JANUARY 1970 / 60¢

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

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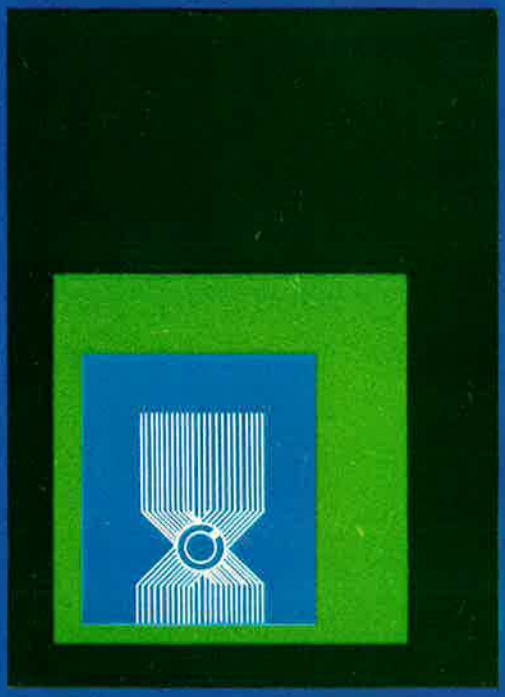

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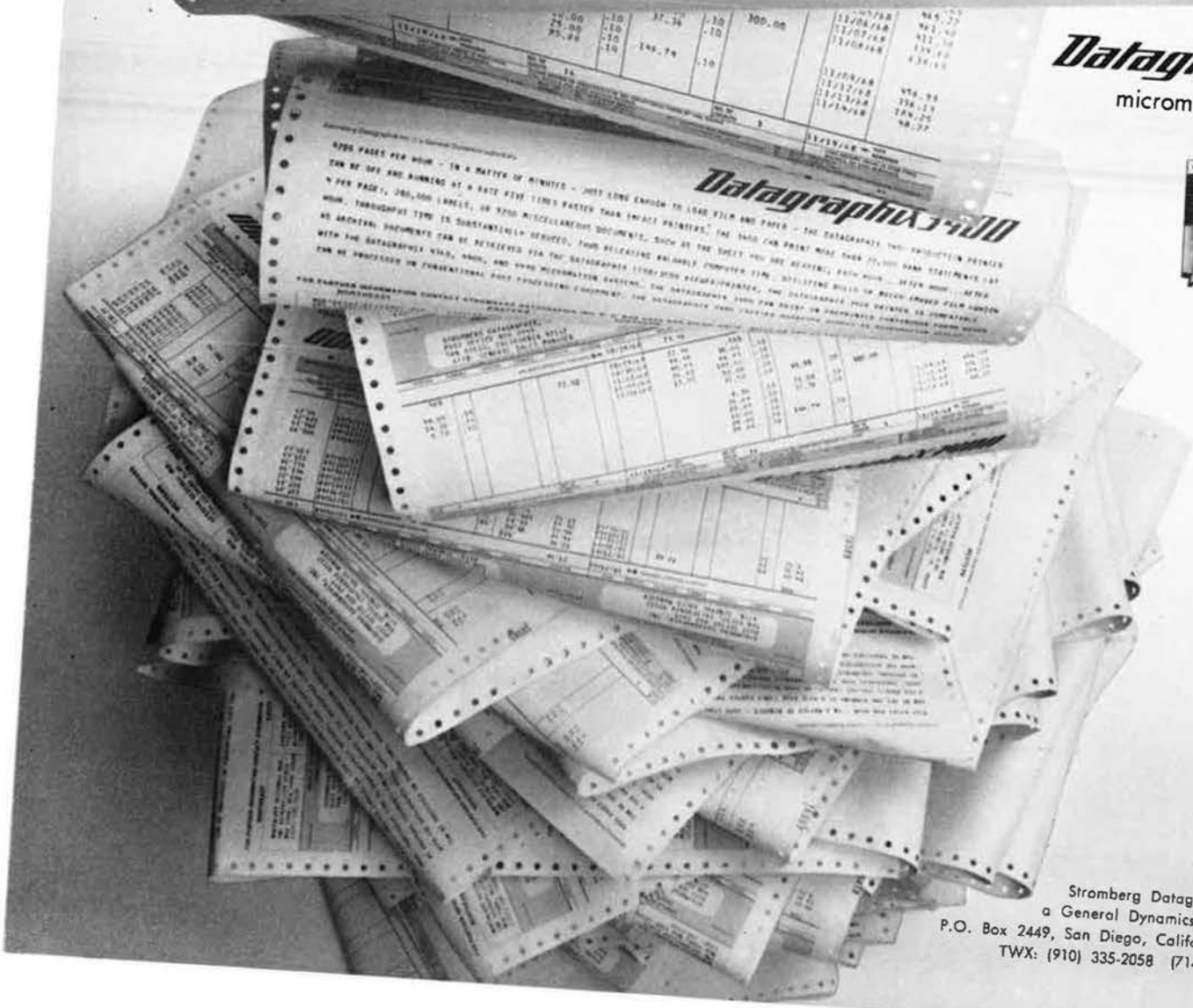

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AIR FORCE and SPACE DIGEST

The Magazine of Aerospace Power
Published by the Air Force Association

VOLUME 53, NUMBER 1 **JANUARY 1970**

DEPARTMENTS

It just broke all weightlift

What's so good about heavy? Simply that the C-5A, in regular flight testing, has more than met another U.S. Air Force requirement—it flew 14 tons heavier than it will in service.

On Oct. 16, 1969, the giant plane lifted off at 399 tons, about the same weight as 15 huge diesel trucks loaded to capacity. With that flight, the C-5A broke the record it had set only two weeks earlier.

Records like that put this country far ahead of the rest of the world in airlift excellence. For the C-5A isn't just a weightlifter. It's a defense system with the range, endurance, and incredible capability to change our entire military strategy.

Foreign military bases may no longer be as necessary, since a C-5A fleet can deploy an army across an ocean in hours. Not only the men, but also the tanks, artillery, helicopters, food, fuel, and ammunition.

And it can put them down where needed. As little as 4,000 feet of dirt or grass will do for an airfield. On short runways, the C-5A can touch down and stop within 1,200 feet—about five times its own length. On dirt surfaces,

records. For the fifth time.

28 huge tires spread the plane's weight while special landing gear struts absorb the shocks.

Electronically, this bird-of-burden is in good hands. Even in dense fog and driving rain, an automatic system can land the plane in complete safety. And there's MADAR—the system that keeps watch over the C-5A's health, spotting possible troubles and printing out maintenance directions.

The C-5A's military impact is undeniable. But it also promises new scope and range for flights of mercy.

The Berlin Airlift took 300 aircraft to keep the city alive. Today 12 C-5As could do the same job.

In 1964, seven large transports needed 10 days to deliver 952 tons of food to famine-stricken Pakistan. The same number of C-5As could do it in 18 hours.

With the C-5A, airlift has entered a new age.

C-5A

Lockheed Aircraft Corporation

AIRMAIL

Improved Personnel Planning

Gentlemen: By omission, General Carpenter's article ["USAF—Where We Stand Today . . . What's Needed Tomorrow," November issue] neglects the "people" need for tomorrow. By virtue of his past positions, I know he is intimately knowledgeable of this problem. The title of his article could be addressed toward personnel as well as hardware. Admittedly, it is not as glamorous to speculate on the officer of ten to fifteen years in the future as on shiny sophisticated pieces of hardware—but it is no less important.

General Carpenter's mathematical visual-acuity odds aren't as great in the personnel field since the conceptual phases of the R&D portion have already been completed, either through accident or parental planning. The USAF goal is to acquire the best people from the available source, our society. This will be the greatest challenge since we cannot, nor does our society desire to, will people into form in the manner that we can will materials.

From my position on a campus experiencing serious ROTC problems, it appears that a study of our future personnel needs does not have the money or personal emphasis necessary to avoid serious consequences. Compare the procurement cost of people versus equipment!

We in the field often are unaware of the activity at top echelons. From here, however, it appears that the Air Force is behind the power curve in planning our personnel posture and environment ten years hence. This must be done within speculative parameters of what our society will be. Our traditional patchwork catch-up system won't work in the continuous accelerating changes that we are experiencing. . . .

LT. COL. LEON C. HEINLE
Professor of Aerospace Studies
Stanford University
Stanford, Calif.

• *The vigorous support AFA always has given to improved Air Force personnel programs puts us firmly in step with Colonel Heinle's assessment of the need for imaginative, long-range personnel planning. It happens, however, that this was not the topic General Carpenter was asked to address. Gen. John C. Meyer's article on page 50 of this issue discusses some philosophy and techniques of a new look in the personnel field. We commend it to your attention.*—THE EDITORS

Gentlemen: I have read a great deal lately on the subject of Vietnam, our involvement there, and the options remaining to salvage something of value. I have found it very difficult to sort out fact from opinion from the wide variety of instant experts who have appeared on the scene like camp followers. The article in the November issue by "Mark E. Swenson" ["Vietnam: Which Way Out?"] was less than helpful.

Besides not adding to the debate anything that is new, he mishandles much of what is old. . . .

With myopic hindsight he ridicules the exaggerated fear of Chinese intervention. I recall that Douglas MacArthur held a similar contempt for Red China in November 1950. As a sidelight, most authors who pooh-pooh the Chinese generally work in a plea for unlimited or "unremitting" bombing of the North at this point in their books and articles. The author waits for three pages, but it is there as usual.

Swenson concludes that Diem "failed to organize his administration effectively." On the contrary, Diem astounded the world (and confounded the North Vietnamese) by crushing the bandit warlords and unifying the South after Geneva '54. It was his successes, not his failures, that prompted Hanoi to launch their campaign of terror from 1957 onward.

Swenson surfaces the old saw about General Westmoreland's requests for 206,000 more men after Tet '68 as if it were an uncontroverted fact. Who says he did? Who can say he wasn't asked for a set of possible alternatives based upon differing "scenarios"?

Swenson makes the incredible assertion that General Westmoreland never placed "nearly enough emphasis on training the Vietnamese." We had 20,000 or more trainers *et al.* in the country already by 1965. What was needed were desperate measures to keep the South from going under. Infiltration by the North Vietnamese, beginning in late 1964 and early '65, is well documented. . . . In mid '67 the big NVA/VC units were stopped cold. The pressure was in evidence everywhere to supply the new M-16 rifle to Vietnamese units and to include them in as many joint, small-unit actions as possible. I remember very clearly the grumblings of US unit commanders having to release some of their finest young officers and NCOs to form mobile training teams to help Regional and Popular Force units. . . . Not that all this was particularly new. I recall seeing *hundreds* of Vietnamese officers at Fort Benning in 1958.

Finally, it's a pity that Swenson only read part of *No Exit from Vietnam;* because he [might otherwise] have discovered that the importance of our national unity is no "myth." The French were beaten on the ground in Indochina; but they were beaten in the streets of Paris and in Algeria. I should think an employee of the Department of Defense at least would know that fundamental fact of history.

That brings me to why I bothered to write this letter. It was not the unoriginality of the ideas, nor their distortion in several instances, but rather that the person hiding behind the *nom de plume* can, from a position inside DoD, launch such a slanderous attack on high officials of the government. . . . I can't imagine such a piece being cleared for publication. It is apparent that it was not.

Surely there are enough authors elsewhere who can fill your pages, or those in the defense establishment who can obtain clearance, that you need not give this one any more space.

K. J. COFFMAN
Falls Church, Va.

The author replies:

• War involves risks but the Korean analogy is unsound. There never was serious consideration of a US ground offensive heading for the Chinese border. Even had the US mounted a heavier bombing campaign over the North, it remains exceedingly doubtful that the Chinese would have intervened. The point is that the threat *was* exaggerated. Also, the long and unremitting Vietnamese hostility for the Chinese must be considered.

• Diem never unified the South. At the time of his assassination, South Vietnam was well along toward a collapse, which was prevented by the US in early 1965.

• Although General Westmoreland and several former high officials in

the Johnson Administration have maintained that the figure of 206,000 was only one of several options, the fact remains that President Johnson's directive to the *ad hoc* committee headed by Secretary Clifford emphasized that the committee deliberations be pointed toward developing and implementing actions necessary to deploy 206,000 additional troops over the next several months.

• General Westmoreland has recently reiterated that the US made a mistake in not establishing an adequate training program for the ARVN several years ago. We are now attempting to make up this lost time.

• It is not possible now to unify our people behind the war in Vietnam. The argument revolves around the timetable for withdrawal. Even were our people unified, I see little evidence in the past or present behavior of the North Vietnamese that indicates they would automatically negotiate after we unified at home. For these reasons President Nixon is pressing the Vietnamization program.

• The pseudonym has a long and honored tradition in political literature. And with good reason. One's first loyalty is to his country and his conscience, not to a particular administration or party. In this case, it is my judgment that the use of the pseudonym is entirely appropriate and in itself a measure of the kind of deeply held feelings that this war has aroused.

MARK E. SWENSON

Harrier Correction

Gentlemen: May I offer my congratulations on the magnificent article on the Harrier, by J. S. Butz, Jr., which appeared in the October AIR FORCE/SPACE DIGEST and September-October AEROSPACE INTERNATIONAL.

This is quite the most effective treatment of the operational concept of the Harrier I have yet read. The conviction and credibility of the writing . . . are most commendable.

I must take issue on only two aspects—the electronics system mean time between failures (MTBF) and the engine-change time. I do not recognize your claimed twenty-hour MTBF on electronics and believe it to be much greater than this. In fact, MTB defects is of this order.

The engine-change procedure is the simplest we could devise without completely redesigning the Harrier so as to drop the engine out through the lower fuselage. The P.1154 was designed to do just this, but our terms of reference in 1965 when we were asked to convert the Kestrel (XV-6A) to the Harrier effectively prevented our adopting this obviously more sensible engine-change mode. I should like to know of *any* other jet fighter that can undergo an engine change on a grass field of CBR 2 to 3 in an unlimited time—never mind 5½ hours. . . .

J. W. FOZARD
Chief Designer (Harrier)
Hawker Siddeley Aviation Ltd.
Kingston-Upon-Thames, England

• *We stand corrected on the reliability figure, as we misinterpreted an English report and believed the mean time between failures for the Harrier electronics system was predicted to be twenty hours. In the case of the engine change, we should have said the design probably will be altered with the next aircraft so that the change can be accomplished with a dolly instead of an overhead crane.*—THE EDITORS

Compliments and Questions

Gentlemen: Your editorial, "The High Cost of Withdrawal" (November) tells the story like it is. I don't believe I have seen it spelled out this clearly before. As usual, there is a high thought-to-word ratio. Claude Witze does a concise job in his blast on "The Wayward Press." And I note with pleasure that Irv Stone is still putting one word after another in his usual informative way.

Lastly, a plea from my son the CAP cadet, age sixteen, with two stripes on his sleeve and nearly eleven hours of dual time. "Pop, ask your friends on AIR FORCE/SPACE DIGEST to give the CAP some space. And how come the guy on the November cover is wearing glasses? Have they lowered the sight requirements?"

JOE ROWLAND
Stamford, Conn.

Gentlemen: . . . I wonder just how long that pilot would last at 30,000 feet should he suddenly need oxygen? I mean, with his mask sitting on top of his glasses like that!

PAUL GOLDBERG, CHIEF
Public Information Division
Scott AFB, Ill.

• *Thanks for the comps. And that ain't no pilot. That's Stefan Geisenheyner, our Editor for Europe, who works out of Wiesbaden, Germany. He snapped this self-portrait while sitting in the cockpit of an F-4C—at 30,000 feet—and felt OK because the mask was not sitting on his glasses. The camera angle just gives that impression. If he had removed his glasses he might not have been able to find the shutter switch.*—THE EDITORS

No Commerce with Commies

Gentlemen: . . . I have received my first order of 100 copies of "The Forgotten Americans of the Vietnam War" [reprint] and propose to distribute many more copies.

The article is very informative and should be read by every American, but I do not agree with your recommended course of action. Our correspondence should be directed to our elected officials and to the ones they have appointed. . . . We elect and pay them to defend our country against all enemies, foreign and domestic.

We have seen enough of those who represent us groveling before the Communist enemy, pleading with them to let us surrender, and begging them to treat our fighting men humanely, of course with negative results. It is time for our officials to stop giving lip service to their announced concerns and to unshackle our military leaders and let's try *winning* for a change. "In war there is no substitute for *victory*." It is time for us to stop providing the Communist enemy with war materials to kill our fighting men in Vietnam. (I refer you to the US Department of Commerce "Current Export Bulletin," Number 941, dated October 12, 1966; to page H693 of the *Congressional Record* dated January 26, 1967; and to information inserted in the *Congressional Record* October 17, 1966, by Congressman Glenard P. Lipscomb, under the title "Selling to the Reds.") It is time to stop authorized invasion of our national capital by the Communists and their dupes, dopes, tools, and fools such as we witnessed November 13, 14, and 15. It is time for all of our elected officials to stand up and be counted on the side of America or to resign.

I recommend that the letters be sent to the President, the Secretary of State, the Secretary of Defense, Chairmen of the Armed Services Committees of the House and the Senate, and to the Senators and Members of the House of Representatives representing the writers. The letters should request immediate action to stop aid to and trade with Communist countries and those countries supporting the Communists; immediate action to unshackle our military services; and immediate action to have our men released from the tortures of Communist prison camps. Petitions to Congress asking them to take immediate and positive action to stop aid in any form to our Communist enemies can be obtained from *The Review of the News,* Belmont, Mass. 02178, fifty copies for $1.

A copy of this letter will be included with every copy of "The Forgotten Americans of the Vietnam War" that I distribute.

LT. COL. WILBUR OUTLAW,
USAF (Ret.)
Fayetteville, N.C.

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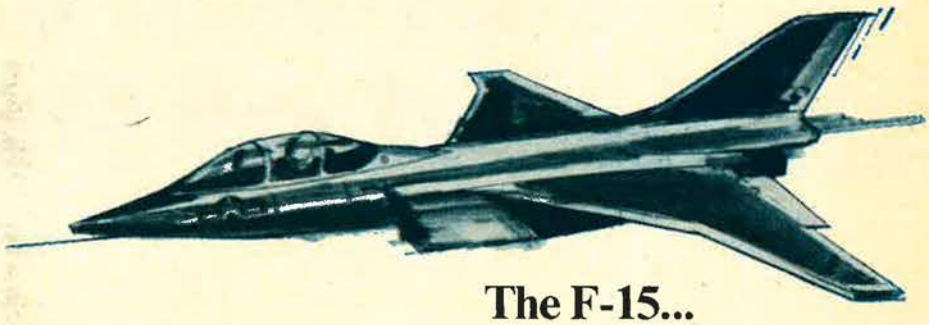

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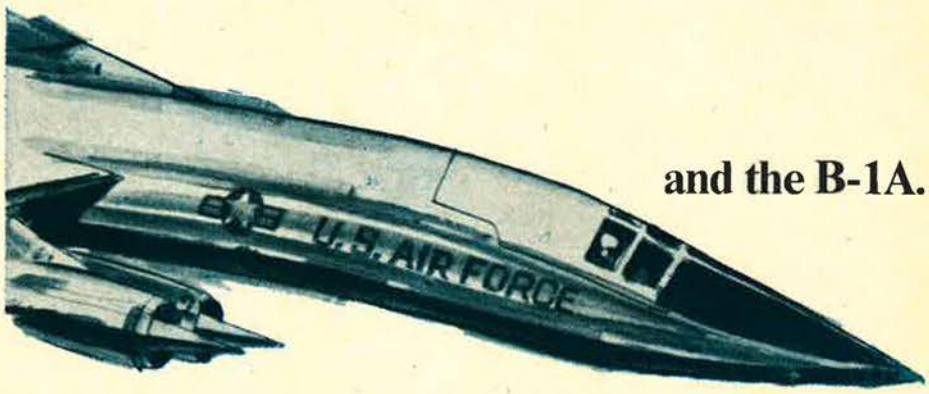

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An Editorial

On My Lai

By John F. Loosbrock

EDITOR, AIR FORCE/SPACE DIGEST

WASHINGTON, D.C., DECEMBER 12

PUBLISHING lead times being what they are, any comment in a monthly magazine runs the risk of being overtaken by events. Yet some things cry out for comment, if only to attempt to provide a yardstick by which future developments may be usefully measured.

A case in point is the widely publicized atrocity allegedly committed last spring by Americans at My Lai, in the province of Quang Ngai, in the Republic of Vietnam. It is an incident that is certain to have lasting significance in this highly traumatic period of our national history.

Prejudice, in the literal sense of "prejudging," abounds in public and private discussion of My Lai, both here and abroad. Presumptions of guilt have been made on the spot, without waiting for the establishment of the credibility of witnesses, the gathering and the shifting of the evidence, and the emergence of the facts of the case. Already, the characters and careers of several persons may well have been damaged unjustly and beyond repair. Certainly the moral stature of the United States and the reputation of its military establishment have been severely tarnished.

We will try not to contribute to the prejudicial atmosphere that further clouds an already clouded case. Rather we will attempt to illuminate, without heat, some of the basic issues public discussion has raised at this point in time.

We in America are in the midst of a wave of self-criticism, which is deeply affecting the totality of our society. The reaction to My Lai is part of that process. It is typically American. It could happen nowhere else in the world. It clearly reflects our historical experience.

In part, that experience is a legacy of the Puritan ethic, which holds good and evil to be incapable of coexistence within man or in his creations. In part, that experience reflects the humanistic ideals set down in the Declaration of Independence, in the Constitution, and in legislation passed and judicial decisions rendered since. In part, it is also a product of two centuries of continental expansion and development, wherein no problem was insoluble, given the resources of the land and the industry and creativeness of the people.

Out of this historical experience has come a national character, rooted in ideals of freedom and equality, confident that all problems can be solved, and unwilling to admit that in the nature of every human being there is an innate and constant clash of good and evil. From this follows the belief that any evil can be isolated and redeemed, if only we set our minds and pocketbooks to the task.

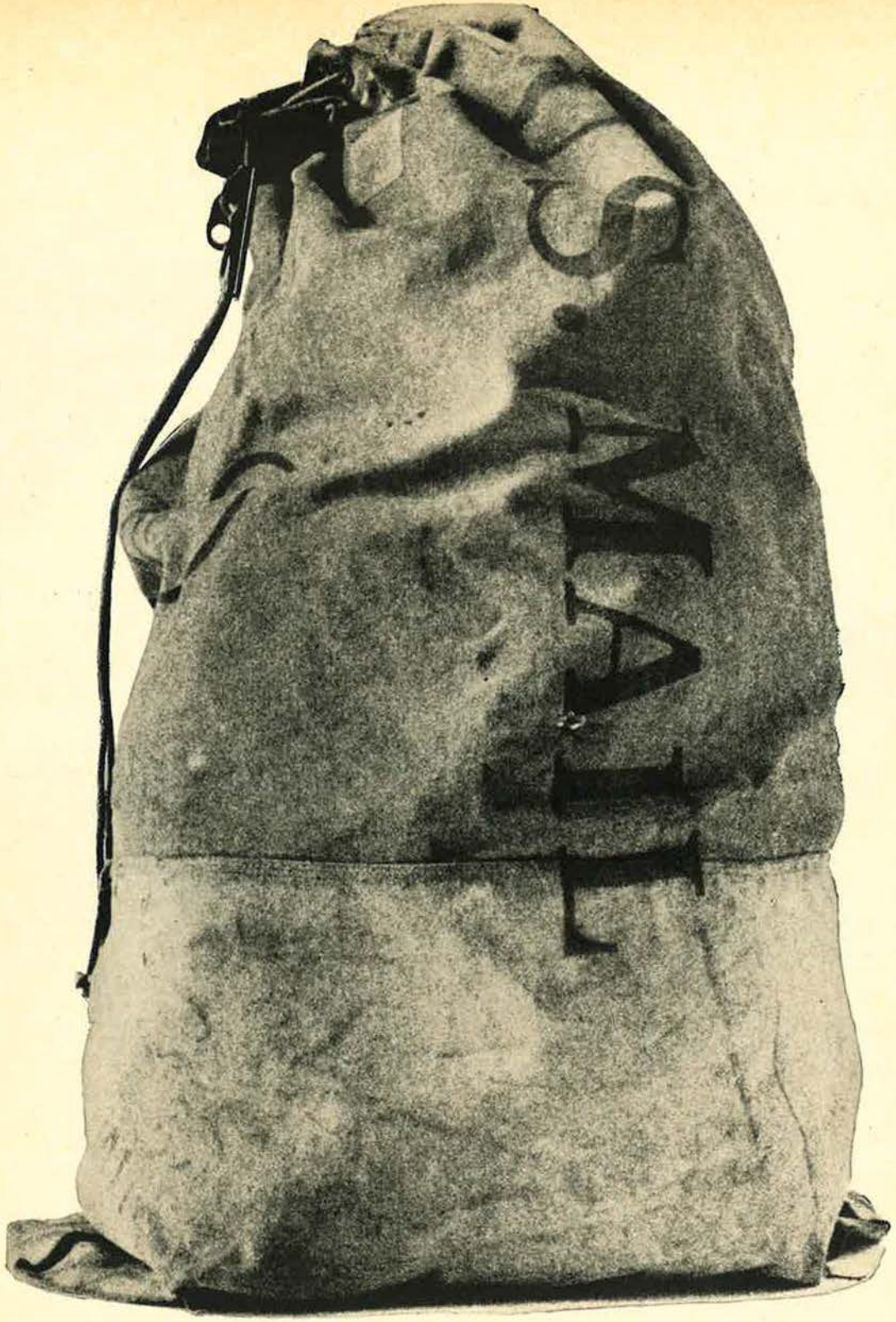
Our experience in World War II tended to confirm these ideals and to indicate that they were as applicable to the problems of world leadership as they were to those of an isolated, developing democracy blessed with vast natural resources. The discovery that this is not wholly true has led to disillusionment for many, and a correlative tendency to place the blame, not on the frailties of human nature, but on the failure of human institutions.

Our institutions are not perfect, and who would say they are? At the same time, the fact that some Americans have failed to attain equal status is not exclusively the fault of our legislative and judicial institutions. If none of us is morally and ethically perfect, the fault is not exclusively that of our religious institutions. Nor is the alienation of some of our young people from society exclusively the fault of our educational institutions. Yet the institution—perhaps because it is a faceless, bloodless, corporate kind of thing—becomes the easy scapegoat for the excesses and omissions of our frail human nature.

Some of the most virulent attacks on American institutions are being leveled at the military. And therein lies the danger of many of the reactions to My Lai. What may or may not prove to be the aberrant reactions of a few against pressures to which most of us have never been subjected is being seized upon to discredit the military *as an institution.*

The war in Vietnam is cited as having brutalized the very nature of the men who fight it. How then account for the schools, hospitals, and orphanages built there by the voluntary labor of American military men and women? War is a brutal experience, it is true, and perhaps only those who have fought it face to face on the ground will ever know just how brutal it can be. But it is not brutalizing, in and of itself, to the individual. It is how one copes with war's brutality, how the struggle between good and evil is resolved within the individual spirit, that determines whether or not war brutalizes a man.

There must be a national sense of proportion and perspective about My Lai. The many must never be dishonored for the alleged despicable behavior of the few. Above all, the institution should not be judged by the conduct of those within it who violate its code and do damage to its purpose.—END



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GENERAL DYNAMICS

AIRPOWER IN THE NEWS

By Claude Witze
SENIOR EDITOR, AIR FORCE/SPACE DIGEST

Challenge to Industry

WASHINGTON, D.C., DECEMBER 10

Congress, at this moment, is preparing to send the Fiscal 1970 Defense Appropriations Bill to the White House. It was passed by the House after a thirty-minute debate on the subject of the Safeguard ABM system; the Senate is expected to approve it after arguing more than thirty minutes on the same subject.

There is no doubt the most important document for the aerospace industry to come out of the 91st Congress is the 102-page report of the House Committee on Appropriations, which accompanied the bill to the floor. It will be reviewed briefly on these pages, but is worth study in detail. Copies may be obtained on request to the Subcommittee on Defense, Room H-144, The Capitol, Washington, D.C. 20515. The telephone number is (202)225-2847. Ask for Report No. 91-698.

The committee says that Fiscal 1969 was the "Year of the Cost Overrun" and provides an excellent summary of weaknesses developed in the past few years of Pentagon management.

"There have been too many instances uncovered this year of cost overruns resulting from such laxities as improperly defined specifications, delays in delivering government-furnished equipment, and too much concurrency between research and development and production," the report scolds. "The pendulum has moved too far from the early concepts of 'fly before buy' and competitive prototype development.

"Also in recent years, there has been a tendency to move too fast into production, even before development and testing is completed and, in some cases, prior to the time development and testing [have] reached the point where a reasonably intelligent decision to enter into production can be made.

"The result has been disastrous in such recent cases as the Sheridan armored vehicle and Cheyenne helicopter, but there have been many other examples. Budgetary considerations based on fear of losing funding authority have often dictated such decisions rather than sound technical judgment."

Chairman George H. Mahon of the House group—where he is chairman of both the Defense Subcommittee and the parent Appropriations Committee—did not stand alone on the subject of overruns. Senator John Stennis, Chairman of the Armed Services Committee on the other side of the Hill, came up with a scoop of his own. Mr. Stennis produced a list of thirty-five major weapons programs with an estimated aggregate cost growth of $19.9 billion over the initial cost estimates.

The Senate table, printed on the opposite page, is worth examination. It shows that the largest dollar amounts of cost growths are $1.379 billion in the Navy's Poseidon submarine-launched missile program; $4.011 billion in the F-111A/C/D/E aircraft program for the Air Force; $1.661 billion for the USAF F-15 air-superiority fighter, for which a contractor has not been selected at this writing; $1.049 billion for SRAM, USAF's air-launched missile; and $1.591 billion for the USAF C-5 transport.

Percentagewise, the record goes to the Navy's Mark 48 torpedo, with an estimated cost growth of 395 percent over the original projection.

Mr. Stennis made an appeal for proper perspective in viewing these figures. He said, first, that they are projections into the future and the science of projecting costs is not exact. He cited inflation, technological improvements, and program delays as causes for the rise in system costs.

Mr. Mahon, on the House side, is more stern in his report. He makes the blunt charge that a contractor may be, in fact, rewarded for poor workmanship. The Air Force takes specific punishment in this regard. Testimony before the House committee shows that USAF spent $90 million on spare parts, production improvements, and retrofits to achieve reliability in the Minuteman II guidance and control system. The committee staff claims the figure should be $152 million. In its testimony, the Air Force cited the major changes made in the Minuteman program over the years since 1958. These were changes in force structure, policy, pace of the program, development of a mobile Minuteman, and improvements in reentry systems as well as guidance and control. A detailed report on the evolution of the system, from an initial missile to one that is almost entirely different except in size, was put in the record. It did not dissuade the committee from insisting on better performance.

The Defense Appropriations Bill calls for $69.9 billion. This is $4.4 billion less than provided for Fiscal 1969 and $5.3 billion less than first sought by the Nixon Administration. The committee, of course, claims credit for the cut despite the fact that the lion's share of the reductions was imposed from inside the Pentagon, where Mr. Laird said cuts must be made and called on the armed services to decide how they would be made. In any event, the reductions are larger than any made in a defense budget since 1954, after the war in Korea.

The committee was careful to emphasize its continued interest in defense. It says, in a statement that will be challenged later this year by the congressional doves, that "this country must maintain its military superiority over any other nation. It is the feeling of the committee that this country does now have military superiority and that steps must be taken now and in subsequent years to continue to maintain our overall military superiority."

If we turn to the hard arithmetic, it becomes clear that most unsophisticated critics of the defense budget do not know where most of the money is spent. The Defense Department's total obligational authority for Fiscal 1970 is set at $77.5 billion. Only $7.5 billion of this is destined for the strategic offensive and defensive forces, about which most controversy rages. A much bigger chunk of the money, $29 billion, is tagged for general-purpose forces, which include all of the Army's combat units, almost all the Navy, all of the Marine Corps, and tactical units of USAF. The bill does not stint in this area, the committee arguing that improvements are needed in firepower, mobility, and readiness. Also, stocks must be replenished as a result of the war in Vietnam.

The report includes the customary summary of USAF forces existing or planned at the ends of three fiscal years:

	1968	1969	1970
USAF combat wings, including missiles	76	67	66
USAF combat support squadrons	145	132	117
Aircraft inventory—active	14,635	14,300	14,362
Active-duty personnel	904,759	862,062	861,200

The report says the Minuteman force of 1,000 missiles will be improved as Minuteman III is phased in. More than 1,000 new airplanes will be delivered, as older models phase out. So far as new procurement is concerned, the budget has funds for 662 aircraft, including A-7s, RF-4s, F-111Ds, and C-5As.

More specifically, the committee recommended an appropriation of $3.4 billion for purchase of USAF aircraft and related equipment. This is $425.3 million less than the 1969 appropriation.

The report says the committee is disappointed that USAF is not going to buy the Lockheed F-12, and it has deleted $55 million from the budget request for this account. It also eliminated $52 million for advance funding to provide more than eighty-one Lockheed C-5A transports, because the Secretary of the Air Force has said they will not be purchased. The committee emphasizes, however, that this will increase the unit cost of C-5As purchased and give the taxpayer less for his defense dollars. "This," the report says, "is the tragedy of cost overruns."

The report seems to acknowledge that our airpower obligation in Southeast Asia may continue long after the withdrawal of ground forces. It suggests that $28 million be made available to start purchase of a fighter that can be useful in that part of the world and flown by our allies. It must be able to handle the threat, be as cheap as possible, and be easy to maintain.

Turning to missile procurement for USAF, the report approves $1.4 billion, down $289 million from last year. Of this, $447 million is for Minuteman II and Minuteman III. A request for $9.5 million for the Shrike antiradar missile is denied, because of "serious deficiencies." Also turned down is a request for $20.4 million to initiate production of SRAM, the short-range attack missile. The committee says further testing is necessary before it will have confidence in the system, which has had technical difficulties, especially in the area of the motor. This project is cited for its overrun features, as noted in Mr. Stennis' table.

One of the major cuts imposed by the committee was one that reflects a different aspect of the Vietnam War. A request for $1.3 billion for munitions was slashed by $226 million, and the report says further reductions may be made possible as the war cools off. In contrast, it was learned that in Fiscal 1968 escalation of the war had resulted in a $250 million underestimate of munitions costs.

Air Force research and development funding is fixed in the report at $3.1 billion, which is down $307.8 million from Fiscal 1969. The major item deleted is the Manned Orbiting Laboratory (MOL). Other projects get rough treatment. Reductions include $13 million in the RF-111 aircraft program; $1 million in the light intratheater transport program; $16 million in the CONUS air defense interceptor program; $9.6 million in the SRAM program; $3 million in the X-3 tactical air-to-ground missile program; $20 million in the Airborne Warning and Control System (AWACS) program; and $4 million in the AX close-ground-support attack aircraft program *(see also page 33)*.

On the subject of the AX, the committee points out that there are a number of attack aircraft already in the armed forces inventory, including the A-7, A-6, A-4, A-37, F-4, F-100, F-8, A-1, A-26, B-57, and the T-28. Says the committee:

"It may be that an aircraft specifically designed for the close-support role would be superior in some ways to the

(Continued on following page)

MAJOR WEAPON SYSTEMS

(In millions of dollars)

	Original Estimate	Current Estimate to Complete	Cost Growth
Sheridan Armored Vehicle	$ 548.0	$ 689.6	$ 141.6
Shillelagh Antitank Missile	380.3	573.2	192.9
Lance XRL Missile	421.9	472.3	50.4
Safeguard ABM	4,185.0	4,185.0	(none)
Cheyenne Helicopter (R&D only)	125.9	203.9	78.0
SSN-688 Attack Submarine	4,192.4	4,470.2	277.8
DD-963 Destroyer	1,737.6	3,422.1	1,684.5
CVAN-68 Nuclear Carrier	427.5	544.2	116.7
CVAN-69 Nuclear Carrier	519.0	519.0	(none)
LHA Landing Helicopter Assault Ship	1,385.5	1,425.2	39.7
DXGN Nuclear Frigate	3,335.0	4,874.9	1,539.9
Poseidon Sub-launched Missile	4,272.0	5,651.0	1,379.0
Phoenix Air-to-Air Missile	903.4	1,498.9	595.5
Sparrow Air-to-Air Missile	265.6	262.7	(2.9)
Sparrow-F Air-to-Air Missile	246.3	425.9	179.6
Walleye II TV-guided Glide Bomb	340.7	348.7	8.0
F-14A/B Navy Fighter Plane	6,166.0	6,373.0	207.0
P-3C Land-based Anti-submarine Plane	2,265.3	2,261.7	(3.6)
S-3A Carrier-based Anti-submarine Plane	2,891.1	2,891.1	(none)
A-7E Navy Attack Plane	1,432.8	1,917.6	484.8
MK-48 Mod O Torpedo	655.2	3,240.8	2,585.6
MK-48 Mod I Torpedo	63.8	132.8	69.0
Condor Missile (R&D only)	126.0	182.2	56.2
SRAM Missile	421.0	1,470.1	1,049.1
Maverick Missile	382.1	367.0	(15.1)
Minuteman II ICBM	4,519.1	4,727.5	208.4
Minuteman III ICBM	4,375.9	5,136.6	760.7
*C-5A Air Force Transport	3,413.2	5,003.9	1,590.7
A-7D Air Force Attack Plane	2,012.1	2,012.1	(none)
B-1 Air Force Bomber	8,954.5	9,267.3	312.8
F-15 Air Force Fighter	6,039.0	7,700.0	1,661.0
AWACS Airborne Warning & Control System	2,652.7	2,652.7	(none)
F-111A/C/D/E	3,266.6	7,277.6	4,011.0
FB-111	738.2	1,207.1	468.9
RF-111	579.4	740.4	161.0
TOTALS	$74,240.1	$94,128.3	$19,888.2

**Cost estimate for revised program of 81 aircraft not provided.*

aircraft currently available, but the Air Force has not demonstrated that the advantages gained would justify the development and procurement costs involved in the deployment of the proposed AX.

"The committee realizes the importance of the close-support role and expects that at some point in time a new aircraft for this role will be required. However, the committee has approved the funding of the development of the F-15 fighter aircraft and the B-1 (AMSA) strategic bomber in the Fiscal Year 1970 program, both of which it considers to be of higher priority than the AX. The fiscal stringencies of today preclude the funding of more new aircraft developments for the Air Force at this time."

Another program cut hard is the one aiming at development of a hard-rock silo for missiles: $50 million was requested, $25 million is granted. The report says hard rock will provide better protection, but silos in hard rock will be expensive. Because ICBMs are becoming more and more accurate, the committee sees some doubt that the money would be wisely spent. The committee also points to its approval of the Safeguard ABM system and suggests there are cheaper ways to ensure survival of the missile force.

USAF think-tank and nonprofit contracts also face reductions. The amount provided for the Lincoln Laboratory is reduced from $23 million to $20.5 million; MITRE Corp., from $12.5 million to $11.2 million; Aerospace Corp., from $24.7 million to $22.2 million; RAND Corp., from $15.6 million to $12.6 million; and Analytic Services, Inc., from $1.6 million to $1.5 million.

There is nothing in the report to indicate that the House committee expects any drastic drop in the rate of development and procurement of aerospace systems. There is constant reiteration, however, of the requirement for more reliability, lower costs, more accurate cost estimates, and high standards of all-round performance by contractors. There is no attack on the military-industrial complex or on either part of that complex. There is only the insistence that performance must improve.

In its discussion on R&D, for example, the report suggests that our tactical bases in the field have, for twenty-five years, been relatively free from enemy interference. One result is that weapon systems tend to depend heavily on plenty of logistics, elaborate facilities, and technical personnel. Like this:

"Technical problems have been routinely solved by bringing factory, and even laboratory level, capabilities to the field along with the consequent support requirements and with the resultant vulnerabilities. In effect, dependence has been placed on the contractor maintainability of weapons rather than on the more fundamental factor of field reliability. Designers have placed far more emphasis on high performance than on the need for durable and damage-resistant equipment. . . . The committee fears that low standards of system reliability have resulted in reduced effectiveness of our military forces."

It is clear that this viewpoint, taken by the men who really control the purse, is a challenge to the products of our defense technology. It also is the opening door to new opportunities for the aerospace industry, which helped so much to put Americans on the moon.

The Wayward Press (cont.)

Last September 6, Lt. Col. Douglas B. Tucker, an Army information officer at Fort Benning, Ga., gave out an announcement that Lt. William L. Calley, Jr., had been charged with murder in the deaths of an unspecified number of civilians in Vietnam, in March of 1968. Further details were not included in the Army release to the press. There is no way of knowing how many newspapers carried the item, but it did appear in the New York *Times* of September 8 on page 38. That clipping is in our file, with the logotype of the Associated Press.

Now the Associated Press is a leading national wire service, and the stories it circulates go across the desks of this nation's most prestigious editors. It is a rare newspaper, news magazine, or radio/TV executive who does not see the AP file, as it is called in the trade. These same men have hundreds of reporters at their disposal, scattered all across the world, from Fort Benning itself, all the way to Saigon and up into the steaming jungles. There is no evidence that any of them, at Fort Benning, the Pentagon, the Caravelle Hotel, or in the neighborhood of My Lai village in Quang Ngai Province, was asked to pursue the Calley story. An unidentified Pentagon lawyer has been quoted in the Washington *Post*, as saying, "We were amazed that the story never went anyplace, absolutely amazed." There were no queries about the specifics of the charge.

Credit for the fact that the story finally went someplace, more than two months after the Army passed out the tip, is given to a man named Seymour M. Hersh, described as a free-lance reporter. He does not have an editor giving him assignments and agreeing to pay his expenses. So he obtained a grant, reputed to be $1,000, and set out to pursue the story. The *Post* says the money came from philanthropist Philip M. Stern. The *New Republic* reports it was handed out by James Boyd, "who will be remembered as the man who undid Senator Tom Dodd [and] is now the head of the new Fund for Investigative Journalism."

The $1,000 investment resulted in a story that was offered to individual newspapers for $100 and a large number of them, recognizing a journalistic bargain on the counter, decided to buy. The sale was brought about by a previously unknown outfit called Dispatch News Service. DNS is described by *Newsweek* as "an antiwar offshoot of Washington's radical Institute for Policy Studies." The Institute for Policy Studies is a pioneer pacifist organization —it favors unilateral disarmament—that has been in the forefront of the antiwar movement. A codirector of the Institute is Richard J. Barnet, author of the new book, *The Economy of Death*. On November 13, just as the Hersh story was being headlined by the new DNS clients, Barnet was in Hanoi, where he took part in a Communist meeting to register support of "massive [American] demonstrations against the US aggression in Vietnam." This was reported with glee by the Hanoi radio.

According to the Straus *Editor's Report*, a weekly copyrighted newsletter published in Washington, DNS now is a success:

"Editors beat a path to the unmarked door of the fledgling Dispatch News Service, which gets credit for breaking the Pinkville 'massacre' story. Dispatch now operates as a syndication service for the work of its star, former AP reporter Seymour Hersh, plus eight stringers (mostly students) around the world."

A week later *Editor's Report* found its clients have "overcome their early resistance to the new, unorthodox and irregular sources of most Vietnam 'atrocity' stories." Having bought the Hersh story for $100, they soon began spending thousands for pictures and alleged eyewitness accounts.

Sometime in April, if the pattern holds, the American Society of Newspaper Editors will hold a convention here in Washington. There should be a spot on the program for a seminar on the subject: "The Pinkville Massacre—Was the Press Really Credible?"—END

Name your weapon...

Beech has a target to match it!

Only Beech has a complete family of target/drones. Power systems include liquid rocket, hybrid liquid/solid rocket, air-augmented rocket, jet and reciprocating engine. There is a Beech system to meet almost every conceivable mission requirement...from slow cruise to blinding flash; at 50 feet or 100,000 feet altitude; launched from portable zero-length launchers or air-launched at supersonic speeds; with radio-controlled or programmed maneuverability.

This speedy member of the Beech family of target/drones is the supersonic AQM-37A—the first *all-service* rocket-powered target. It gets around. Beech Aircraft Corporation has been building AQM-37A target missiles since 1959—has delivered nearly 2,000 to the U.S. Navy, Marines, Army and Air Force. The AQM-37A is a good example of why Beech's ability to perform complete weapon systems management functions is so widely recognized.

The RAF calls it Stiletto. The Beech-built AQM-37A is most versatile. It is readily modified to make it compatible with widely differing weapons systems and range requirements. It is capable of Mach 3 speeds at altitudes up to 90,000 feet with a range in excess of 100 nautical miles. The programmed flight control system has 32 different settings.

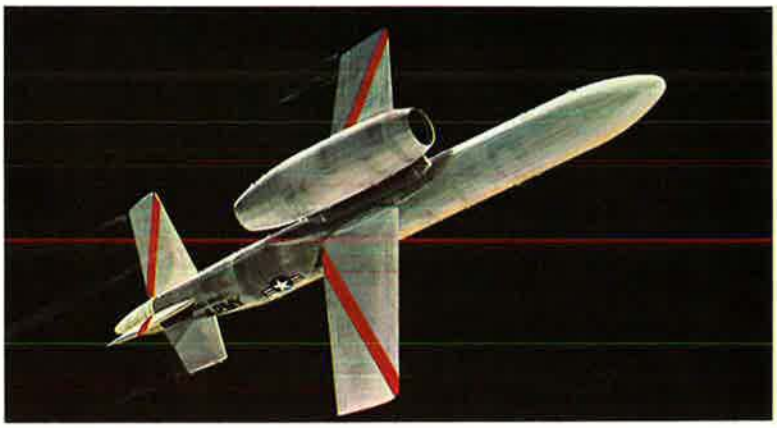
Jayhawk...

off-the-shelf missiles that meet all supersonic target requirements

High reliability typical of Beech is assured in t family of low-cost target missiles. Evolved fr a configuration generally in use with Sparr Sidewinder, Terrier and Tartar missiles, criti propellants and components have been pro in service for more than five years. Each J hawk missile is delivered complete, fully fue and ready to fly. All are maintenance-f after production.

Designed to fulfill today's needs, these tar missile systems have capabilities to meet tom row's requirements. Eight out of ten miss operations against supersonic targets fall wit the Jayhawk II mission spectrum. Jayhawk goes beyond present target requirements w Mach 4.0 speed and an operating altitude over 100,000 feet. The third member of t Beech family, the Jayhawk I, is designed low altitude supersonic performance.

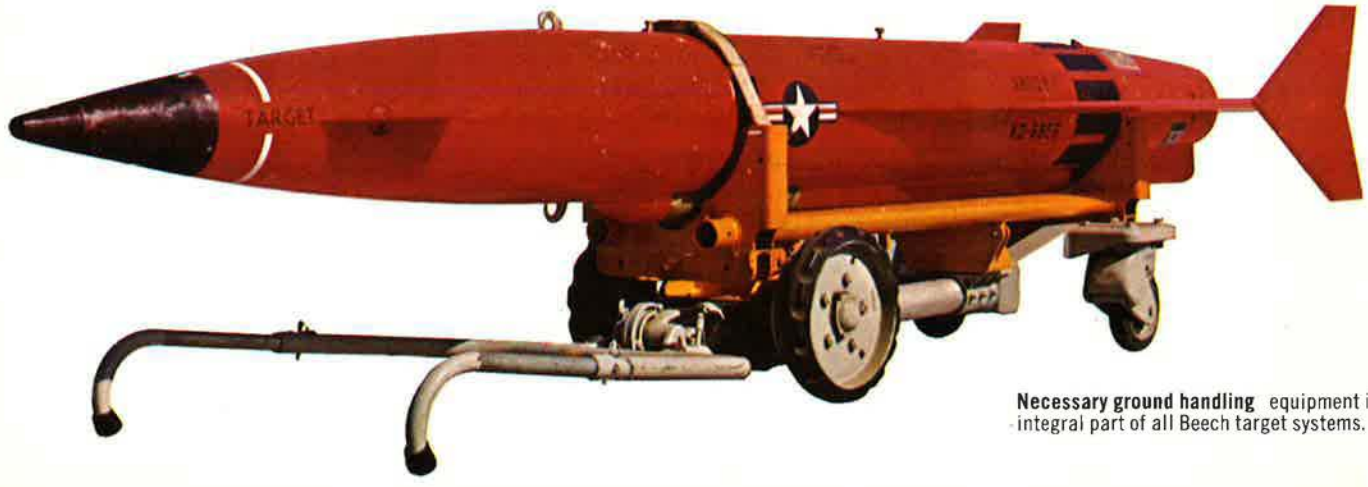
Ample payload space for augmentation is provid in all missiles. Infrared, radar area and mi distance augmentation are optional and install in production. Targets may be "tailored" to specific missions... another budget-stretchi factor in addition to reduced initial cost. Here a product family you should investigate.



This Model 1055 turbojet drone, developed as a target for the Army, has a Mach 0.7 speed and 400 nautical mile range. Add 5 cubic feet of available space and a 500 pound payload capability and you can start ticking off its potential applications. Radar, TV or camera reconnaissance, decoy, stores delivery – and that's just a beginning.

Zero length launch with recoverable Jato rockets can be made in a 20 knot tail wind. The launcher folds up to be carried away by one man. Flight may be programmed or remotely controlled by radar tracking.

Mission completed, the Model 1055 may be recovered and reused. The fiberglass nose absorbs the impact of landing, and damage is of a minor, repairable nature. The turbojet engine can be removed from one target and installed on another by two men in 15 minutes.



Necessary ground handling equipment i integral part of all Beech target systems.

andpiper...

ew proof of Beech rget missile capabilities

signed by Beech Aircraft Corporation to reach ach 4 speeds and altitudes of 90,000 feet or gher, Sandpiper is successfully undergoing velopmental flight testing by the United ates Air Force.

e test vehicle is a modified Beechcraft AQM-A, time and performance-proven all-service ssile. It is demonstrating the feasibility of a brid rocket engine developed and produced United Technology Center. This hybrid cket engine is capable of long-term storage, olonged burning time and variable speeds.

new Beech-designed and built guidance system also being qualified during these test flights. It ovides S-turn maneuverability for the first ne in a rocket-powered target missile.

team of Beech Aircraft Corporation engineers d technicians is assigned to assist Air Force rsonnel at Elgin Air Force Base, where Sandper has taken its place on the hot gun line ongside the latest defense systems under aluation by the Air Proving Ground Center.

The Beech Cardinal target has proven its reliability with more than 5,000 flights. From minus 42 degree weather in Alaska to the hot and humid jungles of Southeast Asia, the Cardinal has been proven a very dependable drone.

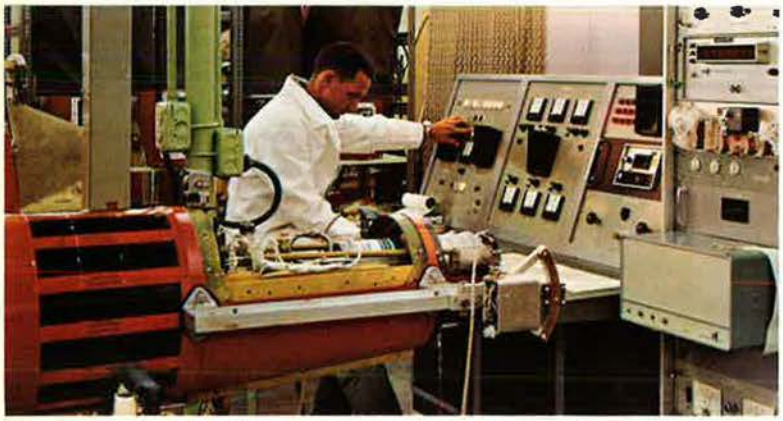
The Beech-built Cardinal is powered by a 125 hp, 6-cylinder engine. Extremely stable and maneuverable, it offers controlled flight from 50 feet over terrain to an altitude of 43,000 feet. It can attain speeds up to 300 knots and can sustain flight for up to 2¾ hours under favorable conditions.

Potential capabilities of the Cardinal drone include adaptations for battle area reconnaissance and surveillance by photograph or television, special stores delivery, meteorological and radiological data collection. Air-launched, it could perform as a decoy.

A Jato rocket boosts the Cardinal from a simple zero-length launcher. Made flight-ready in minutes, checked out and started in seconds, it can be launched with a 20 knot tail wind.

Flight maneuvers are controlled by remote radio. When the target passes out of sight, it is tracked on a radar plotting board. Tracking has been accomplished at slant ranges up to 138,000 yards.

Beech has demonstrated exceptional capabilities for missile system and components design, analysis, development, test and manufacture for two decades.



The tape read-out from this Beech designed automatic tester becomes a permanent record of test results on all functional areas of the AQM-37A.

This Beech missile will be delivered completely fueled and ready for launch.

Proven shelf-life of the AQM-37A is more than three years.

Beech follow-through

gives targets extra performance reliability.

After-delivery service is as much a part of th Beech concept of complete systems manageme as basic research. It has contributed to the ve high reliability ratings received by all Bee target/drones.

A highly trained Beech organization of specializ engineers and technicians goes anywhere in t world it is needed. This group trains oper tional and maintenance personnel. Their expe technical experience is available to help sol problems dealing with special missions, tactic planning and logistics, special configuratio launch systems and support equipment. Th have received repeated commendations fr the military organizations they have served.

For guided missile experience...
Look to Beech Capabilities!

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.

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AEROSPACE WORLD

News, Views & Comments

By William P. Schlitz

NEWS EDITOR, AIR FORCE/SPACE DIGEST

WASHINGTON, D.C., DEC. 12

In line with President Nixon's Operation Reduction Plan, the Defense Department has announced that a reduction of DoD overseas military and direct-hire American civilian personnel is under way. It is expected that a ten percent cut is to be completed by June 30, 1970.

Once completed, the layoff has been estimated as saving $40 million annually in DoD expenditures abroad.

In terms of Air Force spaces overseas, 7,382 personnel will be affected. The total reduction is approximately 15,000.

Excluded from the cutback are forces in the US and its possessions; US forces committed to NATO, in Berlin or essential to their support; forces in South Korea or Vietnam; and units elsewhere in SEA directly engaged in military operations.

Overseas civilian career employees will receive placement assistance for jobs in the US under DoD's priority placement program.

In another matter, with the timetable more or less set for the return of Okinawa to Japanese control, it was announced that by spring the US will remove all toxic chemical munitions now stored there.

The munitions will be transported ultimately to the Umatilla Army depot near Hermiston, Ore.

The Defense Department has given assurances that throughout the entire movement strict safety precautions will be in force.

☆

The Departments of Commerce and Defense have announced that a major breakthrough may have taken place in man's continuing struggle against the more destructive forces of nature.

During two instances of seeding Hurricane Debby over the Atlantic last August, a dramatic lessening in the storm's wind velocity was observed.

While cautioning that the phenomenon might be coincidental, the Departments raise hopes that the seeding in the future could curb to a very significant degree the force of major storms, thereby decreasing their toll in lives and property.

Another point brought out was that the major storms are so powerful that science does not as yet have techniques to break them up entirely, but can perhaps modify them to a certain degree. But even this would constitute a tremendous stride forward.

The seeding operation, part of Project Stormfury, took place several hundred miles northeast of Puerto Rico, and was conducted jointly by Commerce's Environmental Science Services Administration (ESSA) and the Defense Department. On August 18, maximum winds of the hurricane decreased by thirty-one percent for a few hours and on August 20 by fifteen percent.

The seeding experiment is based on the hypothesis that the conversion of liquid cloud particles to ice through the use of silver iodide will release the heat in the droplets, which, accomplished in certain areas of the hurricane, may produce a redistribution of the storm's energy and thereby reduce maximum wind velocity.

Stormfury scientists working on storm prediction and preparedness techniques estimate that if government hurricane modification research continues at its present level for the next decade, and only one major hurricane with the destructive potential of Camille can be weakened as little as ten percent, the investment will have been returned tenfold.

☆

A new type of rotor that promises to double the range of conventional helicopters and push their cruise speed

(Continued on page 23)

—Wide World Photos

Communist guards at Panmunjom surround the three-man crew of a US Army helicopter shot down in August over North Korea. Released in December were, from left, Capt. David H. Crawford, Pooler, Ga.; WO Malcolm V. Loepke, Richmond, Ind.; Sp. 4 Herman E. Hofstatter, Lowpoint, Ill.

—Wide World Photos

In his new role as Assistant Secretary of State for Public Affairs, Michael Collins holds his first meeting with newsmen. Collins, commander of the command module during the Apollo-11 moon flight, resigned his Air Force commission to take the $38,000-a-year government position.

BOEING's NEW GIANT 747 MAKES TRANSCONTINENTAL DEBUT

On December 2, 1969, the world's largest and newest jetliner, the Boeing 747, made its first public flight, from Seattle, Wash., to New York's Kennedy International Airport, with 191 aviation officials and reporters, including an AF/SD representative, aboard.

The four-hour, five-minute trip (including a ten-minute hold over JFK) covering 2,422 miles, flown on preprogrammed inertial navigation *(see page 25 for story on Carousel inertial-guidance system)* outside of conventional airways, led to one conclusion: The wide-bodied superjet is apt to open a "generation gap" with conventional aircraft, reminiscent of the way the first jetliners made the propeller aircraft of a decade ago obsolete. In place of the confining "tube" interior of standard airliners, the 747's twenty-one-foot, five-inch-wide fuselage gives the impression of a spacious living room, a feeling fostered also by the fact that the interior is broken up into four individual compartments.

Twenty-eight US and foreign airlines have ordered 185 of the huge jetliners so far.

Flying aboard the 747 is similar to being on a C-5 Galaxy, both aircraft exhibiting markedly greater stability than smaller airplanes.

Rather heavy clear air turbulence (CAT) encountered early during the flight resulted in some disturbance in the rear of the aircraft but was barely noticeable in the front section and did not cause the pilot to seek relief by an altitude change, as would have been necessary with conventional jetliners.

The particular aircraft used on the first flight was the fourth built by Boeing (thirty-one 747s are currently off the assembly line and 100 will be in airline service a year from now) and bore the colors of Pan American World Airways, which initially launched the 747 program by ordering thirty-three of the $22.5 million aircraft.

While the 747 can be arranged to accommodate up to 490 passengers (a special short-range version offered Japan Air Lines and also under preliminary consideration for shuttle operations in the Northeast Corridor and California can transport more than 500 passengers), Pan Am's 747s are configured to accommodate 362 passengers (not counting seating facilities in the upper deck lounge).

Formal certification of the aircraft by the FAA, in terms of performance, safety, and noise, currently is pending, and operational service by Pan Am is expected early in 1970, several weeks behind schedule.

The delay was caused by an engine problem involving Pratt & Whitney's JT9D-3 engines designed to furnish 43,500 pounds of thrust unaugmented or 45,000 pounds with water injection. In mid-1969 it was discovered that at full throttle settings the engine tends to go out of round by 43/1000ths of an inch, causing minute performance reductions affecting its seals and compression efficiency. This is being corrected by the installation of a special yoke to prevent "ovalization."

Boeing expects to sell about 800 747s over the next decade and already is planning a stretched version capable of accommodating up to 750 passengers.

While the 747's primary impact will be in commercial aviation, its effect on military airlift augmentation and the Civil Reserve Air Fleet (CRAF) will be substantial. The 747, with a gross takeoff weight of 710,000 pounds in the A version and 775,000 in the B version, a cruise speed above that of any existing jet transport, and a maximum payload of 260,000 pounds, markedly increases the airlift augmentation capability of US carriers. In addition, several military derivatives of the 747 have been proposed by Boeing, among them command post, airborne missile platform, tanker, and AWACS.

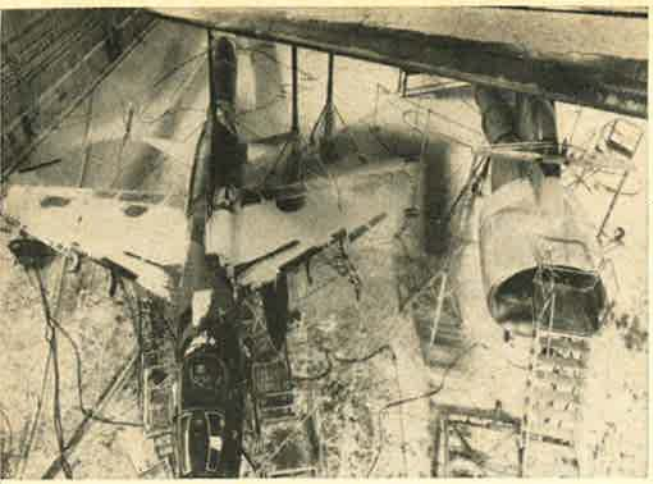
—EDGAR ULSAMER

—Wide World Photos

Boeing's 747 shown at Kennedy International following its transcontinental flight from Seattle on December 2. During its stay in New York the 362-seat giant made several additional demonstration flights. The 747 is 231 feet long and has a wingspread of 195 feet. For comparison, note in the background of the photo the pair of big, but not quite as big, Boeing 707s.

—Wide World Photos

On hand to greet the 747 when it arrived at Kennedy from Seattle was the Lone Eagle, Charles Lindbergh, remembered for his historic flight across the Atlantic in 1927.



An A-7D tactical fighter is only slightly sheltered from sixty-five-degree-below-zero temperatures by the wing of a C-5 in the extreme-weather hangar at Eglin AFB, Fla. The next stop for the A-7D during its year of climatic testing is scheduled to be the steaming jungles of Panama.

An artist's concept of the mammoth and grotesque heavy lift helicopter the US Army has its sights on. If the money is forthcoming, prototypes could be ready by 1976. Design specs call for the big bird to have a lift capability of twenty-three tons at 4,000-foot altitudes, even in warm weather.

to more than 400 mph is being developed for the Navy by Fairchild Hiller Corp.

One very important feature of the new rotor is that it closely resembles present-day rotors and could be fitted to existing helicopter fleets.

Consequently, if the new rotor is as successful as has been predicted, it will be possible to give all helicopters performance equal to turboprop transport airplanes without using folding rotors, stowed rotors, tilting rotors, and the like.

Technically, the new proprietary system is called a reverse-flow rotor. It eliminates many of the retreating blade problems that occur as a turning rotor has its sharp trailing edge facing in the direction of flight.

Small-scale tests have shown that the new rotor design has about twice the lift-to-drag ratio of a conventional system and that it will continue to function effectively to a much higher forward speed. Fairchild Hiller will build and demonstrate a full-scale unit under a $600,000 contract.

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The US Army has its sights set on a heavy lift helicopter (HLH) capable of transporting twenty-three-ton loads at altitudes of 4,000 feet even in warm weather.

The load weight was decided on because in any Army air-mobility role it would be able to handle the heaviest items in the Army's weapons inventory—for example, Sheridan tanks and self-propelled 155-mm howitzers.

The HLH is second on the priority list of Army helicopter development —an advanced armed helicopter is of most crucial interest. In any event, if congressional action is favorable and enough money is forthcoming, the Army hopes to have prototypes of the heavy-lift bird by 1976.

Army estimated the cost of an HLH development program at $300 million, and in congressional testimony Lt. Gen. Austin W. Betts, Chief of Research and Development, pegged HLHs at $6 million each.

In comparison to the twenty-three-ton capability, one of today's most powerful helicopters, the CH-54, can lift slightly more than nine tons, and the Navy recently has issued requests for proposals for an HLH with a 9.8-ton lift capability and of a size for use aboard aircraft carriers.

Interested in the Army HLH development project are Boeing Aircraft Co.'s Vertol Division; United Aircraft Corp.'s Sikorsky Aircraft Divi-

(Continued on following page)

Tampa Bay-area civic leaders are among the many who have pledged support for the wives of US prisoners of war. Many of the POWs' wives have no knowledge of their husbands' state since Hanoi has refused to make public their names. Among various methods suggested to bring pressure on North Vietnam has been use of news media to expose Hanoi's failure to observe the Geneva accords.

AEROSPACE WORLD

sion; Lockheed Aircraft Corp.; and Hughes Aircraft Co.

Officials also said that the proposed Army HLH would be designed for air transport by C-5 aircraft, to complement the air-mobility role.

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Little noticed amid the excitement of the Apollo successes has been the changing of the guard at the National Aeronautics and Space Administration. Lt. Gen. Samuel C. Phillips, the Air Force general who was Director of the Apollo program and headed the team that brought Apollo-11 to fruition, has been succeeded by Rocco Petrone, an ex-Army engineer who held a major post at Cape Kennedy, Fla. General Phillips is now Commander of the Air Force Systems Command's Space and Missile Systems Organization in California.

Also, George Low, who had played a major managerial role at NASA's Houston, Tex., Manned Spacecraft Center, is now at Washington NASA headquarters as Deputy Administrator of the space agency, a post that had been vacant for some time.

The latest command shift at NASA involves the departure for industry of Dr. George Mueller, who had been General Phillips' boss as Associate Administrator for Manned Spaceflight. Dr. Mueller, who came to NASA from STL, Inc., now a part of TRW, Inc., has taken a new post with General Dynamics Corp. as a company vice president.

As to the where-are-they-now department (courtesy *Newsweek*), James E. Webb, the NASA Administrator who put together the Apollo program but left just before the Apollo-8 manned circumlunar flight, is now quietly practicing law in the capital.

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As a way of recognizing "distinguished service to the government of the United States and to the American people," seven federal career officials in December were named recipients of the $10,000 Rockefeller Public Service Awards for 1969.

Air Force MSgt. Earl W. Perdue gives his son, Navy Seaman Marvin L. Perdue, some advice on using the chest parachute. Sergeant Perdue, a radar operator with the ADC's 552d Airborne Early Warning and Control Wing, McClellan AFB, Calif., invited Seaman Perdue on an actual mission of one of the wing's Lockheed EC-121 radar picket aircraft. The flight took place off the coast of California.

INDEX TO ADVERTISERS

The first preproduction AH-1J SeaCobra was unveiled in mid-October for representatives of the armed forces. The Marines have ordered forty-nine SeaCobras, produced by Textron's Bell Helicopter Co. Production deliveries of the twin-engine version of the AH-1G begin in the spring.

Quick-reaction team of Australian perimeter defenders sprints into action against the enemy at Phan Rang AB, South Vietnam. The men are serving with Royal Australian Air Force Number 2 Squadron, under operational control of the US Air Force's 35th Tactical Fighter Wing.

One of the honors was a special "At Large" award won by Dr. Robert R. Gilruth, Director of NASA's Manned Spacecraft Center. This was the first such award in the seventeen-year history of the program, set up by John D. Rockefeller III to compliment public service.

The honors usually are given in five broad areas of government activity, but this time two men were to share jointly the Foreign Affairs or International Operations award: John Frederick Thomas, Director General, Intergovernmental Committee for European Migration, Geneva; and Philip C. Habib, Senior Adviser, US Delegation, the Paris Meetings on Vietnam.

The award for Administration went to Arthur E. Hess, Deputy Commissioner, Social Security Administration, Department of Health, Education and Welfare.

William T. Pecora, Director, US Geological Survey, Department of Interior, was the winner in the General Welfare or National Resources category.

For Law, Legislation, or Regulation, Ashley Foard, Deputy Legal Counsel for Legal Affairs, Department of Housing and Urban Development, was the recipient.

For Science, Technology, or Engineering, John W. Evans, Director of the Air Force's Sacramento Peak Observatory, Sunspot, N.M., was honored.

Among them, the seven men represent almost two centuries of public service. The awards are administered as a national trust by Princeton's Woodrow Wilson School of Public and International Affairs.

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The growing sophistication and magnitude of the commercial avionics market was illustrated clearly by a recent AC Electronics report on the

(Continued on following page)

NEW BOOKS IN BRIEF

Big Friend, Little Friend, by Richard E. Turner. A retired Air Force colonel recalls his early interest in flying and relates his experiences in the air in World War II. Doubleday & Co., Inc., Garden City, N.Y. $5.95.

The Billy Mitchell Story, by Burke Davis. A biography of Mitchell by a great admirer, who sees him as an heroic figure whose drive and patriotism are to be imitated. Burke Davis is the author of more than twenty books, several of them written for young readers. Chilton Book Co., Philadelphia. $4.73.

Campus Apocalypse: The Student Search Today, by Donald L. Rogan. Mr. Rogan rejects phrases like "generation gap" and "identity crisis" that are sometimes offered in explanation of the attitudes and activities of college students in the last few years. Instead, he analyzes the multidirectional student activities in the context of a search for salvation, with salvation defined as self-fulfillment and social health. Included are comments on drug use, antiwar activity, and "confrontation" situations, which Mr. Rogan says bring about a polarization and "apocalyptic attitudes" on both sides that are suicidal to our society. Seabury Press, N.Y. $4.95.

An Introduction to Soviet Foreign Policy, by Richard F. Rosser. A reference work aimed at increasing a layman's knowledge of Soviet foreign policy. The first of the two sections examines the "motivational trilogy." According to this theory, which Mr. Rosser finds quite convincing, the motivations behind Russian foreign policy are the struggle for power by the elite, the preservation of the national interest, and the impact of the Marxist-Leninist ideology. The second section traces the influence of this motivational trilogy on events from 1917 through 1968. The author, head of the political science department at the Air Force Academy, has written an informative and readable book. Prentice-Hall, Inc., Englewood Cliffs, N.J. $8.50. Also in paperback, $4.95.

World War II: A Compact History, by Col. R. Ernest Dupuy, USA (Ret.). While Colonel Dupuy does focus on US participation in World War II, he has attempted to discuss the entire war. This necessitates very cursory coverage of some events, with the result that discussion of the events of December 7-15, 1941, is reduced to eight pages, and of the Battle of Britain, to three pages. More attention is given to Operation Bodyguard, which was directed toward concealing the details of D-Day, and to the Battle of the Bulge. Hawthorn Books, Inc., N.Y. $6.95. —JOANNE M. MILLER

Attending the AFA's Military Manpower Council in November were from left: Gen. Jacob E. Smart, USAF (Ret.), Chairman of the Council; Gen. Charles L. Bolté, USA (Ret.), Council member; Lt. Gen. Austin J. Russell, DCS/Personnel, Hq. USAF; and Brig. Gen. Leo E. Benade, USA, Dep. Asst. Secretary of Defense (Military Personnel Policy).

In late November at the nation's capital a Naval Reserve officer received the Air Force Commendation Medal for counseling military personnel seeking a second career following retirement. Capt. Frederic A. Wyatt, who also is a member of AFA's Military Manpower Council, receives the award from Brig. Gen. David V. Miller of the USAF.

highly successful sales campaign for its Carousel IV inertial-navigation system. To date some 756 of the system have been sold, of which 227 have thus far been produced.

Twenty-four airlines have purchased 205 Carousel IVs while 551 have been sold to the Boeing Co. Many of these will be used on the 747 transport, the first aircraft that has an inertial navigator as an integral part of its electronics system *(for a report on the 747, see page 22).*

Major subsystems in the Carousel IV are an accelerometer group, a gyroscope platform, and a digital computer for processing and storing information from the accelerometer and gyroscopic sensors. The complete unit weighs about fifty pounds and will fit into a standard office file drawer.

SENIOR STAFF CHANGES

M/G Richard S. Abbey, from Dir., Combat Ops. Center, J-3, NORAD/CONAD, Ent AFB, Colo., to Cmdr., 24th NORAD/CONAD Region and additional duty as Cmdr., 28th Air Div., Malmstrom AFB, Mont. . . . **Mr. David F. Barber,** from Supervisory Physical Scientist (General), GS-15, to Senior Scientist (Reliability), GS-16, Rome Air Dev. Center, Griffiss AFB, N.Y. . . . **Mr. Leonard G. Berman,** from Chief, Classification & Regulations Div., GS-16, to Chief, Employee Programs Div., GS-16, Directorate of Civilian Personnel, DCS/P, Hq. USAF, replacing Mr. Floyd E. Van Domelen.

M/G Archie M. Burke, from DCS/Ops, ADC, Ent AFB, Colo., to Cmdr., 25th NORAD/CONAD Region and additional duty as Cmdr., 25th Air Div., McChord AFB, Wash. . . . **M/G Joseph L. Dickman,** from Cmdr., 1st AF, ADC, Stewart AFB, N.Y., to DCS/Ops, ADC, Ent AFB, Colo., replacing M/G Archie M. Burke . . . **B/G Edmund B. Edwards,** from Asst. to Dir. of Plans, DCS/P&O, Hq. USAF, to Chief, Middle East/Africa/South Asia Div., J-5, Joint Staff, JCS, Washington, D.C.

B/G Jack K. Gamble, from Cmdr., 35th Air Div., ADC, Hancock Field, Syracuse, N.Y., to Cmdr., 20th NORAD/CONAD Region and additional duty as Cmdr., 33d Air Div., Ft. Lee AFS, Ft. Lee, Va. . . . **B/G William E. Gernert,** from Vice Cmdr., Northern NORAD Region, to Dep. Cmdr., 22d NORAD/CONAD Region, North Bay, Ontario, Canada . . . **B/G James E. Hill,** from Cmdr., 825th Strategic Aerospace Div., SAC, Little Rock AFB, Ark., to Cmdr., 42d Air Div., SAC, Blytheville AFB, Ark.

B/G Clayton M. Isaacson, from Vice Cmdr., 1st AF, ADC, Stewart AFB, N.Y., to Dep. Cmdr., 23d NORAD/CONAD Region and additional duty as Cmdr., 29th Air Div., Duluth International Airport, Duluth, Minn. . . . **B/G Frank M. Madsen, Jr.,** from DCS/Tech. Training, ATC, Randolph AFB, Tex., to Cmdr., Keesler Tech. Training Center, ATC, Keesler AFB, Miss. . . . **B/G Sanford K. Moats,** from Vice Cmdr., 10th AF, ADC, Richards-Gebaur AFB, Mo., to Cmdr., 26th NORAD/CONAD Region and additional duty as Cmdr., 27th Air Div., Luke AFB, Ariz.

Mr. Austin L. Sea, from Systems Engineering Dir. (B-70), GS-16, to Systems Engineering Dir. (B-1A), GS-16, Aeronautical Systems Div., AFSC, Wright-Patterson AFB, Ohio . . . **Dr. Norman M. Tallan,** from Supervisory Research Physicist (Solid State), GS-15, to Senior Scientist (Ceramics), GS-16, Aerospace Research Laboratories, OAR, Wright-Patterson AFB, Ohio . . . **B/G Guy M. Townsend,** from Dep. for Systems Management, to Systems Program Dir., B-1, Aeronautical Systems Div., Wright-Patterson AFB, Ohio.

M/G Rockly Triantafellu, from Dep. ACS/Intelligence, to ACS/Intelligence, Hq. USAF . . . **B/G Morgan S. Tyler, Jr.,** from Cmdr., 817th Air Div., SAC, Pease AFB, N.H., to Dir., Combat Ops. Center, J-3, NORAD/CONAD, Ent AFB, Colo., replacing M/G Richard S. Abbey . . . **Mr. Floyd E. Van Domelen,** from Chief, Employee Programs Div., GS-16, to Chief, Classification & Regulations Div., GS-16, Directorate of Civilian Personnel, DCS/P, Hq. USAF . . . **M/G George V. Williams,** DCS/Plans, ADC, Ent AFB, Colo., to Cmdr., 21st NORAD/CONAD Region and additional duty as Cmdr., 35th Air Div., Hancock Field, Syracuse, N.Y. . . . **B/G Otis E. Winn,** from Asst. to Dir. of Transportation, DCS/S&L, Hq. USAF, to Dep. Cmdr. for Resources and Management, Military Traffic Management and Terminal Service, Washington, D.C.

PROMOTION: To Lieutenant General: Royal B. **Allison.**

RETIREMENT: M/G Joseph S. **Bleymaier,** B/G John **French,** B/G Charles W. **Lenfest,** B/G James W. **Little.**

CONTINUED

Flight performance of the Carousel IV has been well within FAA specifications calling for twenty miles cross-track and twenty-five miles along-track on ninety-five percent of flights over 1,000 nautical miles, with an in-flight mean time between failures (MTBF) of at least 544 hours. To date the in-flight MTBF has been 993 hours, with the system operating more than 78,000 hours on 7,200 flights.

The emergence of a major civil market for sophisticated airborne computer/electronic systems can only be regarded as a highly favorable sign for the military services. Competition in the commercial sector is certain to bring the cost of all sophisticated systems down, while increasing their reliability and performance.

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NEWS NOTES—The **Air Force Materials Lab,** Wright-Patterson AFB, Ohio, has come up with a prototype transparent material made of polycrystalline magnesium oxide that is suitable for armored windshields on helicopters and vehicles.

During **Exercise Coronet Bare** in the autumn, Air Force technicians turned an abandoned airfield near Columbia, S.C., into an **operational jet fighter base** in seventy-two hours. All equipment was airlifted in by TAC C-130 and MAC C-141 aircraft in a demonstration of air mobility.—END

President Nixon has appointed Col. William B. Taylor III, USAF (Ret.), as one of two US Commissioners on the South Pacific Commission. Colonel Taylor has a long history of service in both the military and industry. The SPC administers the nonself-governing territories in the South Pacific. SPC membership includes France, UK, Australia, New Zealand, and Western Samoa.

Airborne Computers—What Next?

AIR FORCE
JANUARY 1970

A new era in super-accurate automated flight is dawning. Tiny, highly reliable airborne computers of the new generation make it possible for every aircraft and missile to carry unlimited, low-cost computational power. The possibilities for improving navigational accuracy and weapon flexibility are so vast that it is certain that . . .

As Computers Shrink, Their Uses Grow

By J. S. Butz, Jr.
TECHNICAL EDITOR, AIR FORCE/SPACE DIGEST

HISTORIANS tell us to step back and take the long view if we hope to see the true course of human events. They say that too close a look, too much concentration on specific problems, can obscure the matters of greatest importance.

Historians can afford this luxury. Few reporters, facing daily deadlines, can. A case in point is much of today's reporting on the technological revolution. Because reporters often concentrate on a few problem areas, the impression is left that technical progress is faltering, that it creates more problems than it solves, that the benefits are not commensurate with the cost. Actually, the technological revolution has reached avalanche proportions and is certain to hit a weary world soon with the strongest technical shocks humanity has yet experienced.

No better example of this short view exists today than in the airborne-computer field. Public reports on major computer programs have concentrated on cost overruns, criticisms of management, and technical problems. All of these have been substantial and worthy of notice.

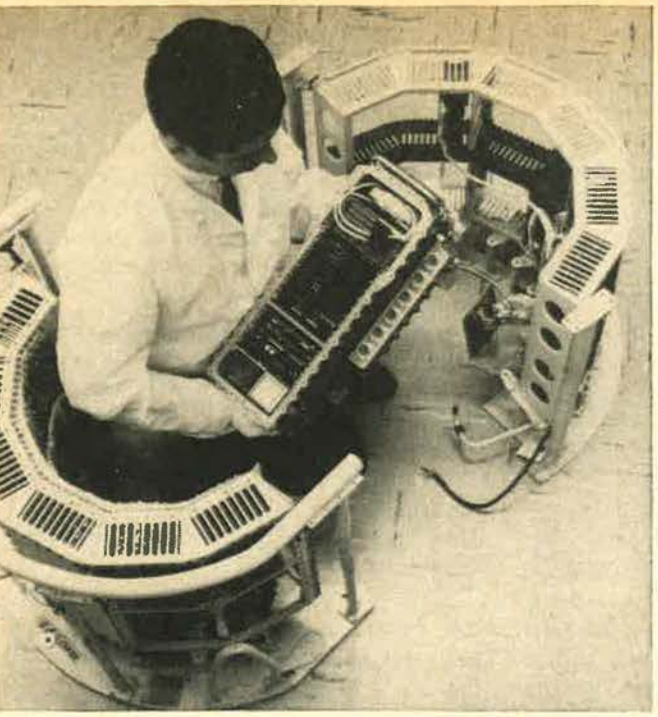
But the press understandably has failed to convey the most important news. Despite all the problems, technical progress is moving at a fantastic speed. A bona fide revolution has taken place in the past decade. Airborne-computer systems of 1960 are completely outclassed by those of 1969. What's more, there is no end in sight and more important advances are forecast for the 1970s.

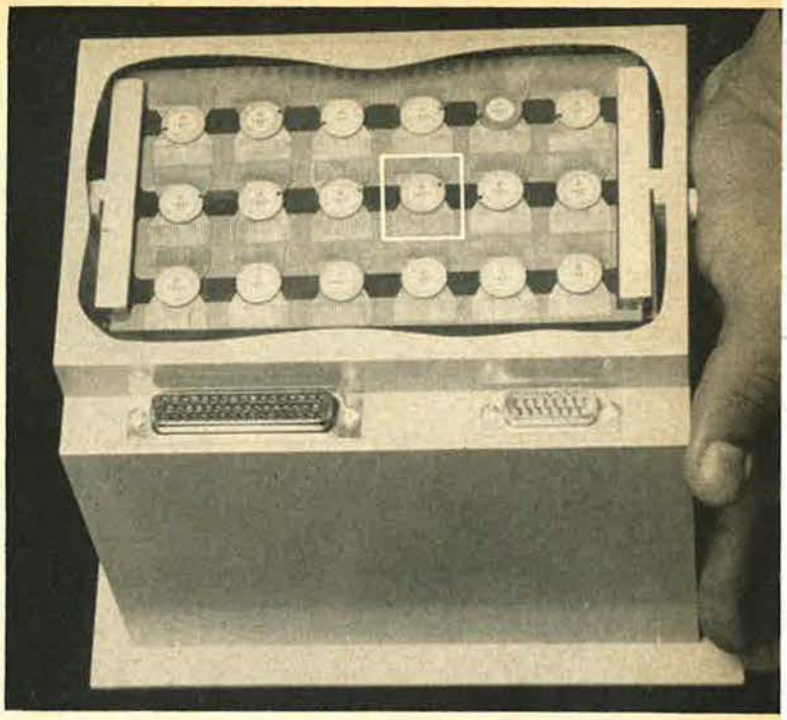
Some predictions are so glowing they are difficult to accept, but they are supported by the record. According to one prognosticator, Glen M. Harold of Control Data Corp., by 1974 an up-to-date airborne computer, equal in performance to the Minuteman I unit *(see page 29)*, will be little larger than a bump in a wire. Instead of costing nearly $500,000, as the Minuteman I system did, the price of the 1974 version would be around $10,000. Just as important, reliability would be improved by one hundred times or better.

Key yardsticks for measuring progress are shown in the tables on page 30. The values beyond 1968 are based on Mr. Harold's predicted timetable. Other experts agree that this type of performance is achievable, but some believe that the "bump-in-the-wire" computer will not become possible until a few years later than 1974.

From the military standpoint it is impossible to underestimate the significance of such an improvement in technology. Computers are the key to giving missiles and aircraft greater operational flexibility and accuracy in attacking targets through any kind of weather and all types of enemy defenses.

As computers grow smaller, cheaper, and more reli-





Four generations of airborne computers are shown here. The oldest two (above, left) are military. The technician is kneeling between the halves of the Minuteman I computer rack. He is holding the computer for the Minuteman II. Current technology is represented by Autonetics' company-developed D200 (above right), which is comparable in performance to the Minuteman II model and sells at less than $25,000 on the commercial market. The white box around one of the D200 chips shows the approximate size of the next generation of computers, expected in the mid-1970s.

able, they can be ganged together to give all flying vehicles almost unlimited computational power. Coupled through elaborate logic circuits to a complete array of modern sensors, such high-capacity computers can give a warhead almost unlimited potential for recognizing and evading defenses while still achieving unparalleled accuracy in weapon delivery.

Strategic armaments naturally have been the first affected by the airborne-computer revolution. This new technology is the primary reason behind the continuous obsolescence of US long-range missiles, which have had the shortest useful life of any major weapon system in history. Three generations were deployed in a period of ten years and a fourth is under development.

The first ICBM, the liquid-fueled Atlas, has been completely retired from the inventory. Only a few storable liquid-fueled Titans still are in service. Minuteman I, the first intercontinental missile with solid-fuel motors, replaced the liquid-rocket models, and also brought a more powerful and flexible guidance system into the inventory. It has been replaced to a great degree by Minuteman II, which has a guidance system of far greater accuracy. Former Secretary of Defense Robert S. McNamara described Minuteman II as a bigger improvement over Minuteman I than the B-52 was over the B-17. Now the Minuteman II guidance, which has been in service only four years, is thoroughly outdated by the Minuteman III system, which will be able to control several MIRV (Multiple Independently Targeted Reentry Vehicle) warheads. And MIRV technology is in its infancy.

Today, the airborne-computer revolution promises to furnish answers to many military problems beyond the one of keeping strategic weapons up to date. Computer size and cost are shrinking to the point that computers soon can be used in very large numbers. It will be possible to guide small tactical missiles with extremely high accuracy and to provide them with elaborate maneuvering capability. Within a decade it will be possible to build a complete new stable of air-to-air, air-to-ground, ground-to-air, and ground-to-ground missiles that will thoroughly outclass today's weapons.

The day also is in sight when rocket-assisted artillery shells, equipped with low-cost terminal guidance, can achieve pinpoint accuracy at ranges beyond 100 miles. Such a guidance system would couple a relatively simple fifth-generation *(see table, page 30),* bump-in-the-wire computer with one of several possible sensors. Some industry experts believe the complete system could turn out to be cheaper than the radio proximity fuzes of World War II.

A host of other changes will become mandatory when low-cost, unlimited computational power becomes available to the military. The most complex operations, from the surveillance of wide areas to the control of battles, can be automated to an extent not even dreamed possible ten years ago. Networks of hundreds, even thousands, of sensors can be monitored continuously. Every small unit, possibly every vehicle, can have a computer. Intercomputer communication will be possible in very large volume, and the logic capacity of the system will

(Continued on following page)

be so formidable that many of the laboriously prepared orders and reports now required to keep military units functioning will be handled automatically.

An example would be a decision by a high-level commander to engage a specific target. He would punch this decision into the computer, and fire orders would appear instantly at the weapons and in the vehicles to which the task was assigned. It is conceivable that these fire orders could even include specific azimuth and range to target for each weapon.

Such a picture of a computerized battlefield can only be seen by stepping back and taking the long view, by using the actual improvements in technology over the past decade to predict what should be possible in the next ten to fifteen years.

Looking too closely at specific programs brings one into range of a cacophony of arguments within the electronics industry about what should be done next, and charges and countercharges within government and industry about the success or failure of past and present programs. The arguments go down to such basic matters as definition of technical terms. There is very little agreement about anything in the electronics business. It has been racked by constant change for more than a decade, and the prospect is for greater change in the years ahead.

However, by accepting a broad definition of terms and a generous allowance for performance estimates, it is possible to break down the computer revolution into five basic generations of machines. A table of the generations is presented on this page; it is derived from material from Mr. Harold, and it checks well with material from other experts.

The mechanical computer, or zero generation, reached its zenith during World War II in Dr. Vannevar Bush's differential analyzer for controlling antiaircraft gunfire.

First-generation electronic-calculation devices were built around 1950, using vacuum tubes. Shortly after, the electronics industry experienced its first major technical revolution in the birth of the transistor and solid-state active devices. By 1956 these devices were being used in computers.

Minuteman I was one of the first major programs to depend on a transistorized airborne computer. Its performance far exceeded the most optimistic estimates of either the Air Force or the contractor, Autonetics Division of North American Rockwell. Mean time between failures on the complete guidance and control system was about double the contract requirements, as shown on page 32. Total cost of the guidance and control system, including R&D as well as production, was within 2.5 percent of the target, even though large numbers of changes were specified by the government and a very rapid schedule was maintained. The initial contract was awarded late in 1958, and the first Minuteman I was operational four years later, in the last quarter of 1962.

The unexpected durability of the guidance system paid off handsomely for USAF. This system had to operate continuously in the silo, with gyros running, so that the missile would be ready for instant flight. Since each missile could operate much longer than expected between maintenance periods, the total number needed to meet the launch-ready requirements was reduced. The computer/guidance system also proved to have a better in-flight reliability and weapon-delivery accuracy than originally specified, which further reduced the number of missiles required to perform the Air Force mission. The cost avoidance in procuring fewer missiles was estimated by the Department of Defense at $1 billion.

Success with Minuteman I did not bring stability, however, because another revolution, as destabilizing as the advent of the transistor, hit the electronics industry. This was the practical development of microelectronic devices, in which several semiconductor elements could be deposited on a tiny chip of silicon.

As late as 1959, these integrated-circuit devices were of interest primarily to scientists, and they were still in the laboratory stage. Few industry experts believed that they would reach the engineering stage in less than a

GENERATIONS OF COMPUTERS

Introduced	Generation	Technology	Application Examples
—	"Zero"	Mechanical	Gear-driven calculators
1950	First	Vacuum Tubes	Early computers
1956	Second	Transistors	Minuteman I
1962	Third	Integrated Semiconductor Circuits (ISC) 4 logic gates per chip	Minuteman II and III
1966	Third-and-a-Half	Medium-Scale Integration of Microcircuits (MSC) 100 logic gates per chip	
1968	Fourth	Large-Scale Integration (LSI) 1,000 logic gates per chip	Autonetics D200 Hayakawa Calculator
1974	Fifth	10,000 logic gates per chip	

COMPUTER TRENDS SUMMARY

Feature	1962	1967	1972
Size	2 cubic feet	0.7 cubic feet	0.1 cubic feet
Weight	100 pounds	35 pounds	8 pounds
Power	250 watts	80 watts	25 watts
Speed (in millionths of a second)	200 microseconds	30 microseconds	5 microseconds
Cost	$160,000	$30,000	$8,000
Airborne Mean Time Between Failure (MTBF)	330 hours	10,000 hours	150,000 hours

The scorching pace of computer technology is illustrated in these tables. The military services paid most of the R&D costs for the first three generations and then did not press to develop fourth-generation systems. That initiative was assumed by industry. Various fourth-generation devices are available commercially, and the market is expanding rapidly. The Electronic Industries Association estimates the market for fourth-generation equipment will reach $500 million by 1973. The lower table, representing sixty aerospace computers, contains data for the "average" system.

decade. But the predictions were wrong and progress was extremely rapid. By 1961, it was widely believed that the only way to increase reliability and computational capacity for airborne computers was by using integrated circuits and that the way was now open to do so. This conviction about the readiness of the technology resulted in the beginning of the Minuteman II project in mid-1962, before Minuteman I even became operational.

The Minuteman II program looked pretty good. It could possibly be given as high a rating as the Minuteman I efforts even though it suffered some major overruns. High marks must be awarded because the Minuteman II guidance and control represented far more than a product improvement. It was completely new, the first major military system to use microelectronics. In terms of equivalent electronic parts of the vacuum-tube-era variety, the Minuteman II guidance and control system was the equal of 64,033, while the Minuteman I system was the equal of 17,444. The Minuteman II computer was rated as two and a half times more complex than its predecessor.

All did not go well. When Minuteman II became operational late in 1965, its guidance set displayed an alarmingly low reliability rate in-silo, as shown on page 32. Its reliability had been set by contract to be equal to that demonstrated by the Minuteman I guidance, but it fell far short of the goal and its useful life was seventy-five percent below predictions. To complicate matters further, Autonetics was not able to solve its manufacturing problems with the tiny microcircuits very quickly, and there was delay in setting up a depot repair system.

Militarily, the situation became serious in 1966 and 1967, as the Air Force launch-ready requirements were not met and a large percentage of the Minuteman II force was out of service because of a lack of guidance sets.

Two major corrective actions were taken. One was an increase in guidance-set production. The other was a large reliability-improvement program by Autonetics, called the Minuteman II Recovery Program. It was predicted within the government in 1966 and 1967 that this activity would add some $400 million to the cost of the guidance—for an overrun near sixty percent—making the total cost about $1.1 billion.

In abandoning the long view and moving closer to this problem, one runs into a thicket of conflicting reports. The Air Force and Autonetics reported that changes in the computer had brought it to a satisfactory state by 1969. Most of the guidance-set problems now are associated with the PIGA (Pendulous Integrating Gyroscopic Accelerometer), which is supplied through the Massachusetts Institute of Technology Instrumentation Laboratory. Warhead accuracy with Minuteman II also is better than specified.

Newspaper accounts have told a different story. One article last June, by Bernard D. Nossiter in the Washington *Post*, said, "A defense contractor who produced substandard 'brains' for the Minuteman II missile has received an estimated $400 million in additional orders for the same device." In July of this year, Patrick Sloyan, writing in the Los Angeles *Herald-Examiner*, quoted a "strategic weapon adviser to Defense Secretary Melvin Laird" as saying, "I am seriously concerned about the reliability of Minuteman II. I have more confidence right now in Minuteman I than in Minuteman II."

Hayakawa Electric Company in Japan builds the desk-top calculator above, using three large-scale integrated (LSI) microelectronic circuits that it imports from Autonetics in the United States. Autonetics is supplying large numbers of these LSI chips under the terms of a $30 million contract.

Further confusion on Minuteman II costs has been generated by the congressional testimony of C. Merton Tyrell, a former Air Force management consultant. He contended last June that the total cost overrun on the missile, including all subsystems as well as guidance, had skyrocketed to almost $4 billion. Mr. Laird recently put the overrun at about $500 million when he reported the cost condition of all major programs to Congress.

The Washington *Post* has also carried stories by Mr. Nossiter which concluded that the electronic systems of the 1950s were more reliable and, therefore, more useful than those of the 1960s. No mention was made of the fact that the microminiaturized systems could handle tasks that were far beyond the capacity of the older equipment. And no mention was made of the fact that the integrated circuits now are realizing their reliability potential after a shaky start.

Back to the long view, another good measure for the speed and direction of computer technology is provided by the change in aircraft-navigation systems. In the mid-1950s there were no computer-controlled inertial-guidance systems aboard aircraft. Today, after significant teething problems, these units are in service aboard commercial jetliners as well as military aircraft. Most

(Continued on following page)

systems have less than a one-nautical-mile position error for each hour of flight, a major improvement in navigational accuracy.

The next step is to improve this accuracy still further, to a few hundred feet, to satisfy bombing requirements. Industry's general approach to the problem is to use a high-capacity microminiaturized computer, which will use the inputs from a variety of sensors to constantly correct the error in the inertial system.

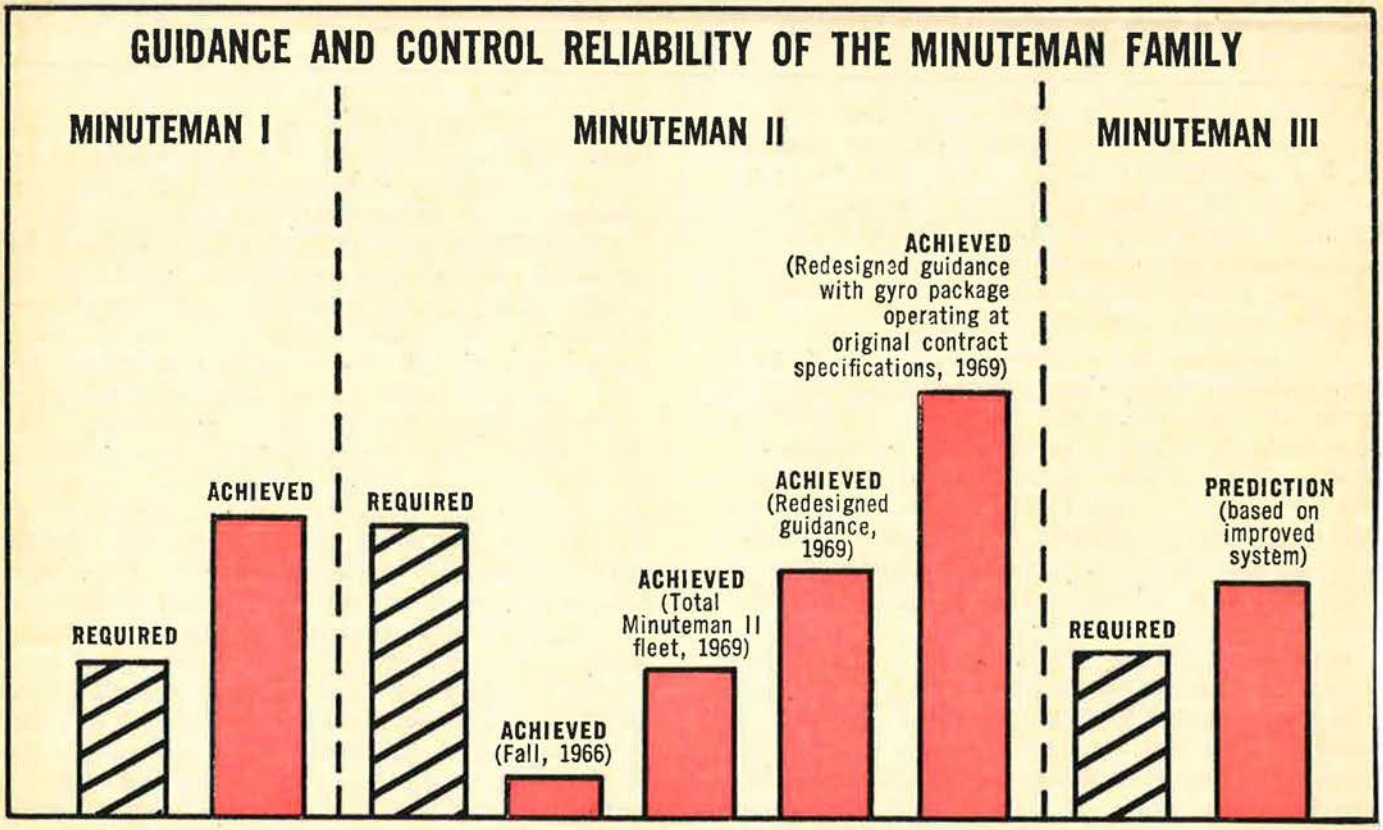
Technical literature from the electronics industry leaves no doubt about present trends. All major companies have built circuit components that are considerably advanced over those of the Minuteman II. These are in the fourth generation, or large-scale integration, listed on page 30, ranging up to 1,000 gates (elements for performing logical functions), with each gate containing several equivalent electronic parts on each chip. The main question today concerns the timing for marketing the new devices and for putting them to use on extremely sophisticated problems.

T. A. Smith, an RCA vice president, describes the problem in this way: "While the value of integrated circuits for military applications and for computers has been so great as to result in forced-draft production and application—in a much shorter time than would normally occur—techniques for both production and application still are changing. Until there is a higher degree of stabilization, it is likely that most applications of integrated circuits will be substitutes for older device functions. . . . Yet this is not the end; full exploitation of integrated circuits means performing entirely new services . . . very complex functions."

The clincher on the validity of the computer revolution comes from the commercial, not the military, market. Fourth-generation computer parts already are a stock item and are being sold under major international contracts. One of the most significant, valued at $30 million, involves Autonetics and Hayakawa Electric in Japan. Autonetics is producing 50,000 large-scale integration, fourth-generation chips per month for the Japanese firm and plans to increase the rate to 150,000.

Hayakawa's initial use of the LSI circuits is in the low-cost desk-top calculator shown on page 31. Only three chips are needed in each one, and, according to one description, a bushel of the *third-generation* integrated semiconductor circuit (ISC) chips would be needed to do the same job, at a much greater cost and lower reliability.

In one sense this development is disturbing. It is the first time in many, many years that electronic components being mass-produced for the world market are more advanced than those in US military systems. Then again this may be a very healthy sign. Commercial demand for advanced electronic systems may become so great that the military services will be relieved of some of the heavy research and development burden that they have borne so long. If the military can buy advanced technology off the shelf, with development costs borne by commercial product lines, the taxpayer will get a good deal more for his money.—END



Comparison of guidance and control reliability (mean time between failures) for the three Minuteman models is shown in the bar chart above. The scale showing the number of in-silo running hours between failures has been deleted for security reasons. However, it does illustrate the serious problem that the Minuteman II system has weathered.

Force modernization has emerged as the principal and pervasive issue facing the "flying" Air Force. Nowhere have attrition and obsolescence taken a greater toll than in the Air Force's close-air-support inventory, with many combat aircraft dating back to World War II. These factors, combined with the Army's demand for more and better integrated aerial fire support, give the development of an optimized close-air-support aircraft a high priority. Following a painstaking concept-formulation process, the Air Force now believes that it will be able to furnish the best ground support for the least cost with its . . .

AX: Lethal, Accurate, Agile, and Cheap

By Edgar E. Ulsamer

ASSOCIATE EDITOR, AIR FORCE/SPACE DIGEST

THE NEED for battlefield mobility has a direct and substantial impact on the nature and role of tactical airpower. As ground troops trade off organic firepower for increased mobility, close air support must fill the void. This the Air Force often cannot now provide as "quickly as needed by the Army," according to Secretary of the Air Force Robert C. Seamans, Jr.

"We need a delivery system that is sufficiently accurate, agile, lethal, and stable to engage the enemy's ground troops without killing our own men, [one] that can operate from nearby airstrips and has good loiter characteristics to make it an organic element of the battle zone, and that is inherently more capable of surviving in heavy ground fire than is the case with current aerial fire-support systems." This succinct statement comes from Maj. Gen. F. M. Rogers, the Air Force Systems Command's Deputy Chief of Staff for Development Plans.

Dr. John S. Foster, OSD, DDR&E, said what's needed is a "new aircraft that can transport a heavy payload, take off from an unimproved field with short runways, an airplane that is very rugged and can take a beating from ordnance fired from the ground. We want an aircraft that can deliver the ordnance on the target and bring the pilot back."

The aircraft that will be asked to do all this—and do it most economically—is called the AX.

The Air Force as well as the Department of Defense has lavished searching scrutiny on the AX's underlying concept and performance specifications, extending and refining its concept-formulation process through a number of trade-off studies. In design, the AX is conspicuous in only one regard: It breaks the trend toward ever faster, more expensive, and more complex weapon systems by stressing simplicity, ruggedness, and low cost as its prime design criteria.

On the Air Force priority list, AX ranks alongside of AWACS, behind the F-15 air-superiority fighter and the B-1 strategic bomber but ahead of the light intratheater transport (LIT). Its initial R&D funding, set at $8 million for the current fiscal year, was scuttled by the House Appropriations Committee in December, but may be restored, at least in part, by the full Congress. If not, the Air Force will seek an AX funding authorization this spring for the coming fiscal year.

Lt. Gen. Marvin McNickle, the Air Force's Deputy Chief of Staff, R&D, told AIR FORCE/SPACE DIGEST "in spite of funding problems, the need for the AX and the Air Force's confidence in its performance continue undiminished. We have pilots flying over enemy territory in aircraft that are more than twenty years old. I believe in some cases the planes are older than the pilots. The average plane in the Air Force inventory is more than nine years old. Force modernization and the need to replace lost or worn out aircraft in Vietnam are compelling reasons for the AX program. Many of the aircraft we want to replace with the AX are so antiquated—the A-1, B-26, AC-47, T-28—that they deserve the classification of 'flying Model Ts.' "

The AX Concept Formulation

The US inventory is crowded with aircraft that can furnish *some* ground-attack capability *some* of the time, and often at a very high price. There are the

(Continued on following page)

A-7, A-37, F-4, F-100, F-105, F-111, A-1, B-57, T-28, OV-10, and some AC-47s equipped with Miniguns. Navy and Marine aircraft, in addition to the A-7 and F-4, which can provide some close air support, are the A-4, A-6, and F-8. But the A-1, F-100, B-57, and T-28 have been around for more than fifteen years, and attrition and age are thinning their ranks. None of the rest was designed specifically for close air support. The A-37 is an interim close-air-support aircraft, with limited payload, loiter, and range capability. The A-7 is a multipurpose aircraft, designed for both interdiction and close support. It costs more than the envisioned AX, has less range with equal payload, and requires long, hard-surface runways. The F-105 and F-111 are expensive, high-speed attack aircraft tailored to interdiction and severely limited by weather and visibility in close-air-support operations.

To meet the intensifying, specialized close-air-support requirement with an optimized design, which meant a fixed-wing aircraft in the Air Force's view, the AX requirement was first stated by the Chief of Staff in September of 1966.

Following in-house concept-formulation efforts, the Air Force awarded preliminary-design study contracts in April 1967 to General Dynamics' Convair Div., Grumman Aircraft Engineering Corp., Northrop Corp., and the McDonnell Douglas Corp. In December 1968, the Air Force's concept-formulation package was approved by the Deputy Secretary of Defense in principle but with the stipulation that the Air Force study how size and weight could be scaled down in the interest of cost. This stage was completed in mid-1969 and did lead to a reduction of the aircraft's cost, size, and weight.

The Shape of the AX

Representing the sum total of what the Air Force has learned about close air support of ground troops in three wars, the AX is the first aircraft planned specifically and exclusively for this mission.

The paramount feature of a close-air-support aircraft, obviously, is that it be almost instantly available to the troops it is to support—to be "contiguous to the combat zone."

How to do this economically and in balance with other specific performance requirements was studied carefully. The two principal options were a V/STOL design (able to take off and land vertically as well as with short ground roll) or a STOL design. The Air Force decided on STOL because, as General McNickle put it, "We couldn't see enough good reasons for limiting the aircraft in payload, range, and loiter, and increasing its costs, which—at the present state of the art—is the price you must pay for V/STOL. If V/STOL is needed only five percent of the time, we shouldn't penalize the remaining ninety-five percent of the missions. This is not to say that we will let up on V/STOL technology. We will continue to fund such efforts so that we can get a better V/STOL later on."

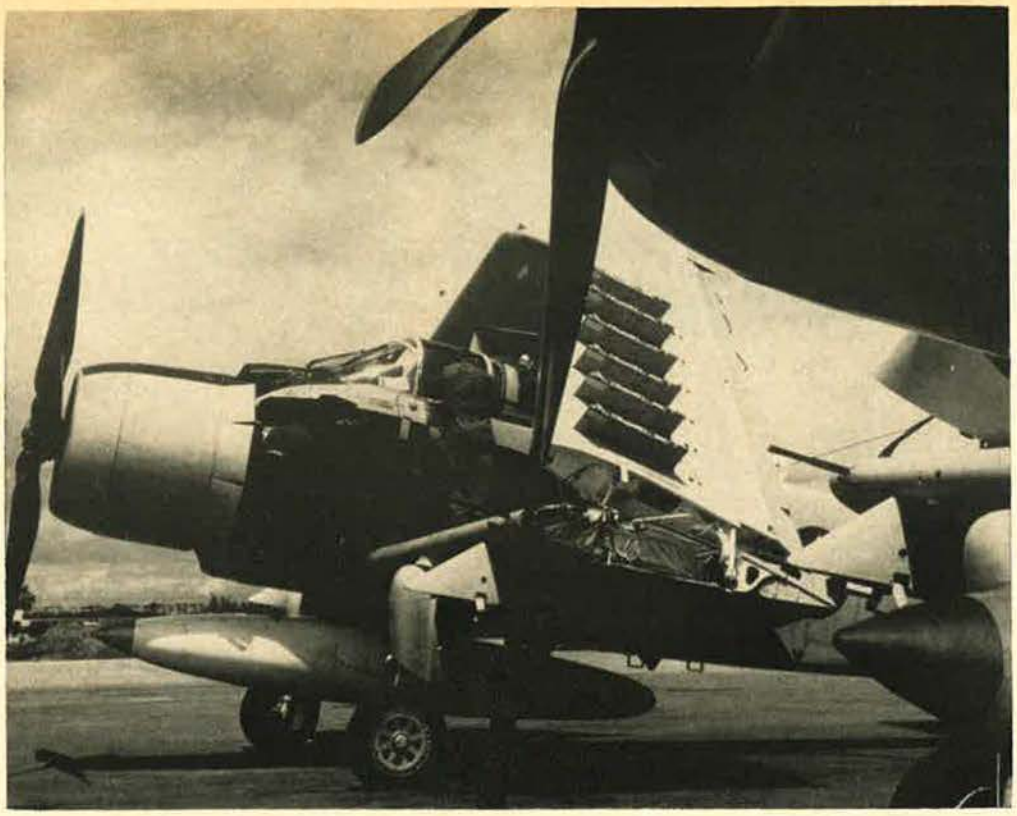
A stringent STOL requirement, therefore, was established to permit operation from small, unimproved airstrips, involving ground rolls as short as 800 feet. This automatically provides two benefits vital to the mission: rapid availability and increased loiter time.

The AX's fast response capability is further enhanced by its relatively high speed, in the range of 350 to 400 knots.

Other performance specifications provide for a mission radius between 200 and 300 miles, combined with a loiter capability of between one and a half and two hours. Reduced and simplified maintenance requirements will allow the AX to operate under austere field conditions. In addition, the AX will be able to operate visually under much lower weather conditions than any existing attack aircraft. The AX, according to Air Force testimony in Congress, will "be able to respond to the [Army's] requirements as fast as any helicopter, including the [AH-56A] Cheyenne, while providing a more stable weapons-delivery platform and carrying a larger payload."

Once on the scene, the AX must be able to survive. According to Secretary Seamans, the AX "will be designed from the first for high survivability in the

Artist's conception depicts the AX as a twin-engine turboprop design with a standard propeller arrangement. USAF plans to allow the manufacturer full latitude in technical approach and will only specify performance requirements as well as well as test and evaluation criteria. For this reason, the AX could emerge as either a turbofan or turboprop design. Among the AX's principal features is good low-speed maneuverability, extended loiter capability, the ability to operate from semi-prepared runways, and survivability. The AX is the first weapon system specifically designed for the close-air-support mission.



Acquired by the Air Force to perform the close-air-support mission in Southeast Asia, the A-1E Skyraider was produced originally for the US Navy and Marine Corps at the time of the Korean conflict. Attrition and combat losses have sharply reduced the number of A-1s in the USAF inventory. By the mid-1970s, the AX is to replace the A-1 and other aircraft currently performing the close-air-support mission. While the exact number of aircraft sought by USAF is classified, there are indications the number is between 500 and 600 AXs.

anticipated ground-fire environment of the 1970s and 1980s."

Far more maneuverable at low and moderate speeds than any existing aircraft, the AX will provide an elusive target for enemy small-arms and antiaircraft fire. Its low wing loading and high thrust-to-weight ratio combine to establish the so-called energy maneuverability factor, meaning the ability to accelerate along the line of flight as well as in turns. The AX's attack speed regime is from 150 to 400 miles per hour, slow enough to assure pinpoint weapons delivery yet fast enough to reduce vulnerability.

A number of features will shield the AX against heavy ground fire. The crew compartment will be armor plated, and all critical components, including engines, will have special shielding. Other protective features include a fully foamed fuel system insulated from all ignition sources, "go-home" fuel in self-sealing reserve tanks, shielding of all fuel lines, blast-resistant and redundant structures, and manual, redundant flight controls.

The AX gets its STOL capability through basic low-wing-loading features rather than movable high-lift devices, which are deemed more vulnerable. The so-called fly-by-wire technique (electronically controlled, movable control surfaces), considered essential for heavy, low-flying combat aircraft, has only limited appeal in the case of the AX, which does not employ any highly vulnerable hydraulic lines.

The Air Force feels that these special survival features will permit the AX to function and survive in an environment of ground-based antiaircraft and small-arms fire as well as "reasonable air-to-air activity."

On flights lasting up to four hours, the AX will be able to carry up to 16,000 pounds of mixed ordnance. An internal, rapid-fire gun in the 30-mm range, plus bombs and rockets, will provide the principal firepower of the AX. The close-air-support Gatling gun, currently under design, will be used on the AX. Such a gun could employ caseless ammunition—also under development—but this feature is not a must. (The Air Force is currently embarked on programs to standardize and improve all its munitions, an effort that would benefit the AX considerably.)

Laser-Guided Weapons Considered

Laser-guided weapons delivery—mainly bombs—is currently being considered and is viewed as a "cost-effective" feature. Eventually an entire laser system could be installed aboard the aircraft to permit both target designation and weapons delivery. Infrared-guided bombs are also being considered.

The AX does not cost out as a good all-weather day/night aircraft. A thorough examination of all likely close-air-support scenarios indicates that the great majority of all future requirements can be performed under visual conditions. Both Air Force and Army planners would prefer an all-weather capability, but "covering the mission spectrum 100 percent extracts an unconscionably high price," as General McNickle puts it. The same reasoning applies to such costly techniques as illumination through light amplifications, which is no longer being considered for the AX. The aircraft will be equipped, however, with a radar beacon to function with ground-based radar.

Integral to the AX design is the ability to add, on a building-block basis, new sensors and other electronic gear that may come into being in the years ahead. The AX will be able to accommodate new systems in terms of weight, space, cooling, and power require-

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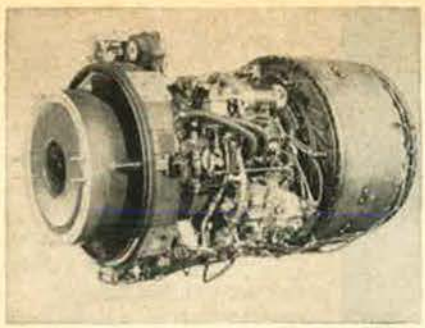
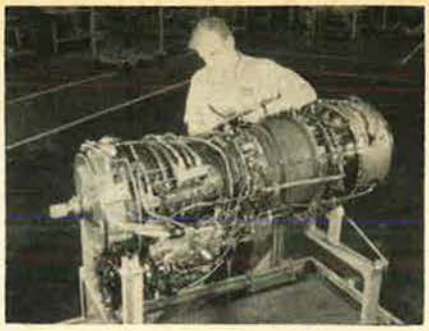
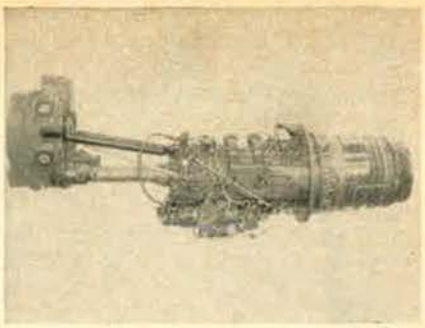


Avco Lycoming's T55 powerplant is considered adaptable to AX engine.



General Electric's T64 design also is suitable for AX engine application.



Allison's T56-derived 501-M56 also is a contender for application to AX.

ments. The AX program staff will be on the lookout for relevant developments, among them possibly even full night/all-weather capabilities.

Initially at least, the Air Force sees the AX as a single seater. But if the eventual addition of complex avionics and sensors increases the cockpit workload, an extra cockpit and crew member can "be added very easily," according to General McNickle.

Rugged, Reliable, and Simple

The basic AX design, envisioned as a combination of low-cost simplicity and ruggedness, is a twin-engine configuration with an empty weight of about 17,000 pounds.

Powered by two turboprop engines of about 4,400 shaft horsepower (or an equivalent in thrust in case of high-bypass-ratio turbofan powerplants), the AX will have a thrust-to-weight ratio of about 1 to 2. Combined with its aerodynamic optimization, this will provide excellent maneuverability in the low- and moderate-speed regimes. Maximum takeoff weight from prepared runways can be in excess of 34,000 pounds while the STOL takeoff weight from rough airstrips is expected to be about 27,000 pounds. The AX is to be self-deployable on a worldwide basis with the use of extra fuel tanks.

With low cost a primary objective, there is little likelihood that advanced new materials, such as composites, will find their way into the AX's airframe, especially since weight is not an overriding issue in its design.

As another economy feature, the Air Force plans no full-scale engine development for the AX and expects to scale existing engines to the specific power and performance level. Among existing engines believed suitable on an essentially off-the-shelf basis for the AX requirement are General Electric's T64, Avco Lycoming's T55, and General Motors' Allison Division's T56. Adapting the gas generators (cores) of these engines, or possibly those of other similar designs, to the AX requirement is expected to be relatively easy and inexpensive.

Because the AX development program is to be carried out on a "program-undocumented" basis (a contractual procedure whereby the government specifies only performance requirements and not design techniques), the competing contractors will have unrestricted latitude to suggest divergent design features and concepts.

The Air Force, therefore, is "completely open-minded" concerning such alternatives as pusher or tractor propeller arrangements, or whether the aircraft's two mandatory engines should drive one or two propellers. This open-mindedness extends to the choice between turboprop and turbofan designs, even though the initial concept formulation seemed to preclude the latter. Many propulsion experts believe that turboprop propulsion, intrinsically, is the most effective thrust producer at speeds below 350 knots. Other experts stress, however, that recent advances in turbofan engines have made them competitive with turboprops in the performance envelope of the AX.

They believe that modern high-bypass-ratio engines can meet the AX's stringent takeoff requirements and that the gap between the prop and the fan is narrowing as far as low-speed maneuverability is concerned. The Air Force has evidence that one or more competitors on the AX program will propose a turbofan design. The fanjet would have certain advantages in the AX's higher speed regime, but this is an area not deemed critical. General McNickle stressed that "part of the selection process will be devoted to an evaluation of the trade-offs involved. The only criterion we will use is how to get the best airplane for the least money."

If the AX is developed as a propeller aircraft, its turboprop will be of a sophisticated, lightweight design, incorporating recent advances effected by the Air Force Flight Dynamics Laboratory and United Aircraft Corp.'s Hamilton Standard Div. These consist of an integral gearbox and propeller, with the propeller constructed of hollow steel spars covered with a glass-fiber-reinforced aerodynamic fairing. Both the gearbox and the propeller would have to be designed specifically for the AX and constitute the only major components not available on an off-the-shelf basis.

Persuasively Cost-Effective

When the former Chief of Staff Gen. J. P. McConnell argued the case for the AX before the Senate earlier this year, he cited its "ability to destroy more targets per sortie, while sustaining lower losses per attack, than [is possible with] aircraft presently used in close air support" and the fact that the AX will be obtained "at a unit cost lower than any attack aircraft with comparable capability."

And he added that, compared with the very efficient,

(Continued on page 39)

In the tough world of air superiority fighters...

For reliability: simplicity of design and use of test-proven components. For durability: rugged design. For maintainability: modular design, with provisions for the most advanced condition monitoring techniques.

For the F-14B and F-15.

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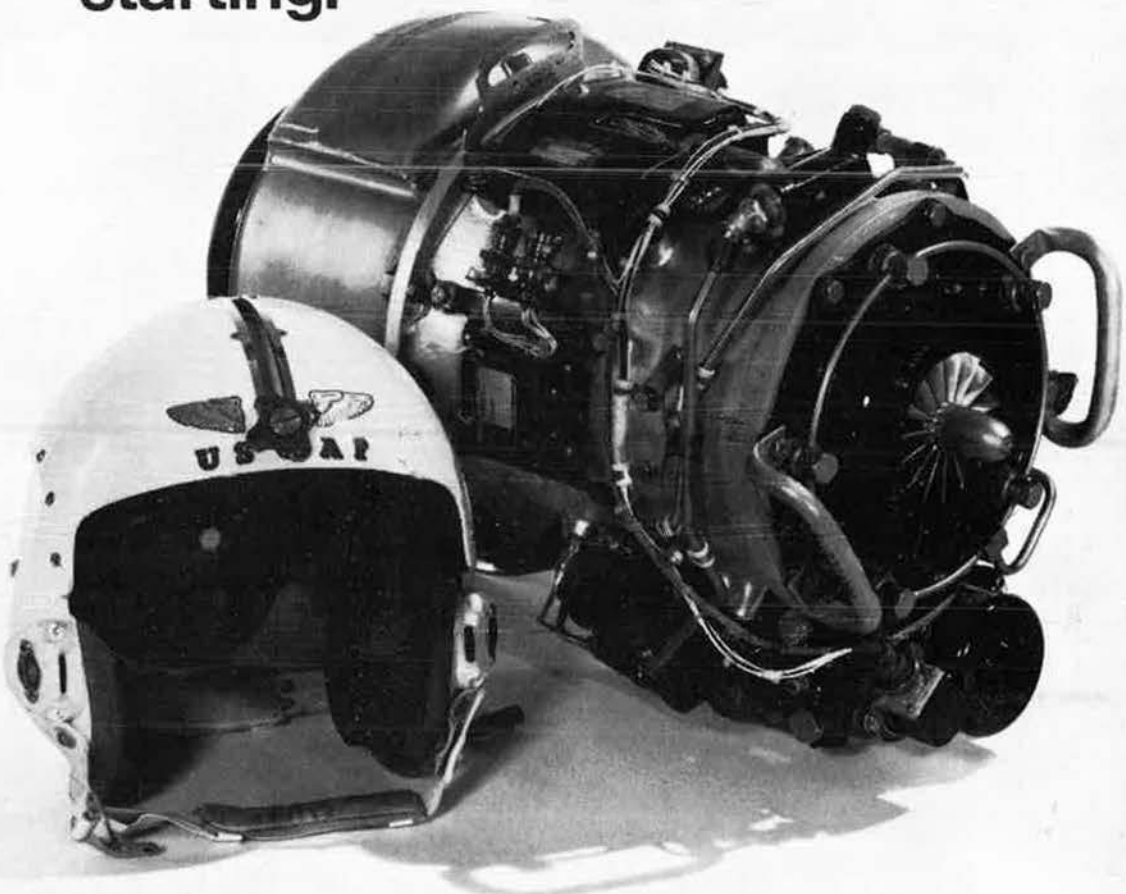
AiResearch jet fuel starter provides tactical aircraft with self-sufficient starting.



Self-sufficient jet engine starting used to take a cartridge for every start. But not anymore. Garrett/AiResearch has developed a self-contained, jet fuel powered, onboard system for starting jet engines again and again. We call it the Jet Fuel Starter—JFS 100. And it was flight tested on the A7D, F-101B, and is in production for the SAAB AJ37.

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ew A-7D, the AX "will be able to operate visually nder much lower weather conditions, and will be ble to operate from runways that are prohibitively hort for the A-7. With equal payloads, the AX will ave twice as much endurance, less critical exposure o enemy fire, and be less expensive both to purchase nd operate."

According to Dr. Foster, the AX will cost "less han $1.5 million," and Air Force spokesmen peg this igure more precisely at about $1.2 million (in 1970 ollars).

While the exact number of AX aircraft sought by he Air Force is classified, there are indications that he range is between 500 and 600 aircraft. General IcNickle said the total estimated procurement cost is about $1 billion, in addition to less than $250 million n ground equipment and spares. The initial operation- l capability (IOC) of the AX is scheduled for the id-1970s." (There is a limited possibility that the Iarine Corps will deploy a small number of AXs.)

deal for Allied Forces

Both the nature and economics of the AX would eem to make it "an ideal weapon system for allied orces." A number of countries have already indicated nterest. The current policy of "Vietnamization" of the ar effort in Southeast Asia can be expected to place ncreasingly heavier demands on South Vietnamese air- ower. Also, any phased withdrawal of US airpower rom Vietnam is contingent upon the availability of ircraft suitable for operation by the South Vietnamese. Iany American attack and fighter aircraft are con- idered too sophisticated and, therefore, too costly nd too difficult to operate by the South Vietnamese. JSAF is consciously meeting this requirement through ne development of the so-called World Freedom ighter, termed by a joint House-Senate conference eport "the first effort on the part of the US to Viet- amize the air defense of South Vietnam—[a plane] ne South Vietnamese can operate and maintain with neir own personnel." The World Freedom Fighter ill be able to deliver bombs and perform a limited round-support role.

The AX appears qualified to act in concert with orld Freedom Fighters and furnish the vital close- r-support capability "better and for less money than ny other aircraft, US or foreign," according to USAF perts. AX program officers stress, however, that the rcraft's concept formulation has not been com- omised by incorporating any requirements other than ose of the United States Air Force. Eventually the X could be used also as a principal system by the uard and Reserve Forces of USAF.

X Flyoff Likely

Present Administration policy is "to encourage com- tition throughout the design and development phase," cording to Undersecretary of the Air Force John McLucas. The Air Force, therefore, is considering ototype competition for the AX, he said, and in such eventuality, "We would contract with two or more mpanies to actually build a flying model to prove ir paper claims."

Along the same line, General McNickle said, "We have a great deal of support, including the Congress and the Bureau of the Budget, concerning the possibility of a prototype-development approach. But if the money is tight and it becomes necessary to take more time (before initiating production), prototype development may not be possible. In such a case we would have to depend on only one contractor, of course."

Should the Air Force decide on a competitive prototype development, divergent technical approaches could be evaluated, among them possibly a flyoff between a turbofan and a turboprop. On the other hand, Air Force planners believe that, even in case of two or more reasonably similar preliminary designs, the cost of competitive prototype development may be well worth the price by establishing clearly "who can do the best job for the least cost."

No final decision will be reached, however, until industry's specific proposals have been evaluated by an Air Force team and a funding schedule is authorized by Congress. Requests for proposals (RFPs) will be released once funding for the program is authorized. They will contain precise information on performance requirements and test and evaluation schedules, but leave all design features to the discretion of the contractors.

The Air Force's evaluating team, in addition to source selection, will decide whether a conventional approach—preliminary designs of airframe, engines, and avionics on a separate basis—or actual flyoff is called for. In the case of the latter, Air Force planners believe that the airframe manufacturers will be given total systems responsibility, including engine development.

It is highly probable that two essentially different contracts will be employed: a firm, fixed-price accord covering the AX program's research and development phase, and a separate incentive-type contract covering acquisition.

The final contracting arrangement will allow for what General McNickle called "Congress' demonstrated desire to have a say [in weapons development] before we enter into production. The contract, therefore, will provide for decision points, covering the various program phases, so that the government will not have to enter a long-term commitment" but can authorize the contractor to proceed in a milestone fashion as indicated by performance and availability of funding.

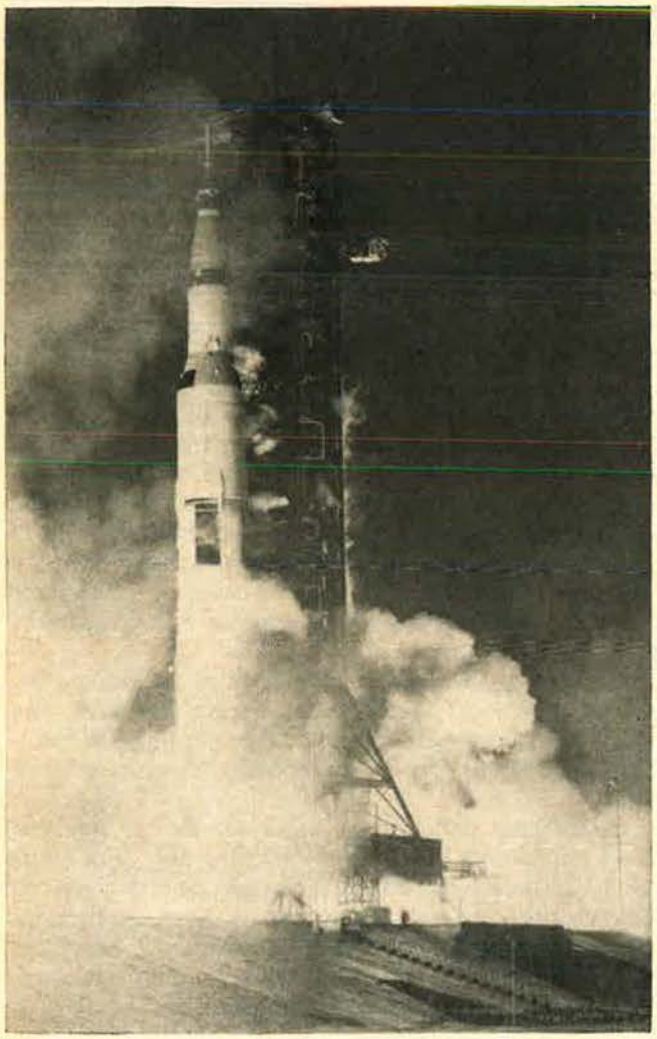
Because of the relative simplicity of the design, the size of the "buy," the potential for overseas sales, and the present competitive state of the industry, the number of bidders on the AX proposals is expected to be high.

Counseling patience in spite of the pronounced need for the AX, General McNickle said, "For years we have been allowed to buy only paper—very expensive paper at that. Now that we have finally been given a chance to buy some hardware, we are faced with a tremendous backlog. There is only so much we can obtain money for at one time."

Because of its relatively short lead time, the AX may have to take a back seat for the moment. But, clearly, the Air Force has no intention of keeping it there for long.—END

A Second Apollo Landing– With a Character All Its Own

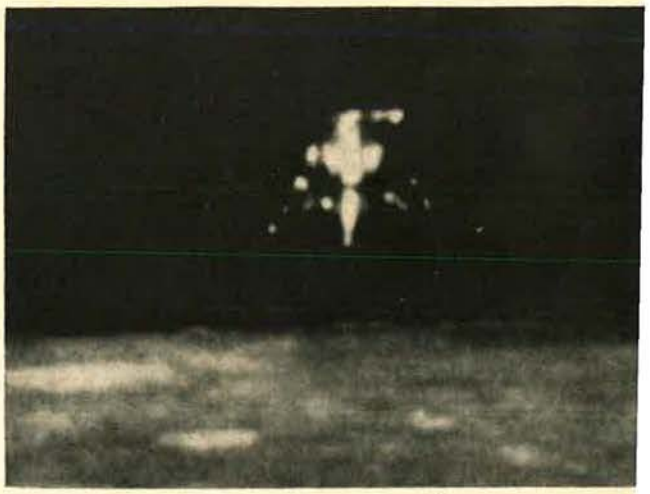
Talkative and good-humored, Apollo-12 moon-walkers Charles Conrad and Alan Bean spent a busy thirty-one and a half hours on the lunar surface while their comrade, Richard Gordon, circled overhead in the mother ship. They not only brought back more precious lunar samples but also performed the first retrieval of man-made hardware from another world.



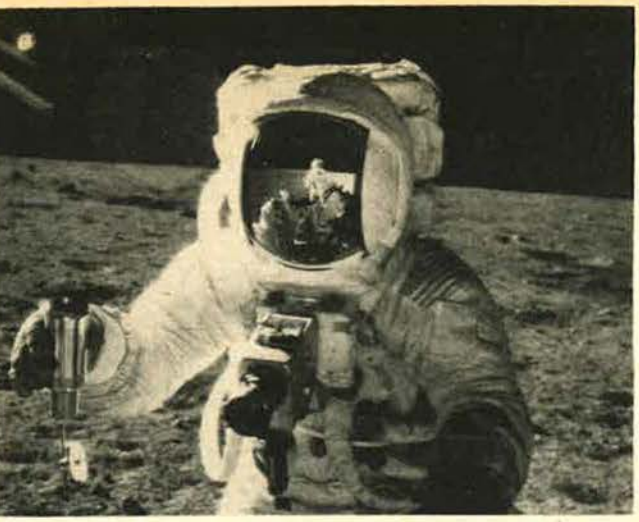
Man's second flight to the moon lifts off from Cape Kennedy, Fla., at 11:22 a.m. on November 14. There were a few frightening moments when lightning appeared to have struck the booster, but the mission proceeded with vast success.

LAST July's Apollo-11 first manned landing on the moon was about as hard an act as you could find to follow, but the crew of US astronauts who performed and expanded on the same feat during the November Apollo-12 mission managed to turn the trick.

Navy men Charles Conrad and Alan Bean spent a spectacular and talkative thirty-one and a half hours on the moon, while their colleague Richard Gordon, also a Navy man, orbited overhead in the mother ship *Yankee Clipper*. After landing with great precision in their *Intrepid* lunar module near Surveyor Crater in the moon's Ocean of Storms sector, they proceeded to prove out at considerable length frail man's ability to explore the lunar surface. They managed, during the lunar forays, not only to set up an array of scientific



***Intrepid*, separated from mother ship, *Yankee Clipper*, heads down for a pinpoint landing on the moon's Ocean of Storms. Astronaut Richard Gordon stayed aboard the mother ship as Bean and Conrad explored the surface.**

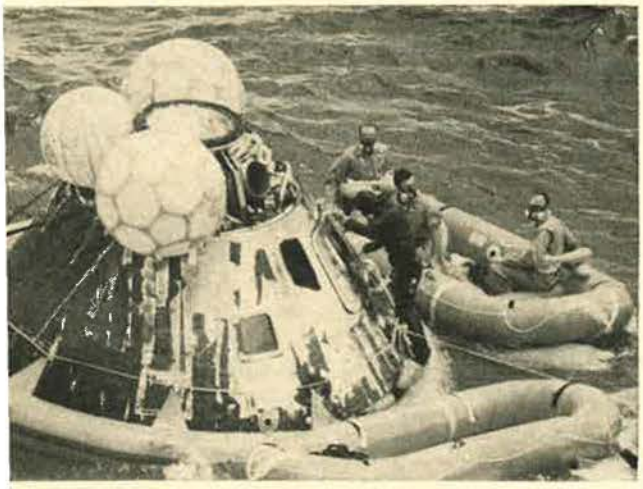


s in the famous Apollo-11 photos, one astronaut is re-lected in the faceplate of the other. Apollo-12 crewman olds in his right hand a container of lunar soil samples. On his left sleeve is a checklist of extravehicular tasks.

nstruments and gather up a heavy load of lunar rocks or transport back to earth, but also to retrieve pieces f a dead unmanned Surveyor probe sent to the moon everal years ago. About the only problem during the wo lunar walks by Astronauts Conrad and Bean was he failure of the color video setup that would have ent some exciting live pictures back to earth.

Astronaut Conrad managed also to achieve another American and world space first—the first fall of a uman being on another world. He commented that it vas "no big deal." His comrade, Alan Bean, quickly elped him back to his feet.

The Apollo-12 crew's return to earth bordered on he routine, if that phrase can be used to describe flight etween worlds. Splashdown into the South Pacific ame on time and on target, and the crew promptly vent into the same sort of quarantine provided for their Apollo-11 predecessors. All were promoted to Navy cap-ain by President Nixon, who had watched their liftoff rom Cape Kennedy, Fla.



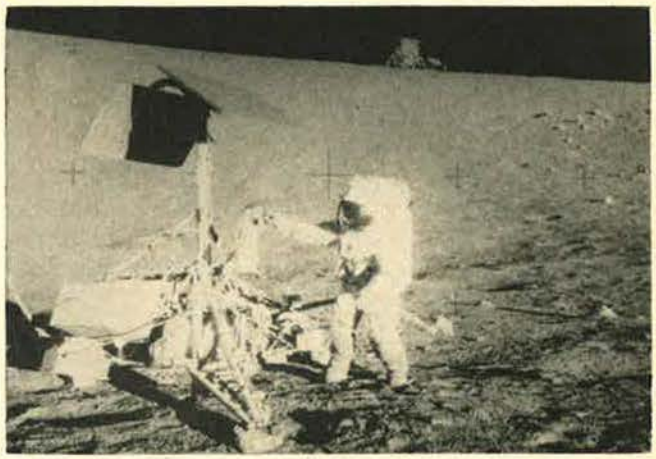
fely back on earth, Apollo-12's crew, in liferaft in the uth Pacific, watch Navy pararescueman close the space-aft's hatch, ten days after liftoff and flight to the on. Crew donned respirators before entering quarantine.

Despite the apparent routineness of the mission, Apollo-12 had hardly finished before scientists listening from earth were being tantalized by new lunar mysteries. After rendezvous in lunar orbit with the mother ship, the crew sent the *Intrepid* on a crash course to the lunar surface. It landed forty-five miles from target and set off a seismic shock heard loud and clear by scientists on the home planet.

But the tremors continued long after they should have stopped, for something like fifty-five minutes. One geophysicist, Massachusetts Institute of Technology's Dr. Frank Press, was quoted as saying, "We've never seen anything like it on earth. We're not sure what it means, but probably it will represent a major discovery completely unanticipated about the moon." That could include the possibility that the moon's interior might be highly unstable and that the impact of the *Intrepid* crash landing had set off a series of collapses.

Future missions—the next one is planned for March —might provide answers to such questions.

—WILLIAM LEAVITT



Old and new space hardware in the same photo. Apollo-12 crewman removes the television camera from the dead Surveyor probe in foreground. On the horizon, some 600 feet away, the Apollo-12 landing vehicle, *Intrepid*, silently waits. Surveyor hardware-retrieval feat was a notable space "first."

Getting the traditional congratulatory call from the President, the crew, left to right, Charles Conrad, Richard Gordon, and Alan Bean, smile inside the Mobile Quarantine Facility aboard the *USS Hornet*, the prime recovery ship.

Speaking of Spinoff

Why not build a space-age "new town" and a national Urban Research and Development Center on the site of the fading NASA Mississippi Test Facility? Here's a report on a daring proposal by a Washington urbanologist . . .

An Idea for a City— Born of the Space Age

BY WILLIAM LEAVITT

Senior Editor / Science and Education

EVERYBODY talks about space spinoff to society, but nobody does anything about it. Well, hardly anybody. It is true, and to the agency's credit, that the National Aeronautics and Space Administration does send out valuable tips to industry on technical developments in the space program that in many cases can be usefully adapted for earthbound enterprise. It's also true that nonaerospace industry, or at least its most forward-looking elements, have put to work some of the systems engineering and management techniques so successfully used in the US missile and space program.

Beyond these efforts, there are also current programs involving the Defense Department and the Department of Housing and Urban Development to explore ways of introducing new technology and mass-production methods into the field of housing construction, an industry now riddled by codes and archaic techniques that make buildings more expensive to build than they should be and less comfortable and functional than they ought to be.

But as useful as these efforts are, they barely scratch the surface of what *could* be done if only we could get cracking in a daring way and apply to earthbound problems the same kind of energy and planning that has gone into the incredible national effort to put men on the moon.

One area where space-age talent, techniques, and push could be put to work is "new towns," that dream we read about so often these days but which remains largely that, just a dream, with only a few excursions into reality such as the two handsome efforts in the Washington, D.C., and Baltimore, Md., areas—the new towns of Reston, Va., and Columbia, Md.

We're told by urban experts that this country will need something like 100 new towns by the end of the century to accommodate decently the burgeonin American population in environments blessed by clea air to breathe, rewarding local or nearby jobs, intelli gently planned transit systems, and, last but hardly leas innovative school systems that will humanely and use fully educate our children's children.

New town planning is admittedly quite complex. I involves not only land-acquisition problems but also th dilemma of finding ways to house and provide commu nity services and local jobs for heterogeneous popula tions that would include people of various social an economic classes. But the complexity does not excus the general lack of progress in this field. Exciting an workable concepts are sorely needed.

One very exciting, daring, and common-sense ide along these lines is currently being studied at the high est levels in Washington. Prepared as a proposal t NASA, it is the brainchild of Robert G. Smith, a Wash ington-based veteran of the aerospace industry who fc the past several years has been specializing in innova tive approaches to the solutions of pressing urba problems.

Mr. Smith's idea is simple, the sort of conception tha makes you wonder why you didn't think of it yoursel He proposes that a new town, which he would call B centennial City, to mark the 200th anniversary of th United States, be constructed on NASA-owned land the site of the fading NASA Mississippi Test Facili near Bay St. Louis, Miss., some fifty miles from Ne Orleans. MTF was a booming operation during the heig of the buildup of the Apollo program, but it is we on its way toward going out of business now that i main purposes have been met. Employment is fallin NASA would play a major role in Mr. Smith's propos enterprise.

Mr. Smith not only proposes building a new city

Site for a city? This is an aerial view of the storage, waterway, and testing area at NASA's Mississippi Test Facility, Bay St. Louis, Miss. MTF played a major role in Apollo booster testing, but its use is now fading. Urbanologist Robert G. Smith proposes building a space-age city and Urban Research and Development Center, first of its kind, on the MTF site.

the MTF site; he also offers a highly imaginative approach to the problem of providing a prime source of employment for the people who would live in the new city. He would build at Bicentennial City an Urban Research and Development Center, the first of its kind in the country. Such a complex would, in the manner of aerospace R&D centers, develop and test in a practical way new approaches to city planning and technology. Staffed by people who would live in Bicentennial City, the center could breathe life into urban planning —a field that up to now has been for the most part a paper-study business involving "experts" who often live halfway across the state or the country from the places they're planning for. At Bicentennial City they would live and work in their own city-laboratory.

Mr. Smith notes in his proposal that, while it is generally agreed that we need a national urbanization strategy, for the sake of present cities as well as future population growth, "the United States has no national, prestigious institute or center of knowledge regarding urban technology. . . ."

Why not build such a center and the city to go with it at the MTF location? he asks.

He lists a collection of reasons why it might be just the place. We quote the rationales from his study:

- "The need to develop as many as 100 new towns to [help] absorb the nation's population growth, reduce the pressures on existing and overcrowded urban centers, and to revitalize and strengthen the rural and economically depressed areas of the United States.
- "The [anticipated] increasing population in the Gulf Coast region from 2,700,000 in 1970 to an estimated 4,700,000 in the year 2000.
- "A related requirement for New Orleans to develop satellite towns to absorb some of the metropolitan growth and to minimize some of the related problems arising from that population growth.
- "The phasing down of NASA's Mississippi Test Facility, resulting in job loss and consequent negative economic impact on the surrounding communities.
- "The location of the Mississippi Test Facility in the center of the Gulf Coast region, one of the twelve largest urban growth areas in the United States.
- "The availability of a large tract of public land in the Mississippi Test Facility, plus an excellent and expanding road network, as well as a connecting rail line, deep-water canal, and new airport.
- "The requirement to revitalize the Gulf Coast region that was devastated by Hurricane Camille, and to construct a town that minimizes hurricane damage and loss of life.
- "The need to develop a new town, utilizing the latest technologies and management techniques such as the systems approach, and to create a direct link between urban-technology development and testing and city planning, design, and operation.
- "The need for a national Urban Research and Development Center that emphasizes a systems approach to urban-technology development and testing. This center could be established at the Mississippi Test Facility as facilities and equipment become available. Remaining Mississippi Test Facility functions could be gradually shifted to the Kennedy Space Center as Urban Research and Development Center responsibilities increased.
- "The need to establish (as was the case with the space program) a federal interagency mechanism to coordinate the presently fragmented urban development and technological programs; and to focus these programs and resources on a specific national goal, *i.e.*, 'to develop a combined new-town urban research and development complex to be officially opened in 1976, the bicentennial anniversary of the United States.'
- "A continuing and related requirement to initiate and support national programs that stress federal interagency planning, federal-state-local cooperation, and joint government-business action. The proposed Bicentennial City would provide a focal point for meeting all of these requirements.
- "NASA's proven management ability to coordinate a diverse group of federal agencies, industries, and universities to work toward a common national goal.
- "NASA's experience in dealing effectively with federal, state, and local governments with a broad spectrum of activity.

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• "Planning and development of the Bicentennial City–Urban Research and Development Center complex would, like the Apollo program, attract the best talents of government, private industry, and the universities. Talents could be focused on the planning and construction of a dynamic new town and research center that would not only represent a positive application of our managerial and technological skills to urban development, but would also be a fitting example of our nation's 200 years of progress."

What kind of new town does Mr. Smith visualize? How big would it be? How much land is available?

The MTF site includes some 13,000 acres of NASA-owned land. There is also a buffer zone of more than 125,000 acres, some of which NASA controls. The overall site, Mr. Smith believes, offers more than enough land for a city of between 50,000 and 200,000 inhabitants.

"To build a new town," Mr. Smith suggests, "it is not only necessary to have a large tract of relatively inexpensive land, but also to build a well-planned community from the ground up, including the roads, sewers, hospitals, schools, homes, and commercial centers with the proper spatial balance and with full consideration of the residents' needs. It is necessary to have zoning and discretionary control of the land, at least during initial development of the new town. Since NASA owns 12,428 acres in the MTF area, plus 7,778 acres in the buffer zone, the degree of control during the initial planning and development stages of Bicentennial City would be maximized in terms of the public interest, and this would assure an orderly and systematic town-planning and implementation process."

There would be at least two prime sources of population for the new town. A majority of the residents, Mr. Smith expects, would come from nearby urban centers, specifically New Orleans, while there would also be an influx of people to staff the Urban Research and Development Center—managers, scientists, and technicians—who would come from the New Orleans area and from far beyond.

Although the MTF area is presently in trouble, because of cutbacks in Apollo-connected employment and marginal agriculture, and because nearby Gulf Coast tourism has suffered as a consequence of the Hurricane Camille disaster, the community also has a lot going for it. It has a good road network, a deep-water canal, and rail connections. That system could be expanded to provide emergency evacuation to Bicentennial City in the event of future devastating hurricanes along the Gulf Coast.

As one of many possible design approaches for Bicentennial City, Mr. Smith envisions a self-sustained city of 50,000 to 70,000 people, which could be built on 5,000 to 7,000 acres of the presently defined MTF area.

He suggests that the city center could be an "architecturally and functionally integrated business, commercial, and shopping plaza where surface vehicles—other than public safety and medical vehicles—[would] be restricted, with underground or peripheral parking provided for private automobiles. The downtown commercial plaza and shopping center [would] also contain public administration buildings, hospitals, an auditorium, a central library, and hotels. The necessary linkages to the downtown plaza [would] be accomplished through the systematic design of the city's transportation, water, sewage, and communication systems. All utilities [would] be placed underground and common conduits [would] be used where possible."

To encourage social, racial, and economic diversity, Mr. Smith proposes that "the city center be surrounded by ten villages of 5,000 to 7,000 people per village; each village served by a multipurpose shopping, educational, and recreational center. To emphasize the diversity inherent in human needs, the overall design and specific structures in each village [would] have individual characteristics [to] differentiate it from each of the other villages."

The "beauty part," of course, is that since the total acreage and tracts would be controlled as public land, the overall plan and its execution could be carried out to permit what Mr. Smith calls "an optimum match between people's needs, design, city functions, aesthetics, and technological innovation." Free from archaic codes, planners could use the latest materials and construction techniques. They would also be free to test on-site the very latest ideas, ideas that could emerge from the local Urban Research and Development Center. The Center would *not* be a paper-producing think-tank but truly a living laboratory.

As Mr. Smith points out: "Other than the need for a sound economic and employment base, the rationale for and considerations that [enter] into the proposal for a National Urban Research and Development Center are [also] based on the fact that there is no national center for conducting urban research, technology development, and testing, in the same sense that NASA has R&D facilities like the . . . Manned Spacecraft Center; the Air Force, the Wright Air Development Center; the Navy, the Naval Research Laboratory; and the Army, the Aberdeen Proving Ground.

Such a center, Mr. Smith believes, could bring unity to what until now has been a quite fragmented urban-development effort around the country. Not only would the center be physically incorporated into the overall design of Bicentennial City, but also concepts developed at the center would serve the emerging requirements of a real city as it grew. "Thus," as he suggests, "a closed loop between basic and applied research and practical applications, and between emerging urban needs and mechanisms for meeting those needs, will be maintained."

Existing MTF layout and facilities could effectively be used by the new complex. The existing rail line and deep-water canals would allow the transport of bulk raw materials, such as cement, steel, timber, bricks, and even large modular housing and building units to build Bicentennial City. Also, the existing data-acquisition center, administration buildings, electronics and materials lab, sonic and acoustics facilities, and meteorological labs could be used by the Urban Research and Development Center, along with the heating plant maintenance building and warehouses, docks, and rail yard. The nearby associated NASA Michoud Facility might also be used by the center for assembly and testing of large modular housing and building structures, and the nearby NASA Slidell Facility's computer operation could be put to work too.

It's a terrific idea.—END

The dip in aerospace spending that can be traced to reductions in the Defense Department budget must be measured against the fact that 1968 was a record year and 1969 stands in second place. A survey of leading executives discloses no straight pessimism, but varying degrees of optimism. The larder is nearly empty and many major projects have been deferred. On top of this, technology is pregnant with new and better ways to ensure security . . .

Defense Cutback— What It Means to Industry

By Claude Witze

SENIOR EDITOR, AIR FORCE/SPACE DIGEST

PINCH the aerospace industry—as Uncle Sam is doing right now—and you will get a yelp, but not a loud one. As outlined in these pages last month, the US Air Force is streamlining its organization. The first major steps, to be completed by next June 30, will move USAF swiftly toward the kind of setup it had expected to have four or five years hence. There will be an equipment gap—Defense Secretary Melvin R. Laird says our capabilities will be reduced and defenses weakened —and the gap will persist until it is filled by production lines.

The $20.7 billion defense authorization bill, approved by Congress in early November, calls for a new generation of aircraft, ships, and tanks, and progress on the much-debated antiballistic-missile system called Safeguard. Chairman John Stennis of the Senate Armed Services Committee declared that this action did not disturb the "bone and muscle" in the program, an observation that is true as far as it goes but does not soothe the apprehension with which defense industry now looks at Washington.

Mr. Laird wrote a letter in mid-October to Paul W. McCracken, Chairman of the Council of Economic Advisers, in which he said Defense Department spending is high and "contributing toward overheating the economy at an unprecedented rate." This he traced to programs laid down while Robert S. McNamara was in charge at the Pentagon.

Secretary Laird gave Mr. McCracken some indications that the course is being changed. He mentioned:

- Procurement obligations now being incurred are at the lowest level in four years.
- While prime contractor awards are at the lowest level since September of 1965, "missile and space systems and combat vehicles have not shown this sharp turndown, but the most recent figures on awards for both are under the average awards for the past two years."

It is important to remember that when Mr. Laird talks about cutbacks for industry he does not separate the aerospace industry from the rest of his suppliers. Thus, Deputy Secretary David Packard says that 215,000 jobs in defense industry soon will be eliminated, and the Aerospace Industries Association estimates that 83,000 of these will be dismissals from aero-

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Defense Secretary Melvin R. Laird says US security will be weakened by the anticipated equipment gap at least until it is filled in the mid-'70s.

David Packard, Laird's deputy and himself an industry veteran, is the key man in the struggle to regain control of the department. He anticipates industry cuts, but the aerospace share of this will stay within bounds.

space plants. AIA says the cut between March 1969 and March 1970 will be about six percent, but only after pointing out that record employment levels were reached in 1968.

AIA also says the prime cause of cuts in the aerospace payroll comes from reductions in the civilian space program and declining sales of large civilian transports. The latter is expected to be temporary.

A recent two-week survey trip of major aerospace plants on the West Coast, from Southern California to Seattle, did not uncover any outright industry pessimism. The degrees of optimism varied, and in some places the marketing experts were downright cheerful. Those who were not gloomy had certain common convictions. These included the certainty that in-plant cutbacks are nearly complete, oncoming technology is opening new vistas and opportunities, competition will continue to be tough and get tougher, but there may be less of it, and military inventories, depleted by the Vietnam War and the lag in "new starts" under the McNamara regime, will be restocked.

There is strong recognition in the industry that new premiums are being placed on company performance. The president of one major aerospace firm in Los Angeles needs only mild stimulation to launch into a lecture on the subject. He starts by attacking the cost-effectiveness of Defense Department management—he calls it "horrible"—and says the country will not be basically strong until the Pentagon and its outposts get rid of surplus people.

"The top management job in both the Defense Department and in industry is to cut the overhead," this executive declares. "The organization of DoD is so massive that it does not work. On a single new weapon system they can have up to 20,000 people providing some kind of input and, when it is all over, one man puts together a paper for the Secretary of Defense, and he makes the decision. His staff has got the dope; but he does not, and the reason is that the department has become entirely too big."

The basic policy decision that the Secretary of Defense should hand down is the one about basic military posture, he says, and the decision on which weapons are needed to gain that posture will follow from the existing military machinery.

"You can't improve on Wright Field," he adds, "and there would be more resources of all kinds to put into necessary weaponry if we can reverse this proliferation of management staffs."

He has a frankly selfish reason for wanting the Defense Department to cut back on this level. Industry has been forced, in his opinion, to put thousands of men on their payrolls in order to face up to the exploded bureaucracy in Washington and at military installations around the country where procurement decisions are worked out.

"The industry has to be overstaffed and shuffle a lot of useless paper because the customer does it," he says. This expert estimates that overall defense industry could do away with 200,000 jobs, but not until DoD makes it possible. He adds that Secretary McNamara, in his opinion, lost control; Mr. Laird and Mr. Packard are struggling to regain it.

Grabbing a piece of chalk, he makes a hasty chart, of the common pie variety, and divides it into three sections. The smallest section is for research and development. The two larger ones are labeled for procurement and people. The urgency, he says, is to cut back on the staff functions so that the money can be given to the more critical areas.

As pointed out in these pages last month, there are signs that this trend already has started and it will be accelerated in 1970 after further study by such groups as the new Blue Ribbon Panel, created for this purpose by Mr. Laird.

Many industry executives and marketing experts feel that the Army, Navy, and Air Force, once their organizations are trimmed to modern fighting weight, will turn to wider use of new technologies. Like industry, they will find that automation is cost-effective, and so are space systems, which may be an essential part of automated approaches. The most common example cited by industry has a bearing on the Navy's current effort to put more ships at sea. The trouble with today's ships, industry experts say, is that they are full of sailors. Automation of the ship must be laid down in the basic design; once built, vast numbers of sailors will not be needed.

"I see no reason in the world," said one man who makes a business of looking far into the future, "why a submarine should not be run like an aircraft, instead of a battleship. This industry can show them how to do it. The duty crew should fit in a cockpit." Pioneering efforts in this direction already are being made in the commercial sealift business.

There are ideas rampant in industry for the Army and Air Force as well. Most of them are classified. They call for more capital investment in technical systems to relieve men from essentially nonproductive jobs. They have application in both maintenance and operations as well as the elaborate logistics paraphernalia required to support military action.

"The savings must be made in operations, maintenance, and personnel," one man said. "They should not be made in hardware. For efficiency, for real cost effectiveness, that is where more investment is needed." Then he added:

"In industry, we have to measure our success by earnings per share, not by the number of employees on the payroll. The defense organizations must come to the same thing. The output per man has to go up

It has been poor in Vietnam, as we all know, and the reason is that there is too much focus on non-productive tasks."

One man who can be quoted directly, because he has put his opinions on the record, is J. Leland Atwood, veteran president of North American Aviation, from before the time it was merged into North American Rockwell Corp.

Last fall, Mr. Atwood made a speech to the Los Angeles Chamber of Commerce. He pointed out that space technology, as demonstrated by his company in the Apollo project, is leading North American into new science and engineering fields. About twenty percent of all the nation's scientists and engineers are employed by the aerospace industry, and it is the largest single employer of research and development experts.

"This broad technical base," Mr. Atwood said, "makes aerospace an open-ended industry—oriented toward capabilities rather than toward narrowly defined products.

"For these and other reasons I've called the industry a time machine. It is immersed today in the products, materials, and processes that will not be part of everyday reality until some time in the future.

"I am not speaking here solely of vehicles and other hardware. I am speaking also of its capabilities in organization, particularly in disciplines that will shape the future, such as computer-based information systems and systems analysis."

Mr. Atwood took a look at the budget and found that almost all of the increase in recent years has been poured into the war in Vietnam. It pays for personnel, supplies, and conventional weapons. What Uncle Sam is spending for aerospace products and services increased fifteen percent from 1964 to 1969. That just about pays for the cost of inflation over that period. He concludes that the aerospace industry has been hurt, not helped, by the war.

Aerospace industry executive J. Leland Atwood of North American Rockwell says the Vietnam War has hurt, not helped, major companies in his field.

Why? Because many of the things it could have been doing, and should have been doing, while the war raged, have not been done. Major new strategic weapons have been deferred. Space programs have been curtailed. Only token funding has been provided to loosen the industry so that it can apply its unique talents to the social and urban problems that have assumed major importance during these war years. These problems have created an atmosphere, fed by inflation and the real cost of the war, that makes them more urgent, while the biggest reservoir of capability to tackle them is diverted, restrained from performing as well as it can.

It is ironic, Mr. Atwood said, that "the very military and space programs, so criticized by those eager to attack urban problems, have created the best organizational, managerial, and technical tools we have for solving such problems."

So far as the civilian space program is concerned, it is true that the National Aeronautics and Space Administration faces cutbacks, not unlike those in the Pentagon. The NASA budget has gone down from a peak of $5.8 billion in Fiscal 1966 to about $4 billion for Fiscal 1969. For the coming year it will be some $3.7 billion.

But marketing experts in the industry feel strongly that a high proportion of the dollars will be spent for space hardware. After all, the cement has all been poured at Cape Kennedy, and the Houston Manned Space Center—"the rich man's Wright Field"—is built and operating. With a lessened requirement for plant investment, there should be more money available to use the plant.

Also, it is in the next few years, as Mr. Atwood declared, that the benefits of space—and a recognition of how it can be used—will become more apparent. Scratch a booster-maker in California or Maryland or Alabama and you will find a man looking to new horizons. The Space Shuttle or Space Transportation System is going ahead and it means we are going to

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'A TIME FOR REEVALUATION'

"With a twinkle in my eye, let me say we will continue our harassment of the Air Force.

"This is a time of skepticism, a time of reevaluation of our problems in our society. This is certainly not all bad. Congress has had its ups and downs from the standpoint of public favor. The military have had their ups and downs. The Supreme Court has had its ups and downs. They have been mostly down in recent years.

"In the third chapter of Ecclesiastes, it is said that there is a time for everything under the sun, a time to love, a time to hate, a time to plant, a time to reap, and so forth. I think there comes a time for a reevaluation of the procedures and programs of the military. Now is the time.

"This Committee on Appropriations is highly motivated toward the security of the country. . . . There will be a lot of mistakes made, just as there are mistakes made in a housewife's kitchen, or in Congress, or in business. But we want to keep these mistakes to a minimum. Defense contracts have reached such importance in the economy of our country . . . we just have to insist on getting the best we can for our money."

—Rep. George H. Mahon, Chairman of the House Subcommittee on Defense Appropriations, at hearing session of May 28, 1969.

EMPLOYMENT OF SCIENTISTS AND ENGINEERS IN THE AEROSPACE INDUSTRY
(March 1969 - March 1970)

Date	Number of Scientists and Engineers	Percentage Change from March 1969
March 1969	222,000	—
June 1969	221,000	down 0.5%
December 1969	214,000	down 3.7%
March 1970	213,000	down 4.1%

EMPLOYMENT OF TECHNICIANS IN THE AEROSPACE INDUSTRY
(March 1969 - March 1970)

Date	Number of Technicians	Percentage Change from March 1969
March 1969	82,000	—
June 1969	87,000	up 6.1%
December 1969	85,000	up 3.7%
March 1970	84,000	up 2.4%

put more things in space for both scientific and military reasons.

The booster-maker's counterpart in the electronic part of this wonder world has a long list of new "packages" that can go up there for a profitable reason.

At the same time, looking at the broad picture, industry can make no bones about the fact that sales are declining and will continue to do so. AIA's year-end review of sales and employment statistics carefully emphasizes that 1968 was a record year and that 1969 is bowing out in second place.

Here is the arithmetic:

Aerospace sales in 1969 declined by 4.1 percent, from a record $29.5 billion to an estimated $28.3 billion. Everything leveled off from the 1968 records, except the output of nonaerospace products made by aerospace companies.

Then, these sales can be divided into the defense and commercial categories. In 1969 the Department of Defense spent $16.2 billion, compared with $16.6 billion in 1968, a decline of 2.2 percent. Commercial sales, which include jet transports, executive and utility fixed-wing aircraft, helicopters, engines, and spare parts, declined from $6.4 billion to $5.8 billion—down 9.8 percent.

For more detail on the defense side of this picture, AIA selects these points:

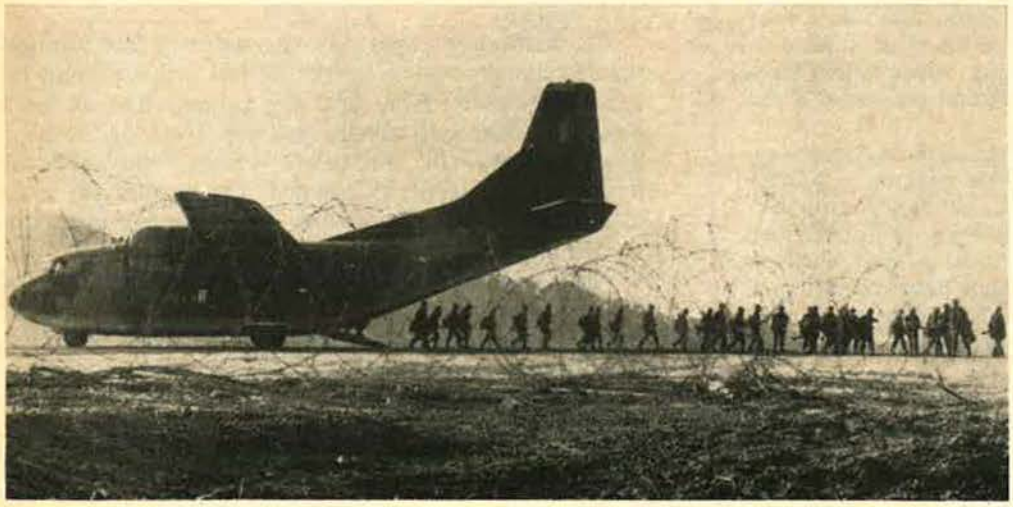
- Military aircraft sales declined from $10.7 billion in 1968 to $10 billion in 1969. This is due, in part, to deescalation of the war in Vietnam.
- Missile sales during this same period rose from $4.7 billion to $5 billion, an increase of 6.7 percent.
- Nonmilitary space sales declined from $5.1 billion to $4.5 billion between 1968 and 1969, down 11.9 percent.
- Sales of nonaerospace products and services, mentioned above, are estimated to have increased between 1968 and 1969, from $2.6 billion to $2.9 billion. In this category, AIA includes work using aerospace technology in such areas as marine sciences, water desalinization, crime control, rapid transit, job retraining, and other areas.

Turning to forecasts for 1970, industry spokesmen anticipate that sales will decline another 2.1 percent, to $27.7 billion from $28.3 billion in 1969. This is the real bite taken in defense procurement, primarily in purchases of military aircraft.

At the same time, commercial sales are expected to rise in 1970, from $5.8 billion to $6.1 billion, or 5.2 percent. Here the Boeing 747 transport is an important factor, helping to push the civil transport business up from $2.9 billion to $3.2 billion, or 9.2 percent.

Other items from the forecast for 1970:

- Utility and executive aircraft production will rise, from $478 million to $532 million.
- Helicopter production will go down, from a value of $66 million to $61 million.
- Sales to the Department of Defense will decline from $16.2 billion to $15.4 billion. As indicated, this will be primarily in aircraft sales; military missile and space programs are expected to remain level.



C-123 Provider, our senior attack transport, has been a mainstay for hauling cargo and troops in Vietnam. It is a weary airplane, and must be replaced if the Air Force is to maintain its capability to provide this kind of airlift for US Army forces.

EMPLOYMENT IN THE AEROSPACE INDUSTRY

(March 1969 - March 1970)

Date	Aerospace Employees	Percentage Change from March 1969
March 1969	1,388,000	—
June 1969	1,358,000	down 2.2%
December 1969	1,311,000	down 5.6%
March 1970	1,305,000	down 6.0%

EMPLOYMENT OF PRODUCTION WORKERS IN THE AEROSPACE INDUSTRY

(March 1969 - March 1970)

Date	Number of Production Workers	Percentage Change from March 1969
March 1969	720,000	—
June 1969	695,000	down 3.5%
December 1969	665,000	down 7.7%
March 1970	663,000	down 8.0%

• Nonaerospace sales are expected to increase slightly over the 1969 level of $2.9 billion.

A study of the aerospace industry's backlog provides only approximate figures. These indicate a decline, also, from about $31.5 billion last year to $28.8 billion at this time. The only thing that runs contrary to this estimate is the backlog of foreign orders for commercial aircraft. It has been rising.

So far as profits are concerned, AIA says that the net, after taxes and as a proportion of sales, decreased between 1968 and 1969 from 3.2 to 2.8 percent.

Employment figures for the aerospace industry are outlined in the accompanying charts, also compiled by AIA. They show that the industry remains the nation's largest manufacturing employer, with more than 1.3 million workers. This is after a decline of about 119,000 in calendar 1969. Even today's level was exceeded only in 1967 and 1968. AIA predicts there will be a further decline in employment of about two percent in 1970, from 1,311,000 to 1,285,000. Even this figure is higher than at any time from 1959 to 1966.

All of this focus on the outlook for aerospace factories, and the almost unlimited future they promise with proper utilization of their abilities and technologies, is not intended to slight the importance of research and development. Dr. John S. Foster, Jr., Director of Defense Research and Engineering, says he is worried about the future.

The reason?

"I am concerned because this country is in danger of losing its technological superiority. . . . We are technologically superior today. I am not disputing that. I am concerned for the next decade. Will we be technologically superior a decade from now? That is what I claim is in doubt."

Dr. Foster says the Soviet Union's effort in research and technology is growing steadily at a rate of about ten percent per year. Ours is not. He anticipates that for 1970 the Soviet Union will have about $16 billion available for this effort. He expects the United States to spend less than $13.9 billion, through the Defense Department, NASA, and the Atomic Energy Commission.

In the face of these facts, there has appeared in Congress this year a concerted effort to curb funding of independent research and development efforts by defense contractors. Most outspoken Senator is William Proxmire, of Wisconsin, who started last August with an effort to restrict DoD use of appropriated money in this area.

Senator William Proxmire of Wisconsin is a leading advocate of cuts in defense spending. Not on the Armed Forces Committee, he does head the Subcommittee on Economy in Government.

—Wide World Photos

In the months since, Mr. Proxmire has changed and revised his amendments as he has learned more and more about the subject. The Senate version of the Fiscal 1970 defense authorization bill put a restriction on the amount of money that could be spent for independent research and development, bid and proposal costs, and other technical efforts. The ceiling sought was $468 million. In conference, this was changed to say that the cost was not to exceed ninety-three percent "of the amount contemplated for such purposes."

At this writing, there has been no adequate definition of what this means, from Mr. Proxmire or anyone else. The industry is concerned, much as Dr. Foster is, for it can produce a long list of technological advances that came from this effort. Dr. Foster has said that of 300 identified leaps in the state of the art, at least forty-four percent "were initially financed by funds controlled internally by the performing organization, and did not require high-level approval."

The list of products ranges all the way from our synchronous satellite family to the ruby laser, the transistor, and the TV cameras used on the Apollo spacecraft.

Next month, there will be a study of the entire matter by the Senate Committee on Armed Services. Then Dr. Foster and the industry will have a chance to defend the program. In the long run, it is the fruit of this effort that is most crucial to both the industry and the nation.

Dr. Foster says the security we have now results from the R&D work done in the 1940s, '50s, and '60s. It is too late to stop.—END

This article is derived from a speech by USAF's Vice Chief of Staff at the Worldwide Personnel Conference last September in San Antonio. In his remarks, General Meyer struck some pertinent points concerning problem areas facing those responsible for Air Force management. He described two central and related trouble spots: the vital need to restore full confidence in the USAF as an intelligent, purposeful, efficient organization and the acquisition and retention of the service's lifeblood—the nation's young people—during a time of intense social turbulence . . .

Managing the USAF: The Now and Future Challenges

By Gen. John C. Meyer, USAF

VICE CHIEF OF STAFF, UNITED STATES AIR FORCE

THE actual day-to-day management of more than a million people—military and civilian—constitutes the most difficult management problem we have. Managing people is not like managing hardware or supplies or even programs. People not only are our most valuable asset. They also are our most *complex* asset. People vary intellectually and physically, but the simplest man is more complicated than our most sophisticated weapon or machine.

Personnel management is also potentially the most productive kind of management. The performance of a machine is predictable within the rather narrow bounds of design limitation. We can't improve the accuracy of a missile by a factor of four merely by managing it more effectively. On the other hand, it's possible to increase the productivity of a man severalfold by education, training, motivation, and leadership.

The potential for improved efficiency within the Air Force through personnel management is great, and the cost, compared to that of a major weapon system, is small. That's good, because we are at a point where increased efficiency is essential if we are to do our job in the climate of the day.

Good management of people has another effect. It can generate a self-sustaining cycle in which more effective people develop more effective systems and use them with greater efficiency. This, in turn, creates greater intellectual and technical challenges that attract a constantly higher caliber of people, who regenerate the cycle. Quality begets quality.

Always at the center of the cycle are people with loyalties and ambitions that are sensitive to the policies and practices of management. Are the attitudes of our people to be an asset or a liability? The answer is largely in the hands of our Air Force personnel managers. I think we can predict with greater confidence than in the past that it will be affirmative. Within the last couple of years, the philosophy and techniques of Air Force personnel management have come rapidly abreast of the times.

Gen. John C. Meyer, USAF Vice Chief of Staff, was a fighter pilot in World War II, becoming one of America's top aces. He served again in combat in Korea. Before taking his present post, he served as Director of Operations (J-3) for the Joint Chiefs of Staff. General Meyer, born in Brooklyn, N. Y., in 1919, began his long and varied military career in 1939 as an aviation cadet, and in 1940 was commissioned and received his wings.

That, also, is good. For many years, the military professionals, particularly in the Air Force, have been looked at as leaders in the management of large programs. There now has developed something approaching a crisis of confidence in the ability of the military to

plan and manage effectively. Our halo has slipped. It needs to be put back in place.

You and I know that in most cases there are rational explanations for cost overruns and for personnel actions that don't appear on the surface to have been models of good management. But no amount of explanation by USAF people will have much immediate impact on public opinion. We have to undertake the process of restoring full confidence in the Air Force as an intelligent, purposeful, efficient organization that puts its own interests second to those of the nation as a whole. It has to be done from the inside out by people who have been convinced through good management that an Air Force career offers more challenge, more opportunity, more satisfying rewards than almost any other profession. What we need is quality.

We need this kind of quality for reasons other than refurbishing a current image. For, in addition to this immediate problem, there are the near-term responsibilities of the Air Force, and its problems for our longer-term future.

All of these problems fall at a time that's nearly unique in the history of this country. We are caught up in a social revolution at a time of simultaneous economic stress, while debating foreign policy and, at the same time, fighting an unpopular war. The total impact of this novel environment has had a tremendous and generally unfavorable effect on attitudes toward the military services, particularly the attitudes of young people.

This is of unusual significance to us, because we are in the youth business. Youth is our long-range future. Attracting and retaining superior young people is a continuing problem that I want to discuss.

Fifty-three percent of all US citizens are under the age of thirty, but in the Air Force more than two-thirds of our people have not yet reached that magic age. About half of our men and women are twenty-five years of age or younger. So we, in the Air Force, have to be concerned with youth and its attitudes.

Today a principal issue between generations is the role of the individual in a complex, technical society. In the past, the question generally has been not *what* that role is, but rather *how* one fills an agreed-upon role.

This current and continuing question is important to us because the gap has to be bridged by the military services in the interest of effective national security.

In this particular environment, the personnel officer has to be more than a technician. He has to be part manager, part sociologist, part psychologist, part student of history. It's a fascinating problem. Today's young people have more to offer than any preceding generation, yet they are less oriented toward military careers than at any time since the wave of antimilitarism of the late 1920s and early '30s. We won't reach them by turning to the past or by setting the present in concrete. A solution to this problem is important in any case, but vital if a volunteer force becomes a fact, or if draft quotas taper off to a point where they no longer serve as a stimulus to recruiting.

A small minority of young people are either totally alienated from American society or are professional revolutionaries with no constructive program. They can't be reached and, in any case, would not be an asset to a military organization. The *majority* of today's youth have professed ideals that are not unlike the values that underlie the military profession: for example, integrity ("Tell it like it is"), equality, commitment to purposeful activity, service to others. They shouldn't intrinsically have a totally negative view of the military profession.

We haven't *failed* completely in our dealing with these young people, as anyone who has seen them in Southeast Asia will agree. We have not *succeeded* completely, as evidenced by retention rates of both officers and airmen. How many of the really good ones we would have attracted without the stimulus of the draft is an open question. Certainly not all that came our way.

There are legitimate gripes about the structure and operation of American society and of the military as part of that society. What is being questioned by the young are institutions that submerge the individual in the mass, that seem to deprive a person of any significant control over his destiny; institutions that appear to reduce human dignity by failure to fully use and reward the intelligence and initiative of the individual, institu-

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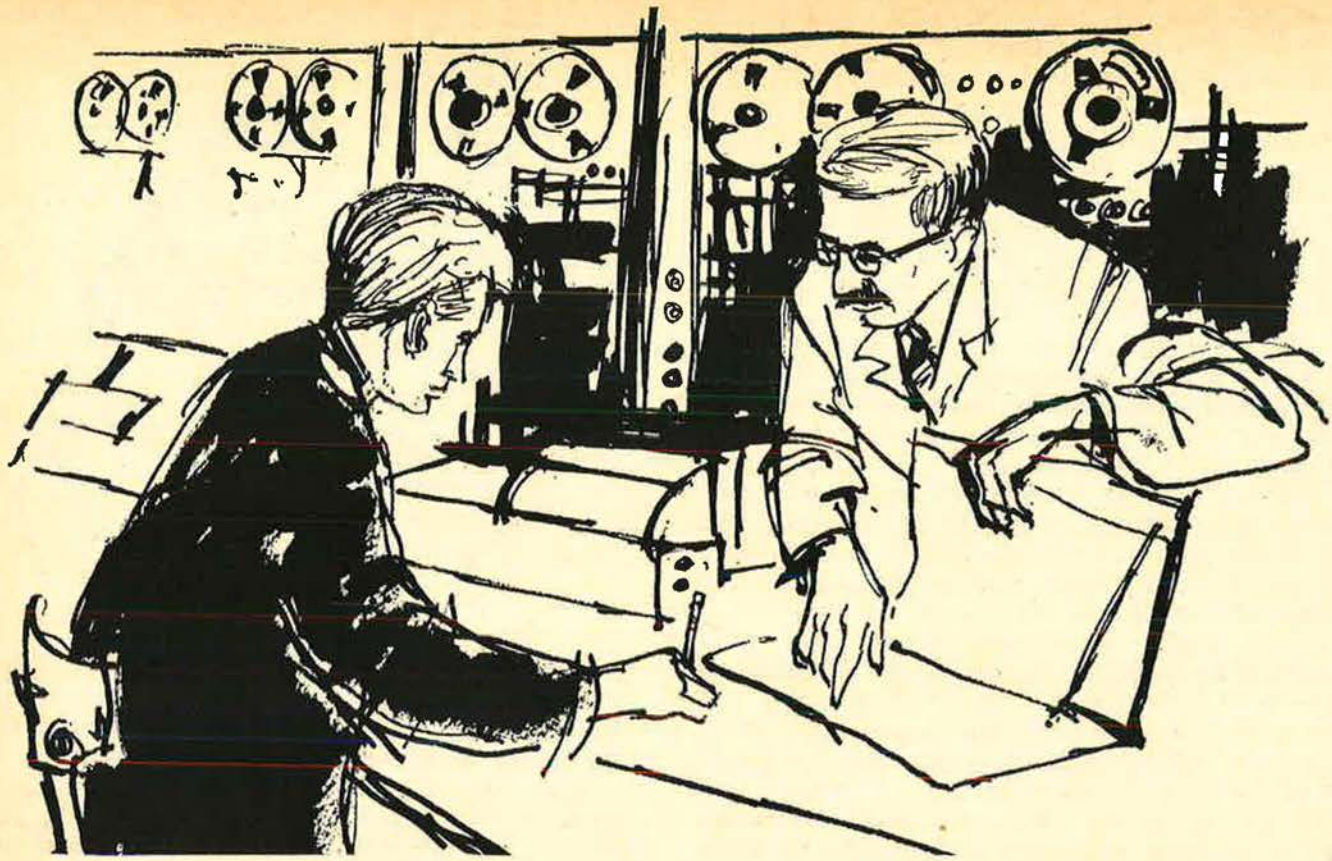

tions that may *unnecessarily* abridge individual freedom of choice and action.

We have to ask ourselves, "Have we been guilty of these offenses?" I think the answer is, "Yes, to some degree, all of them." The rules, regulations, customs, and procedures that govern the military can never be as free as those of a civilian society. But, as an agency of American society, we have an obligation to adjust to changes in behavioral norms insofar as that adjustment produces greater, rather than lesser, operational effectiveness. There are limits that must be set with mature, sophisticated judgment.

Two major faults in personnel management have tended to prejudice the young people we really want to recruit and retain. The first has been an apparent lack of stability in personnel programs, ofttimes through circumstances over which we in the Air Force have little control. But we now are in a position to reduce it to a minimum. Techniques of personnel planning, based on sophisticated modeling and computer analysis, give great promise of better long-range stability. The Officer Career Development Program and new management procedures, especially in the assignment of NCOs, depend on long-range planning of requirements and are a long stride in the right direction.

The second major fault is a product of size. In the past, we have not had the tools that make it possible to really put the *personal* back in personnel. A lot of lip service has been paid to that slogan, but, to borrow a line from *Hamlet,* it often has been "more honored in the breach than in the observance."

We now have the tools and the programs to individualize personnel management on a limited scale, and plans to expand these programs Air Force-wide.

A personalized, individualized approach to personnel management—rather highly centralized—does create potential dilemmas. Striking a proper balance between the desires of the individual and the needs of the organization requires some difficult judgments. If carried too far in one direction, there is danger of infringing operational purpose. If carried too far in the opposite direction, there is danger of alienating the individual and losing exactly the kind of people we need to keep. Few solutions are ever perfect, and the answer to one problem usually creates new ones. But I believe we are on the right heading for the future.

There are other things that have to be done, of course. We must get rid of any mickey mouse and bunny rabbit programs that are left over from the days when airmen and junior officers were less well educated and less sophisticated than today. Where we find archaic attitudes on the part of supervisors, either the attitudes or the supervisors must go. We must disabuse ourselves of fascination with the superficial aspects of tradition that may no longer be important, while retaining and enhancing those that are—in the modern vernacular—relevant.

When the programs and practices we've been discussing are fully implemented, the Air Force should be in a strong position to attract American youth. I believe we can show them that our values and theirs are not in conflict. We can show them that no one has to sacrifice his personal identity or relinquish all control of his future when he puts on a blue suit. We can demonstrate that training and intelligence will be as fully used as in any other profession or business. These things are important to you and me. They are even more important to the younger generation.—END

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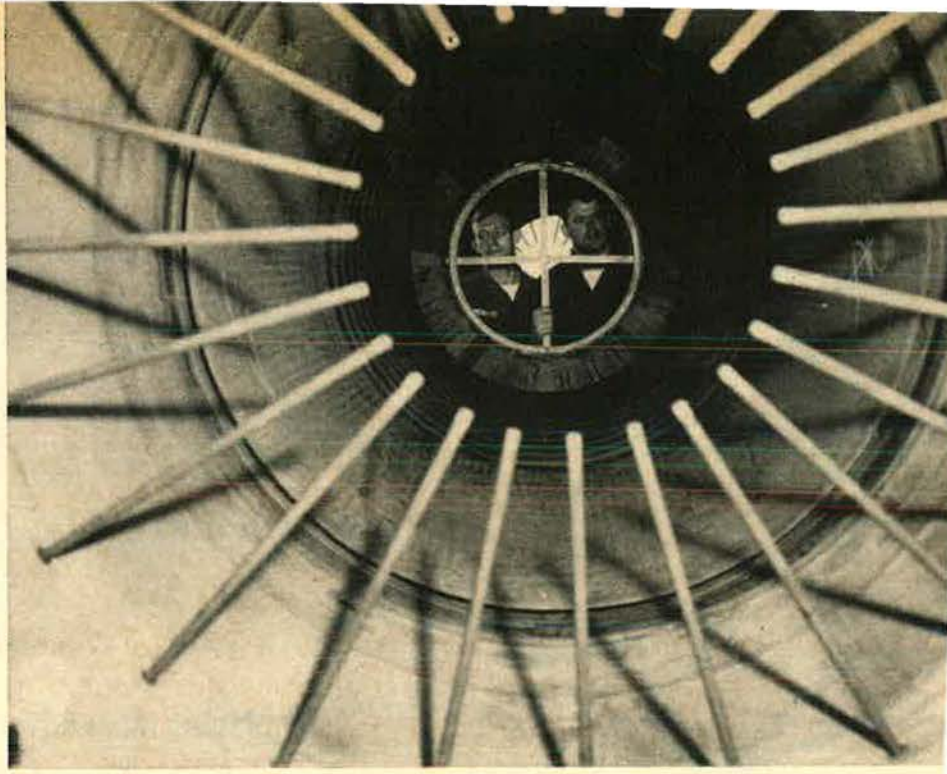


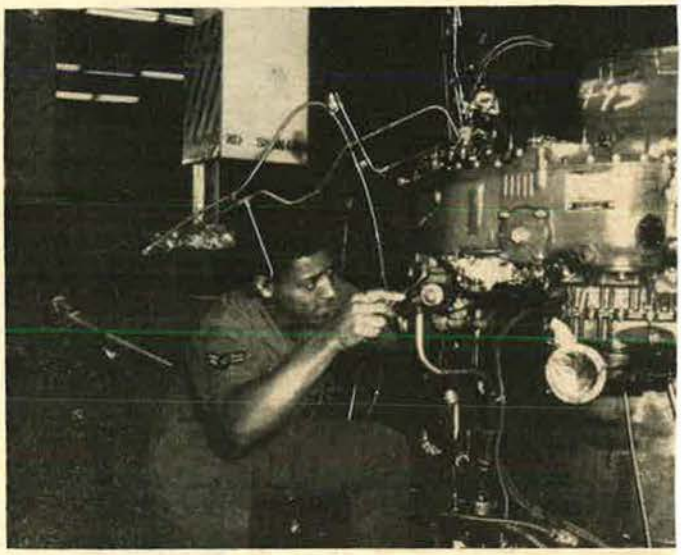
Framed in metal, Airmen First Class Robert W. Morris (left) and James M. McKee of the 355th Field Maintenance Squadron's propulsion branch align the afterburner nozzle of a jet engine. The accuracy of their adjustments is critical to keeping such big birds as the F-105 Thunderchief in peak flying condition.

An AF/SD Photo Feature

A special report on the demanding work being done by the 355th Field Maintenance Squadron, based at Takhli RTAFB, Thailand. The sweat and know-how of these men keep USAF's F-105s and EB-66s flying in Southeast Asia . . .

The Engine Managers of Takhli

By Capt. John M. Moscatelli, USAF



Airman First Class Sidney J. Wright applies his wrench to the bolts of a Thunderchief's J75 jet engine while installing an oil pump. Airman Wright is one of some 270 USAF personnel who are serving with the 355th's propulsion branch.

TAKHLI RTAFB, THAILAND (7/13 AF)

HOW do F-105s fly? Not by the grace of God, though some of the pilots whose aircraft experienced extensive battle damage when USAF was flying bombing missions over North Vietnam will swear that God gave them a helping hand more than once.

No, the birds of the US Air Force's 355th Tactical Fighter Wing get off the ground mainly because they've got engines, wings, and, of course, an experienced pilot at the controls.

The 355th Field Maintenance Squadron's propulsion branch is the reason the engines are ready to propel

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On ... EB-66 side, SMSgt. Donald Jenkins, thirty-three, Elyria, Ohio, J71 engine shop NCOIC, adds, "At the present time our shop is in the middle of an engine retrofit program. The Destroyers' J71 engines are being returned to the depot in the States for compressor changes. By the end of the program about eighty-four engines will have been sent to depot and returned."

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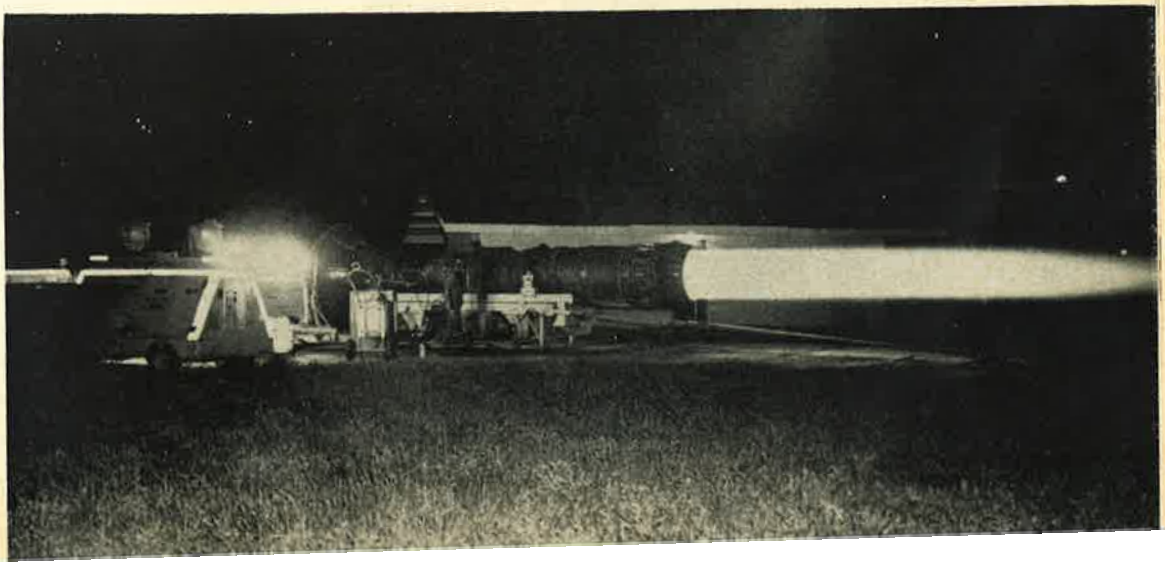
...nagers," continues Captain ...ing the status of all jet engines on the ...ase. We are the prime source of supply information for the engine parts. Our job is vital. If somebody didn't keep tabs on the engines—and anticipate future requirements—eventually, there wouldn't be any flyable aircraft."

Sergeant Tucker, a jet engine maintenance man for eighteen years, cautions, "Remember, the next time you see an F-105 or EB-66 take off, it's not all done by the grace of God. He helps, but the sweat and know-how come from the men like those of the FMS propulsion branch."—END



Resembling a huge acetylene torch, a jet engine spouts an awesome column of flame as it is put through its paces during a leak check being conducted by SSgt. C. R. Hatchette, noncommissioned officer in charge of the engine test cell.

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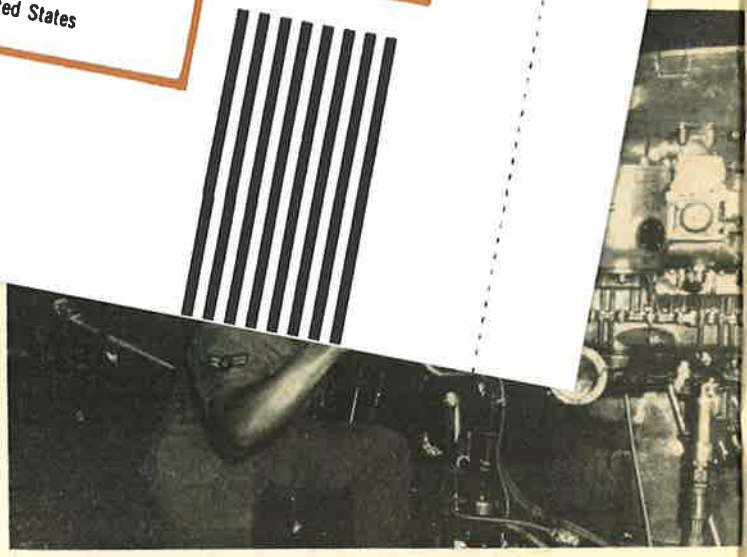

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The 355th Field Maintenance Squadron's propulsion branch is the reason the engines are ready to propel

Monitoring the control panel of a J75 engine test cell is TSgt. Phillip Stratford. Performance procedure requires that following maintenance the jet engines undergo static tests before they are reinstalled in the aircraft.

Sgt. David A. Johnson with the 355th Field Maintenance Squadron's propulsion branch and Prayoon Suwanjack, one of fifteen Thai employees at the propulsion branch at Takhli RTAFB, torque the number-four bearing on a J75 engine.

the wings, pilots, and the rest of the plane into the sky.

"Keeping the Douglas EB-66 Destroyers and Republic F-105 Thunderchiefs outfitted with good engines is a tremendous job," says CMSgt. Jerry E. Tucker, forty-five, from Vallejo, Calif., who is propulsion branch superintendent.

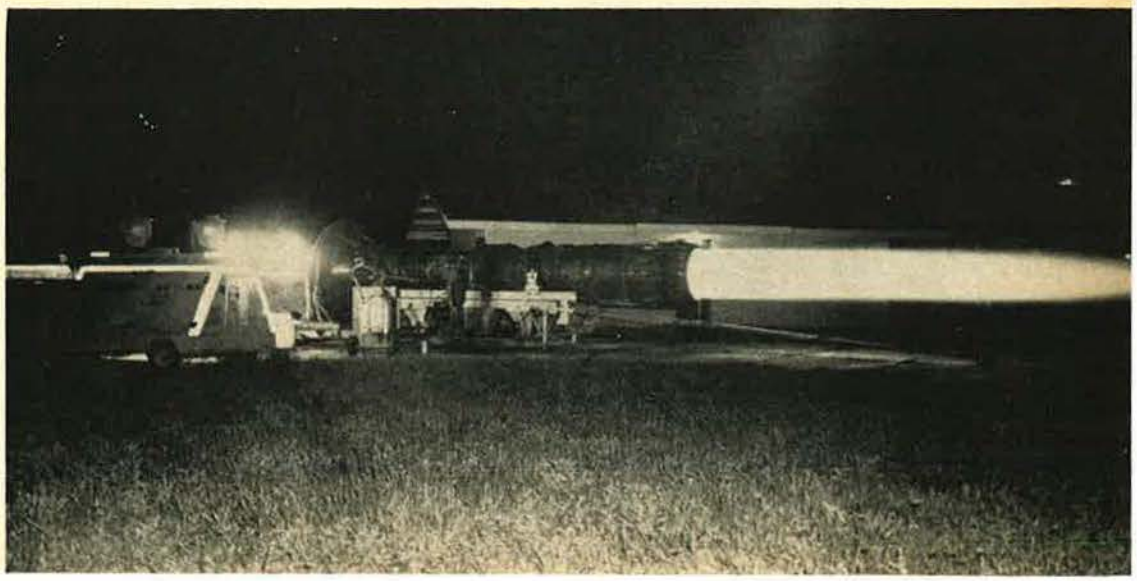
In the J75 engine shop, MSgt. Richard Casey, thirty-six, from Wichita, Kan., noncommissioned officer in charge, says: "During the past year we've accomplished two major modifications of the F-105 engines. These modifications required removal of the J75 engines from their airframes and extensive shop work. The entire operation involved a total of eighty-five engines."

On the EB-66 side, SMSgt. Donald Jenkins, thirty-three, Elyria, Ohio, J71 engine shop NCOIC, adds, "At the present time our shop is in the middle of an engine retrofit program. The Destroyers' J71 engines are being returned to the depot in the States for compressor changes. By the end of the program about eighty-four engines will have been sent to depot and returned."

"The entire branch numbers 270 Air Force enlisted men, fifteen Thai employees, and myself," offers Capt. Gary D. Eppler, twenty-seven, Pratt, Kan., branch officer in charge. "We conduct intensive training programs for both the Air Force and Thais. In fact, we can boast of a 100 percent skill knowledge test (SKT) passing rate for the first quarter of 1969."

"We are the engine managers," continues Captain Eppler, "reporting the status of all jet engines on the base. We are the prime source of supply information for the engine parts. Our job is vital. If somebody didn't keep tabs on the engines—and anticipate future requirements—eventually, there wouldn't be any flyable aircraft."

Sergeant Tucker, a jet engine maintenance man for eighteen years, cautions, "Remember, the next time you see an F-105 or EB-66 take off, it's not all done by the grace of God. He helps, but the sweat and know-how come from the men like those of the FMS propulsion branch."—END



Resembling a huge acetylene torch, a jet engine spouts an awesome column of flame as it is put through its paces during a leak check being conducted by SSgt. C. R. Hatchette, noncommissioned officer in charge of the engine test cell.

An AF/SD Photo Feature

Snakes, ponies, ducks, dogs—even a wolf and a mynah bird—these are some of the creatures that serve as mascots of the men and women of PACAF and make up an amazing menagerie at a score of bases throughout the Pacific. These mascots perform a valuable function in making life immeasurably more interesting for their masters . . .

The recipient of an unofficial Purple Heart, Butch, the pet of the 309th Special Operations Squadron, Phan Rang AB, poses with Airman Pat Nugent and Sgt. John Peavley.

Pythons, Ponies, Puppies— The Peculiar Pets of PACAF

"One-and-a-Half," a pony of Chinese descent and mascot of the 554th Civil Engineering Squadron (Red Horse), suffers through a coat grooming by Sgt. Stanley D. Kerby.

CHARLIE really gets wrapped up in his work. "One-and-a-Half" is really only one. Snoopy isn't, and Daphne and Reginald are always in a stew about their futures.

Who are Charlie, "One-and-a-Half," Snoopy, Daphne, and Reginald? Just part of an amazing menagerie of animals serving as mascots to Pacific Air Forces (PACAF) men and women at a score of bases throughout the Pacific.

Air Force mascots perform a role as military morale boosters. Pampered more than any zoo resident, they generally lead far more exciting lives than their caged cousins in the States. And they make the lives of their masters immeasurably more interesting.

Take "One-and-a-Half," for example. He sports the top enlisted insignia of Chief Master Sergeant on his blanket. "One-and-a-Half" is a pony who serves as mascot of a Red Horse squadron.

The pony, of Chinese descent, belongs to the 554th Civil Engineering Squadron (Red Horse) at Phan Rang Air Base, Republic of Vietnam. He is described by his caretakers as an avid eater despite his small size. "One-and-a-Half" does his part for antismoking organizations too, by eating every cigarette he can get. Other items in his diet include grass, corn, oats, and carrots.

Another Phan Rang Air Base member is Staff Sergeant Butch, a dog of unknown parentage, who is rated No. 1 Air Force combat veteran in Vietnam.

This canine, who has been with the 309th Special Operations Squadron since 1963, has a remarkable combat record. Once wounded by .50-caliber machine-gun fire, he was saved by the quick action of a Green Beret medic at a Special Forces camp. He was unofficially given a Purple Heart.

Even the members of the 309th admit it's hard to separate fact from fiction when it comes to the exploits of Sergeant Butch. What is known to be fact is his daily ritual of appearing in the squadron operations office at 6:00 a.m. and sitting upright with his paws crossed until someone gives him a sugar cube.

It is also known that Sergeant Butch once went AWOL in Saigon in pursuit of a cute French poodle. He returned to duty, however, twenty days later, and today carries the title of Canine Casanova.

Sergeant Butch became very attached to Airman Pat Nugent, son-in-law of former US President Lyndon B. Johnson. His devotion to Nugent was so deep-rooted that since Pat's return home, Sergeant Butch has refused to take a new master.

A monkey named Leonard and a matched pair of ducks named Reginald and Daphne are popular mascots at Nakhon Phanom, Thailand. All three are "assigned" to the Armed Forces Thailand Radio Station there. Leonard shipped over to the Air Force at NKP from a nearby Army engineering battalion. The ducks were part of a package deal that included them—and four cousins destined for the cooking pot.

Meanwhile, a beauty named Suzie, who sports the sizzling dimensions of 14-14-14, is the pride of the 632d Combat Support Group at Binh Thuy Air Base,

Sebastian Cabot, star of TV and the movies, is fondly embraced by Suzie, the friendly python mascot of the 632d Combat Support Group, stationed at Binh Thuy AB, Vietnam.

Charlie, the pet python of the Jungle Survival School at Clark AB, Philippines, exhibits warmest regards for two friends, Maj. Frederick Ewing and Sgt. Roger D. Edwards.

Airman Scott Gentry of the Armed Forces Thailand Radio Station has his hands full with pet ducks Daphne and Reginald while Leonard monkeys around on the overhead.

Vietnam. Although her vital statistics might leave some a little cold, it's guaranteed that one hug from Suzie will set any man's heart fluttering.

Suzie is a ten-foot-long, sixty-five-pound python. Nicknamed "the Ravishing Reptile," she may eventually grow thirty-three feet long and weigh 200 pounds. Suzie resides in a "penthouse" complete with bedroom and bath. Her diet consists of whatever is left over from the mess hall.

Suzie has a distant relative named Charlie, formerly of Bangkok, Thailand, who now resides at Clark Air Base, Republic of the Philippines. Charlie weighs in

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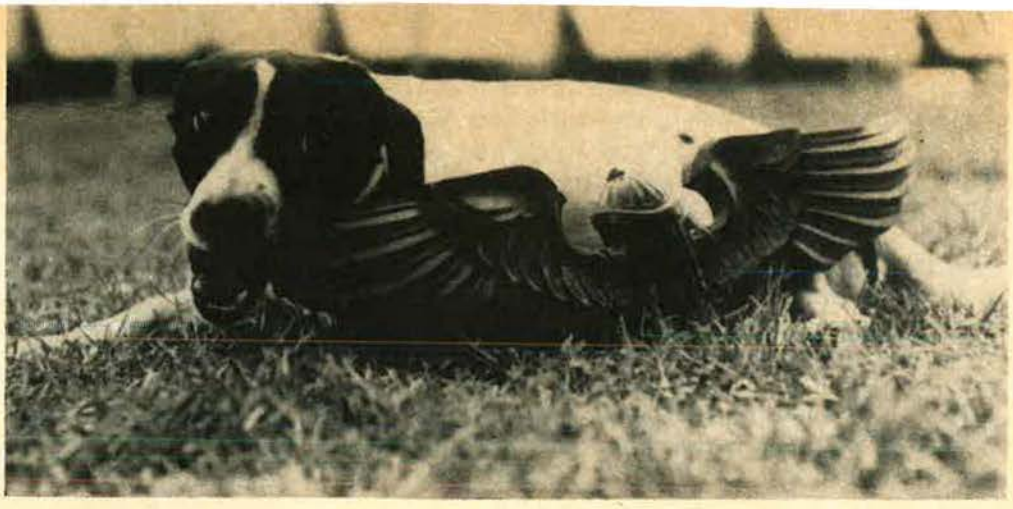


Chief Mascot Sergeant Snoopy of the 553d Reconnaissance Wing, Korat Royal Thai AB, Thailand, who signed up in the US because of his resemblance to his famous cartoon namesake, displays his personalized set of wings.

at 180 pounds (before eating) and can stretch out to a majestic sixteen feet.

He is the mascot of the Pacific Jungle Survival School. Charlie eats rodents and other wild animals caught in the jungles of the Philippine Islands and looks forward to personally meeting each new aircrewman assigned TDY to the Jungle Survival School.

Another popular Air Force animal is Chief Mascot Sergeant Snoopy, a special aerial observer with the 553d Reconnaissance Wing at Korat Royal Thai Air Base, Thailand.

Snoopy is one of the few mascots who can claim the distinction of joining a unit in the United States. His Air Force career began in July 1967 at Otis AFB, Mass., when the 553d was organizing for deployment to Southeast Asia. A contest was held to find a dog most resembling the Snoopy of "Peanuts" cartoon fame. Chief Mascot Sergeant Snoopy was found residing in a local dog pound. Sprung on $3 bail, he won the contest and a free trip to Southeast Asia.

Snoopy has racked up an enviable record since joining the wing at Korat. He has been on hand to meet dignitaries and personalities ranging from former President Johnson to Bob Hope and (woof!) Raquel Welch.

He has his own personal dog tags, was paw-printed by the base security police, and is the proud possessor of his own set of silver wings mounted on a miniature fire hydrant. Now on his second tour of duty, Snoopy has given indications he may stay for the duration.

Meanwhile, Airman Eric Von Zipper, a huge, playful Belgian shepherd, dominates the mascot scene for Detachment 11, 7th Aerial Port Squadron at Tachikawa Air Base, Japan. According to his handler, he once went AWOL but otherwise has been a good troop.

Von Zipper's favorite pastime is chasing unit members as they float to earth during practice parachute jumps. In fact, Von Zipper has hopes of someday becoming a parachutist. He heard that in Vietnam scout dogs have been jumping for some time. For this reason, he is submitting a request for special "canine" jump school training.

Another well-known PACAF mascot is still another relative of Suzie—Ramrod the reptile, favorite pet of the 531st Tactical Fighter Squadron ("Ramrods") at Bien Hoa Air Base, Vietnam. Slender and eleven feet long, he weighs thirty-five pounds, give or take a few rats.

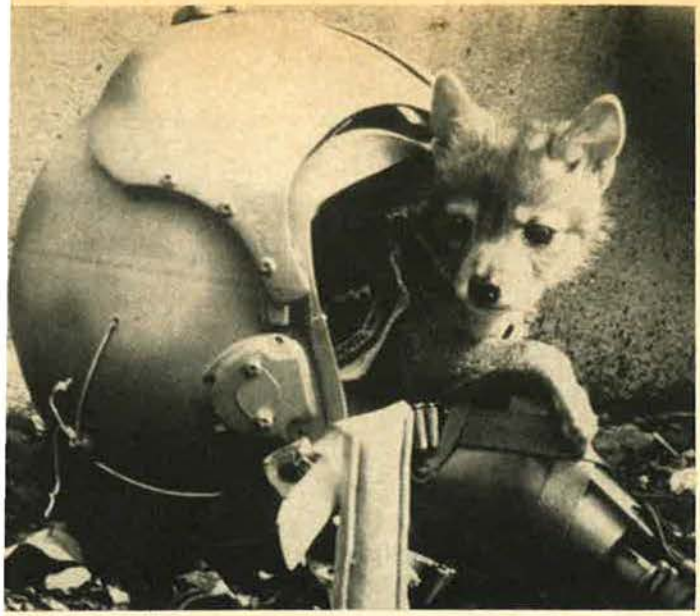
Known as a good troop is Airman Eric Von Zipper, Belgian shepherd pet of Detachment 11, 7th Aerial Port Squadron, at Tachikawa AB, Japan. Eric is fond of parachutists.

Ramrod joined the 531st for two cases of beverages (given to the Army man who found him) to replace an earlier Ramrod who fell prey to a Viet Cong booby trap.

His favorite resting place is the commander's desk tray or the first sergeant's desk drawer. He is fond of meeting people, especially those who bring food to give him.

One of the most famous mascots in PACAF is El Lobo—a tiny wolf cub belonging to the 8th Tactical Fighter Wing at Ubon Royal Thai Air Force Base, Thailand.

Early in 1969, word spread around Ubon that the 8th needed a wolf mascot. Thai Border Patrol Police



The 8th Tactical Fighter Wing (Wolfpack) at Ubon Royal Thai AB, Thailand, lived up to its name when it adopted a real live wolf cub, appropriately dubbed "El Lobo."

A fine feathered friend is Charlie, mynah bird pet of the 31st Tactical Fighter Wing, Tuy Hoa AB, Vietnam. Here bilingual Charlie chats with an amused Sgt. Leslie W. Deal.

captured a wolf cub and passed it to the 56th Special Operations Squadron at Nakhon Phanom. NKP's commander, in turn, presented the wolf to the 8th TFW. Documents accompanying the mascot listed him as a *"Canis Lycus,* critter, male, brown, furry, perpetually hungry, complete with four legs, tail, and teeth." His current duty assignment is 1111 Pilot, Tactical, Fighter, Biter.

Rounding out PACAF's collection of furry, scaled, or feather-covered mascots is a bilingual mynah bird at Tuy Hoa Air Base, Vietnam. Charlie by name, the mynah is the mascot of the 31st Tactical Fighter Wing. He joined the unit after accidentally falling from his nest in a large hangar. Ever since he has been content to keep wing airmen laughing at his linguistic talents and antics.—END

Ramrod finds himself slung around the neck of Lt. Col. Robert W. Bazley, Commander of the 531st Tactical Fighter Squadron (Ramrods), at Bien Hoa AB, Vietnam. An earlier Ramrod died in the line of duty after eating a rat that had been poisoned by the Viet Cong.

LETTER FROM LOS ANGELES

By Irving Stone

WEST COAST EDITOR, AIR FORCE/SPACE DIGEST

Aerospace View of the 1970s

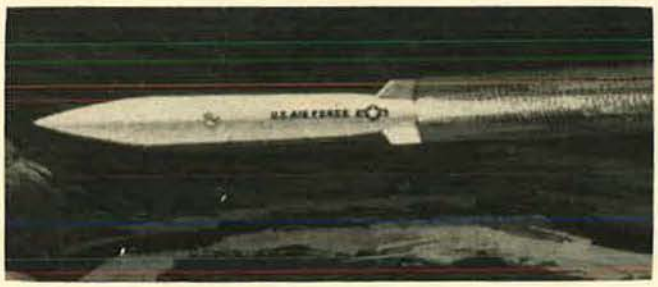
With the Air Force's effort for the advanced manned strategic aircraft—the B-1—finally launched with an industry engineering development competition, the big question now is how fast will the program be pushed to achieve an initial deployment sometime in the mid-1970s? The B-1 type aircraft has long been needed for upgrading the mixed bomber/missile retaliatory force.

The engineering development competition will be keen. Basic technical proposals for the airframe should be submitted by industry on January 12. Proposals for airframe management and cost factors are due early in February. Submission dates for proposals by engine manufacturers for the powerplants coincide with the airframe proposal dates. Probably two or three months will be required for proposal evaluation. And with no holdup, contractors for the B-1 airframe and engines should be selected by late spring or early summer.

Only three airframe companies initially were tagged to receive the Air Force's requests for proposals (RFPs)—Boeing, General Dynamics, and North American Rockwell. However, Lockheed also requested and received an RFP for the company to determine whether its Georgia Division would compete. For the task of developing the engines, General Electric and Pratt & Whitney are competing.

The philosophy underlying the need for the B-1, plus a broad overview of USAF possibilities for the 1970s, was outlined by Maj. Gen. William G. Moore, Jr., Director of Operational Requirements and Development Plans, Hq. USAF, at the recent sixth annual meeting of the American Institute of Aeronautics and Astronautics at Anaheim, Calif.

"In view of the increasing Soviet defenses, the ability of the B-52 and the FB-111 to penetrate to their targets is gradually decreasing. Over the years we believe we will be able to do a better job of maintaining the deterrent posture at less cost if we proceed with the development of a new bomber," General Moore said. Considering its greatly improved capability over the programmed force of B-52s and FB-111s in limited nuclear and nonnuclear conflicts, a new bomber has even greater utility than has been credited to it in the general-war scenario, he declared.



Artist's conception of one of the newest weapons in the Air Force's arsenal on its way to a target. SRAM, a supersonic, short-range attack missile with nuclear capability, is designed so that pilots can attack enemy ground targets from beyond the range of his defensive sites.

Despite extensive commitment to operations in Southeast Asia, nearly forty percent of the authorized B-52 strength is being maintained on nuclear alert. (The B-58, USAF's only operating supersonic bomber, has contributed to the basic deterrent posture, but is being phased out.)

"We plan to disperse part of our bomber and tanker alert aircraft to selected military or joint-use satellite bases," General Moore said. The objective of satellite basing is to increase alert-aircraft survivability by reducing the time required to launch the force and, at the same time, compounding enemy targeting problems, he added.

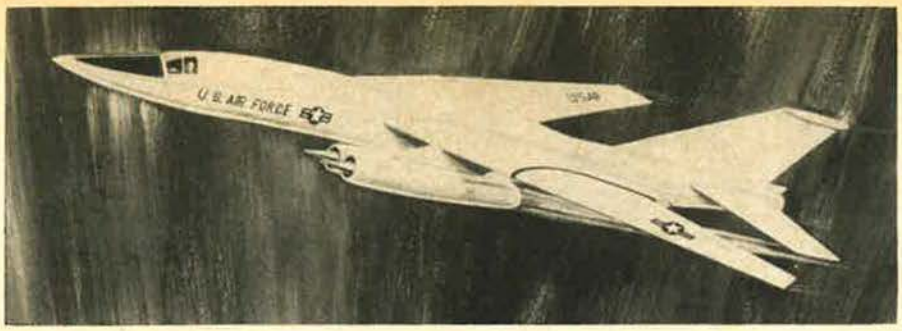
A limited modernization of the bomber force is to be achieved with the introduction of the FB-111, and the phase-in of this interim medium bomber is planned to be completed by the end of FY 1971.

A highly vocal champion of development of the B-1 is Maj. Gen. W. G. Moore, Jr., Director of Operational Requirements and Development Plans, Hq. USAF, who outlined the philosophy underlying the need for the new bomber at the recent sixth annual meeting of the AIAA.

Penetration Aids/Weapons

The Soviet air defense planners undoubtedly have acquired much information from the Vietnam conflict. Since the Soviets are noted for their defense syndrome, we should expect them to use the data gained to improve their defensive systems, General Moore claimed. The bomber force must be provided the necessary means to permit penetration of enemy defense. To this end, the short-range attack missile (SRAM) is being developed for the FB-111 and B-52. This missile will permit a standoff suppression of Soviet low-altitude, surface-to-air missile defenses, and also will be an effective weapon against other targets, General Moore said.

Also under consideration is the development of two additional penetration aids. These are the subsonic cruise armed decoy (SCAD), and the bomber defense missile,



The proposed B-1 bomber, with the use of advanced penetration aids, is visualized as the next step to replace the interim deterrent force of FB-111s and aging B-52s.

General Moore revealed. The SCAD could be carried and launched by the B-1 or the B-52, as a means of upgrading their capabilities. The primary function of the decoy would be to create diversionary targets, and to confuse the enemy surveillance and control capability.

The bomber defense missile is projected to attack vehicles that are launched against our aircraft. These enemy defensive vehicles could be manned fighter-interceptors, airborne warning and control centers, or even surface-to-air missiles, General Moore said. The expected long development cycle required that R&D studies be initiated to provide data for design factors, to estimate the development risk, and to permit determination of operational feasibility, he added. From this information, rational development and deployment decisions can be made. However, these programs to upgrade the B-52 and FB-111 capabilities are only interim solutions to the problem of penetrating Soviet defenses, and assessment indicates that a new bomber, which has evolved into the B-1, is required.

B-1 Objectives

The B-1 characteristics, General Moore pointed out, satisfy the following objectives for a future bomber force:

- Prelaunch survivability through quick-reaction capability.
- Ability to be withheld from immediate execution through capability to operate from austere landing sites.
- Aircraft characteristics such as reduced infrared signature and radar cross-section, to increase penetration capability.
- Large payload capacity to accommodate a wide variety of penetration aids/weapons.
- Speed and altitude versatility to provide a broad range of operational tactics in the face of future threat uncertainties.
- Long, useful operational life.
- High utility across the spectrum of conflict.

Discussing strategic defense, General Moore pointed out that a defensive capability provides augmentation to offensive forces by introducing uncertainty into the enemy's planning, compounding his targeting profile, and, finally, forcing him to divert resources from other tasks.

"Thus, the capability of our current defenses against air attacks," he said, "dilutes the Soviet bomber capability by depriving them of optimum tactics. He is forced to plan low-level attacks, thereby significantly decreasing his payload capability. Or, as an alternative, the Soviets have had to equip their bombers with air-to-surface missiles (ASMs). The combination of ASM and low-level penetration has effectively reduced the total payload Soviet bombers can deliver."

Three-Element Concept

To maintain the maximum capability against the Soviet bomber threat, the Air Force, in collaboration with the Office of the Secretary of Defense, has developed a concept to improve our air defense posture. This concept consists of three major elements, General Moore pointed out—a modern interceptor, an airborne warning and control system (AWACS), and over-the-horizon (OTH) radar.

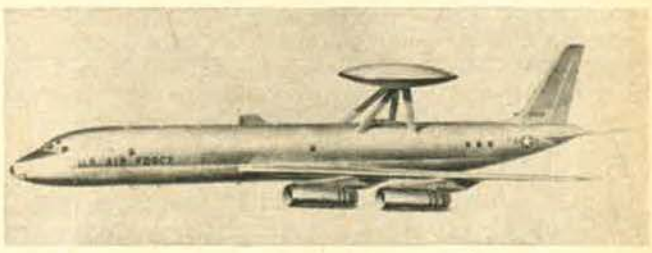
The addition of a modern interceptor to the defensive fleet would solve both the problem of identification of supersonic penetrators and the potential for increased Soviet capabilities, he said. Its armament must include shoot-down, air-to-air missiles capable of killing bombers penetrating at low level. High speed and long range will be necessary to intercept supersonic aircraft at extended distances from the continental land mass.

Several candidate aircraft could accomplish these demanding tasks, and investigation of the alternative aircraft will be continued to optimize effectiveness against an advanced Soviet threat, General Moore said. The R&D program will continue the studies and applied research necessary for better insights into the development problems.

The second major element of the improved air defenses —the AWACS—envisions the use of existing commercial transport-type aircraft with a new radar system. AWACS will provide extended low-altitude surveillance and improved control of interceptor aircraft. The radar technique

(Continued on following page)

To counter any Soviet bomber threat, the planners have listed three essential elements: a modern interceptor, an airborne warning and control system, and over-the-horizon radar. Shown above is Boeing's version of AWACS.



McDonnell Douglas' AWACS is also a commercial liner in military uniform. Working with interceptors and over-the-horizon radar, the system could deny the enemy the element of surprise despite the direction of an attack.

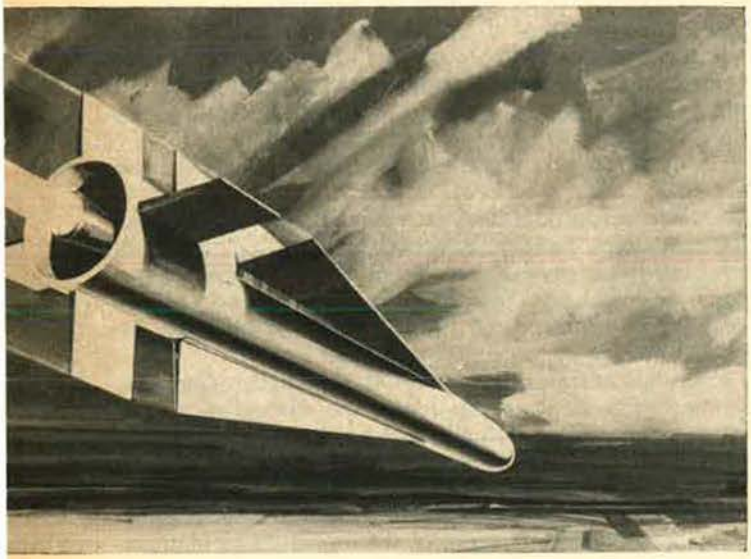
to accomplish this has been demonstrated, General Moore declared.

Complementing the modern interceptors and the AWACS will be the third element of the improved air defenses—an OTH backscatter radar system. OTH sites will be located in the continental US and provide a long-range detection capability from the earth's surface to the ionosphere, and this system, with increased operational deployment, he said, could deny the enemy the element of surprise regardless of attack direction.

Slants on F-15 and AX

During the 1970s the backbone of the tactical force will remain the multipurpose F-4, which will continue to have the capability of performing a variety of tactical missions. But, by the mid-1970s, the basic technology of the F-4 will be more than fifteen years old, General Moore pointed out. A need exists for an air-to-air tactical fighter system that can operate within heavily defended hostile environments and outperform the first-line enemy fighters that we can expect to face in the 1975-1980 time frame. Technology now is at the point where an outstanding air-to-air fighter —the F-15—can be built for employment in that time period, General Moore said.

This single-seat, twin-engine fighter will have a full complement of air-to-air weapons including relatively long-range missiles and new short-range maneuvering missiles. A new gun, currently in development for the F-15, will be of intermediate caliber, and have a higher muzzle velocity than existing guns. These weapons, coupled with an advanced, all-altitude, all-aspect radar, will provide the flexibility to assure air superiority, General Moore declared. The first flight is expected in 1972, he said.



In artist's view, an Air Force Maverick streaks toward a ground target. The TV-guided missile would be locked on target and launched by a pilot, who would then be free to leave the area. Maverick is designed for such tactical aircraft as the A-7, the F-4, and the swingwing F-111.

Another vital tactical requirement for the 1970s is the AX close-air-support aircraft, General Moore said, to replace the aging fleet of A-1Es and F-100s (*see also page 33*). The AX, using current state-of-the-art technology, would be the first aircraft weapon system to include high survivability as a primary design objective, and would include manual and redundant flight controls, a fully foamed fuel system remote from ignition sources, go-home fuel in self-sealing tanks, blast-resistant and redundant structure, plus extensive armor provisions for the pilot and for subsystems and engine protection, he revealed.

The aircraft would be a single-place configuration powered by twin-turboprops for a wide usable speed range and unsurpassed maneuverability at speeds below 300 knots. Development is scheduled to permit an initial operational capability in the mid-1970s, General Moore declared.

Two missiles under development to boost the capability of future aircraft include the Maverick and the tactical short-range missile (SRM). The Maverick is a small, electro-optically guided weapon projected for use against hard mobile or fixed targets, and will include a line-of-sight capability to destroy targets in day-visual conditions, General Moore said, and its design will permit use on current and future close-support aircraft. The Maverick is expected to enter the inventory in the early 1970s, he declared.

The SRM, an air-to-air weapon, would permit the F-15 and other tactical fighters to destroy enemy aircraft in a close-in, hard-maneuvering, dogfight environment, because the missile will be designed for extreme turnability. It would be optimized for the F-15. Hence, its development schedule is phased with the F-15 development program.

Need for LIT

Tactical airlift systems in direct support of military operations within the overseas theaters are needed to establish and sustain air lines of communications, to provide theater-wide mobility for combat forces and for tactical aeromedical evacuation. By the mid-1970s, the age of the C-130, C-7, and C-123 aircraft will be approximately fourteen, fifteen, and twenty years, respectively. Combat operations in Southeast Asia have required intensive use of tactical airlift with a resulting increase in maintenance, General Moore declared, and the aircraft are wearing out in advance of their expected lifespan. For example, accelerated use of the C-130 has required a wing modification to repair fatigue damage.

Thus, it is becoming increasingly evident that a new tactical airlift aircraft, a light intratheater transport (LIT), will be required. Studies show a need for a vehicle of sufficient payload and with sufficient volumetric dimensions to accommodate Army vehicular and resupply requirements, General Moore said. (Note: The LIT has been deleted from the Fiscal 1970 budget.)

Various V/STOL concepts powered by various propulsion systems for a wide range of payloads have been examined for the LIT. For STOL systems both the turboprop and the turbofan have been investigated. Various vertical-propulsion concepts have been studied, including the tiltwing, lift-fan, and stowable-rotor designs. As a result of these investigations, General Moore said, the concept-formulation study indicated a need for a V/STOL aircraft that can provide both vertical capability for added flexibility and a short takeoff capability to permit transport of larger payloads when landing facilities are available.

Currently, he said, the tiltwing turboprop design is the leading contender because it offers the least technical risk, earliest capability, and effectively meets mission requirements. Confidence in this concept is based on the successful completion of the XC-142 flight-test program, he said. With properly phased decisions and funding support, the initial operational capability date for the LIT could be in the late 1970s, General Moore declared.—END

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THE UTAH STATE ORGANIZATION

cited for consistent and effective programming which has focused community, state, and national attention on the AFA mission.

The sponsorship of outstanding community events by AFA's **Utah State Organization,** "Unit of the Year" for the past two years, has become almost commonplace. Utah's observance of the twenty-second anniversary of the Air Force is a good example.

The major events in a six-week program included Utah's **Fourth Annual NCO Honors Night Dining-In** at the Hill AFB NCO Club; an **Air Force Family Day** at Lagoon and an Anniversary Ball; a **Commander's Dining-In;** the **Fourth Annual Logistics Awards Banquet;** and the **Annual AFROTC Dining-In,** the latter three all at the Hill AFB Officers Club.

Among the guest speakers were USAF Medal of Honor winner **Lt. Col. Joe M. Jackson;** the **Hon. Curtis W. Tarr,** Assistant Secretary of the Air Force (Manpower & Reserve Affairs); **Anthony C. L. Bishop,** Executive Director, Society of Logistics Engineers; and **Peter Kim,** special assistant to the Group Vice President of the Ampex Corp.

Other program participants included Utah **Governor Calvin L. Rampton; Maj. Gen. Robert H. McCutcheon,** Commander, Ogden Air Materiel Area (OOAMA); **Col. Jack Alston,** Commander, Hill AFB; AFA National Directors **Nathan Mazer** and **Jack Withers;** and Utah AFA President **Jack Price.**

In keeping with established policy of involving its units in State AFA functions, each event was hosted by one or more of the State AFA's chapters. Utah AFA President **Jack Price,** his staff, and the officers of each chapter within the state are to be congratulated not only for another outstanding series of Air Force Anniversary observances, but for the dedication and the spirit of cooperation that make it possible for the state unit to be a frequent recipient of AFA honors and recognition.

We are proud of the Utah AFA's record and pleased to recognize it as **Unit of the Month** for January.

* * *

The Edgewater Hyatt House in Long Beach was the site of the **California AFA's Twenty-second Annual Convention,** October 17-19.

Hosted by the **Long Beach Chapter,** with Chapter President **Floyd Damman** serving as Convention Chairman, the program included tours of the McDonnell Douglas DC-10 mockup; a poolside reception saluting the Air Force Space and Missile Systems Organization (SAMSO) and its new commander, **Lt. Gen. Samuel C. Phillips,** who was represented by **Maj. Gen. Louis L. Wilson,** SAMSO's Vice Commander; a business session; an AFA Organizational Awards Luncheon; an Honors and Awards Banquet; and—in conjunction with the Fall Conference of the California Aerospace Education Association—a program entitled "Youth and Aerospace Education Conference—A Cooperative Approach."

In the keynote address, US **Rep. Don H. Clausen** (R-Calif.), Chairman of California Governor Ronald Reagan's Aerospace–Aviation Education Task Force, said: ". . . I feel we must now dedicate ourselves to a creative society in which there are *both* swords and plowshares. Not one or the other. History proves that having only one or the other does not make for progress or survival in the final analysis."

Dr. Mervin Strickler, Special Assistant for Aviation Education, Federal Aviation Administration, moderated the conference. Panelists included **Collier McDermon,** Assistant Superintendent, California State Department of Education; **Dr. Floyd Grainge,** Assistant Dean, California State College at Long Beach; **Ted Misenhimer,** Redondo Unified School District; **Robert Mullen,** Richmond Unified School District; and **John V. Sorenson,** Assistant Deputy Chief of Staff, Civil Air Patrol Headquarters, Maxwell AFB, Ala.

AFA President **George D. Hardy,** principal speaker at the luncheon, discussed the issues facing AFA: the unwarranted and vicious attacks on

Enjoying a story being told by Utah Governor Calvin Rampton, right, are Maj. Gen. Robert H. McCutcheon, left, Commander of Ogden Air Materiel Area; and the Hon. Curtis W. Tarr, Assistant Secretary of the Air Force (Manpower and Reserve Affairs). Secretary Tarr was the guest speaker at the Utah AFA Commander's Dining-In.

the ROTC, the so-called military-industrial complex, and the military in general, and the POW situation.

Brief remarks of welcome were made by Long Beach **Mayor Edwin W. Wade** and **Dr. Daniel G. Walker,** President of Cypress College, representing Governor Reagan. **Walker M. "Bud" Mahurin,** President of the American Fighter Pilots Association, was Master of Ceremonies. California AFA "Family Awards" were presented by State President **Robert Lawson.** Awards to winners in the State AFA's Aerospace Design Competition for Teen-agers were presented by **Dr. Marjorie Beringer,** California AFA Education Director.

Senator Barry Goldwater (R-Ariz.) was the honored guest and speaker at the Honors and Awards Banquet. In his address, Senator Goldwater urged the American people to make a special occasion of Veterans' Day (November 11) this year to show our fighting men in Vietnam "that the vast majority of 200 million people support them and are proud of them and wish them the very, very best of good fortune."

During the awards portion of the program, **S. Samuel Boghosian,** a Past President of the **Fresno Chapter** and Chairman of the Chapter's award-winning Annual Air Force Honors Night Banquet, was named the State AFA's **"Man of the Year."** The **"Chapter of the Year"** award went to the **San Bernardino Chapter,** largest in the state, leader among the State AFA's chapters in the field of membership, and sponsor of many successful programs during the year, including its First Annual California AFA Charity Golf Tournament. The proceeds ($8,000) went to Air Force-oriented charities. Chapter President **Robert Fullerton** accepted the award.

Other awards were presented to **Maj. Gen. Kenneth W. Schultz,** Deputy Commander for Maintenance, SAMSO, "Military Man of the Year"; **MSgt. James Spellman,** USAF recruiter in Los Angeles, "Military Non-commissioned Officer of the Year"; **Maj. Gen. Glenn C. Ames,** California Adjutant General, military community service award; **Col. Walter J. Wilson,** USAF (Ret.), former Mather AFB Commander, military community relations award; and, to **Lt. Col. Arthur Ragen** and **Maj. Richard Schaller,** both with the Secretary of the Air Force Office of Information in Los Angeles, the State AFA's military service award.

Awards were presented by Far West Regional Vice President **Will Bergstrom** and State President **Robert Lawson. Beirne Lay, Jr.,** coauthor of the book and TV series *Twelve O'Clock High* and a recipient of AFA's Arts and Letters Trophy (1956), was Master of Ceremonies.

Sen. Barry Goldwater (R-Ariz.), center, honored guest and speaker at the California AFA Convention Honors and Awards Banquet, enjoys a joke with other distinguished guests and participants (from left): newly elected State President Gene DeVisscher; AFA President George D. Hardy; Convention Chairman and newly elected State Vice President (South) Floyd Damman; Mrs. John R. Alison; and her husband, Past President and current National Director, John R. Alison.

At the business session, delegates elected **Gene DeVisscher,** the State AFA's immediate Past Vice President (North), to serve as President during the coming year. Other officers elected include: **Robert Lawson,** Chairman of the Executive Committee; **Floyd Damman,** Vice President (South); **Stanley Hyrn,** Vice President (North); **Barbara Rowland,** Secretary; and **Robert Szabo,** Treasurer.

Among the twelve resolutions adopted was one reaffirming the State AFA's **support of the AFROTC program,** and one urging each AFA chapter in the state to provide a **membership in AFA** to at least two AFROTC, AFJROTC, and CAP cadets.

The State AFA's officers, the Convention Chairman, and the committees are to be congratulated on the largest and most effective convention of the State AFA in a number of years.

(Continued on following page)

Midwest Regional Vice President and outgoing Missouri AFA President Earl Wilson congratulates newly elected State President Rodney G. Horton, center. Also elected at the State AFA's recent convention are (from left): Lt. Col. (USAFR) Earl Clark, First Vice President; Jack Armel, Secretary; and C. H. Canada, Second Vice President.

The Twenty-second Annual Convention of the **Massachusetts AFA** was hosted by the **Otis Chapter** and held at the Otis AFB Officers Club, October 24-26.

A Friday night Reunion Reception and Buffet opened the convention program. State President **Andrew W. Trushaw, Jr.,** presided at the opening ceremonies and at the business session. New England Regional Vice President **Edward T. Nedder** addressed the opening ceremonies.

In keeping with the convention theme, "Yesterday, Today, and Tomorrow," **Maj. Burton Moore,** Commander, 26th Bomarc Missile Squadron, guest speaker at the Awards Luncheon, titled his speech "Muskets to Missiles." During the program, awards were presented to **CMSgt. and Mrs. Arthur A. Snow** for their work in helping to publish the State AFA's quarterly newsletter; to **Albert A. Eldridge,** a Past President of the State AFA and cochairman of the convention, for "Loyal Time and Effort in the Furtherance of AFA Activities"; and to **Miss Juanna Garcia** of Boston for designing the convention poster.

Maj. Gen. Don J. Strait, Chief of Staff, New Jersey Air National Guard, and Vice President of the Fairchild Hiller Corp., guest speaker for the Awards Dinner, spoke on the development of fighter aircraft from the Spad of World War I to the F-15 of tomorrow. **Col. Richard E. McLaughlin,** Executive Officer of the Massachusetts Air National Guard Air Staff, and Massachusetts Registrar of Motor Vehicles, was Master of Ceremonies. **Don Steele,** AFA's Director of Field Organization, presented a message from AFA President **George Hardy.**

During the program, the Otis Chapter's **Frederick J. Waters trophy** was presented to **TSgt. Hugh E. Buckley,** "Airman of the Year" for the 102d Tactical Fighter Wing, Massachusetts Air National Guard.

Distinguished guests included **Lt. Gen. John W. O'Neill,** Vice Commander, Air Force Systems Command; **Maj. Gen. Joseph M. Ambrose,** Massachusetts Adjutant General; **Brig. Gen. Charles W. Sweeney,** Chief of the Air Staff, Massachusetts Air National Guard; **Col. James M. Fahey,** Commander, Otis AFB; **Col. Arthur C. Carroll,** Commander, 94th Military Airlift Wing; New England Regional Vice President **Edward T. Nedder;** AFA National Director **Joseph E. Assaf;** and **Msgr. R. L. U. Montcalm,** State AFA Chaplain, who conducted a short Memorial Service as a part of the convention program.

Delegates reelected State President **Andrew W. Trushaw, Jr.,** for another term. Other officers are: **James Fiske, Jr.,** and **Paul A. Robinson,** Vice Presidents; **Betty Topjian,** Executive Secretary; **Marie Robinson,** Recording Secretary; and **A. A. "Gus" Raidy,** Treasurer.

Convention Chairman **John White** and his committeemen are to be congratulated.

* * *

Pennsylvania's **Olmsted Chapter** hosted the Twenty-first Annual Convention of the **Pennsylvania AFA** at the Penn Harris Motor Inn, Camp Hill, October 24-26.

Maj. Gen. Richard Snyder, Pennsylvania Adjutant General, was the guest speaker at the Aerospace Power Banquet. In his address, General Snyder called attention to the contributions of the Pennsylvania and other Air National Guard units to the USAF mission. "The Air National Guard," General Snyder said, "has flown over a thousand airlift support missions to Vietnam. The readiness of our [Pennsylvania] Air National Guard has made possible our fourth year of flying aeromedical evacuation missions for the **Military Airlift Command."**

William T. Lunsford, Jr., a Past President of the Pennsylvania AFA, was the Toastmaster and served as Convention Chairman for the fourth time. In recognition of his contributions to the Pennsylvania AFA, he was presented a painting of his wife.

At the Convention Luncheon, **Debra Wallet,** a Gettysburg College freshman, received a Pennsylvania AFA scholarship of $200 for her outstanding achievements at the Science Fair. Miss Wallet also received a $100 scholarship from the Olmsted Chapter. AFA National Director **Carl J. Long** made the presentation.

During the business session, **Gilbert E. Petrina,** Harrisburg attorney, former national commander of the Arnold Air Society, immediate Past Vice President of the State AFA, and a Past President of the Olmsted Chapter, was elected to serve as State President during 1969-70. Mr. Petrina succeeds **Edmund Gagliardi,** who was elected State AFA Treasurer. Other officers for 1969-70 are **Charles E. Sharp,** Vice President; and **Mrs. Fran Sigmund,** Secretary.

Distinguished guests included **Brig. Gen. Richard B. Posey,** Pennsylvania Deputy Adjutant General for Air; AFA National Treasurer **Jack B. Gross;** and Northeast Regional Vice President **John Brosky.**

—DON STEELE

For Miss Debra Wallet, the highlight of the recent Pennsylvania AFA Convention was receiving the State AFA's $200 scholarship and trophy from AFA National Director Carl J. Long, left. Brig. Gen. Richard B. Posey, center, Pennsylvania Deputy Adjutant General for Air, and outgoing State President Edmund Gagliardi participated in the program.

THIS IS AFA

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.

Membership

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.

Service Members (non-voting, non-officeholding): US citizens on extended active duty with any branch of the United States armed forces—$7 per year.

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.**

ALASKA: Robert Reeve, P. O. Box 3535 ECB, Anchorage, phone 272-9426. **ANCHORAGE, FAIRBANKS, KENAI, NOME, PALMER.**

ARIZONA: Hugh P. Stewart, 709 Valley Bldg., Tucson, phone 622-3357. **PHOENIX, TUCSON.**

ARKANSAS: Alex E. Harris, 3700 Cantrell Road, Apt. 612, Little Rock, phone 664-1915. **FORT SMITH, LITTLE ROCK.**

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DELAWARE: Vito A. Panzarino, Greater Wilmington Airport, Bldg. 1504, Wilmington, phone 328-1208. **WILMINGTON.**

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NEW HAMPSHIRE: Stuart N. Shaines, Northfield—Beech Road, Dover. **PEASE AFB.**

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OREGON: Clayton Gross, 804 Portland Medical Center, Portland, phone 233-0875. **CORVALLIS, PORTLAND.**

PENNSYLVANIA: Gilbert E. Petrina, 223 N. Front St., Harrisburg, phone 367-3368. **ALLENTOWN, AMBRIDGE, ERIE, HARRISBURG, LEWISTOWN, PHILADELPHIA, PITTSBURGH, WAYNE.**

RHODE ISLAND: William V. Dube, T. F. Green Airport, Warwick, phone 781-8254. **WARWICK.**

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WYOMING: Merle W. Allen, Veterans Administration Center, Cheyenne, phone 634-1581, Ext. 232. **CHEYENNE.**

Air Force Association Military Group
For Immediate, Worldwide, Full-Time

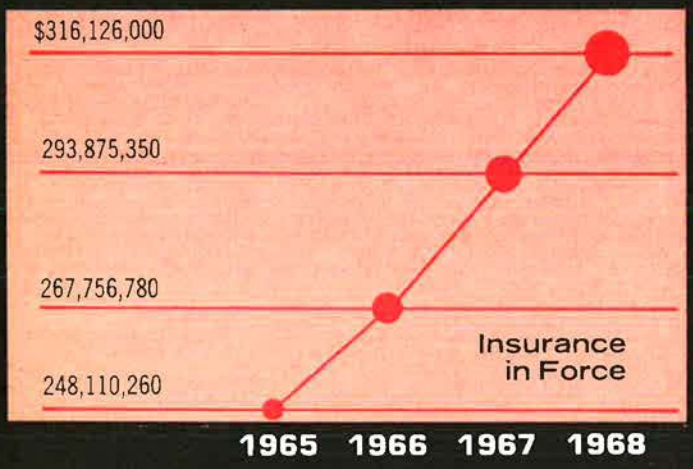
8 Years of Continuous Growth and Service

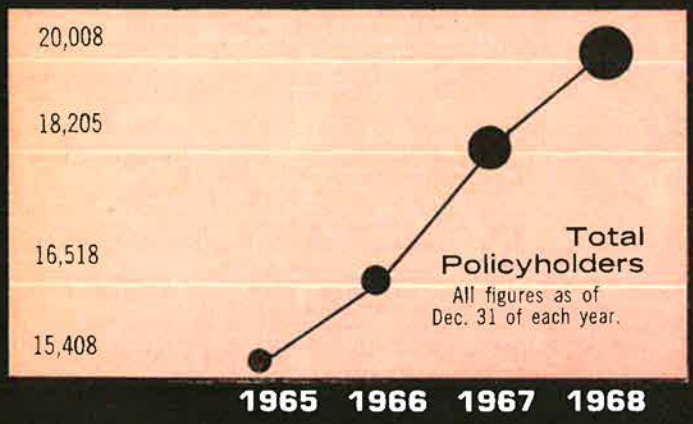
BIG BENEFITS! LOW PREMIUMS!
Professionally Administered by AFA!

BENEFIT SCHEDULE

Age	Basic Coverage *	Extra Accidental Death Benefit
20-39	$20,000	$12,500
40-44	17,500	
45-49	13,500	
50-59	10,000	
60-64	7,500	

* A flat sum of $15,000 is paid for all deaths which are caused by an aviation accident in which the insured is serving as pilot or crew member of the aircraft involved. In this case, the accidental death benefit does not apply.





LOW PREMIUM !

A low premium of $10 per month (reduced by dividends each year since 1962) provides COMPLETE coverage.

Policyholders Have Shared in Dividends (Plus Increased Benefits) for Seven Consecutive Years—Including Four War Years.

VIETNAM WAR YEARS

1961	Policy changed to permit policyholders to keep insurance at the low, group rate when leaving military service.
1962 20%	20% dividend paid to all policyholders.
1963 25%	25% dividend paid to all policyholders. Coverage extended to include AF Ready Reserve and Air National Guard.
1964 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.

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.

EQUAL COVERAGE — AT THE SAME LOW PREMIUM — FOR FLYING AND NON-FLYING PERSONNEL

All policyholders are insured for the same basic amounts, at the same low premium, whether or not they are on flying status. This eliminates the penalty of lower coverage for the men on flying status whose death is caused (as most are) by illness or ordinary accident. There is one exception* to this provision which is clearly stated below in the benefit table on the opposite page.

PROFESSIONALLY ADMINISTERED

Military Group Life Insurance is administered by professionally trained insurance personnel within the Air Force Association. This provides efficient, thorough service at the lowest possible cost.

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 CONVERSION TO PERMANENT 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

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

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 .....

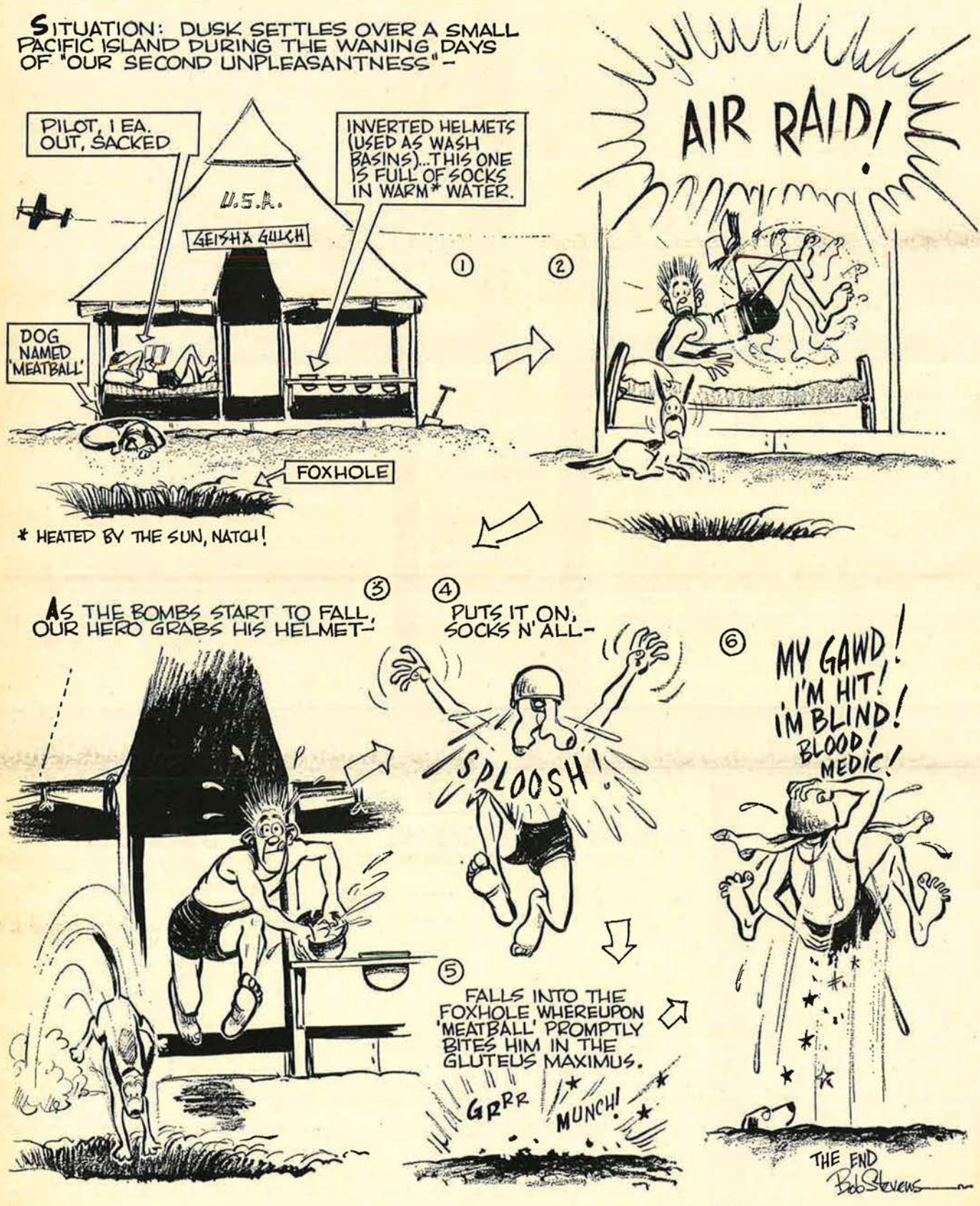
Application must be accompanied by check or money order. Send remittance to: 1-70

INSURANCE DIVISION, AFA, 1750 PENNSYLVANIA AVE., N.W., WASHINGTON, D. C. 20006

Bob Stevens'

"There I was..."

The story you are about to read is true. Only the names have been omitted—to protect the magazine from lawsuit. Cartoonist Stevens isn't saying who the star of the show was—all he'll admit to is, "There I Was . . ."



this cooler really earned its stripes!

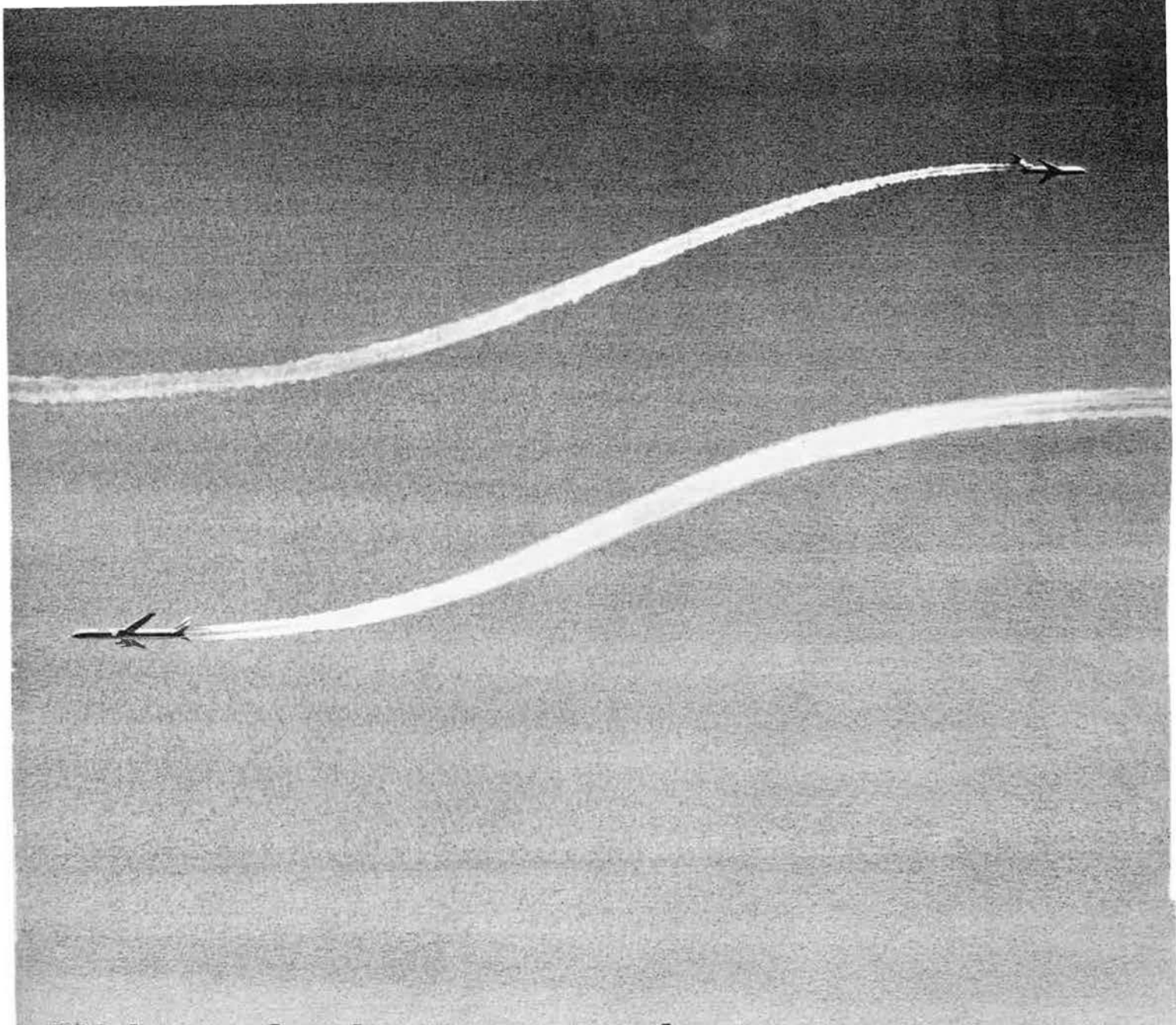
Accepted as "standard" by the Department of Defense, it meets MIL-C-38392 and MIL-STD-810B. One of the reasons is that our precision is similar to that required in watchmaking—for example, 0.00005″ tolerance between cylinder and rotor head adjustment. Actually, as rotor blades wear in, compression efficiency and output capacity increase and less energy is consumed. And operation is so smooth that it can be hard-mounted with no worry about vibration problems.

Also, Whirlpool rotary compressors are nearly 30 pounds lighter than reciprocating types, yet deliver the same Btu while requiring less space. They cool more at higher temperatures as shown by a flatter curve of Btu capacity over a much wider range than reciprocating types, while requiring less energy input. Our stripes were earned by more than four years' duty serving radar units and mirrors, communications and other GSE equipment as well as airborne applications, including helicopters.

Whirlpool compressors are "high side" and thus eliminate problems of foaming and oil distribution on start-up. They meet military specs of performance over the −65 to +160°F. range and provide cooling over the ambient range of 0-125°F. If you require such rugged reliability and performance, just write to us describing your problem.

Whirlpool CORPORATION

COMPRESSOR SALES DEPT. P.O. BOX 4308, EVANSVILLE, INDIANA 47711 PHONE: (812) 424-7741



We're perfecting the sure miss.

We've developed a new concept in airborne collision avoidance. It uses time reference technology—the precise measurement and division of time—to let thousands of aircraft converse automatically. It alerts pilots of converging aircraft and instantly directs the evasive action they should take. □ A leader in air and space systems for 50 years, McDonnell Douglas responded to the need for anti-collision devices by creating a new technology to solve the problem. Our imaginative and practical time reference system meets the immediate needs of air traffic control, and can grow to meet increased traffic volume in coming decades. □ Our system, called EROS, has already been flight tested by the airlines' Air Transport Association, and we're working on and beyond a NASA-sponsored study contract to apply the system to general aviation aircraft. □ For more information, please write Dept. E080, Box 516, St. Louis, Mo. 63166.

MCDONNELL DOUGLAS