leaders "keep themselves informed on all aspects that govern our foreign policy and on the political objectives which their forces are expected to support.

"Since political objectives determine military objectives, military planners must consider every possible contingency that may affect our national interests," he emphasized, adding that, therefore, "our planners must seek to always have the most advanced military forces and materiel in being to meet whatever contingency may arise."

As a result, the task of modern military leaders, who are, in effect, "highly trained and well-educated warfare specialists, [is] to contribute their professional evaluation and recommendations; to carry out decisions of the civilian authorities to the best of their abilities, whether or not such decisions reflect their recommendations; and to maintain a military establishment that is responsive enough and flexible enough at all times to accomplish any task assigned to it."

Because of the coalescence of political and military objectives, General McConnell said, "the role of the military has become many-sided and complex . . . [and] it may be used to deter, to persuade or dissuade, or to carry out a variety of missions, frequently short of actual warfare, which are deemed necessary by our statesmen for the protection of our national interests and of our allies." (*The text of General McConnell's speech begins on page 102.*)

Secretary Seamans addressed the US tendency "to drift into periods of neglected defense," which he linked to the present trend "toward viewing all national questions in the context of the frustrating struggle against aggression in Vietnam. For many," he told the AFA Convention, "it has been difficult to grasp the long-term threat to the United States of that aggression. And when the threat is not clearly understood, the heavy cost in lives and resources is hard to accept. As a result, many of the opinion leaders of our country are turning against military preparedness almost as if

our own military program were the real danger."

Warning that the cost of failure in Vietnam, on the other hand, may result in an immediate nuclear threat to the United States along with military aggression against and elimination of many of its allies, he cited President Nixon's statement that "to all those who would be tempted by weakness, let us not leave doubt that we will be as strong as we need to be for as long as we need to be." As a result of critical attitudes toward the defense sector, and the requirement to deal with domestic needs, the Secretary said, "We [the Air Force and the aerospace community] must be exceptionally capable in discharging this public trust—in fact, obviously and demonstrably so."

Calling for continuously improving efficiency, "credible estimates and plans," and avoidance of "even the appearance of unnecessarily high expenditures," he said "competition resulting in awards, and penalties for failures, and the use of incentive contracts when competitive practices are not possible, will go a long way in helping us achieve our goals." (*The text of Secretary Seamans' speech begins on page 100.*)

The theme of balancing and blending the defense requirements and legitimate domestic needs was accented also by the Association's 1969 Statement of Policy. Calling for a solution of domestic problems in a manner which doesn't weaken the nation's military posture at a time when "the threat to our nation's security [is] greater than ever," AFA's Statement of Policy called for a "long overdue . . . deep and searching reassessment and evaluation of national purposes, priorities, and interests."

Pointing to the pioneering role of the military in the erasure of all forms of discrimination, and the teaching and training of those "whom civil society has discarded as unteachable and unusable," as well as to the unique reservoir of broad skills and resources accumulated by aerospace industry, the Statement of Policy explained: "Taken together, the military-industry team, which protects our national interest against foreign enemies, constitutes at the same time a valu-

able national resource that contributes on an ever-increasing scale to solutions for many of our domestic ills." (*The full text of the AFA Statement of Policy may be found on pages 8 and 9.*)

Man-in-Space Symposium

A pivotal Convention event was the wide-ranging and illuminating seminar on the national space effort involving a unique array of NASA executives. Serving first as speakers, and later, as panelists during the question-and-answer phase, were the recently appointed Administrator of the National Aeronautics and Space Administration, Dr. Thomas O. Paine; the Associate Administrator for Manned Space Flight, Dr. George E. Mueller; the Director of the Apollo Program, Lt. Gen. Samuel C. Phillips; the Director of the Manned Spacecraft Center in Houston, Dr. Robert R. Gilruth; and the Apollo-8 Spacecraft Commander, who now serves as Deputy Director of Flight Crew Operations at the Manned Spacecraft Center, Col. Frank Borman.

Providing a detailed status report on the national space effort, the seminar described also the wide range of benefits attainable through further space exploration in such earthbound disciplines as communications, meteorology, cartography, geology, mineralogy, hydrology, oceanography, and agriculture. Dr. Paine, discussing the earth-application potential of space across the spectrum of man's interests, foresaw "tremendous advancement for mankind in the understanding and management of the total resources of the earth."

Systematic moon explorations, beginning with the emplacement of scientific instruments and culminating in the installation of Antarctic-type permanent bases to permit continuous experimentation and research, were envisioned by the panel. General Phillips, in describing the laser and seismometer instrumentation to be installed during the first moon landing (and to remain operational for a year thereafter), said this will permit precise distance measuring between the earth and the moon, and furnish, for the first time, an exact understanding of the moon's interior.

Dr. Paine, who termed these efforts "really man's conquest of the seventh continent, an area as large as

North and South America," explained that the ten moon flights currently proposed are not enough to furnish all the answers concerning this landmass. He suggested that further efforts be launched as an extension to the Apollo program.

In terms of unmanned space exploration, Dr. Paine described preliminary plans for a "planetary tour," to begin in the 1977 to 1979 time period when "there exists a unique lineup of the planets which won't occur for another 170 years.

"This will permit us to swing in and out of the gravity field of Jupiter, on to Saturn, past Uranus, and out to Neptune." This program, he said, requires a "spacecraft with nuclear power aboard, able to operate for nine years in order to complete the journey and send back the information." NASA, according to Dr. Mueller, expects to start production of the NERVA nuclear engine in 1970 and be able to power the third stage of the vehicle needed for this "grand tour of the planets" by 1977.

Dr. Mueller, stressing the close cooperation and hardware sharing with the Air Force, discussed NASA's plans for the development of space stations and accompanying reusable supply vehicles capable of shuttling from the ground to the orbiting station and back with "a minimum of refurbishing." These vehicles, he said, would eliminate the need for the presently practiced, costly ocean landings. Space stations, once in orbit, he said, are more economical "in terms of miles per gallon than a Volkswagen" and can cover a billion and a half miles a decade.

Colonel Borman discussed the Apollo-8 and -9 missions. He revealed new details concerning the Christmas prayer episode—the reading of Genesis from outer space by the Apollo crew. Aware of the fact that because of the worldwide direct radio and TV coverage "our voices and images would go to more people than had ever simultaneously heard a human voice before," government authorities, nevertheless, left the decision on what to broadcast up to the crew. "I think it was a remarkable testimony that this government, with the largest captive audience in history, chose not to propagandize or gain a political advantage. I was very proud

(Continued on following page)



US Senator Barry Goldwater, AFA Board Chairman Jess Larson, and Secretary of the Air Force Seamans listen attentively while George Hardy, the Air Force Association's new President, elected unanimously by the delegates to the 1969 National Convention, makes his acceptance remarks at the Secretary of the Air Force Luncheon.

The Assistant Secretary of the Air Force for Installations and Logistics, Mr. Robert H. Charles, US Senator Barry Goldwater, AFA Board Chairman Jess Larson, and Secretary of the Air Force Dr. Robert C. Seamans are shown during invocation at the Secretary of the Air Force Luncheon.



of my government indeed," Colonel Borman told the applauding audience.

The seminar was moderated by Roy Neal, an NBC news correspondent. In a brief ceremony at the close of the seminar, General McConnell, on behalf of the President of the United States, presented Distinguished Service Medals to Colonel Borman and Lt. Col. William A. Anders "for exceptional meritorious service in duty of great responsibility as crew members of the Apollo-8 spacecraft." AFA President Robert W. Smart announced that the other Apollo-8 crew member, Capt. James Lovell (USN), had been detained at Cape Kennedy by a test program, and that the planned presentation of his DSM to him by the Chief of Naval Operations, Adm. Thomas H. Moorer, had to be postponed.

Captain Lovell, however, was able to attend the luncheon the next day, honoring the Secretary of the Air Force, at which President Smart presented AFA's highest award, the H. H. Arnold Trophy, to the trio of Apollo-8 crew members for the supreme achievement of breaking "through the most awesome of all known frontiers—that of gravity and outer space—to traverse the 233,000 miles of void that separate the earth from its nearest neighbor, and thereby becoming the first men to step among the stars."

USAF Looks to the Future

Another focal Convention event was an Air Force symposium on Friday, which detailed through formal, illustrated presentations the principal existing and foreseeable threats to the national security of the United States, the translation of these threats into concepts and tactics, and, ultimately, the specific hardware needs that result. Because of the importance of this three-part presentation, it is reprinted in its entirety beginning on page 77.

The question-and-answer phase which followed was moderated by the Chief Counsel, Committee on Armed Services, US House of Representatives, Mr. John R. Blandford. The panelists were Lt. Gen. Glen W. Martin, Deputy Chief of Staff for Plans and Operations; Lt. Gen. Robert G. Ruegg, Deputy Chief of Staff for Systems and Logistics; and Lt. Gen. Marvin L. McNickle, Deputy Chief of Staff for Research and Development.

In a highly informative panel discussion which responded to questions from the audience, the three Deputy Chiefs clarified a number of important issues involving currently pending weapon systems and their priorities. Among them were:

- That contracts on both AMSA and the F-15 were likely to be let late this year or early in 1970, with the F-15 coming first.
- That AMSA, in the view of the Air Force, must have supersonic capability, but that DoD as yet has not officially concurred.
- That the Air Force would, once again, attempt to win approval for the F-12 interceptor program during 1969.
- That the Air Force, on the strength of recommendations by scientific and technical experts, does not plan to develop and deploy a fractional orbit bombardment system (FOBS) at this time because of deficiencies in such a system as far as AF requirements are concerned.
- That Washington speculation to the contrary, the Air Force's F-15 and the Navy's F-14 and F-14B are not competitive with each other, and that there is a distinct, separate requirement for both aircraft—a fact that is acknowledged by both service heads.
- That the F-15 will be more than able to cope with any existing or planned aircraft including those of the F-12 type.
- That the Light Intratheater Transport's final configuration is still under study, and that probably no contracts will be let until next year.
- That the United States could devise means to neutralize and render useless the Soviet ABMs, assuming that the political decision to do so were made.

AFA—Now 100,000 Strong

In his final report to the Association during the Secretary of the Air Force Luncheon, outgoing President Smart was able to announce a significant achievement in terms of membership: AFA now boasts more than 100,000 members.

Mr. Smart explained that "progress can be measured in many ways, but in the last analysis, the single most important element is the number of loyal people who make up AFA. We have, throughout our twenty-three-

year history, shied away from seeking members just for the sake of being able to flaunt cosmic numbers," he said. AFA's membership growth is premised on a renewal rate "that is consistently above eighty percent—the highest of any organization comparable in make-up and mission," Mr. Smart explained.

He announced that this deliberately conservative growth policy notwithstanding, "we reached a milestone shortly before this Convention was convened—we passed the 100,000 mark in card-carrying, dues-paying members." In a surprise move, Mr. Smart then presented 2d Lt. Raleigh A. Sandy, Jr., an OTS graduate on duty at Bergstrom AFB, Tex., as AFA's 100,000th member.

The busy and full agenda of the Convention included a new event, a special Awards Luncheon emceed by President Smart and Chairman of the Board Jess Larson. (See also awards roster on page 95.)

The traditional luncheon honoring the Chief of Staff of the United States Air Force was a fitting backdrop for the presentation of other AFA awards, including a Citation of Honor to Apollo Program Director General Phillips, the David C. Schilling Trophy to Capt. Albert R. Kaiser for high professionalism in the aerial recovery of parachute-suspended capsules ejected from space, and the Theodore von Kármán Trophy to Lt. Col. Harry F. Rizzo for nuclear weapons effects research.

Smoothness and productive content characterized the entire Convention programming, beginning with the opening ceremonies and Convention business session, to the Junior Officers' Conference, the seminars "The Air Force and Its People" and "Single Air Force Team," the Outstanding Airmen's Dinner, the special receptions, the tours of the Manned Spacecraft Center, and the American Fighter Pilots Association Reception and Awards Banquet which featured entertainer Bob Hope and US Senator Barry Goldwater. Convention attendance numbered over 2,500.

Capstone of the Twenty-third Annual Convention of the Air Force Association, and prologue for the coming Association year, were the thoughtful acceptance remarks by AFA's new President, George Hardy, a World War II tailgunner, affiliated with the Association almost since its inception, and its former Chairman of the Board. He said, in part, "I have no illusions about the stewardship over AFA being an easy road to glory in these troubled times. The challenges which confront us, domestically, internationally, in terms of philosophy as much as in specific needs, are towering indeed. But overshadowing the hurdles and the burdens is the fact that at no time has the mission of AFA been more vital, and our job more needed."

The works and spirit of AFA's 1969 National Convention would seem to augur well for the Association's ability to achieve its goals.—END

AFA Honors USAF's Outstanding Airmen

One feature of any AFA Convention is the assembling of USAF's Outstanding Airmen—one man from each major command and separate operating agency. Selection is made by the individual commands, and the broad guideline is that each Outstanding Airman shall have demonstrated "unique, unusual, or outstanding accomplishments within the preceding twelve months."

The twenty-four Outstanding Airmen for 1969 were honored at Houston at a dinner on March 19. Cartoonist Milton Caniff, creator of "Steve Canyon," was master of ceremonies, and the speaker was USAF's Vice Chief of Staff, Gen. John D. Ryan, who commented on the ways advanced technology is changing USAF's manpower requirements. The new Undersecretary of the Air Force, the Hon. John L. McLucas, also made brief remarks.

This year's Outstanding Airmen:

★ SSgt. Malcolm G. Aldridge, Strategic Air Command, Whiteman AFB, Mo.

★ TSgt. Mathew W. Banks, Air Force Reserve (Active Duty), Andrews AFB, Md.

★ TSgt. Louis Benavides, Jr., Tactical Air Command, Forbes AFB, Kan.

★ TSgt. James W. Blee, USAF Security Service, Iraklion Air Station, Crete.

★ A1C David E. Chesnes, Headquarters Command, Andrews AFB, Md.

★ TSgt. Donald L. Crosson, United States Air Forces Southern Command, Howard AFB, Canal Zone.

★ MSgt. Bobby M. Edwards, Aeronautical Chart and Information Center, Molesworth, England.

★ SMSgt. Jack E. Eyster, Air Force Systems Command, Kirtland AFB, N. M.

★ CMSgt. John J. Friel, Jr., Aerospace Defense Command, Ent AFB, Colo.

★ CMSgt. Bobby L. Gonshor, Air Force Reserve (Reservist), Kelly AFB, Tex.

★ CMSgt. John V. Jenkins, Jr., Alaskan Air Command, Elmendorf AFB, Alaska.

★ SMSgt. Douglas W. Johnston, Air Force Data Systems Design Center, Suitland Hall, Md.

★ MSgt. Joe E. Jones, United States Air Force Academy, Air Force Academy, Colo.

★ MSgt. Arnold W. Moulds, Air Force Communications Service, High Wycombe Air Station, England.

★ Sgt. Dannie B. Needham, Pacific Air Forces, Tan Son Nhut Air Base, Vietnam.

★ SMSgt. Earl C. Page, Office of Aerospace Research, L. G. Hanscom Field, Mass.

★ Sgt. Robert W. Patton, United States Air Forces in Europe, Wiesbaden Air Base, Germany.

★ MSgt. Jerry D. Sides, Air University, Gunter AFB, Ala.

★ MSgt. Edwin R. Thurston, Air Reserve Personnel Center, Denver, Colo.

★ TSgt. Garry T. Valentine, Air Force Logistics Command, Tinker AFB, Okla.

★ SMSgt. Freddie J. Walton, Air Training Command, Lowry AFB, Colo.

★ SMSgt. Tim E. Wheeler, Air National Guard, Arizona ANG, Phoenix, Ariz.

★ CMSgt. Livingston J. Williams, Jr., Air Force Accounting and Finance Center, Denver, Colo.

★ TSgt. Richard E. Williamson, Military Airlift Command, Heidelberg, Germany.

Report from Houston

The new Secretary of the Air Force is convinced that the US must have the capability to deal with its domestic needs while maintaining a strong defense posture, and in this, he says, the Air Force and the aerospace community must continuously strive for efficiency. A big help in this effort should be the Secretary's unique technical and managerial background of many years with DoD, the aerospace industry, and as Deputy Administrator of NASA, a factor that also should help realize his prediction of . . .

Continuing Cooperation Between NASA and DoD

BY DR. ROBERT C. SEAMANS, JR.

Secretary of the Air Force

IT IS a pleasure to be with you at this year's Air Force Association Convention. As a preface to my remarks, I would like to repeat the thought expressed yesterday by General McConnell. With military technology and military forces changing drastically in short periods of time, this Association performs a vital service in stimulating discussion about national security problems and publicizing the Air Force role in national defense.

Since I have been Secretary of the Air Force for only a little over one month, I will not speak at length about Air Force problems and accomplishments. I am sure there will be many other occasions, formal and informal, to go into these issues in detail.

Experience shows that there is a tendency to focus primarily on the current environment and current problems, sometimes forgetting lessons learned earlier. This is especially true of our own country, which has a tendency to drift into periods of neglected defenses.

There seems to be a trend toward viewing all national questions in the context of the frustrating struggle against aggression in Vietnam. For many it has been difficult to grasp the long-term threat to the United States of that aggression. And when the threat is not clearly understood, the heavy cost in lives and resources is hard to accept. As a result, many of the opinion leaders of our country are turning against military preparedness almost as if our own military programs were the real danger.

But there is no doubt that, however frustrated we are with the conflict in Vietnam, the cost of failure to provide adequate forces for our security could be infinitely higher than the cost in Southeast Asia. The potential nuclear threat to our country could become immediate indeed, and the long-term effect of less serious military aggressions could eliminate many of our allies if we are not prepared to assist them.

For this reason, we must dedicate ourselves to the goal established by President Nixon in his Inaugural

Address when he said: "... to all those who would be tempted by weakness, let us leave no doubt that we will be as strong as we need to be for as long as we need to be."

I am convinced that in addition to a strong defense posture we must have the capability to deal with our domestic needs.

If we are to do this, if we are to carry out great national goals, we of the Air Force and the aerospace community must do our part with continuously improving efficiency.

We must be exceptionally capable in discharging this public trust—in fact obviously and demonstrably so. As a nation we should never hesitate to spend what is truly needed for defense, but we must avoid even the appearance of unnecessarily high expenditures. We cannot achieve this without credible estimates and plans, and without taking advantage of the inherent strengths of our economic system. Competition resulting in rewards for success, and penalties for failure, and the use of incentive contracts when competitive



Dr. Seamans was born in Salem, Mass., on October 30, 1918. In 1942 he received his M.S. degree and in 1951 his Sc.D. degree from MIT. Dr. Seamans taught and was project manager at MIT for fourteen years, working on aeronautical and aerospace problems. Before joining NASA in 1960 he was Chief Engineer of RCA's Missile Electronics and Controls Division.

practices are not possible, will go a long way in helping us achieve our goals. However, there are no easy answers in providing for national defense. The extremely high level of investment necessary for modern weapons, and the long lead times required for these complex systems, add an almost irreversible finality to decisions that have far-reaching effects. The final costs and the quality of our products will determine to a great degree the kind of support we will receive from Congress and our fellow citizens.

I would like to turn from these basic goals to a most important portion of our national effort, so evident here in Houston. I, of course, share the great pride that all Americans feel in our recent accomplishments in space. I wish to congratulate my former associates in NASA for the flights of Apollo-7, -8, and -9. I particularly congratulate the recipients of the Arnold Trophy—Colonel Borman, Captain Lovell, and Lieutenant Colonel Anders. With the confidence born of excellence, we all look forward to the culmination of this series of flights—the lunar landing and return.

Clearly, there is a continuing requirement to justify our expenditures in space. Those of us who have been involved personally know the relevance and importance of our work. But, as in all national endeavors, we must also realize that necessary support can come only from a public understanding of the great value of these activities.

Man is unique among creatures in that he not only adjusts to his environment, but actually changes it within limits to suit his needs. In doing this, he changes himself by becoming something a little better than he was. Our history is the unfinished story of the realization of our potential as men. As President Kennedy said: "... the power of science and the responsibility of science have offered mankind a new opportunity not only for intellectual growth, but for moral discipline; not only for the acquisition of knowledge, but for the strengthening of our nerve and our will."

But, spiritual growth is possible only when our basic human needs are met. Much remains to be done. We are faced with complex problems of rapidly increasing population, urban congestion, and pollution of our environment. Space research gives us new perspectives and the promise of useful solutions.

There is much, for example, that we must learn about the transmission and absorption of solar energy. The earth is a large heat-exchange engine on which we have absolute dependence and of which we have very limited knowledge, much less control. It is this better understanding of our world that is the goal in the study of the planets in the solar system. Here I would include the obvious first step—our moon. The benefits to be derived are still largely unknown, but after our very first achievements we have already profited in the fields of meteorology, communications, and navigation, and we expect comparative benefits in cartography, geology, hydrology, oceanography, and agriculture.

Our planet is composed of highly competitive nations, some of which strive to preempt activities which can be used to enhance their power and diminish another's. Military force is an important part of any nation's ability to maintain its freedom and indepen-

dence of action. We must achieve a high level of technical capability so that any challenge in space can be met. Already we have enhanced traditional military abilities.

These multiple uses of space that I have briefly outlined are demonstrated by our plans for the Manned Orbiting Laboratory, conceived to enhance our national security, and the more scientifically oriented Apollo Applications Program. Although similar space technology is used in Apollo Applications and the Manned Orbiting Laboratory, there is no unnecessary duplication in the experiments planned. These activities require different equipment, different orbits, and different timing. I believe that any attempt to combine the two programs would jeopardize the returns to each agency and would ultimately increase the cost. There is a distinct need to continue with manned space operations under both military and nonmilitary auspices.

Cooperation between NASA and DoD has been close, and will continue. In addition to the boards and committees that coordinate policy, there is a framework of formal and informal channels and joint organizations to ensure a maximum interchange of men, ideas, technology, and hardware. There is extensive cooperation, on a daily basis, in research, exploratory development, aerospace medicine, test programs, and the use of operational support facilities.

A dramatic example of this cooperation in the past was the use of Air Force-developed Atlas and Titan boosters for NASA's manned Mercury and Gemini programs. For the Air Force's MOL, we will use the NASA Gemini spacecraft and systems similar to those in Apollo. As an example of the interchange in subsystems, the spacesuits for the MOL astronauts are a modified Gemini design which was a direct development of the Air Force spacesuit program for the X-15 and X-20. There is a great deal more joint work to be done, for example, in developing and establishing an economic, efficient, and frequent resupply for future manned space stations.

This close association will continue as the NASA program serves the national goal of space exploration and the Air Force enhances our defense posture.

It became clear to me, while I was helping to manage our space programs, that great benefits are derived from a multidisciplinary approach. Actually, this is true of any complex activity—such as ensuring our national defenses—that requires varied skills and judgments based on quite different experiences. In my past and present contacts with the Air Force as a group, and with particular men I've known, I have found these varied and necessary skills and experiences. I can readily second President Nixon's observation, when he visited the Pentagon last January, that neither the knowledge nor the interests of our men in uniform are limited simply to their military responsibilities.

There are many contributors to national security, and success demands close cooperation. This Convention, this bringing together of agencies, groups, and individuals with disparate tasks and one common goal, helps achieve the necessary partnership. As Secretary, I look forward with confidence and anticipation to working with you on the tasks ahead.—END

Report from Houston

Until recently, it was generally accepted that the singular mission of the armed forces was to fight and win wars when diplomacy failed. That role has changed, however, and now our military establishment "must serve as a responsive, flexible, and precise instrument" of our statesmen in pursuit of the major national goal of world peace. This means that the political and military leaders must have the closest possible rapport. But if this unique partnership is to be effective, defense planners must have at hand the most advanced military forces and materiel in being, if we are to attain . . .

Peace Through Military Strength

BY GEN. JOHN P. MC CONNELL, USAF

Chief of Staff, United States Air Force

THE city of Houston has many distinctions, but to us in the aerospace field it is primarily the home of NASA's Manned Spacecraft Center. Therefore, the choice of Houston as the site of this year's AFA Convention not only gives us the welcome opportunity to enjoy Texas hospitality but also lends emphasis to the growing significance of the nation's space activities.

This emphasis is highlighted further by the presence of the Apollo astronauts at this Convention and by the well-deserved honors accorded to them on this occasion. I am confident that the worldwide acclaim they have received is being matched here at home by increased popular support of our moon program. Of course, there are bound to be exceptions, like the little old lady who reportedly wrote the following letter to one of our top space scientists: "Dear Sir: Why do we have to go to the moon? Why can't we stay on earth and watch television the way the good Lord intended?"

The Air Force is proud indeed of all its people who have contributed, in space and on the ground, to the success of the nation's space effort. Secretary Seamans will talk to you about this effort tomorrow, and his remarks should be of particular interest because of his former association with the National Aeronautics and Space Administration. He has been instrumental in fostering the very gratifying and rewarding cooperation between NASA and the Air Force. I have no doubt that, under his leadership, the Air Force will continue to strengthen its partnership with NASA in the pursuit of the nation's peaceful objectives in space.

But in talking about space travel and moon landings as if these were the most natural things, I can't help reflecting on the tremendous changes I have witnessed in the military during the forty years since I entered

the Military Academy at West Point. I hope you will bear with me for a few moments if I take this occasion to talk to you briefly about some of these changes that impressed me most, because this is the last time I will have the privilege of addressing a National Convention of the Air Force Association as the Chief of Staff of the Air Force.

It is, of course, impossible to cover the impressions of four decades in some ten to fifteen minutes. Moreover, many of you in this audience have witnessed the same developments and events that I have witnessed and doubtless have come to similar conclusions. But I do want to touch on three areas which, in my opinion, are of particular significance to the security and welfare of this country. These areas pertain to the changes in military hardware, the military mission, and military people.

All three areas are closely interrelated because of the fact that the development of nuclear weapons initiated a new era in both military strategy and the



General McConnell was appointed USAF Chief of Staff in February 1965. During WW II, he served in command positions in the China-Burma-India theater, was later named Senior Air Adviser to the Chinese government. In 1962 he was appointed Deputy Commander in Chief, USEUCOM, and later was Vice CINCSAC.

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- ☐ USAF Active Duty
☐ USAF Civilian
☐ Other Active Duty
☐ Other Civilian

Aerospace Industry

- ☐ Manufacturing
☐ Engineering
☐ Commercial
☐ Aviation
☐ General Aviation

**Other Industry
or Business**

Professional

- ☐ Educator
☐ Lawyer
☐ Doctor
☐ Administrator
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use of military power. Our nuclear weapons, in combination with modern delivery vehicles such as the ICBM and the strategic bomber, have given us an unprecedented capability for strategic deterrence and for retaliation, should deterrence fail. But, conversely, the same weapons in the arsenal of a potential aggressor have also exposed us to an unprecedented threat. And, for the first time in its history, this country came to face a military threat that was—and still is—not only ominous in its implications but also global in its scope. All this meant that our military planners and strategists had to go back to their drawing boards and formulate new steps and means for protecting the nation's security.

There is no need for me to recite the long and imposing list of the many other advances in technology that have brought about the incredible expansion in military capability which we—and our opponents—possess today. But there is one thought I want to leave with you, a thought that gives me both much concern and great hope. If I could witness, throughout my military career, the advent of nuclear weapons, ICBMs, supersonic aircraft, and man-made satellites, what miracles of technology are in store for those who are beginning their military careers today?

It is futile to speculate about what those miracles may be, just as I would have never dreamed of the miracles that became stark reality in my lifetime. But I am quite certain that the accelerating pace of technology will result in advances during the next decades that will revolutionize the art and techniques of warfare even more dramatically than have the nuclear bomb and ICBM. For the sake of this nation's security, I hope and pray that our science and industry will succeed in always keeping us ahead in this technological race with the Communist world, as they have to this day.

Turning now to the mission of our armed forces, I see the most significant change in the fact that our military establishment now must serve as a responsive, flexible, and precise instrument to our statesmen in the pursuit of our national objectives. This is a role which is frequently misunderstood and sometimes misinterpreted. Not so long ago, it was generally accepted that nations maintained military forces for one purpose only, and that is to fight and win wars. This was still true throughout the early years of my career, but it is no longer true today, at least as far as this country is concerned.

It must be remembered that, in times of peace, our national objectives used to be entirely political and, in times of war, entirely military. In turn, purely diplomatic means were employed in the pursuit of our political objectives, and only if diplomacy failed did we call on the military to achieve on the battlefield what we could not achieve at the conference table. War, therefore, was in effect a "continuation of politics by other means," as the German strategist von Clausewitz put it so aptly over 150 years ago. But this is no longer the case.

The tremendous destructiveness of nuclear weapons and the incredible rapidity of modern delivery means have brought about a profound change in the sometimes fatalistic attitude toward war as an undesirable

but effective alternative to political action. Provocations and diplomatic failures which, in the past, might have precipitated a major war, today are being met by a unique combination of political and military activities that are designed to achieve our national objectives with minimum and, preferably, no force of arms.

The role of the military in that combination—and I am speaking strictly of the military establishment in this country—has become a many-sided and complex one. In serving to help achieve political objectives, it may be used to deter, to persuade or dissuade, or to carry out a variety of missions, frequently short of actual warfare, which are deemed necessary by our statesmen for the protection of our national interests and those of our allies. Let me cite a few examples to illustrate, first, the peaceful use of military strength in the achievement of political objectives.

Undoubtedly, the most important and demanding task in this respect is to meet the threat of nuclear war. We have been able to deter nuclear war by convincing any potential aggressor that we possess the strategic power to counter a nuclear attack in such a manner as to assure his destruction while limiting the damage to ourselves to the point where we would prevail over him. This unprecedented strategy of deterrence has been successful to this date, and I am hopeful that it will continue to be successful as long as we maintain our strategic power and defenses at an adequate level.

Our military strength also has served successfully in political conflict management by strengthening the hand of our civilian authorities in resolving the crises in Quemoy, Lebanon, and the Dominican Republic which, otherwise, might have sparked open warfare. The great Berlin Airlift, some twenty years ago, is a dramatic example of the extensive use of military facilities and organization in the peaceful resolution of a major political crisis that had ominous implications. And the clear knowledge that we were prepared to employ our full military strength enabled the late President Kennedy to "persuade" Khrushchev to withdraw his missiles from Cuba, thus averting what might have become a major war.

The military contributions which we have made to our alliances have served to maintain a precarious balance of power throughout much of the world. This is especially true for NATO (the North Atlantic Treaty Organization). [In April,] NATO will celebrate its twentieth anniversary, and there can be no doubt that the military strength it represents—primarily because of our participation—has been instrumental in preserving a long, although uneasy, peace in Europe.

But just as we have managed to deter the Soviets from initiating nuclear war, the Soviets know that we will do everything in our power to avoid precipitating such a war. This has encouraged them to support armed aggression at the conventional level, as was the case in Korea and is now the case in Vietnam. In both these cases, treaty obligations and our national interests compelled us to become involved in what the Communists call so euphemistically "Wars of National Liberation." But Korea was the first instance in our history where the goal of our military involvement was no longer total military victory and the enemy's

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surrender, but the achievement of a limited political objective. This is also true in Vietnam today.

Time does not permit me to dwell on the many complexities involved in using military power as a political instrument in a war that may be limited in scope but certainly entails tremendous sacrifices in men and materiel. The point I want to make is that, as far as this country is concerned, war is no longer undertaken independently of other national instruments as a continuation of politics, in the sense of von Clausewitz. Rather, it is the measured and sophisticated use of military power in support of political objectives.

It follows that the civilian authorities responsible for the formulation and conduct of our foreign policy must be thoroughly familiar with the nature and scope of the military capabilities at their disposal if they are to employ them effectively in conjunction with other elements of national influence. In fact, their intimate knowledge of these capabilities has become a major factor in setting political goals and in making certain that the achievement of these goals entails realistic military objectives.

By the same token, military leaders must keep themselves fully informed on all aspects that govern our foreign policy and on the political objectives which their forces are expected to support. Since political objectives determine military objectives, military planners must consider every possible contingency that may affect our national interests. And a point not always fully accepted by the public—our planners must seek to always have the most advanced military forces and materiel in being to meet whatever contingency may arise.

All this requires the closest possible rapport between the nation's policy-makers on one hand and the civilian and military leaders of the armed forces on the other. But this does not mean that military considerations and recommendations carry undue weight in the shaping of our foreign policy, as is sometimes claimed. I explained before why our national leaders seek the advice of their military experts before undertaking political moves requiring the direct or indirect support of military strength. But their final decisions are also based on the advice of experts in all other areas which, in one way or another, are affected by such decisions.

Moreover, it must be realized that formulation of our national policy and strategy is no longer a unilateral process. As affirmed by successive Administrations, our paramount aim is to maintain the security of this country as a sovereign state. Beyond that, our purpose is to help bring about a world environment in which the rule of law is respected and in which other free nations can survive and prosper. This national aim and this global purpose will not change. What will keep changing, however, is our response to unforeseeable events, developments, and actions abroad over which we have no control but which affect our vital interests and, therefore, require instant and appropriate action on our part.

The agonizing task of our national leaders is to arrive at the right decisions for meeting such contingencies. The task of the military is to contribute their professional evaluation and recommendations; to carry out the decisions of the civilian authorities to the best

of their ability, whether or not such decisions reflect their recommendations; and to maintain a military establishment that is responsive and flexible enough at all times to accomplish any task assigned to it.

I am confident that we possess a military establishment today that meets those conditions. The challenge is to keep it that way in the face of the uncertainties and variables of the future. I have no doubt that airpower will contribute an increasing share in that respect. It provides the versatility, instant reaction, and mobility which are the prime prerequisites of a military force that must serve as a potent and effective political instrument regardless of what the demands of the future may entail.

As I indicated earlier, the global and complex threats which this nation is facing call for a military establishment possessing the most advanced and sophisticated equipment our science and industry can provide. But, in turn, this equipment must be operated and maintained by people who are not just soldiers, sailors, and airmen but, in effect, highly trained and well-educated "warfare specialists." It is this combination of superior equipment and people that gives us a capability of sufficient scope, versatility, and quality to meet any military demands across the entire spectrum of warfare. And notwithstanding the fantastic advances in military hardware and the immense expansion of the military mission, the most gratifying change I have witnessed is the dramatic improvement in the quality of the people carrying out that mission.

What impresses me about today's military people is not only the unprecedented level of their education and skills, but their sophistication and the high degree of their mental and moral qualities. As President Nixon said in a recent talk in the Pentagon, "I know that the military man in the United States today is a broad-gauged man. His knowledge is not limited simply, and his interests are not limited simply to the military responsibilities that are his. He knows the world in which we live." And perhaps even more importantly, the performance of our astronauts in space and of our fighting men in Southeast Asia represents what I consider a new order of deliberate courage and selfless devotion.

I have watched members of our armed forces at many of our military installations in this country and all over the world, and I have met and talked with thousands of them in the combat zone during my frequent visits to Southeast Asia. I can best summarize my impressions of them by saying that the professionalism, ingenuity, and dedication of today's military men are unmatched in the history of the world. They truly represent our "ultimate weapon," and this is the one weapon on which we can always rely in safeguarding the security of this country.

In conclusion, I would like to add a personal note. As I approach the end of my tenure as Chief of Staff of the Air Force, I want to express my sincere appreciation to you, the leaders and members of AFA, for the unstinting support you have given to the cause of airpower, to the Air Force, and to me personally. This support, the services you have rendered, and the good fellowship we have shared—for all these I am deeply grateful. I salute AFA for a job well done, a job that serves the best interests of our nation.—END

Report from Houston

Following is a well-rounded summary of the major prospective challenges facing NASA, as visualized by the space agency's new chief, Dr. Thomas O. Paine. The framework for moving ahead is in place, he says, and now the task of NASA, DoD, the Air Force, the President, and the Congress is to make the right decisions and follow through with the needed support to fulfill the promise of . . .

Space and National Security in The Modern World

BY DR. THOMAS O. PAINE

Administrator, National Aeronautics and Space Administration

THE equations of national power in the modern world are extremely complex. But no serious student of the problem of national security in the broadest sense can doubt that the space program of the United States is contributing in a major way to our world position today. The openness of NASA's program has brought home to the people of all nations the nature of our free society, the scientific and technological power of the United States, our governmental and industrial ability to organize and apply this power, and our intention to do so in beneficial ways which do not threaten the security or vital interests of other nations. The lunar voyage of Apollo-8 reminded the entire world of what some had forgotten and others had come to doubt: that the exploration of space is a profoundly moving human experience which people everywhere on earth can share, through the miracle of satellite communications. Christmas 1968 brought to men around the world a sense of participation and triumph in a major achievement of the human race.

Let me acknowledge here the many contributions of the Air Force to our Apollo program, including the initiation of both the F-1 and RL-10 engines. The engines fired in space in Apollo-9 by "Gumdrop" and "Spider" were previously tested at Tullahoma, Tenn.,

by the Air Force's Arnold Engineering Development Center in their large vacuum test chambers. On the other side of the coin, NASA is proud of the contributions our Gemini and Apollo programs have made to the Air Force's Manned Orbiting Laboratory program. The National Aeronautics and Space Act of 1958 wisely provided that activities primarily associated with the defense of the United States, including the research and development needed to make effective provision for the defense of the United States, were the responsibility of the Department of Defense. How-

(Continued on following page)



NASA's space goals for the future, NASA Administrator Dr. Thomas O. Paine told the Air Force Association Convention at Houston, Tex., in March, are of major significance to those charged with US defense. The accompanying article is condensed from his address to the AFA Convention.

ever, our cooperative programs have saved the American taxpayer hundreds of millions of dollars.

Looking ahead now to the next decade, I believe we all agree that the framework for moving forward together is in place, and that the spirit and mechanisms for cooperation are good. The task we all now face—NASA, the Defense Department, and USAF, the President, and the Congress—is to make the right decisions within the framework and to follow through with the support needed to carry the programs to completion. President Nixon recently established a special Task Group to consider the direction the US space program should take in the post-Apollo period. It consists of the Vice President as Chairman, Secretary Seamans representing the Department of Defense, the President's Science Adviser, Dr. DuBridge, and myself. The President has asked each of the members to develop proposed plans and to meet together to prepare for him a coordinated space program proposal. The Task Group is already looking at the immediate critical problems in the space program. Its comprehensive recommendations to the President on the future course of the space program are to be submitted by September 1.

Let me now list briefly for you my present view of NASA's major goals for the next decade, and then explore some of the points of mutual interest to NASA and the Air Force.

- First, we should do all we can to understand and put to early use the promise of space for people here on earth. We should increase our scientific knowledge of the vital earth-sun relationship and study the earth itself from space. We should develop and experiment with new and improved practical applications of satellites, particularly in earth resources. We should continue to foster prompt introduction into the economy of space applications and technology.

- Second, we should follow up the first Apollo landing with a program of manned lunar exploration.

- Third, we should proceed with the development and experimental operation of a permanent US space station in earth orbit.

- Fourth, we should move out steadily in the exploration of deeper space, exploring the planets with unmanned probes, and the sun, stars, and galaxies from orbital observatories outside the atmosphere.

- Fifth, we should provide the technology for developing the full potential of US military and civil aeronautics.

- Sixth, we should maintain a strong momentum of broad technological advance in all aerospace disciplines.

Directly or indirectly, all of these goals are of interest to those charged with our nation's defense, but let us concentrate for the moment on several of particular importance.

Let me say a few words about the space station. Our studies have for some time pointed to the conclusion that the capability for operating a manned space station in earth orbit is the necessary and logical next major step in the development of manned spaceflight. We have come to this position for several reasons.

For one thing, we are impressed with the number

of potentially important future uses for a permanent manned station in a wide variety of fields. For example, we foresee significant uses in biomedical research, in astronomy, in materials research, in scientific observation of the earth and its atmosphere, and in high-energy physics. We also see the capability for very long duration operations in earth orbit as an essential prerequisite to truly extended operations elsewhere in space, such as in a lunar base and, eventually, in manned flight to the planets. Finally, we see the goal of the establishment of a permanent space station in earth orbit, that can evolve and grow by adding modules over a period of many years, as providing a central focus for the next big forward leap in the development of aerospace technology.

Now what is the relevance of this to the future needs and concerns of the Department of Defense and, in particular, the Air Force? This is not a question for me to answer, but it is one that, in my opinion, deserves careful consideration by the responsible officials in the Department of Defense and the Air Force. In my view, it is a question that should not be considered only from the narrow standpoint of specific operational systems requirements that can clearly be established as necessary today. The lead times are too great. The uncertainties as to the future world situation and the precise nature of future defense needs are also too great. I believe that the approach should be to consider carefully what our long-term national security posture would be ten to fifteen years from now if by then the United States has developed a space-station capability and the logistics or "space-shuttle" system necessary to utilize it, and compare this posture to what it might be if we do not then have the capability, and the Soviet Union has developed and is fully utilizing such capability.

I am raising questions and not giving answers, although I am frankly suggesting the direction in which I believe the correct answers lie.

In the months ahead, we in NASA plan to work closely with the Defense establishment to reach a common understanding of the best policy for the United States to follow in this important area. We hope to configure a national program for the development of a permanent space station and a logistic support system in a way that will not only serve the needs and goals of the civilian space program, but will also be capable of supporting future defense research and development requirements as needs become clearly defined. If this approach succeeds, much of the equipment and operational experience in the civilian program would be directly applicable to defense requirements when needed, and costs and lead times for additional development would be limited to those of specialized equipment or modules. This pattern, you will recognize, is closely analogous to the way in which NASA Gemini hardware and experience are being used so effectively in the MOL program. We envision a common NASA-DoD logistics vehicle and launch complex. We both need a reliable, easy, and comparatively inexpensive way to get in and out of space. Between us last year we launched a payload into orbit every five days. Here is a common requirement that we can work toward together.

A substantially lower-cost space transportation system is one of the greatest needs in the entire space program. We need boosters as reliable as those we have now which can carry their payloads at a fraction of present costs. This means a fresh approach to present concepts of boosters and a critical examination of each step in the complex process from the drawing board to the end of the boost operation.

There are two candidates for a low-cost first booster stage—the large solid-propellant motor and the large, simplified liquid engine, sometimes called the “big dumb booster.” Cost analyses, which are not too reliable at this state of the technology, indicate little significant cost difference. The technology for large solid motors, however, as a result of our joint Air Force/NASA program, is probably further along than that of the simple liquid booster.

If it were decided this year to move out strongly in a space-shuttle development project, the system could probably be put into operation before the end of the next decade. And when we get to the point where we can transport passengers and cargo into earth orbit at reasonable prices, a space station will become attractive to a larger number of users, and a large traffic volume generated.

Once up there, a space station is more economical in terms of miles per gallon than even a Volkswagen. Do you really want sustained flight operations? The nonstop range of a space station is 25,000 miles every ninety minutes, 400,000 miles a day, 150 million miles a year, a billion and a half miles a decade. There are no lift-over-drag problems in space; the drag is very low. The space station is the first vehicle that solves the flight endurance problem and gives you a real flight, not just a hop.

There are, of course, many problems to be solved. How do you design for the needed ten-year lifetimes for the basic systems? And equally important, how do you make them last that long without incurring costs of testing and qualification so exorbitant as to make the whole project uneconomical? Of course, you can perform on-board maintenance. The approach of accelerated testing may also help to solve this problem.

Over that long a time period with scientist crews we will probably need artificial gravity. We will need nuclear electric power and improved provisions for food and waste management. There are plenty of questions to answer and new technologies to learn.

Let me say a few words about our joint nuclear programs with the Atomic Energy Commission.

The first logical use of the NERVA engine would be for a third stage to replace the S-IVB stage of Saturn V. It doubles the specific impulse of chemical rockets and doubles the payload. It is most effective for high-velocity missions into deep space and the planets, but would also be useful for boosting a space station into synchronous orbit. We are already in the design stage and are recommending that a flight-weight NERVA engine now be built. It could be ready for a mission by 1977.

We are also working jointly with the AEC on space nuclear electric power generation. Radioisotope electric power systems for twenty-five to sixty-five watts are already being used or planned for flight missions.

Our largest prototype power reactor is SNAP 8, which will generate thirty-five to fifty kilowatts. Possible applications for such a power system include the lunar surface and a space station.

Finally, let me turn to another area in which we have many mutual interests: the field of aviation, where we have been working with the Air Force for almost half a century longer than NASA has been in business—clear back to the beginning of the old National Advisory Committee for Aeronautics. There have

“... I believe that the approach [to planning our space goals] should be to consider carefully what our long-term national security posture would be ten to fifteen years from now . . .”

been many notable US accomplishments in aeronautics as a result of this cooperation, but this is no time for self-congratulation. The best abilities of government, industry, and the universities are needed now to encourage new advances in US civilian and military aeronautical technology. Our joint research programs with the XB-70 and now the YF-12 have been highly productive.

We need an updated US air transport system that can deliver people and cargo much nearer their ultimate destinations than is now possible.

Such a system of air transport must, of course, be closely integrated with modernized ground-based systems. Both air and ground systems require new technology to adequately meet the identified needs of the nation.

NASA is stepping up its pace of work on VTOL and STOL aircraft, with emphasis on greater economy and all-weather operation.

In basic aeronautical design, an extremely promising new breakthrough is the supercritical wing, which we expect can increase the speed and maneuverability of subsonic aircraft much as the famous “Coke-bottle” fuselage design of several years ago did in the case of today’s supersonic aircraft. Both advances were made by Dr. Richard Whitcomb of our Langley Research Center in Virginia.

We need more materials advances—particularly to develop high-temperature capabilities for high-performance engine production. We also need to make better use of our avionics know-how, using in aeronautics some of the techniques we now use successfully in spaceflight.

In my opinion, we need a new look at the desirability of increased prototype testing. The Russians are using this very successfully, as we used to during and after World War II. Perhaps we should now be building entirely new airframes and engines as proof-of-concept demonstrations. We, in concert with the Air Force, must use every worthwhile means at our command to maintain American aeronautics preeminence.—END

Report from Houston

Initiation of an effective bombing campaign against appropriate strategic targets; support for the President's decision to deploy an ABM; expression of gratitude to the Air Force and its personnel in Southeast Asia; commendation for those in the Apollo program; and a call for Presidential action to expedite AMSA contract definition are some of the items making up the list of . . .

AFA's Policy Resolutions for 1969-1970

NO. 1, VIETNAM

WHEREAS, the Air Force Association, in convention assembled, last year pledged its support to the United States commitment in Southeast Asia; and

WHEREAS, the Association at that time recognized both the desire and the responsibility of the President of the United States to seek peace by every honorable means; and

WHEREAS, the Association likewise pointed out that the bombing pause involved grave military risks; and

WHEREAS, North Vietnam has taken full advantage of the bombing pause to strengthen its air defense system and to move, unimpeded, quantities of supplies amounting to a fivefold increase in the southward flow; and

WHEREAS, the enemy, even as he talks peace in Paris, is waging a cruel and violent war in the South and inflicting heavy damage and loss of life on the civilian population, including rocket attacks on refugee villages; and

WHEREAS, the President of the United States has stated that the North Vietnamese attacks constitute a violation of the understanding under which the bombing of North Vietnam was halted and, further, that a continuation of such attacks would bring an appropriate response;

NOW, THEREFORE, BE IT RESOLVED that the Air Force Association supports the President's position and urges that an appropriate response would be the immediate initiation of an *effective* bombing campaign against appropriate *strategic* targets.

NO. 2, ABM DECISION

WHEREAS, on March 14, 1969, President Richard Nixon announced his decision to proceed with development and deployment of a "substantially modified" antiballistic missile program; and

WHEREAS, the President's decision recognized the overriding need to protect the strategic deterrent force as "the best preventive for war"; and

WHEREAS, the President likewise made provision for an

annual review of the ABM program based on three major factors:

(1) Changes in the threat as reflected in intelligence reports,

(2) Impact of the system on possible arms-control talks, and

(3) Changes made possible by the acquisition of technological capabilities;

NOW, THEREFORE, BE IT RESOLVED that the Air Force



The Air Force Association's annual Convention in Houston, Tex., devoted time to two business sessions, which were heavily attended by representatives of state organizations.



Speaker addresses assembled state delegations during one of the business sessions held at the AFA Convention in Houston. At these sessions the Policy Resolutions appearing on these pages were voted upon.

Association supports the President's decision with respect to development and deployment of the ABM system as announced on March 14 and commends him for a prudent and courageous resolution of this important problem.

NO. 3, SOUTHEAST ASIA COMMENDATION

WHEREAS, the ground-support operations of the United States Air Force have contributed immeasurably to the morale and effectiveness of the ground forces in Southeast Asia; and

WHEREAS, United States Air Force pilots have exercised admirable discipline and restraint in avoiding strikes on unassigned targets, regardless of how important and lucrative the target might appear;

NOW, THEREFORE, BE IT RESOLVED that the Air Force Association commends the United States Air Force for its professional and precise performance in Southeast Asia and expresses its gratitude to all personnel who have participated in and contributed to this great effort.

NO. 4, APOLLO

WHEREAS, the year 1969 is the year of Apollo, culmination of man's ancient dream and modern determination to explore his neighbor world, the moon; and

WHEREAS, the Air Force Association is honored to meet for its 23d National Convention in Houston, Tex., home of the National Aeronautics and Space Administration's Manned Spacecraft Center and focal point for the mobilization of the technological and management skills that have brought Apollo from dream to the brink of achievement;

NOW, THEREFORE, BE IT RESOLVED that the Air Force Association, in convention assembled at Houston, commends the leadership and personnel of the National Aeronautics and Space Administration for their monumental contributions to the success of Apollo. In concert with American industry and in cooperation with the Department of Defense, the dedicated men and women of NASA have worked hard and long with great skill to bring Apollo from the drawing board to actuality. They merit the commendation of all Americans.

NO. 5, ADVANCED MANNED STRATEGIC AIRCRAFT

WHEREAS, the Air Force Association has repeatedly urged the development of an advanced manned strategic aircraft to ensure that the United States maintains its strategic capability in the years ahead; and

WHEREAS, under current planning the manned bomber

forces through Fiscal Year 1972 will consist only of B-52G and -H aircraft and the FB-111 aircraft; and

WHEREAS, at that time the B-52 aircraft will be approximately fifteen years of age; and

WHEREAS, the FB-111 aircraft will not be capable of meeting all strategic role requirements; and

WHEREAS, the Joint Chiefs of Staff have recommended that the Secretary of Defense authorize contract definition of an advanced manned strategic aircraft; and

WHEREAS, the Congress authorized and appropriated \$11.8 million in Fiscal Year 1967 so as to permit contract definition of an advanced manned strategic aircraft;

NOW, THEREFORE, BE IT RESOLVED that the Air Force Association urges the President and the Secretary of Defense to expedite action and authorize contract definition of an advanced manned strategic aircraft so as to ensure the continued strategic military superiority of the United States.

NO. 6, ADVANCED FIGHTER AIRCRAFT

WHEREAS, the history of military conflicts has confirmed that superiority in the air is essential to winning on the ground; and

WHEREAS, the Soviet Union has already displayed several new fighter aircraft estimated to have maximum speeds of about 2,000 mph; and

WHEREAS, to gain and maintain air superiority we are currently relying on aircraft which are tailored to interdiction and close-support roles; and

WHEREAS, Air Force officials have proposed the development and production of an advanced fighter, the F-15, for the air-superiority role;

NOW, THEREFORE, BE IT RESOLVED that the Air Force Association urges Congress and the Secretary of Defense to support the development and production of the F-15 advanced air-superiority fighter aircraft as expeditiously as possible, with the goal of having such an aircraft operational in the Air Force inventory early in the 1970s.

NO. 7, MANNED BOMBER FORCE STRUCTURE

WHEREAS, the unqualified success of the B-52 operations in relieving the enemy pressures upon Khe Sanh and in other important ground engagements has earned the respect of all Allied field commanders in Vietnam; and

WHEREAS, the use of strategic bombers in a tactical role will go down in our history as one of the finest examples of the inherent flexibility of airpower; and

(Continued on following page)

WHEREAS, the Air Force has not yet received full authorization to replace its aging B-52 force with FB-111 aircraft, as planned, or to develop and procure an advanced manned strategic aircraft;

NOW, THEREFORE, BE IT RESOLVED that the Air Force Association strongly urges President Nixon, Secretary of Defense Laird, and the Congress to review in depth the manned bomber force requirements with a view to ensuring that this very essential arm of our national defense posture is not degraded or compromised.

NO. 8, MANNED ORBITING LABORATORY

WHEREAS, recent disclosures concerning Soviet space efforts, including their development of a Fractional Orbit Bombardment System, make clear the continuing military content of the Soviet program and underscore the need for the United States to pursue its military space efforts as a matter of national urgency; and

WHEREAS, during the coming year, the Air Force Manned Orbiting Laboratory is scheduled for testing of its major systems components, delivery of flight hardware, and mission training of pilot astronauts in flight simulators;

NOW, THEREFORE, BE IT RESOLVED that the Air Force Association urges Congress and the Department of Defense to continue their support of the Air Force Manned Orbiting Laboratory program as a matter of urgent concern to our national security.

NO. 9, EXCHANGE OF PRISONERS

WHEREAS, in his opening statement on January 25 of this year at the Vietnam peace talks in Paris, Ambassador Henry Cabot Lodge urged the discussion at an early date of arrangements for the prompt release of prisoners of war held by both sides; and

WHEREAS, the exchange of prisoners has benefits to both sides and, therefore, can be a definite and early step in the direction of a negotiated peace settlement;

NOW, THEREFORE, BE IT RESOLVED that the Air Force Association urges the Secretary of State, as this country's agent in our foreign relations, to continue his support of the position on the release of prisoners of war being held by both sides so that they may be reunited at the earliest possible date with their families and loved ones.

NO. 10, SUPERSONIC TRANSPORT

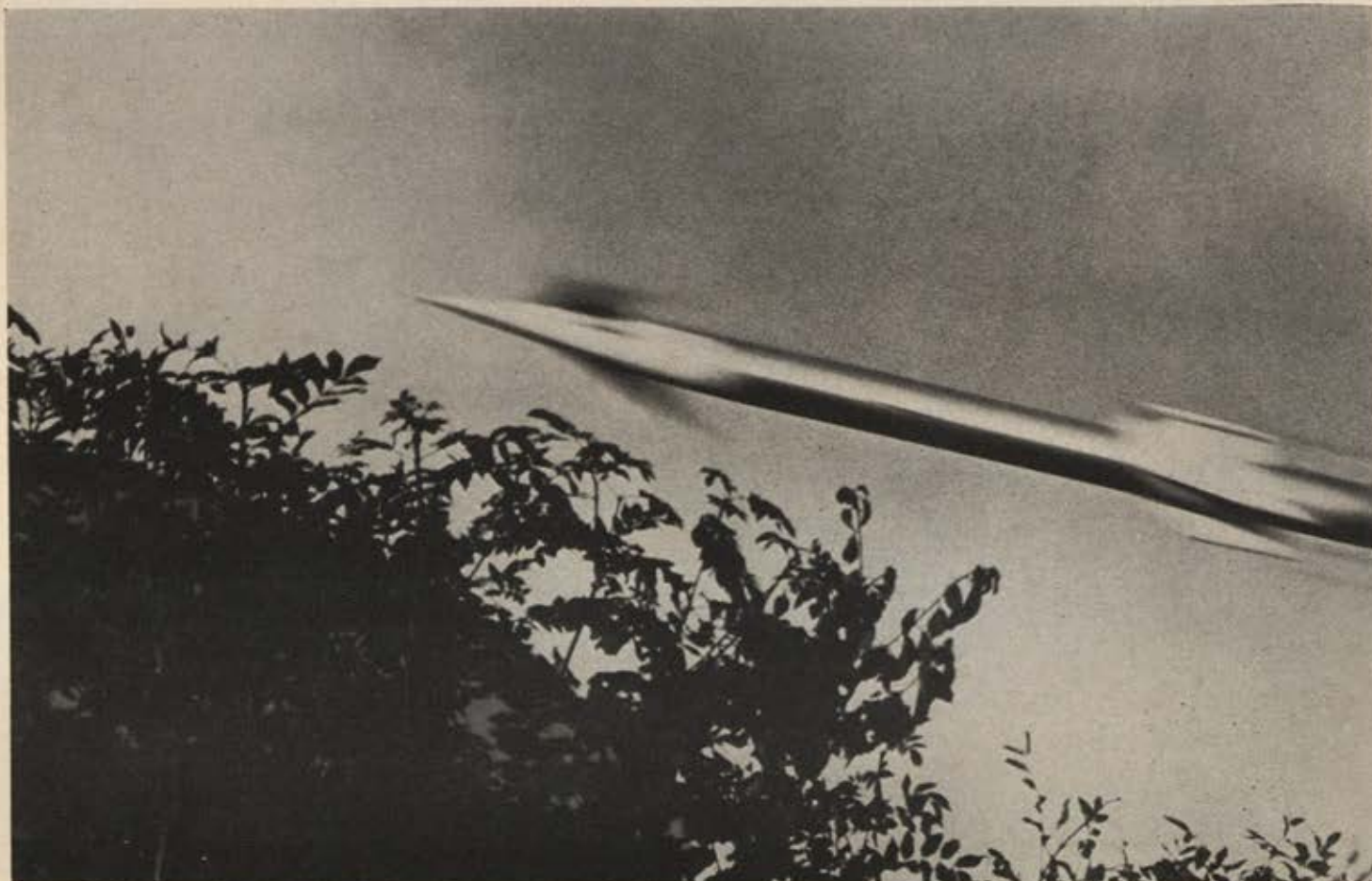
WHEREAS, both the Soviet TU-144 and the British-French Concorde supersonic transports have entered full-scale flight testing; and

WHEREAS, the long-time American preeminence in the world commercial aviation market and aeronautical technology stands in danger of being forfeited unless the United States implements its long-delayed SST development program; and

WHEREAS, the benefits from such a program to the United States are estimated to include a worldwide sales potential of \$20 billion by 1990, as well as direct and indirect advantages to the national security of this country; and

WHEREAS, an impartial commission comprised of 100 government experts, including twenty-six representatives from the Department of the Air Force, and another commission comprised of the technical experts of all major airlines have adjudged the present US SST design feasible and in accord with the government's performance requirements;

NOW, THEREFORE, BE IT RESOLVED that the Air Force Association urges the Administration and the Congress to institute, without further delay, a full-scale American SST prototype construction program leading to an actual pro-



duction aircraft to retain this nation's aeronautical lead in decades to come.

NO. 11, ADVANCED TECHNOLOGY FOR BALLISTIC MISSILE SYSTEMS

WHEREAS, the requirements of Vietnam and other considerations have deferred the start of a new ballistic missile system; and

WHEREAS, such deferral affects state-of-the-art development of certain essential subsystems; and

WHEREAS, further improvements to Minuteman or the initiation of a new missile program which may be required under a new threat can be more rapidly accomplished if the subsystem technology is accomplished now;

NOW, THEREFORE, BE IT RESOLVED that the Air Force Association urges the continuation and expansion of programs in the field of ballistic missile subsystems technology, looking toward continued improvement in the Minuteman weapon system, as well as the development of new ballistic missile systems as required.

NO. 12, AEROSPACE DEFENSE

WHEREAS, the number of intrusions by Soviet Union bomber aircraft into the North American airspace during 1968 was three to four times the number of intrusions during the previous year; and

WHEREAS, the aerospace defense forces of the United States are rapidly falling behind in capability to meet a continually growing requirement; and

WHEREAS, these urgent requirements include an advanced manned interceptor, airborne warning and control system, over-the-horizon/forward and backscatter radars, advanced sensors, space-borne surveillance system, boost

and midcourse destruct antiballistic missile systems, plus a terminal homing interceptor and a direct interceptor system;

NOW, THEREFORE, BE IT RESOLVED that the Air Force Association urges the Department of Defense and the Congress to provide programs and funds adequate to meet the aerospace defense needs of this nation.

NO. 13, SUPPORT OF ROTC PROGRAM

WHEREAS, the primary source of new officers for the active-duty military establishment continues to be the Reserve Officer Training Corps programs on the campuses of the nation; and

WHEREAS, ROTC has become a prime target of disaffected students and faculty in a growing number of colleges and universities; and

WHEREAS, several colleges and universities have taken steps either to downgrade ROTC or to eliminate it altogether; and

WHEREAS, the Air Force Association, through its affiliation with the Arnold Air Society, has consistently supported and endorsed the Air Force ROTC program;

NOW, THEREFORE, BE IT RESOLVED that the Air Force Association reaffirms its support of the AFROTC program in general and supports the current efforts of the Department of Defense and Department of the Air Force leading to improved academic relationships with the colleges and universities where ROTC units are located; and

BE IT FURTHER RESOLVED that the Air Force Association urges the administrations and faculties of these institutions to consider carefully and without prejudice the proposals of the Department of Defense and the Department of the Air Force before taking precipitate action regarding the status of ROTC at their respective institutions.—END

The Equaliser

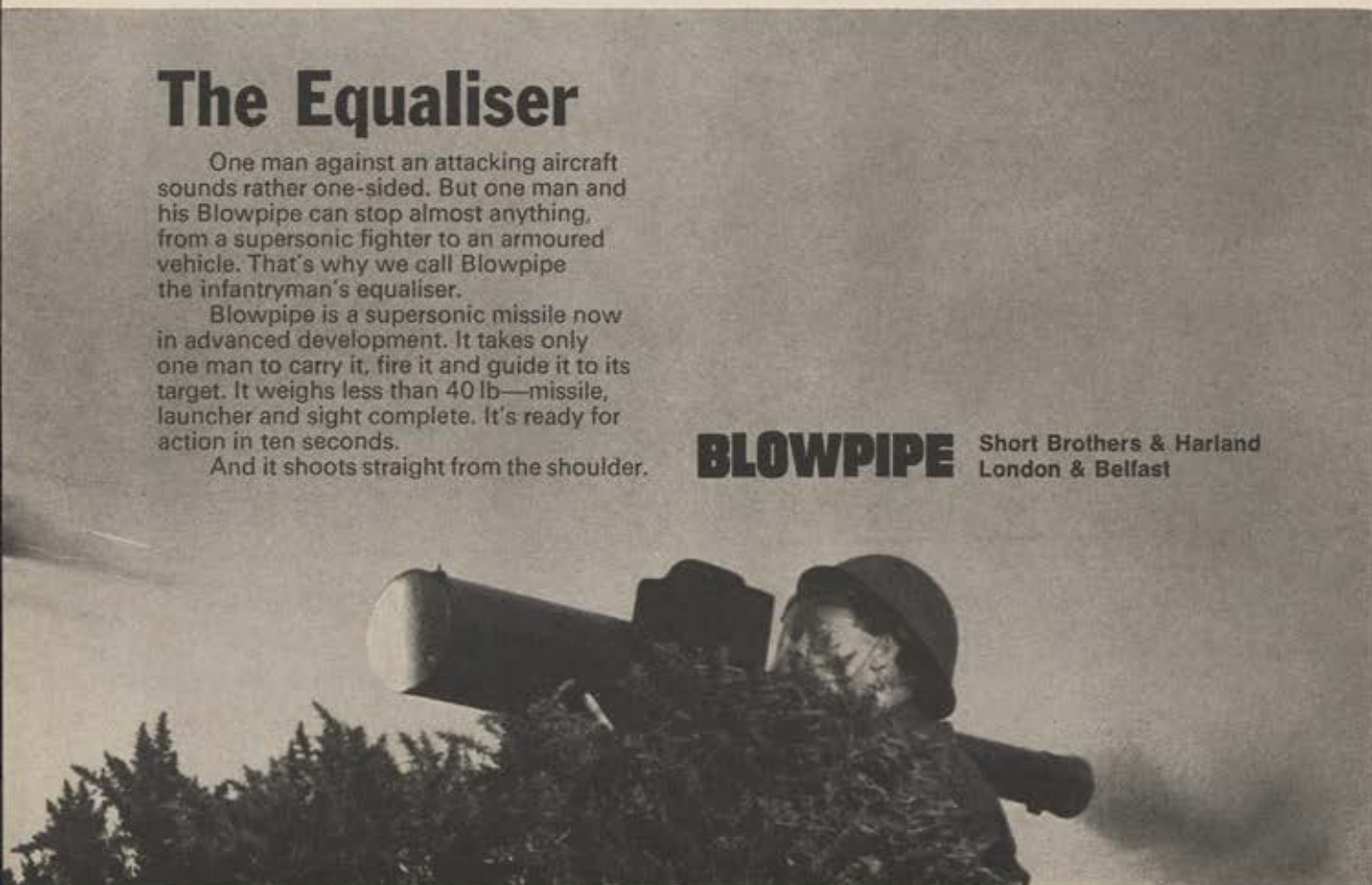
One man against an attacking aircraft sounds rather one-sided. But one man and his Blowpipe can stop almost anything, from a supersonic fighter to an armoured vehicle. That's why we call Blowpipe the infantryman's equaliser.

Blowpipe is a supersonic missile now in advanced development. It takes only one man to carry it, fire it and guide it to its target. It weighs less than 40 lb—missile, launcher and sight complete. It's ready for action in ten seconds.

And it shoots straight from the shoulder.

BLOWPIPE

Short Brothers & Harland
London & Belfast



Report from Houston

Three formal sessions at the AFA Convention offered an encompassing view of matters regarding personnel in the Air Force. The first, a symposium entitled "The Air Force and Its People," witnessed a team of panelists, expert on personnel problems, discussing a wide range of subjects important to the AF's military and civilian personnel alike. Another symposium, labeled "A Single Air Force Team," dealt with Air Reserve and Guard topics. And, at the AFA Junior Officer Council Conference, the service's younger set was represented by sixty officers from all across the country . . .

People: USAF's Most Valuable Asset

BY WILLIAM P. SCHLITZ

News Editor, AIR FORCE/SPACE DIGEST

A HIGH point of the 23d Annual AFA Convention, March 18-21 in Houston, Tex., was a symposium entitled "The Air Force and Its People." Moderating the event was Louis R. Stockstill, an expert on legislation affecting Air Force personnel and a Contributing Editor of AIR FORCE/SPACE DIGEST.

AFA President Robert W. Smart opened the program with praise for Air Force cooperation in arranging the symposium, dedicated to "people in the Air Force."

The symposium's keynote speaker, Gen. John P. McConnell, Air Force Chief of Staff, thanked AFA "for providing us with the opportunity for the exchange of views on the policies which relate to our most important resource—the airmen, the civilians, and the officers who perform our missions." He referred to steps he initiated in May 1965, later known as the Thirteen Point Program, that directed greater emphasis toward the treatment of people in the Air Force. The General said that considerable progress had been made in the program's first general category, the pay and promotion area, and that the second, the self-help area within the Air Force structure, "still demands a greater share of our attention because it involves every one of us." General McConnell said that within the program the "golden rule of leadership" has been adopted, "a rule which would require all supervisors in the Air Force to treat their subordinates" as they themselves would expect to be treated.

Only if we "demonstrate sincere interest in those working" for and with us, he said, "can we expect to increase the attractiveness of service life."

The General said that recommendations on personnel problems he asked for from personnel managers have provided much insight, especially in making assignments to "minimize second involuntary tours in Vietnam."

Hubbell Bill to Revise Pay

Regarding another matter, General McConnell told the seminar "you will undoubtedly hear comments with respect to the so-called 'Hubbell Bill,' so designated because it was the responsibility of Admiral Hubbell—who is with us this afternoon—together with the help of all the services, as well as the interference on some occasions of all the services and a lot of people not in the service—to draft this bill . . . designated 'Modernization of Military Pay Act of 1969.'" (See "Answers to Some of the Tangled Questions About the Hubbell Pay Proposals," by Louis R. Stockstill, March '69, AF/SD, page 50.)

"There has been considerable opposition to the Hubbell Bill. It is my opinion that not very many people understand it and what it provides for," General McConnell said.

"It is now under the consideration of the Secretary of Defense, the Bureau of the Budget, and the President.

"I hope that when you finish this afternoon you will



Symposium panel (left to right): CMSgt. Paul Airey; WAF Deputy Director Joan B. Weeks; Director of Civilian Personnel John A. Watts; Maj. Gen. Robert J. Dixon, Commander, USAF Military Personnel Center; Lt. Gen. J. W. Carpenter, III, Deputy Chief of Staff, Personnel; James P. Goode, Deputy for Personnel Policy, Office of the Secretary of the AF; and panel moderator Louise R. Stockstill.

have an over-all understanding of it because I have been familiar with it ever since Admiral Hubbell first started working on it, and I believe I understand it as well as anybody except him. And I can tell you that it is good for each and every one of us, and it is good for the future of the United States."

Air Force Personnel Managers

The first panelist, James P. Goode, Deputy for Manpower, Personnel, and Organization, Office of the Secretary of the Air Force, said that Air Force personnel managers have done "a magnificent job" over the years "in recruiting, training, and assigning an all-volunteer force to satisfy the constantly changing requirements of our various commands as technological developments necessitate changes in missions, weaponry, and types of skills that must be provided to utilize and maintain extremely complicated equipment."

For the future, Mr. Goode said, "We have a great deal of change occurring, not only in technological developments but also in social welfare programs. We are all aware of the social unrest and racial tensions."

He predicted that the recent change in Administration will not bring about a "retrogression to a previous state of affairs some years back." President Nixon "will be faced with the same problems of the ghetto, urban development, and rehabilitation, social justice for all, and the various legislative and judicial decisions guaranteeing equality of opportunity for all citizens."

"I recommend that as a primary Air Force policy we should assume there will be no change in direction or emphasis of existing programs along these lines."

Concerning the feeling shared by many military men and civilians that the courts have gone too far in protecting the individual against the dictates or the requirements of government and military authority, Mr. Goode said, while they "may be correct in certain respects," in a country that will become increasingly crowded in the future, the individual "will grow increasingly irritated" over interference in his affairs.

"The Supreme Court has been fearful that it is too easy for individual rights to be submerged, and the bigger the government gets and the more authoritative powers given to the governmental officials over the conduct of the life of the individual citizen, the more

he can become lost and have a feeling of desperation.

"I predict that in the future there probably will be more concern in both the legislature and the courts, and possibly the Executive Branch, in preserving individual rights to privacy than there will be in conferring more authority on military commanders or civil police officers," Mr. Goode said.

Mr. Goode also expressed his concern for the young people taken into the military service, and the debt that was owed by society to help make them productive citizens through the help of the training and discipline given them by the military.

He forecast that pressure will be put on the military not only to train and educate the young, but to rehabilitate those who "go wrong or become involved in some character or behavior disorder." Mr. Goode said he anticipated pressure on the military to do more, not less, toward solving society's problems.

USAF's Personnel Policies

Another panelist, Lt. Gen. John W. Carpenter, III, AF Deputy Chief of Staff for Personnel, commented that the Air Force includes civilian employees as well as uniformed officers and airmen. He said that the total annual budget for all AF personnel is "well over \$8 billion"—about one-quarter of the AF budget, "so while people are our most important asset, they are also certainly our most expensive."

General Carpenter discussed AF personnel management in terms of yesterday, today, and tomorrow. He mentioned the savings in money and manpower brought about by the centralization of personnel management that followed World War II. But in meeting

(Continued on following page)



Gen. J. P. McConnell awards Distinguished Flying Cross to Lt. Col. Donn F. Eisele for his Apollo-7 contribution.

the needs of the Air Force, he said, "we began to lose sight of the needs of the individual. Personnel in the field began to show great dissatisfaction with the personnel system we had created and refined." Particularly, younger men were leaving the service in great numbers.

General Carpenter outlined another phenomenon that contributed to the problem of nonretention—the growing competition from industry for the better trained and educated people of the post-World War II period. Another factor in lower manpower retention was that job satisfaction had "clearly become a very important consideration in career progress," on somewhat of a par with pay.

But, he said, in the attempts to solve these problems, it must be kept in mind that in formulating personnel policy "we are constrained by several factors which limit" flexibility, such as budgetary limitations, force structure decisions, executive orders, and the like. But progress is being made, the General said, particularly in the pay area.

As for career progression opportunities, the General said that they are "better now than at any time in recent Air Force history." He mentioned the FY 1970 Officer Promotion Program announced February 19 that is intended to improve promotions in grades and numbers.

The outlook for airmen promotions continues to be similarly favorable, he said, with an additional advance being the "Weighted Airman Promotion System which will provide considerably greater visibility in our airman promotion programs."

General Carpenter referred to the research being done in career motivation. In this area, "The Career Motivation Conferences—the most recent of which was held at Offutt Air Force Base in November—provided us with the opportunity to discuss in depth with the people who are closest to the problem those motivational factors" affecting career decisions. General Carpenter also spoke of four resolutions passed on to him by the AFA Junior Officers Advisory Council: "I assure you they will receive careful study."

As for the future, the need for technically qualified personnel "to man the more complex systems" will not diminish. "Instead, our technical training programs will become even more complex as we keep pace with the advancing technology," he said.

The Assignment Function

The third panelist, Maj. Gen. Robert J. Dixon, Assistant Deputy Chief of Staff and Commander of the USAF Military Personnel Center, on operations at the center, located at Randolph AFB, Tex., commented, "The part of our job you are most interested in . . . is the assignment function." He said, "We assign from Randolph everything from lieutenant colonel on down, and there are 130,000 of them. . . . We also assign some 700,000 airmen. . . ."

"We also act against a changing world—missions changing, missiles changing—and it is a very complex business. We do it, however, with one clear knowledge: We are required to put people where people are needed to do the job the Air Force has to do.



Air Reserve/Guard Symposium panel (left to right): Brig. Gen. I. G. Brown, Assistant Chief (Air), National Guard Bureau; Maj. Gen. Tom E. Marchbanks, Jr., Chief of AFRes; Dr. Theodore C. Marrs, Deputy for Reserve Affairs, Office of AF Secretary; Maj. Gen. J. S. Patton, Military Executive, RFPB; Comoderators Maj. Gen. B. J. Webster and Maj. Gen. R. E. L. Eaton; AF Secretary Seamans.



Dr. Robert Gilruth receiving Outstanding Air Force Services Award from AF Secretary Robert C. Seamans, Jr., on behalf of the Houston-based Manned Spacecraft Center.

"We also are very much aware that the NCOs and officers and their families are people. We are people, and we have sense enough to know what they want. Our problem is to consider people's goals while we meet Air Force requirements."

General Dixon described the use of various media—including regulations, publications, and movies the center makes itself—to keep AF people informed on personnel policy, because "we have found out it isn't what people understand that bothers them; it is what they never heard of that bothers them." He urged that junior officers read the *Officer Career Newsletter*, which the center distributes.

General Dixon said an important step was getting the younger people involved in the personnel management process, such as through participation in the Junior Officer Councils.

"As for enlisted personnel, you can report to us by putting your decisions in the newly expanded assignment preference statement within the personnel data system." In considering assignment preference, "we try our best to get you there but we need to know where you want to go."

For officers there is the new Officer Career Objective Statement, AF Form 90; "This is your way of telling the Air Force assignment people what you want to do in the short term and the long term . . . sit down and plot your career; and that is not an easy task." He said that in the last thirteen months the Career Devel-

opment Division has been in contact with 50,000 officers, as part of a people-contact program.

General Dixon said that the Weighted Airman Promotion System, to be implemented in a year, would allow airmen to know exactly how they stand in the promotion process by their report cards, which will list their skills and other pertinent data.

The General spoke of the use of electronic data processing to predict "where people have to be" a year, and soon two years, in the future. "We are now predicting retirement, deaths, promotions, and all other possibilities . . . with about twice the accuracy" of before. This means, the General said, that if AF personnel inform the center of their career and assignment plans, officers and airmen both will play a much larger role in determining their own futures.

USAF's Civilian Employees

A fourth panelist, the Director of Air Force Civilian Personnel, John A. Watts, discussed the role that 336,000 civilian employees play in Air Force affairs. Occupationally they vary from laborers to scientists, he said.

"Like the military members of the Air Force team," the civilian workers have their "individual aspirations and career needs," Mr. Watts said.

The Air Force recognizes civilian contributions in a program that ranges from letters of commendation from supervisors to cash awards, along with grade salary and advancements, Mr. Watts said.

Through the suggestion program, civilians were paid \$896,000 for the 21,260 suggestions adopted last year.

Procedures allow civilian appeals to go as high as the AF Secretary's office for a final decision, Mr. Watts said.

"The basic compensation and fringe benefits of Air Force civilians follow the civil service-wide principles of comparability of pay with the private sector and equal pay for equal work within the service," with the Air Force supporting both concepts, Mr. Watts said.

Among programs for career management, there is a competitive internal promotion program; civilians can serve at overseas posts with guaranteed employment upon return; and the Air Force sponsors extensive training in various skills and professions. Until recent years, Mr. Watts said, most management and employee training was confined to a particular base and its needs. Now, however, formalized career development programs, service-wide and even DoD-wide, have been established, Mr. Watts said.

As part of a defense-wide program, he said, "any civilian employee who is adversely affected by base closures or reduction in force can register for and get top-priority placement at Air Force installations of his choice."

Women in the Air Force

Another panelist, Deputy Director of Women in the Air Force Lt. Col. Joan Bennett Weeks, commented on women's personnel problems in the Air Force.

Women are not subject to draft pressures, she said, and serve in the armed forces on a purely voluntary basis. For this reason the number of women in the Air



Director D. G. Kadrovach receives AFA Award for Support of Air Force Reserve from Air Force Secretary Seamans on behalf of Houston's Hermann Hospital, cited for the assistance it has given to the Reserve on many occasions.

Force "will be tripled over the next few years." The principal constraint in this expansion, Colonel Weeks said, is not the number or kinds of jobs available for women, but "the ability to recruit and retain the quality we want."

The problem, she said, is that youths today view military service as the symbol of the "establishment"—"bureaucracy and red tape, regimentation, and pressures to conformity and uniformity . . . and of forced labor at that."

A new image of the professional military man and woman is needed, Colonel Weeks said, with those aspects that young people find so offensive played down or eliminated.

Colonel Weeks stressed that pay scales competitive with the civilian world are necessary, as well as attention paid to an individual's needs and aspirations, job equality being part of this from a woman's point of view.

Again concerning women, the Air Force "in recent months opened an entirely new spectrum of jobs previously closed to them . . . a wider range of assignment options. . . ."

"People don't want their careers based on 'chance,'" she said. "They want to know where they are going or expect to go, if they perform well." For example, now people are selected "for our professional schools . . . at the time their records go before the promotion board, and their attendance . . . can be worked around overseas assignments and other controlled tours."

"The computerization of our personnel system lends credence [to a fear of becoming just a number] . . . we recognize that the computer is a very useful tool but the day we take *personal* out of *personnel* we are in trouble . . . we are already finding areas where we have had to go back to hand-massaging personnel actions. So far it is the only way we can keep husbands and wives together if the wife happens to be in the Air Force. So long as the Air Force is willing to make this little special effort, we need never fear that people will become just numbers to us," Colonel Weeks said.

The Problem of Retention

The sixth member of the panel, Chief Master Sergeant of the Air Force Paul W. Airey, based his remarks on the problem of retention. "The Air Force,"
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he said, "has been very, very proud of the fact that fifty-five percent was made up of men and women in their second enlistment who had decided to make a career in the Air Force." But the thousands of non-commissioned officers dating back from Korea to World War II are reaching retirement age, he said.

If this group reaches the thirty-nine-percent level projected for the early '70s, the Sergeant predicted, "the Air Force will not be the same and maybe the United States will not be the same."

To stop this trend, he said, several weeks ago the Top Three Program was established; "We want each of our top-graded 65,000 men to sell one young person on a career in the Air Force; if each could enlist one person, we would have no problem in retention."

Questions From the Audience

At the conclusion of Sergeant Airey's comments, Mr. Stockstill opened the symposium for questions from the audience. The most pertinent follow.

The first question was referred by Mr. Stockstill to Admiral Hubbell, who was in the audience:

Q: What chance does the Hubbell pay bill have if Public Law 90-207 becomes effective first?

ADMIRAL HUBBELL: If Public Law 90-207, which is a twelve-and-one-half percent increase, is effective on the first of July, it means the bill for going to a salaried system will be considerably more than it is right now. My personal estimate is that it would be much more difficult.

Q: General Carpenter, what do you think the increased use of electronic data processing will do to recent personnel management policies that have tended to personalize action?

GENERAL CARPENTER: Well, frankly, I don't think we can implement any of these programs we have been talking about without the computer. By use of the computer we are able to free the assignment specialists from hand-massaging records to allow them to take a look at many more jobs requiring many more people who come out of the machine, and actually come a lot closer to the personnel management that we seek.

Q: Colonel Weeks, are any plans being considered for a women's ROTC program?

COLONEL WEEKS: Yes, there is a plan for women ROTC programs at four colleges commencing in the autumn.

Q: Sergeant Airey, what has been the response of the senior NCOs in regard to the recruitment and retention of NCOs?

SERGEANT AIREY: I have been hearing from senior NCOs from all over the world, and the overwhelming majority of the senior NCOs is behind this program one hundred percent, and they think it is the right way to go.

Q: General Dixon, when will the Air Force change to a nonvoluntary basis for pilots in Southeast Asia?

GENERAL DIXON: Not this year. It depends on our success in getting helicopter and '105 pilots and depends on the conflict over there. Thanks to the computer, and to the people who volunteered to go back a second time, we are going to get through this year.



Maj. Gen. Benjamin J. Webster, the Chairman of AFA's Air National Guard Council, awards the Earl T. Ricks Memorial Trophy to Maj. M. G. Yen of Hawaii's 154th Fighter Group for professionalism in landing a malfunctioning aircraft.

Following this year some helicopter and '105 pilots are going to get to go back and, I might add, some are going back for the third time.

Q: Mr. Goode, aren't you afraid we may be adopting a too-lenient attitude on crime and violence? Doesn't this create more problems than it solves?

MR. GOODE: I certainly didn't mean I was tolerating any breach of military discipline or disorders. I have fully supported military commanders in the field who have not tolerated this and who have eliminated offenders. What I wanted to convey was the size of the problems we are constantly being faced with, the fact the military has superb training structures and has all the facilities society is desperately short of to conduct rehabilitation efforts with individuals who get in trouble. . . . The natural tendency will be to look to the military to perform more salvage of potentially reclaimable individuals—not of those who are beyond the pale.

Q: Mr. Watts, are there any plans to increase assignment mobility of the civilian personnel force, particularly GS-12s and above?

MR. WATTS: Yes, we are studying increased mobility for civilian employees that will be on a voluntary, not a mandatory, basis. However, where a career field indicates the need for mandatory moves, we have approved plans where some civilian employees can be moved on a mandatory basis from one geographical area to another.

Q: Mr. Goode, will family separation allowances be restored to families staying with kin while their spouses are away?

MR. GOODE: We have a bill designed to achieve this, and I am hopeful this will be passed by Congress.

Air Reserve/Guard Seminar

Another important AFA Convention program, the sixteenth consecutive Air Reserve Forces Seminar, also was opened with a few words by President Smart. The symposium was entitled "A Single Air Force Team."



AFA President Robert W. Smart presents Brig. Gen. Joseph J. Lingle, Commander, 440th Tactical Airlift Wing, Wisconsin, with AFA's Outstanding Air Force Reserve Unit Trophy for the best performance of an AF Reserve unit.

Secretary of the Air Force Dr. Robert C. Seamans, Jr., delivered a brief keynote address that paralleled the seminar's theme.

He referred to the country's need for flexibility through such sound resources as technology and people trained to use it. "It seems to me that the Air Reserve Forces are one very important part of this flexibility, this bank of capability that the country needs," he said.

A case in point, the Secretary noted, was the Reserve call-up to stabilize the Korean situation after the *Pueblo* capture since aircraft couldn't be diverted for the purpose from Southeast Asia.

Secretary Seamans said that the Reserves are used not just in crises but regularly carry out airlift, rescue, and air defense missions, thereby adding to the nation's strength even on a nonmobilized basis.

Perhaps most important, the Secretary said, was the role played by Reserve personnel in forming a communications link with their communities that helps to put across the Defense Department's position concerning defense matters.

Following Secretary Seamans' comments, President Smart turned the proceedings over to the two comoderators, Maj. Gen. Benjamin J. Webster, Chairman, Air National Guard Council, AFA; and Maj. Gen. Robert E. L. Eaton, USAF (Ret.), Chairman, Air Reserve Council, AFA.

The first panelist introduced was the executive officer of the Reserve Forces Policy Board, Maj. Gen. John S. Patton. The General, the first Air Force Reserve officer to serve as military executive to the board's chairman, said that the RFPB held its eighty-fifth meeting in February, and that Secretary of Defense Laird and other prominent Defense officials were present.

The twenty-one-member board, he pointed out, is simply advisory now, with "planning programming and other work being given to other agencies." Its mission is to advise the Secretary of Defense on matters pertaining to Reserve components of all the armed forces, he said. Its representatives provide geographic

dispersion that can feed the Secretary grassroots aspects on policy from the field as well as from Washington, the General said.

The board, which by law has a civilian at its head, communicates directly with other agencies, the Military Department, and the appropriate subdivisions on questions of mutual interest, he said, and five duty officers representing the five services meet with the board regularly to further strengthen the communication link. The board's recommendations go through the Assistant Secretary of Defense, Manpower and Reserve Affairs, Mr. Wright T. Kelly, the General explained.

"We also coordinate our efforts with and recognize the agencies outside the defense establishment, one of which is the Air Force Association," General Patton commented.

The board also has an advisory panel on ROTC matters consisting of a chairman and eight other notable educators, most of them college presidents. This panel has explored a number of significant long-range policy issues long before they surfaced, General Patton said, but also an important aspect is its "view from the campus itself."

The board "also has had a hand in a number of key policy issues" such as the problems associated with partial mobilization dating from Korea to Vietnam and "the need for Reserve pilot and observer training programs."

More recently, "the role and readiness of Reservists to participate in civil disturbances and riot control" has been studied, as have the volunteer force concept and its potential impact on Reserves, and the subject of pay, General Patton commented.

Dr. Marrs and the Crystal Ball

The second panelist, Dr. Theodore C. Marrs, Deputy for Reserve Affairs, Office of the Secretary of the Air Force, good-naturedly accepted a crystal ball from the comoderators to assist him in his predictions concerning future Reserve affairs.

"As far as I am concerned, the Air Force is one organization and the Air Reserve Forces, their people and their equipment, are integral parts of a single team," Dr. Marrs declared in his remarks preceding the crystal-ball session. He then went on to list his predictions for the future:

"Prediction one: The total force concept will be applied in all Air Force plans. This total force concept means the concurrent consideration of special and Reserve resources to determine the most effective and economical mix to support the strategy and meet the present needs.

"Prediction two: Guard and Reserve peacetime missions as an adjunct of training will result in continuing manpower and monetary savings.

"Prediction three: Lower peacetime sustaining costs of Guard and Reserve units will be recognized as the means to providing a larger total force at a lower budget than for the same size regular force.

"Prediction four: Operationally capable aircraft in diverse mission areas will be programmed for Air
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Force Reserve and Air National Guard. This will permit responsiveness at high levels for stable contingencies in addition to responsiveness at the initial levels for second contingencies. These first four predictions are pretty general so now I'll get more specific.

"Prediction five: A single Air Force Reserve team is going to be captained by Generals Marchbanks and Anderson.

"Prediction six: We are going to further tighten our participation requirements and place greater emphasis on the service school completion and senior service school completion for promotion to general officer.

"Prediction seven: The Air Staff will recommend another board to reduce strength to required ceilings and that recommendations from the Air Staff will be reviewed by the Air Reserve Force Policy Committee before being implemented.

"Prediction eight: The single Air Force will be improved by the smoother flow of technicians and others to section 8033, 265, and 8496 officers positions, with increased opportunities for career advancement as a result of such flow. The elimination of the requirement for one year of extended active duty before wearing the higher grade would help, and I'd like to predict it—I've been predicting that one for so long that I don't have a lot of confidence in it.

"Prediction nine: Retiring Reservists will soon be allowed to wear their highest Reserve rank during the retirement ceremony.

"Prediction ten: USAFR, after the Air Force Reservist's name, will soon be official. I like that US in there, it sort of fits that one Air Force concept. It's a good idea, and symbols like these are important.

"Prediction eleven: Retention of units will continue. The manpower resource of the Air Force Reserve and the Air National Guard is important. We should replace lesser priority missions for higher priority missions. In the Reserves we move the mission to the manpower resources instead of—as in the active force—moving the manpower resource to the mission.

"Prediction twelve: Higher pay for the Air Force Reserve will come with Guard support.

[There was no prediction thirteen.—Ed.]

"Prediction fourteen: The apparently increased Guard/Reserve appearance on Air University platforms and participation in residence and correspondence courses are increasing the understanding essential to the single Air Force team we are seeking.

"Prediction fifteen: The full protection bill that is to come out of the House during this session of Congress giving, in essence, the same hospitalization and other benefits to Reservists who have less than thirty days' tours as now enjoyed by Reservists on tours of more than thirty days. It will also provide, as a result of the efforts of some friends in the House Armed Services Committee, military fringe benefits to survivors of Reservists whose deaths result from disease or injury incurred while on training duty status."

Air Reserve Planning

The third member of the panel, Maj. Gen. Tom E. Marchbanks, Jr., Chief of the Air Force Reserve, said the plan for the Air Force Reserves had been refined



Lt. Col. Robert E. Leighton, Commander of the 133d Military Airlift Group, Minnesota, says a few words of appreciation on award of the Air Force Association's Outstanding Air National Guard Unit Trophy by President Smart.

and would be presented to the Chief of Staff June 15. What would probably happen, he said, was that the region structure would be reduced in number to three, with each region headquarters becoming more of an integral part of the management structure. This should improve the management system, the General said. Announcement has been made that the fourth region will be relocated from Randolph AFB, Tex., to Ellington AFB, near Houston, Tex.

"Headquarters of the Air Force Reserve and AFTOR have been welded into a team, and we're working together now," he said. "We find that there are many things that we can do together that we couldn't have done separately."

General Marchbanks outlined briefly the future prospects for and problems of the Air Reserve. One major problem—equipment—will have to wait until termination or down-phasing of the Southeast Asia conflict; "We will fly anything in the Air Force Reserve. Equipment is not important; people are," he said.

The General mentioned a study to be completed by April 15 of the Individual Mobilization Augmentee Program, "probably one of the most important studies we have ever undertaken."

The officer said that a recent trip to Europe to visit the Pueblo-mobilized personnel there was very enlightening. "Their attitude is terrific," he said. The General plans to visit the 71st Gunship Unit stationed in Southeast Asia in May.

"All of these things only point out to me what you already know. We've never had a major emergency in this country where the Air Reserve Forces were not used and we never will have. So we've got to—in face of every obstacle whether it be equipment or just opposition—do what we know is right and build this machine that will be available when the time comes."

The panel's anchor man, Brig. Gen. I. G. Brown, Assistant Chief (Air), National Guard Bureau, outlined

Guard activities in 1968 and commented on the future and the total force concept as it will affect the Guard.

He said that of the fourteen Guard units mobilized early in the year, four F-100 groups entered combat in Vietnam, and other units served in Japan and Korea.

General Brown stressed that in the world we know today no organization can survive unless it is flexible and vital, and what worked in such past emergencies as the Cuban crisis probably wouldn't in the future.

He said that early in the Southeast Asia buildup it was decided that Air Guard and Reserve units would not be called up but the armed forces would be increased in size from stepped-up enlistments and increased draft calls. Later the Reserve Forces were strengthened at home without mobilization, and responded when the call-up came with "absolutely no delay in top capability" while the mobilized non-beefed-up units "were not as ready as they could have been or should have been. This differential lesson was well demonstrated at all levels in the defense structure," and should "ensure full consideration of the resource priorities when the dollars are distributed under the total Air Force concept," General Brown said.

Despite the confusion created by the mobilization and "the few protests that were made, our people performed well," and that will do much "to erase the sour image a few of our protesters created." For the future, the officer said, a strong recruitment program will be necessary to replace those who have fulfilled their military commitment and chosen not to remain in Guard or Reserve status following deactivation this summer. "We will need to use every method that we can determine to attract and keep the young man with the skills to fly and maintain modern aircraft inventory," he said.

Questions and Answers

A question-and-answer period followed the conclusion of General Brown's remarks. Below are those of most interest, synopsisized because of space limitations.

Q: General Patton, what are some of the more important issues that may impact the Reserve Forces which you see coming up in the next year?

In reply the General said that in his estimation the principal one was the volunteer force concept because "a lot of other problems fold into it." Both a Presidential commission and studies in DoD will be directed toward a variety of subjects involved with a volunteer force and relevant to the Reserve role, such as requirements, utilization of Reserve Forces, morale, pay, with a short-term goal being correction of inequities in the draft, based on the assumption it will be maintained, and the long-term aim of considering achievement of an all-volunteer force.

Q: Dr. Marrs, you have been working under Public Law 90-168, "The Reserve Bill of Rights," for about a year now. What changes or additions would you make in it?

DR. MARRS: "I think it is good the way it is." Of the other legislation to be up before the next congressional session, he said, there is that dealing with after-death benefits for Reservists' families and equipping Reserve Forces. The equipping part Dr. Marrs would like to

see made stronger, "getting into something we could really call modernization."

Q: General Brown, the Air National Guard pilot trainee goes to pilot school as second lieutenant with minimum officer training. He is competing with academy graduates, AFROTC, and OTS graduates. Can't we make OTS a mandatory part of the pilot program with completion of OTS required before starting pilot training?

GENERAL BROWN: "We are in the process now of following a directive establishing new criteria" for Guard officers, particularly in the educational area. "I think this will satisfy your claim."

Q: General Marchbanks, to what extent is the RAND Reserve roles-and-missions study being used in Air Force Reserve program planning?

GENERAL MARCHBANKS: "The RAND study has really come into its own, and what it has said is a definition of the total force concept." There has to be, he said, "some combination of men, money, and equipment to meet the threat." In light of the total force concept, we have to get away from the feeling that what is given the Reserve Forces is taken from the active, he said. "I think the RAND study will be the most important guide in this atmosphere on money, men, and equipment."

Q: General Webster, what is the future of the ROTC?

In his answer the General stressed the importance of ROTC graduates to all the services and that "we are going to see this through and emerge stronger." The key point, he said, is getting recognition for the military as a profession. A selling job has to be done, particularly at the graduate student level—those who are going into the faculty and have never been in the service.

DR. MARRS: (replying to the same question): "Most of the universities in this country are well satisfied with the Air Force ROTC curriculum and intend to keep it on the campus." In some universities where the dissident element of the faculty combines with the student members "who objectively want to improve curriculum, we're put at a distinct disadvantage."

But just like any other disruption of the system, "you can use it to your advantage and come out with a better system." Many college presidents are "quite interested, as interested as we are, in doing something about the problem" of the application of academic credit for ROTC courses.

Q: General Marchbanks, what are you going to do about the second generation of Reserve leadership?

GENERAL MARCHBANKS: "The leadership is going to leave us all at once," and a major concern is the leadership gap that will be left when this occurs. "We've got to get some of our younger people in the leadership area." He said Dr. Marrs has asked the Air Staff to undertake a study of the problem with a view to developing a program to train young leaders.

Junior Officer Conference

For the first time at an Air Force Association Convention the service's younger set was represented
(Continued on following page)



After being briefed on a number of subjects important to them, members attending the first annual Convention AFA Junior Officer Council Conference broke up into several workshops such as this to discuss their recommendations.

formally at an AFA Junior Officer Council Conference attended by some sixty officers from all across the country.

The day-long conference was broken into two segments—a lengthy morning session that consisted of a series of briefings by senior officer specialists on subjects of interest to Council members and young officers in general and an afternoon workshop session for which those attending were divided into six panels to discuss various aspects of service life important to them. At the conclusion of the workshop session, the panelists offered recommendations that will be “submitted for consideration by appropriate agencies on the Air Staff” on nineteen of the subjects discussed.

During the morning briefings the young officers—several WAF officers attended—were told that they could play an important part in helping to increase the airman reenlistment rate by showing a sincere interest in individual airmen they deal with in face-to-face contacts. It was also mentioned that, through the young officers’ example and personal relationships with airmen, they “could motivate a dedicated force regardless of the length of term” of enlistments.

Officer retention also received special emphasis during the briefing session. The junior officers were informed that one of the major factors contributing to officer nonretention was the lack of career development control, but that it was up to the young officers to plot their careers and work with the personnel center through the career management program.

The subjects of officer force management and active-duty service commitments were gone into in considerable detail during the briefings. It was noted that because of the pilot and navigator shortage, brought about by the war in Vietnam and Air Force commitments on a global basis, fighter pilots now found themselves flying transports and other aircraft while other pilots were being trained to fly fighters. This was necessary, the junior officers were told, to put equity into the combat duty in Vietnam and get the most mileage out of the available pilot force, since pilot production was not sufficient to fill all the slots. It was pointed out that those responsible for Air Force personnel management liked the idea of pilots capable of flying a mix of aircraft types, a view not universally shared.

The Air Force’s officer promotion and career selection policies were outlined for the junior officers along with trends predicted for the future in both those areas. One point highlighted was that young officers seeking careers in the support areas could be optimistic about the future since it was anticipated there would be plenty of room at the top in the support field.

In its recommendations, the Junior Officer Conference said “it appreciates the unique opportunity to express its views and make recommendations in all areas of concern to all Air Force personnel” and called for the Junior Officer Conference to be instituted as an annual AFA Convention event lasting two days “so that more time may be devoted to the highly complex subjects involved.”

The Conference recommended that the JOC involve itself more aggressively in airman programs through the NCO/Airman Council and in community activities through officer membership and participation.

The Conference said that “the advancement of outstanding officers by means of secondary zone promotions is one way of enhancing officer prestige” and the percentage of such promotions should be increased.

The junior officers also called for the establishment of a seminar program for the Air Command and Staff College similar to the Air War College Seminar Program, and the establishment of a senior level NCO Professional Military Education Program at the AU.

In its recommendations on promotion policy the conference said that provisions should “be made to provide each officer with an accurate appraisal of his future in the Air Force with regard to future promotions and a regular appointment. This should occur between the six- and seven-year point” and could be accomplished with computer use, “comparing the officer with his peers.”

The junior officers recommended that the Air Force discontinue the “up or out” facet of the promotion system and “permit those officers who twice fail temporary promotions to remain on active duty” to meet Air Force needs but should not be considered for temporary promotion after the second passover.

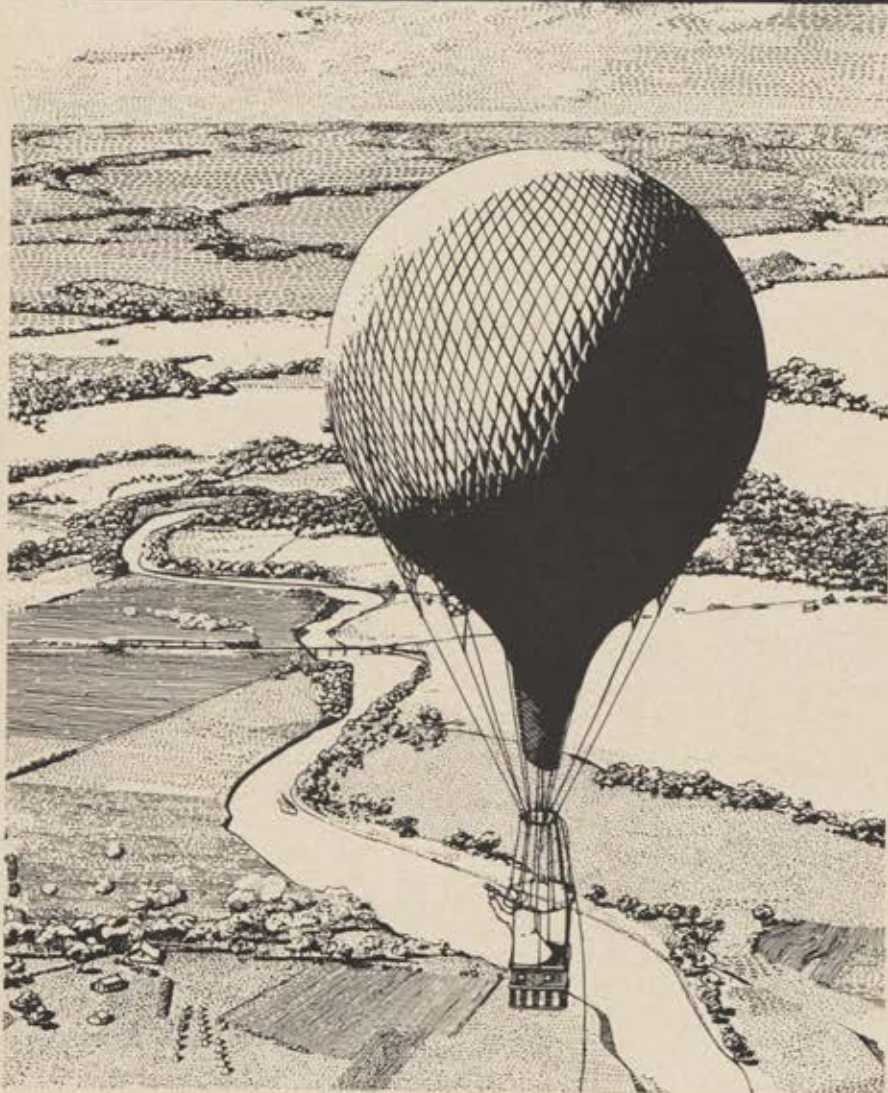
The Conference asked for “resumption of the Warrant Officer program or any other suitable means of contracting for a job to be done in the Air Force,” because it is losing too many good engineers, scientists, pilots, etc., by trying to move them into management positions for which they are not suited.

The young officers asked that “administrative controls be applied to limit the maximum number of days TDY or alert incurred by an officer in any one year” because of family separation problems.

The Conference suggested that it would be to the good of the service if a limited number of officers were allowed to develop expertise in narrow fields, and recommended that an assignment program “be developed to identify the specialist and retain him in his specialty.”

It was also recommended that officers assigned to missile operations be removed from missile launch duty upon completion of three years’ combat-ready time, “and where possible, be assigned to their requested specialty area,” except for those seeking degrees in the Minuteman Education Program.—END

A Page From The History of Surveillance



Using his balloon, "Great Western," in which he had been making exhibition flights, T. S. Lowe joined the Union forces as the first military balloon observer in the United States. In this capacity he reconnoitered enemy positions and aided artillery in directing its fire. Lowe later became one of the nation's outstanding astronomers as head of Lowe's Observatory in California.

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Report from Houston

At the Convention marking the twenty-third anniversary of the Air Force Association, the delegates adopted a strong Statement of Policy on common defense and domestic tranquillity, honored outstanding leaders of AFA, the Air Force, and NASA, and celebrated the breaking of the 100,000-member barrier . . .

Delegates Chart AFA's Future

BY DON STEELE

AIR FORCE/SPACE DIGEST Editor for AFA Affairs

IN THE wake of Apollo-9's brilliant mission into the realms of space, AFA's Twenty-third National Convention got under way in Houston, Tex.—space capital of the world—to chart the Association's future course and to honor those individuals and units who made outstanding contributions to AFA, to the Air Force, and to the United States during 1968.

While 1968 was a highly successful and effective year for AFA—with membership soaring to almost 100,000—the continuation of the war in Vietnam, the "Peacenik" movement, the campus revolts, and the other civil disturbances were all clear indications to the delegates that the year ahead would test the Association—and the nation—more than ever before.

With this in mind, the delegates adopted a strong annual Statement of Policy that rejects any philosophy that common defense and domestic tranquillity are incompatible, or that the one can be achieved only at the expense of the other (see pp. 8 and 9 for text).

The Convention's Opening Ceremonies began with music by the Bagpipers from the 581st Air Force Band, Robins AFB, Ga., and the posting of the colors by the color guard from the 2578th Air Base Group at Ellington AFB, Tex. The Rev. Henry J. McNulty, C.S.Sp., AFA's National Chaplain, delivered the invocation.

Lt. Col. Stephen E. Harrison, a staff officer in the Office of the Director of Operations, Office of the Deputy Chief of Staff/Plans and Operations, Hq. USAF, delivered the keynote address. In his address, Colonel Harrison, who sometimes is referred to as "the Will Rogers of the Air Force," spoke on "The Challenge of Change," and cited the many and varied AFA programs designed to meet this challenge.

Remarks of welcome were made on behalf of the host State and Chapter by Texas AFA President Ben Griffith, and Houston Chapter President Dan McKee, and on behalf of the military by Brig. Gen. Russell F. Gustke, Commander, 446th Tactical Airlift Wing at Ellington AFB. Other head table guests included the Hon. Dudley Sharp, a former Secretary of the Air Force; AFA Board Chairman Jess Larson; and Jack B. Gross and Glenn D. Mishler, AFA National Treasurer and Secretary, respectively.

During the program, seventy-eight individuals and/or units were recognized for their efforts in behalf of the Association's mission and membership objectives (see complete list on pp. 126 and 127).

In recognition of her dynamic, effective, and dedicated

efforts as an elected Chapter President, Marjorie O. Hunt, President of AFA's Mount Clemens Chapter, Mich., received the President's Trophy designating her "AFA's Woman of the Year," the first time in AFA's twenty-three-year history that the trophy has gone to a woman.

For stimulating enthusiastic public support of US aerospace power and the United States Air Force through continuous and excellent statewide programs which mobilized public interest in all facets of the Air Force and attracted the participation of ranking state officials, including the Governor as well as top leaders of industry and the Air Force, the President's Trophy to "AFA's Unit of the Year" went to the Utah State Organization and was accepted by Jack Price, Utah AFA President. Before the presentation of the trophy, a film entitled "Project Navajo" was shown. This film documents one of the Utah AFA's community service programs and received wide TV coverage in Utah and the surrounding states.

Jess Larson, Chairman of AFA's Board of Directors, presented President Smart AFA Gold Life Member Card No. 8, AFA's highest "Family Award." He also presented President Smart a compact portable television set on behalf of the membership in appreciation of his outstanding leadership during the past two years. Mr. Price, for his part, presented President Smart the Utah AFA's coveted "Order of the Big Belt," only six of which had previously been presented.

Participants in the USAF Memorial Service, held just prior to the Opening Ceremonies, included: Chaplain (Col.) Weldon B. Morton, Wing Chaplain, 446th Tactical Airlift Wing, and Chaplain (Capt.) Melvin T. Sims, Base Chaplain, both from Ellington AFB; Chaplain (Col.) John F. Graf, Office, Chief of Chaplains, USAF, Washington, D. C.; Chaplain (Lt. Col.) C. J. Hinckley, Deputy Command Chaplain, Hq. Air Force Reserve, Robins AFB, Ga.; and the Houston Baptist College Singers under the direction of Paul Green.

First Business Session

The following morning, delegates from thirty-five states and the District of Columbia assembled for the first Business Session of the Convention. In addition to adopting the annual Statement of Policy as recommended by the Board of Directors, the delegates adopted thirteen policy resolutions (see page 110), twelve resolutions dealing with military and civilian personnel matters, and one resolution dealing with support of the Air Force Museum. Dele-

gates were pleased that a resolution dealing with the restriction on overseas space available travel of uniformed personnel did not require action because Secretary of Defense Melvin R. Laird had just announced lifting of the restriction.

Resolutions dealing with military and civilian personnel matters urged that:

- * The Department of Defense lift restrictions on recruiting nonprior-service physicians for Reserve units;

- * The United States Code be amended to provide equality of treatment for married female members of the military and Civil Service in the area of survivor's benefits;

- * The Department of Defense and the Congress establish a realistic military construction program based on the mission needs of the services, necessary replacement of facilities, and truly economical management;

- * The Department of Defense submit, and the Congress enact, legislation which would permit early Reserve retirement on a reduced annuity basis;

- * The Secretary of Defense submit, and the Congress enact, an appropriate amendment to the Reserve Forces Bill of Rights and Vitalization Act to provide a separate Reserve budget for the Office of Air Force Reserve;

- * Congress enact legislation to provide that all federal pay of members of the armed forces in a missing or captured status be exempted from federal income taxes;

- * The legislation be amended to lift restrictions on Civil Service employment on those programs vital for the national defense and security;

- * An Armed Forces Medical Academy be established;

- * The Department of Defense seek legislation that would provide an accelerated promotion program for Reserve medical officers comparable to that in effect for the active forces;

- * The Congress enact legislation that would authorize

an Assistant Secretary of Defense for Health Affairs;

- * The Civil Service Commission study the desirability of legislation to authorize the heads of agencies to (1) initiate retirement action for all eligible employees, and (2) reassign, with his consent, an employee eligible for retirement to a less demanding, lower grade position without any resultant salary differential.

Another resolution urges AFA members to support the Air Force Museum national fund drive, when it is officially announced, and encourages the Secretary of the Air Force to publicize the Air Force Museum through all Air Force publications and at all Air Force bases.

Continuing Resolutions

The delegates renewed the following continuing resolutions of the Association:

- * An increase in military housing;

- * That military pay be at least comparable to Civil Service;

- * An increase in the number of Air Force General Officers be authorized;

- * Continue support of the Air Force Village;

- * Recomputation of retired pay based on active-duty pay scales;

- * Legislation to equalize military and Civil Service movement allowances;

- * A dental care program for military dependents;

- * An increase in domestic per diem rates for both civilian employees and military personnel;

- * Provide a medical scholarship program to provide the greatest possible number of physicians for the AF;

- * Authorize enlisted retirees to credit nonactive-duty Reserve time for retirement purposes in the same manner

(Continued on following page)

AIR FORCE ASSOCIATION'S NEW LEADERS FOR 1969-70

SECRETARY

*Glenn D. Mishler
Akron, Ohio

PRESIDENT

George D. Hardy
Hyattsville, Md.

TREASURER

*Jack B. Gross
Harrisburg, Pa.

REGIONAL VICE PRESIDENTS

Central East Region
A. Paul Fonda
Washington, D. C.

South Central Region
*Jack T. Gilstrap
Huntsville, Ala.

Midwest Region
O. Earl Wilson
St. Louis, Mo.

Southeast Region
Lester C. Curl
Melbourne Beach, Fla.

New England Region
Edward T. Nedder
Hyde Park, Mass.

Rocky Mountain Region
Nolan Manfull
Roy, Utah

Great Lakes Region
*W. M. Whitney, Jr.
Detroit, Mich.

Northwest Region
Clair G. Whitney
Bellevue, Wash.

Far West Region
*Will H. Bergstrom
Colusa, Calif.

North Central Region
*Dick Palen
Edina, Minn.

Southwest Region
Sam E. Keith, Jr.
Fort Worth, Tex.

Northeast Region
John G. Brosky
Pittsburgh, Pa.

NATIONAL DIRECTORS

*Chairman of the Board—Jess Larson, Washington, D. C.

Martin H. Harris
Winter Park, Fla.

**John P. Henebry
Kenilworth, Ill.

*Joseph L. Hodges
South Boston, Va.

**Robert S. Johnson
Woodbury, N. Y.

**Arthur F. Kelly
Los Angeles, Calif.

**George C. Kenney
New York, N. Y.

*Maxwell A. Kriandler
New York, N. Y.

**Thomas G. Lanphier, Jr.
La Jolla, Calif.

**Curtis E. LeMay
Bel Air, Calif.

*Joseph J. Lingle
Milwaukee, Wis.

**Carl J. Long
Pittsburgh, Pa.

**Howard T. Markey
Chicago, Ill.

Nathan H. Mazer
Roy, Utah

**J. B. Montgomery
Tulsa, Okla.

Warren B. Murphy
Boise, Idaho

*Martin M. Ostrow
Beverly Hills, Calif.

*Earle N. Parker
Fort Worth, Tex.

**Julian B. Rosenthal
New York, N. Y.

**Peter J. Schenk
Arlington, Va.

*Joe L. Shesid
Fort Worth, Tex.

**Robert W. Smart
Washington, D. C.

**C. R. Smith
Washington, D. C.

**Carl A. Spatz
Chevy Chase, Md.

**William W. Spruance
Wilmington, Del.

**Thos. F. Stack
San Francisco, Calif.

**Arthur C. Storz
Omaha, Neb.

**Harold C. Stuart
Tulsa, Okla.

**James M. Trail
Boise, Idaho

**Nathan F. Twining
Hilton Head Island, S. C.

*Robert C. Vaughan
San Carlos, Calif.

*Jack Withers
Dayton, Ohio

*Incumbent

**Permanent National Director



In a moment of levity at the Convention Opening Ceremonies, Rocky Mountain Regional Vice President Nathan Mazer, left, and Utah State AFA President Jack Price, right, present President Smart the Utah AFA's "Order of the Big Belt," only six of which had previously been presented.

that such service has been counted by officers since June 1, 1958;

- ★ Establish a pilot training program to provide direct substantial input into the Air Reserve Forces;
- ★ Provide modern equipment for the Air Reserve Forces;
- ★ Extend Servicemen's Group Life Insurance to Reservists and Guardsmen;

★ A complete combat-zone tax exemption for military and Civil Service personnel;

★ Amend the Retired Serviceman's Family Protection Plan so as to bring the program into closer alignment with the provisions of the Civil Service retirement plan;

★ Repeal those provisions of the Dual Compensation Act which restrict Department of Defense agencies in hiring qualified retired military personnel during the first six months following their retirement; and eliminate the gross inequity which exists in the treatment of retired regular officers employed in the Federal Civil Service;

★ Authorize an increase in the pilot training facilities of the armed forces, and enact legislation which will provide incentives to attract pilots to remain in the armed forces beyond their initial periods of obligated service;

★ Liberalize the provisions of the Servicemen's Group Life Insurance Program;

★ Provide funds to (1) permit the advancement of many deserving and qualified airmen who are occupying jobs calling for higher grades, (2) permit the payment of proficiency pay to airmen in all critical skill areas, and (3) permit payment of greater reenlistment bonuses to personnel possessing technical skills vital to the Air Force mission;

★ Amend the Civil Service Retirement Act to provide that accumulated sick leave be credited to the employee's length of service; and to add accumulated sick leave at retirement to the length of service of the employee before computing his annuity; and

★ Reenlistment pay and proficiency pay for members of the Reserve components.

George Hardy Elected President

To lead the Association as its President during the coming year, delegates elected George D. Hardy of Hyattsville, Md. Mr. Hardy is President of the Harry B. Cook Co., a food brokerage firm with offices in Washing-

AFA UNITS AND INDIVIDUALS HONORED AT THE CONVENTION

AFA PRESIDENT'S TROPHY

- To Marjorie O. Hunt, President, Mount Clemens Chapter, Mich., designated "AFA Woman of the Year."
- To The Utah State Organization, Jack Price, President, designated "AFA Unit of the Year."

AFA PRESIDENTIAL CITATIONS

- Charles W. Burnette, Anchorage, Alaska
- Salvatore Capriglione (posthumous), Newark, N. J.
- Nolan W. Manfull, Roy, Utah
- Nathan H. Mazer, Roy, Utah
- Maj. Gen. Robert McCutcheon, Hill AFB, Utah
- Maj. Gen. Frank E. Rouse, Kelly AFB, Tex.
- Maj. Thomas F. Seebode, Langley AFB, Va.
- Capt. William P. Turk, Montgomery, Ala.
- Aerospace Education Council, Inc., New York, N. Y.
- Fresno Chapter, Calif.
- Hoyt S. Vandenberg Chapter, Mich.

AFA UNIT EXCEPTIONAL SERVICE PLAQUES

- Community Relations Award—To the Alamo Chapter, Tex.
- Aerospace Education Award—To the Boise Valley Chapter, Idaho
- Unit Programming Award—To the Florida West Coast Chapter, Fla.
- Best Single Program Award—To the Iron Gate Chapter, N. Y.

AFA INDIVIDUAL EXCEPTIONAL SERVICE PLAQUES

- J. Raymond Bell, New York, N. Y.
- Lester C. Curl, Melbourne Beach, Fla.
- S. Parks Deming, Colorado Springs, Colo.
- Joe Draper, San Antonio, Tex.
- Lyle Freed, Bellevue, Wash.
- K. G. Freyschlag, Colorado Springs, Colo.
- Jack T. Gilstrap, Huntsville, Ala.
- Edward D. Gray, London, England
- Ben Griffith, San Antonio, Tex.
- Dr. Boyd Macrory, Montgomery, Ala.
- Vera B. Wright, Santa Monica, Calif.

AFA MEDALS OF MERIT

- Charles Alexander, New York, N. Y.
- Walter E. Barrick, Jr., Danville, Va.
- Robert H. Bowman, Roy, Utah
- Cecil G. Brendle, Montgomery, Ala.
- B. L. Cockrell, San Antonio, Tex.
- Michael G. Coleman, Dayton, Ohio
- Louis W. Davis, Washington, D. C.
- Carolyn DeVore, Los Angeles, Calif.
- Dr. Clayton Gross, Portland, Ore.
- Stewart D. Hawkins, Kettering, Ohio
- Mamie Kinsley, Belleville, N. J.
- Lloyd G. Nelson, Park Ridge, N. J.
- Margaret A. Reed, Seattle, Wash.
- Col. James F. Sunderman, Tampa, Fla.
- Betty Topjian, Watertown, Mass.
- Andrew W. Trushaw, Jr., Florence, Mass.
- Herbert M. West, Jr., Shalimar, Fla.

ton, D. C., Baltimore, Md., and Richmond and Norfolk, Va. During his more than twenty-one years of dedicated service to AFA, he has earned about every award AFA can bestow for which he was eligible. He has occupied about every elective AFA office—State President, Regional Vice President, National Secretary, National Director, and Chairman of the Board.

Three incumbent National Officers—Board Chairman Jess Larson, Treasurer Jack B. Gross, and Secretary Glenn D. Mishler—were reelected.

Mr. Larson, a retired Air Force Reserve major general and a prominent District of Columbia attorney with a record of high government service, served the Association as National President for thirty months prior to being elected Chairman of the Board in 1967 at the San Francisco Convention. He now begins an unprecedented third term as AFA's Chairman of the Board.

Mr. Gross, a prominent Harrisburg, Pa., businessman and civic leader, is a former Chairman of the Board and has served eight previous terms as National Treasurer.

Mr. Mishler, Akron, Ohio, a Section Head in the Engineering Department of the Goodyear Tire & Rubber Co., is a former Chapter and State President, Inspector of Elections Chairman at several AFA National Conventions, Regional Vice President, and Chairman of the Organizational Advisory Council.

Eight new Regional Vice Presidents were elected to head AFA activities in as many Regions, joining four others who were reelected. The new Regional Vice Presidents are: Judge John G. Brosky, Pittsburgh, Pa. (Northeast); Lester C. Curl, Melbourne Beach, Fla. (Southeast); A. Paul Fonda, Washington, D. C. (Central East); Sam E. Keith, Jr., Fort Worth, Tex. (Southwest); Nolan W. Manfull, Roy, Utah (Rocky Mountain); Edward T. Nedder, Hyde Park, Mass. (New England); Clair G. Whitney, Bellevue, Wash. (Northwest); and O. Earl Wilson, St. Louis, Mo. (Midwest).

Six new Directors were elected to the Board. They are M. Lee Cordell, Berwyn, Ill., a former National Director; S. Parks Deming, Colorado Springs, Colo., current President of AFA's Colorado State Organization; Paul W. Gaillard, Omaha, Neb., former Midwest Regional Vice President; Martin H. Harris, Winter Park, Fla., former Southeast Regional Vice President; Nathan H. Mazer, Roy, Utah, former Rocky Mountain Regional Vice President and Chairman of the Organizational Advisory Council; and Warren B. Murphy, Boise, Idaho, former Northwest Regional Vice President.

The six newly elected Directors join twelve incumbent Directors who were reelected for another year, as well as all the Past National Presidents and Board Chairmen, other permanent Directors, and National Officers, to form



President Smart presents the President's Trophy to Marjorie O. Hunt, "AFA's Woman of the Year." The Hon. Dudley Sharp, a former Secretary of the AF, is at left, and AFA's National Chaplain, Rev. Henry McNulty, is at right.

AFA MEMBERSHIP ACHIEVEMENT AWARDS

REGIONAL AWARDS

REGION	REGIONAL VICE PRESIDENT
*Southwest Region	Jesse J. Walden, Jr.

STATE AWARDS

STATES	PRESIDENT
**Alaska	Robert Reeve
Colorado	Robert M. Lee
Oklahoma	Lawrence E. Leffler
Tennessee	Howard F. Butler
*Texas	Sam E. Keith, Jr.

CHAPTER AWARDS

CHAPTERS	PRESIDENT
*Alamo (Tex.)	B. L. Cockrell
**Anchorage (Alaska)	Victor Davis
Antelope Valley (Calif.)	Jim Donahoe
*Big Spring (Tex.)	Jeff Brown
Biloxi (Miss.)	M. E. Castleman
*Colorado Springs (Colo.)	Thomas W. Shoop
*Del Rio (Tex.)	Philip Ricks
Duluth (Minn.)	W. K. Wennberg
Eglin (Fla.)	Herbert M. West, Jr.
*Erie (Pa.)	Charles Sharp, Jr.
*Gen. Claire Chennault (Mich.)	Dorothy Whitney
Gen. Thomas P. Gerrity (Okla.)	Arthur O. de la Garza
Jack Manch (Va.)	Orland Wages
Logan International (Mass.)	John F. White
Lynchburg (Va.)	James H. Ford
Middle Tennessee (Tenn.)	Samuel R. Altman
**Montgomery (Ala.)	Boyd E. Macrory
*Mount Clemens (Mich.)	Marjorie O. Hunt
*Ogden (Utah)	R. W. Cassell
*Pueblo (Colo.)	John K. Hall
Richmond (Va.)	W. G. Plentl
Roanoke (Va.)	George W. McKay
Savannah (Ga.)	Jim A. Evans
Tidewater (Va.)	Brodie M. Williams, Jr.
Tulsa (Okla.)	Ed McFarland
*Wasatch (Utah)	Glen L. Jensen
Florida West Coast (Fla.)	Joseph M. Martin

*Award Winner for Two Consecutive Years.

**Award Winner for Three Consecutive Years.

a Board of fifty-seven. The full Board membership appears in the box on page 125 as well as in "This Is AFA," page 133.

Judge Brosky served as Convention Parliamentarian; Mr. Mazer served as Chairman of the Credentials Committee and was assisted by Far West Regional Vice President Will H. Bergstrom, Colusa, Calif., and Great Lakes Regional Vice President W. M. Whitney, Jr., Detroit, Mich.

South Central Regional Vice President Jack T. Gilstrap served as Chairman of the Inspectors of Elections, assisted by Harold C. Bates, Brookfield, Wis., President of AFA's Wisconsin State Organization; and Kenneth Banks, Jr., Akron, Ohio, Treasurer of AFA's Ohio State Organization, who served as Inspectors of Elections.

The Inspectors of Elections were assisted in the task of tabulating election votes by the following who served as Tellers: Cecil Brendle, Montgomery, Ala.; Edgar W. Kynaston, Pewaukee, Wis.; Lloyd Nelson, Park Ridge, N. J.; Hugh Simms, Lincoln, Mass.; Edward A. Stearn, San Bernardino, Calif.; Clyde Stricker, Spokane, Wash.; Stephen C. Yednock, Camp Hill, Pa.; and Charles Whitaker, Akron, Ohio.

Outstanding Airmen Honored

Among the honored guests at the Convention were
(Continued on following page)

twenty-four men, one from each major air command and separate Air Force agency, who had been selected as USAF's Outstanding Airmen for 1968. These, the top non-commissioned officers in the Air Force, and their wives, opened their Convention stay by attending an elegant banquet in their honor Wednesday evening at the Warwick Hotel. There they were addressed by Gen. John D. Ryan, USAF Vice Chief of Staff. AFA National Director Milton Caniff served as Toastmaster.

The Outstanding Airmen were introduced by AFA President Smart, and each received an AFA Citation of Honor. The Outstanding Airmen are listed on page 99.

During the First Annual Air Force Awards Luncheon, President Smart and Board Chairman Larson presented eleven AFA Citations of Honor to outstanding Air Force personnel and units (*see page 95 for a complete list of award recipients*).

Gen. John P. McConnell, in his final appearance before an AFA Convention as USAF Chief of Staff, addressed the more than 1,500 persons who attended the Chief of Staff's Luncheon (*General McConnell's speech appears on page 102*). AFA Board Chairman Larson served as Toastmaster, and President Smart presented the David C. Schilling Trophy for Flight, the Theodore von Kármán Trophy for Science and Engineering, and an AFA Citation of Honor.

The Hon. Robert C. Seamans, Jr., in his first appearance as Secretary of the Air Force before an AFA Convention, was the guest speaker at the Secretary's Luncheon held in his honor on Friday. (*Secretary Seamans' speech is reprinted on page 100.*)

President Smart served as Toastmaster at this luncheon and, during the program, announced that AFA's membership had reached the 100,000 mark. Then he introduced the 100,000th member, Lt. Raleigh Sandy, and Mrs. Sandy. Lieutenant Sandy recently graduated from Officers Training School and is stationed at Bergstrom AFB, Austin, Tex. AFA Board Chairman Jess Larson presented the H. H. Arnold Trophy, the Gill Robb Wilson Trophy for Arts and Letters, and an AFA Citation of Honor. In an unexpected presentation, Secretary Seamans presented President Smart the Air Force Exceptional Service Award.

Meetings and Seminars

Other meetings and events held during the Convention included a Reception honoring the Secretary and Chief of Staff of the Air Force; an AFA Board of Directors Meeting; three symposia and a seminar—"Man in Space," "The Air Force and Its People" (*see article, p. 114*), "The Air Force Looks to the Future" (*symposium text begins on p. 77*), and "Single Air Force Team"; a Junior Officer Conference and Workshop; a USAF World-Wide Information Officer Conference and Reception; an Air Force Reserve Commanders' Conference; an AFA Golf Tournament and luncheon; and an Air National Guard Commanders' Meeting. For those who wanted to stay over one more day, a tour of NASA's Manned Spacecraft Center was conducted on Saturday morning.

In conjunction with the Convention, the American Fighter Pilots Association held its Reception and Awards Banquet on Friday night. Senator Barry Goldwater (R-Ariz.) was guest speaker and Bob Hope, Toastmaster.

With deep gratitude, AFA acknowledges the support of the following: Eastern Air Lines, Inc., for registrants briefcases, badge holders, and program inserts; General Motors Corp., for courtesy cars; the Federal Systems Division of International Business Machines Corp., for sponsoring the Outstanding Airmen program, and the Office Products Division of IBM for the use of office equipment; Ling-Temco-Vought, Inc., for sponsorship of the Press Lounge; Fairchild Hiller Corp., for providing staff airlift to Hous-



Outgoing AFA President Robert W. Smart, right, receives AFA's Gold Life Member Card No. 8 from Board Chairman Jess Larson during the Convention Opening Ceremonies. Mr. Larson also presented Mr. Smart a compact television set in appreciation of his outstanding service to AFA during his two-year tenure as President of the Association.

ton; and, for furnishing Coke throughout the Convention area, the Coca-Cola Company.

We acknowledge the contributions made to our program by personnel of the United States Air Force . . . far too numerous to list here . . . but represented by: Maj. Gen. Rollin B. Moore, Jr. (Military Host), Commander, Hq. Air Force Reserve, Robins AFB, Ga.; Brig. Gen. Russell F. Gustke (Military Host), Commander, 446th Tactical Airlift Wing, Ellington AFB, Tex.; and by these Project Officers: Col. William P. Dent, Hq. USAF, Washington, D. C.; Col. George W. Franklin, Chief, Office of Information, Hq. Air Force Reserve, Robins AFB, Ga.; Col. James S. Coward, Commander, Ellington AFB, Tex.; Lt. Col. David L. Stiles, Hq. USAF; Lt. Col. Alfred R. Gould, Jr., Director of Operations, 2578th Air Base Squadron, Ellington AFB; Maj. L. G. Baird, Director of Communications, Hq. Air Force Reserve; Maj. James D. Flecker, 2578th Air Base Squadron; and Maj. Melvin A. Bailey, Hq. USAF.

To each of these officers—and to the many officers and airmen they represent—we express our deep and enduring gratitude.

In the opinions of many leaders of the Air Force, government, NASA, and AFA, this was one of our most successful and meaningful Conventions—culminating in a strengthening of the NASA-Air Force cooperation in the nation's space program—each voicing public appreciation of the other's programs, missions, and motivations.

Because of production deadlines, this article was prepared too soon after the Convention to include excerpts from the bulk of the congratulatory messages. However, excerpts from a few of those already received are:

"The 1969 Air Force Association Convention was an outstanding success and a fitting climax to your two-year tenure as President of the Association."

"Once again it was my privilege to attend an AFA National Convention. I felt the business sessions were very interesting and thought-provoking. The entire Convention was well organized and managed."

"The Air Force is extremely fortunate to have the magnificent support from AFA that was displayed in Houston last week."—END

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5-69



*THE ANCHORAGE, ALASKA, CHAPTER . . .
cited for effective programming in support
of the Air Force Association mission.*

AFA's Anchorage Chapter, Alaska, presented its 1968 awards and honored the Alaskan Command's and Alaskan Air Command's Outstanding Airmen during a recent banquet at the Elmendorf Noncommissioned Officers' Open Mess.

Lt. Gen. Robert A. Breitweiser, Commander in Chief, Alaska, formally introduced SMSgt. William A. Fletcher as the Alaskan Command's Outstanding Airman. General Breitweiser presented Sergeant Fletcher with a plaque commemorating the award.

Col. E. S. E. Newbury, Vice Commander of the Alaskan Air Command (AAC), introduced CMSgt. John V. Jenkins as the AAC honoree and MSgt. James W. Brown, the runner up.

The four annual AFA awards were established by the Anchorage Chapter to honor active-duty Air Force personnel in Alaska for outstanding performance in keeping with the AFA objective of "maintaining adequate aerospace power for national security and world peace."

The AFA award for the outstanding contribution to the Air Force community was presented to SMSgt. William H. Watkins and his wife Helen, by Anchorage Chapter President Robert G. Livesay. Sergeant Watkins is stationed at Eielson AFB, Fairbanks, Alaska.

SSgt. Stephen J. Spear, 1931st Communications Squadron, Elmendorf AFB, received the Major Norman C. Miller Memorial Award from Mr. Livesay. The award is presented "for an act of heroism performed in connection with saving or attempting to save the life of another person in Alaska during the year." Sergeant Spear distinguished himself by an act of heroism performed in connection with saving the lives of two small children during a trailer fire last October.

Mr. Livesay also presented Maj. Norman B. Kamhoot, 21st Operations Sq., Elmendorf AFB, the Lt. Gen. Glen R. Birchard Memorial Award "for a conspicuous act of valor or courage



Robert C. Reeve, left, President of AFA's Alaska State Organization, congratulates Lt. Col. Robert E. Tinney, Commander, 17th Tactical Airlift Squadron, recipient of the Anchorage Chapter's Robert C. Reeve Award. The Squadron was recognized for its unique capabilities in the 49th state such as flying the only squadron of ski-equipped C-130 aircraft in the AF.

Displaying their awards received at the Anchorage Chapter's recent Awards Banquet are, from left, SSgt. Stephen J. Spear, Lt. Col. Robert E. Tinney, MSgt. Joseph F. Bagwell, Chapter President Robert G. Livesay, Maj. Norman B. Kamhoot, and SMSgt. and Mrs. William H. Watkins. (See adjacent story for details.)



Apparently enjoying some of the guest speaker's humor at the recent Installation Meeting of the Fort Worth Chapter, Tex., are, from left, Sam E. Keith, now Southwest Regional Vice President; newly installed Chapter President Gordon Brownlee; Lt. Col. Stephen E. Harrison, guest speaker; AFA National Director Earle N. Parker; and outgoing Chapter President Malcolm Holloway.



Shown at a recent black-tie dinner, cosponsored by AFA's Colorado Springs Chapter and the Falcon Flight of the Order of Daedalians, to honor the Air Force Academy's Head Coach and football team, are, from left, Chapter President Tom Shoop; Lou Saban, Head Coach, Denver Broncos, and guest speaker; Ben Martin, Head Coach, Air Force Academy and honoree; and Col. E. E. Flesner, Commander, Falcon Flight 11, Order of Daedalians.

performed during an aerial flight by a member of the Air Force stationed within Alaska during the year." Major Kamhoot piloted his helicopter on instruments into a narrow mountainous valley during a "white-out" condition with rapidly deteriorating weather to rescue a pilot who had ejected from his disabled aircraft.

The fourth AFA award, named in honor of Robert C. Reeve, a pioneer Alaskan aviator and President of AFA's Alaska State Organization, was presented to the 17th Tactical Airlift Sq., Elmendorf AFB, "for the most outstanding contribution of the year to aviation and aerospace progress or activity within the State of Alaska by an Air Force active-duty unit." Mr. Reeve made the presentation to Lt. Col. Robert E. Tinney, Commander, and MSgt. Joseph F. Bagwell, First Sergeant of the squadron.

More than 250 members and guests of the Anchorage Chapter attended the banquet.

James E. Curley, Military/Civilian Liaison Officer to the Governor of Alaska, was Master of Ceremonies for the event.

JACK W. SHELDON

Jack W. Sheldon, Vice President (South) of AFA's California State Organization, died on March 5, 1969, after a short illness. A dedicated AFAer, Jack was a former Organizational Director for the California AFA, and a Past President of California's Long Beach Chapter. In addition, he was very active in the California AFA's youth and education activities. AFA extends its deepest sympathy to Mrs. Sheldon.

More than 200 members and guests attended the Fort Worth Chapter's recent Installation Banquet at the Carswell AFB Officers' Club.

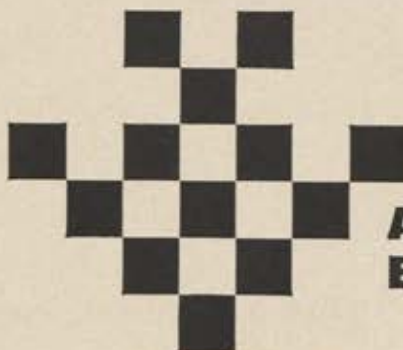
Lt. Col. Stephen E. Harrison, staff officer in the office of the Director of Operations, Office Deputy Chief of Staff/Plans & Operations, Hq. USAF, Washington, D. C., and the guest speaker of the evening, received a standing ovation. Those who attended

AFA's recent National Convention in Houston will remember Colonel Harrison as the Keynoter at the Convention Opening Ceremonies.

During the program, the Chapter's "Airman of the Year" award was presented to MSgt. Guinn Timmerman, 7th Combat Support Group, Carswell AFB, Tex.

AFA National Director Earle N. Parker installed the newly elected of-

(Continued on following page)



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SMSgt. William L. Larson, left, recently named Chanute AFB's "Airman of the Year," receives a plaque honoring his selection from AFA's Illini Chapter President Horace Henderson. Maj. Gen. M. C. Demler, Commander, Chanute Technical Training Center, looks on. Sergeant Larson was selected for his performance as an instructor at the center.



Following retirement March 1 after thirty years of service, Brig. Gen. John A. Rouse, right center, receives a Certificate of Appreciation from Washington State AFA President Peter Tuohy, left center, as W. F. Cronin, left, chairman of Washington AFA's Aerospace Council, and Lyle Freed, right, State AFA Organizational Director, look on.

ficers of the Chapter, who are: Gordon Brownlee, President; Don Hanson and Charles Boyd, Vice Presidents; Mrs. Ruby Hickman, Secretary; and Monte Davis, Treasurer.

Astronaut Owen K. Garriott of the Manned Spacecraft Center, Houston, Tex., was the guest speaker at a recent meeting of the David D. Terry, Jr., Chapter in Little Rock, Ark.

During the meeting, which more than 100 members and guests attended, David T. Rennie was elected

to serve as President of the Chapter for 1969. Other officers elected are: Jack Holt, Jr., Vice President; Guy Amsler, Jr., Secretary; and R. Eugene Bailey, Treasurer.

While in Little Rock under the sponsorship of the Chapter, Astronaut Garriott spoke to more than 2,400 students at two high schools and attended an AFJROTC Unit class where he conducted a question-and-answer session.

COMING EVENTS . . . AFA's Air Force Academy Program, Colorado

Springs, Colo., May 30-31 . . . Texas State AFA Convention, San Antonio, June 13-15 . . . AFA's Fall Meeting and Aerospace Development Briefings, Washington, D. C., September 22-24 . . . Alabama State AFA Convention, Huntsville, October 4 . . . Massachusetts State AFA Convention, Otis AFB, October 16-18 . . . California State AFA Convention, Long Beach, October 17-19 . . . Idaho State AFA Education Seminar, Twin Falls, December 5-6.

—DON STEELE



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The Air Force Association is an independent, nonprofit airpower organization with no personal, political, or commercial axes to grind; established January 26, 1946; incorporated February 4, 1946.

Objectives

• The Association provides an organization through which free men may unite to fulfill the responsibilities imposed by the impact of aerospace technology on modern society; to support armed strength adequate to maintain the security and peace of the United States and the free world; to educate themselves and the public at large in the development of adequate aerospace power for the betterment of all mankind; and to help develop friendly relations among free nations, based on respect for the principles of freedom and equal rights to all mankind.

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Active Members: US citizens who support the aims and objectives of the Air Force Association, and who are not on active duty with any branch of the United States armed forces—\$7 per year.

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Cadet Members (non-voting, non-officeholding): US citizens enrolled as Air Force ROTC Cadets, Civil Air Patrol Cadets, or Cadets of the United States Air Force Academy—\$3.50 per year.

Associate Members (non-voting, non-officeholding): Non-US citizens who support the aims and objectives of the Air Force Association whose application for membership meets AFA constitutional requirements—\$7 per year.

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State Contacts

Following each state contact's name and address are the names of the localities in which AFA Chapters are located. Information regarding these Chapters, or any place of AFA's activities within the state, may be obtained from the state contact.

ALABAMA: Dr. Boyd E. Macrory, 3721 Princeton Road, Montgomery, phone 262-2079. **BIRMINGHAM, HUNTSVILLE, MOBILE, MONTGOMERY, SELMA.**

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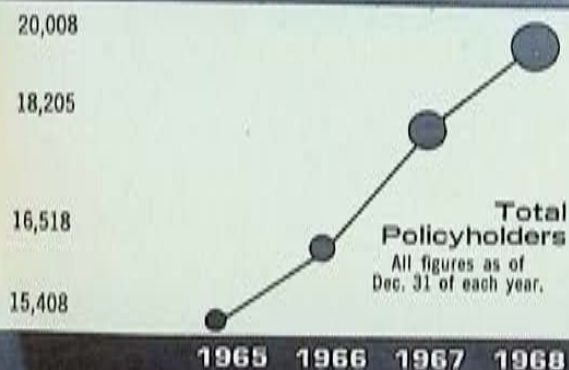
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20%

20% dividend paid to all policyholders.

Accidental death benefit increased to \$12,500. Coverage increased for flying personnel at no increase in premium.

1965

9%

9% dividend paid to all policyholders, a decrease reflecting AFA's decision not to limit coverage in combat zones.

1966

10%

10% dividend paid to all policyholders. Coverage continues to insure policyholders in combat zones with no restrictions.

1967

8%

8% dividend paid to all policyholders. Coverage continues to insure policyholders in combat zones with no restrictions.

1968

8%

8% dividend paid to all policyholders. Unrestricted coverage continues to offer broadest possible protection.

VIETNAM WAR YEARS

Life Insurance Protection!

No Hazardous Duty Restriction,
War Clause, or Combat Zone
Waiting Period!

NO WAR CLAUSE! NO HAZARDOUS DUTY RESTRICTION!

There is no war clause, combat-zone waiting period, other hazardous duty restriction or geographical limitation on AFA Military Group Life Insurance coverage. It is AFA's policy to continue to provide the broadest possible protection to all of our member-policyholders, including those in combat zones. We believe we can best fulfill our mission of service to the Air Force and to members in this way.

\$12,500 ACCIDENTAL DEATH BENEFIT

An additional benefit of \$12,500 is paid for accidental deaths—even those caused by aviation accidents—except when the insured is serving as pilot or crew member of the aircraft involved.

EXCLUSIONS—FOR YOUR PROTECTION

In order to provide maximum coverage at minimum cost for all participants, there are a few exclusions which apply to your coverage. They are:

Death benefits for suicide or death from injuries intentionally self-inflicted while sane or insane shall not be effective until your policy has been in force for twelve months.

The Accident Death Benefit shall not be effective if death results: (1) From injuries intentionally self-inflicted while sane or insane, or (2) From injuries sustained while committing a felony, or (3) Either directly or indirectly from bodily or mental infirmity or poisoning or asphyxiation from carbon monoxide, or (4) During any period while the policy is in force under the waiver of premium provision of the master policy, or (5) From an aviation accident, military or civilian, in which the insured was acting as pilot or crew member of the aircraft involved.

OTHER BENEFITS

COVERAGE MAY BE
RETAINED AFTER
LEAVING ACTIVE
DUTY TO AGE 65

GUARANTEED CON-
VERSION TO PERMA-
NENT INSURANCE

WAIVER OF PREMIUM
FOR DISABILITY

FULL CHOICE OF
SETTLEMENT
OPTIONS

ELIGIBILITY

All active duty personnel of the United States Air Force (under Age 60) and all members of the Air Force Ready Reserve and Air National Guard (under age 50) are eligible for this insurance provided they are now, or become, members of the Air Force Association.

PAYMENT OF PREMIUMS

Premiums may be paid direct to AFA in quarterly (\$30), semiannual (\$60), or annual (\$120) installments. AFA will send statements 30 days before each premium due date. Active-duty personnel may also pay monthly by government allotment (\$10), thereby having their premiums paid automatically and preventing any possible lapse in coverage.

AF Active Duty, Ready Reserve & National Guard Personnel Are Eligible

OTHER FACTS ABOUT YOUR POLICY

All certificates are dated and take effect on the last day of the month in which your application for coverage is postmarked. Coverage runs concurrently with AFA membership. AFA Military Group Life Insurance is written in conformity with the Insurance Regulations of the District of Columbia.

The insurance will be provided under the group insurance policy issued by United Benefit Life Insurance Company to the Air Force Association. However, National Guard and Reserve members who are permanent residents of Ohio, Texas, Wisconsin, and New Jersey, will not be covered under the group policy, but will be eligible for individual policies providing somewhat similar benefits.

MAIL YOUR APPLICATION TODAY!

AFA MILITARY GROUP LIFE INSURANCE

(UNDERWRITTEN BY UNITED OF OMAHA)

Rank (please print) _____ Name _____ Service Number _____
Mailing Address _____
City _____ State _____ Zip Code _____
Date of Birth _____
Beneficiary _____ Relationship _____

This insurance is available only to AFA members:

☐ I enclose \$7 for annual AFA membership dues (includes subscription (\$6) to AIR FORCE/SPACE DIGEST).

☐ I am an AFA member.

I understand the conditions governing AFA's Group Life Insurance Plan. I certify that I am eligible for this insurance under the category indicated, that I am currently in good health, and that I have successfully passed, within the past two year period, the last physical examination required by my branch of service. (Reserve and Guard personnel not on extended active duty must include with this application a copy of their most recently completed SF88.)

Signature of Applicant _____

Date _____

Application must be accompanied by check or money order. Send remittance to:

INSURANCE DIVISION, AFA, 1750 PENNSYLVANIA AVE., N.W., WASHINGTON, D. C. 20006

Please indicate below the form of payment you elect:

☐ Monthly government allotment (I enclose \$20 to cover the period necessary for my allotment to be processed.)

☐ Quarterly (I enclose \$30)

☐ Semi-annually (I enclose \$60)

☐ Annually (I enclose \$120)

Category of eligibility (please check appropriate box)

☐ Active Duty, Air Force

☐ Ready Reserve, Air Force

☐ Air National Guard

Bob Stevens' "There I Was..."

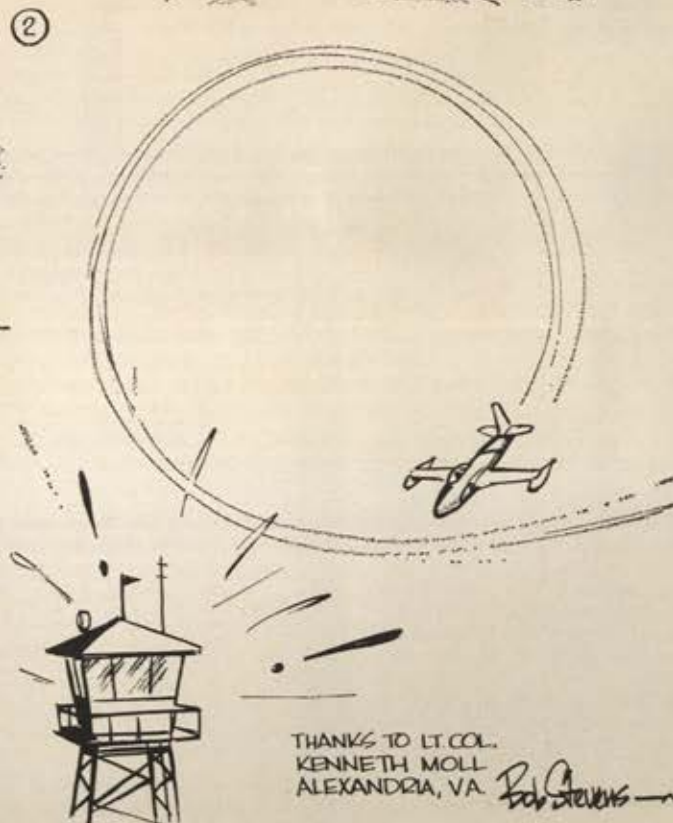
When jets first came on the scene, a new book had to be written. The sequences depicted below are attributed to 2d Lt. Bruce Jones (now a Lt. Col. in SEA). Bruce developed the "Selfridge Let-down" long before anyone ever heard of a "teardrop" jet instrument approach pattern . . .



① ② AND AS THE CONTROLLER STARTS TO READ 'GONE WITH THE WIND,' BRUCE EXECUTES A CLASSIC SPLIT S ---



AND ON ANOTHER OCCASION :





737, world's most advanced short-haul jet



NASA's Boeing-built Lunar Orbiter



U.S. Air Force Minuteman ICBM



SRAM, Air Force short-range attack missile



Boeing helicopter



B-52 eight-jet Stratofortress



Burner II



NASA's Apollo/Saturn V moon rocket

Capability has many faces at Boeing.

Boeing 737, the world's most advanced short-range jetliner, is the first airliner to bring big-jet comfort to short-haul routes.

NASA's Boeing-built Lunar Orbiter was the first U.S. spacecraft to orbit the moon and photograph far side of moon. Orbiters have photographed thousands of square miles of the lunar surface to help NASA scientists select best landing site for Apollo astronauts.

Boeing B-52 global nuclear weapons carrier and missile-launcher-bomber has demonstrated its versatility by carrying out conventional bombing missions against the Viet Cong.

Minuteman is U.S. Air Force's quick-firing, solid-fuel ICBM. Boeing is weapon system integrator, responsible for assembly, test, launch control and ground support systems.

SRAM, a short-range attack missile with nuclear capability, is being designed and developed by Boeing for U.S. Air Force.

Twin turbine Boeing helicopters, built by Vertol Division, are deployed to Vietnam. They serve with U.S. Army, Navy, Marine Corps.

Burner II, USAF's new Boeing-built upper stage vehicle, is smaller, less costly than other upper stages. It's applicable to almost all

USAF launch vehicles, also scientific experiments, weather, navigation or communications satellites.

NASA's Apollo/Saturn V moon rocket, largest, most powerful in world, launched first Americans on voyage to moon and return. Boeing builds first-stage booster, integrates Saturn V with Apollo command, service and lunar modules, and performs systems engineering, launch and integration support for NASA on entire Saturn V system.

BOEING



When our customer pushes the button, things get done. That takes teamwork!

When a McDonnell Aircraft Company program manager gets a customer's request, he doesn't have to call a meeting to get the job done. Organization charts aside, we give a man the kind of authority that surmounts paperwork and cuts through red tape. It was this kind of "get-on-with-the-job" management teamwork that put America ahead in space with our Mercury and Gemini spacecraft, and Saturn S-IVB stage. Teamwork tripled our F-4 Phantom production rate to meet expanded Air Force fighter requirements. And teamwork delivered Military Airlift Command's new C-9A aeromedical jet transport four months ahead of schedule. If you want to know why we're known as the company that gets things done, just ask the Air Force. We've been responding to USAF needs for more than 45 years.

MCDONNELL DOUGLAS

