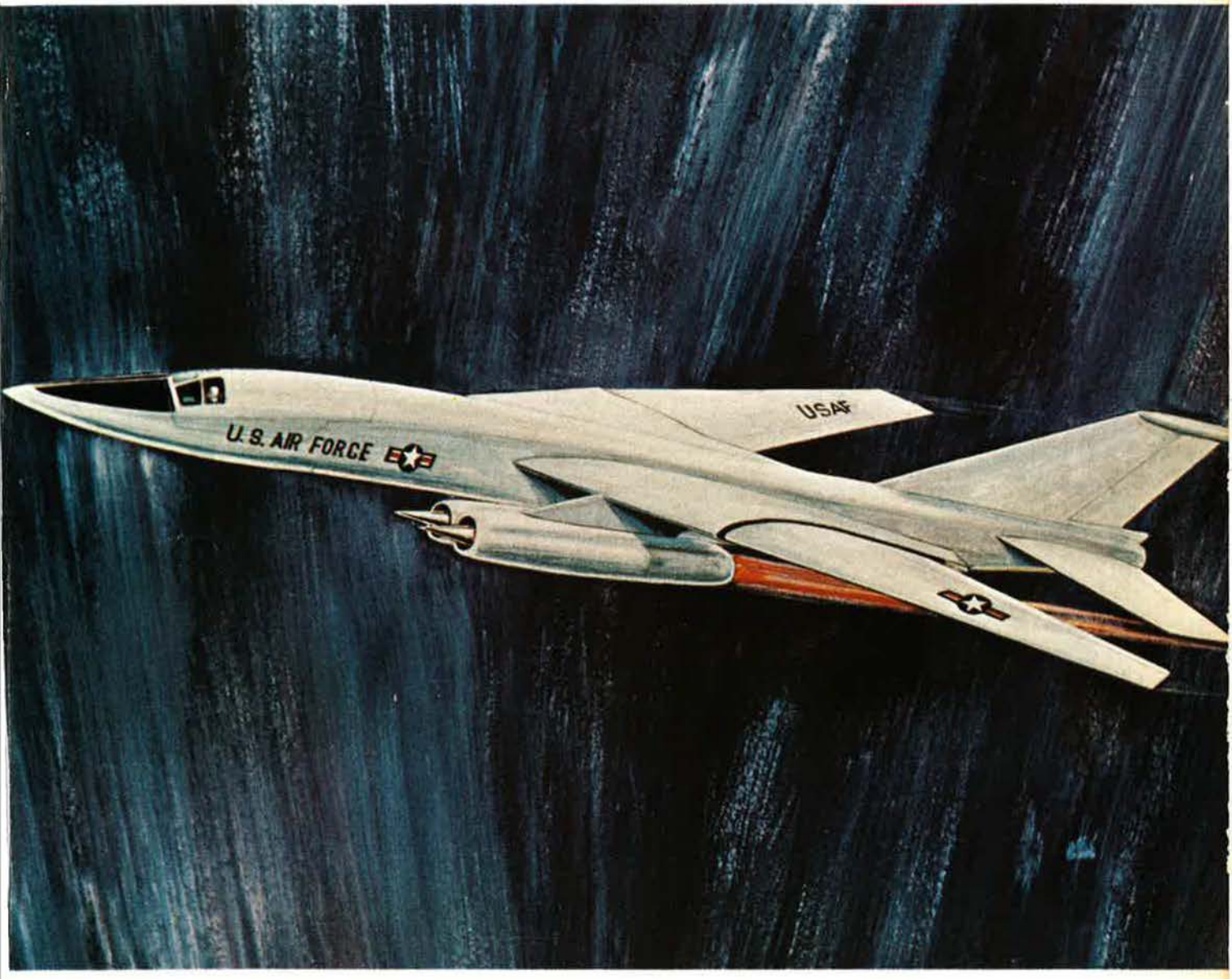
April 1970 / 60c

AIR FORCE

and **SPACE DIGEST**

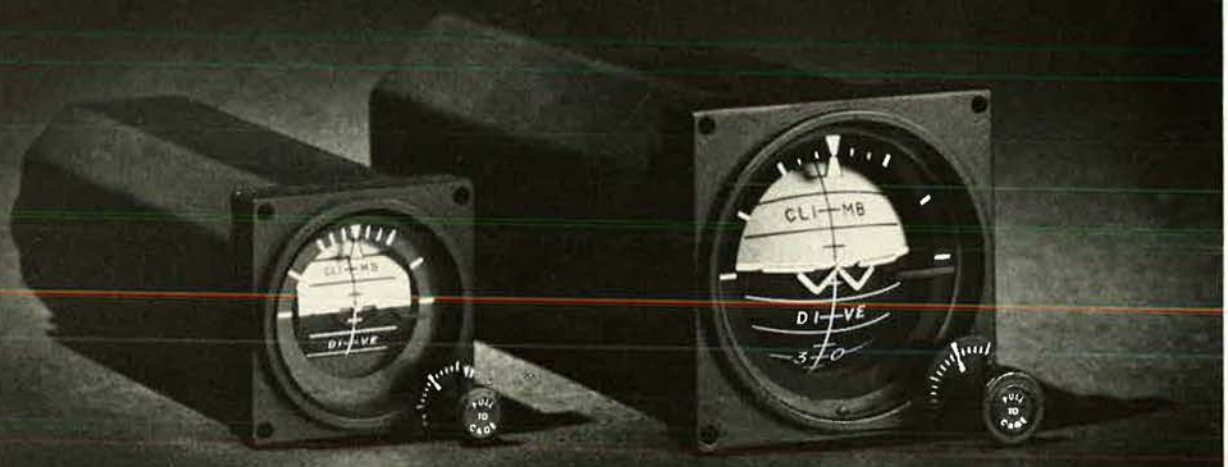
The Magazine of Aerospace Power / *Published by the Air Force Association*



1 . . . USAF's Next Strategic Bomber

ist's conception shows one design approach to the Force's new supersonic bomber, currently in engineering velopment. Combining the best features of the B-52 l the FB-111 with a wide range of recent technological ances, the B-1 is to serve as a vital strategic system ough the 1980s and beyond.

these self contained gyro horizons will take a load off your mind ...



and your plane

Lightweight and unmatched for reliability and safety, the 2″ and 3″ gyro horizons from J.E.T. eliminate the need for any additional electronic components. The Model 903 3″ gyro (weight 4.5 lbs.) and the Model 803 2″ gyro (weight 2.5 lbs.), both standard equipment on many military aircraft, assure accurate presentation with pitch indication amplified at a ratio of 1.5:1 and 2:1 respectively. The primary reference, 3″ gyro, is available with either red or white integral lighting, and its direct mechanical linkage eliminates servo response and lag. In the event of complete power failure, an additional 9 minutes of attitude information is presented. The 2″ gyro, also with direct mechanical linkage and red and white integral lighting, is designed specifically as a standby reference indicator, and like the primary reference, presents 9 minutes of attitude information after complete power failure. For complete information on the 2″ and 3″ gyros write:

Jet Electronics and Technology, Inc., 5353 52nd St., S.E., Grand Rapids, Mich. 49508.

J.E.T.

2″ – MIL – I – 81454 3″ – MIL – I – 81606

JAMES H. STRAUBEL
Publisher
JOHN F. LOOSBROCK
Editor and Assistant Publisher

EDITORIAL STAFF
1750 Pennsylvania Ave., N. W.
Washington, D. C. 20006

Richard M. Skinner, Managing Editor

Claude Witze, Senior Editor; **William Leavitt**, Senior Editor/Science and Education; **John L. Frisbee**, Senior Editor/Plans and Policy; **William P. Schlitz**, News Editor; **Edgar E. Ulsamer**, Associate Editor; **J. S. Butz, Jr.**, Technical Editor; **Jackson V. Rambeau**, Military Affairs Editor; **Don Steele**, AFA Affairs.

Philip E. Kromas, Art Director

James Keaton, Assistant Art Director

Mary Bixiones, Production Manager

Editorial Assistants: **Nellie M. Law, Peggy M. Crowl, Joanne M. Miller, Pearlie M. Draughn, Kay Colpitts.**

•

Irving Stone, West Coast Editor, 10000 Santa Monica Blvd., Los Angeles, Calif. 90067 (213-878-1530). **Stefan Geisenheyner**, Editor for Europe, 6200 Wiesbaden, Germany, Wilhelmstr. 52a, Apt. 123.

•

ADVERTISING DEPARTMENT

Charles E. Cruze, Advertising Director, 1750 Pennsylvania Ave., N.W., Washington, D. C. 20006 (202-298-9123).
Mary Bixiones, Production Manager; **Joanne M. Miller**, Production Assistant, Suite 400, 1750 Pennsylvania Ave., N.W., Washington, D. C. 20006 (202-298-9123).

•

EASTERN SALES OFFICE: Douglas Andrews, Mgr.; John Hemleb, Regional Mgr., 112 E. 40th St., New York, N.Y. 10016 (212-687-3544). **MIDWEST:** James G. Kane, Mgr., 3200 Dempster St., Des Plaines, Ill. 60016 (312-296-5571). **WESTERN:** Harold L. Keeler, West Coast Mgr., 10000 Santa Monica Blvd., Los Angeles, Calif. 90067 (213-878-1530). **SAN FRANCISCO:** William Coughlin, Mgr., 420 Market St., San Francisco, Calif. 94111 (415-421-0151). **UNITED KINGDOM AND EUROPE:** R. A. Ewin, European Sales Director, 20-23 Holborn, London EC1, England (01-242-7484). **FAR EAST:** Yoshi Yamamoto, Regional Mgr., P.O. Box 410, Central Tokyo, Japan (535-6614).

•

BPA

AIR FORCE Magazine and SPACE DIGEST is published monthly by the Air Force Association, 1750 Pennsylvania Ave., N.W., Washington, D. C. 20006 (phone Area Code 202, 298-9123).

PRINTED in USA, by McCall Corporation, Dayton, Ohio. Second-class postage paid at Dayton, Ohio. Photoengravings by Southern & Lanman, Inc., Washington, D.C.

ADVERTISING correspondence, plates, contracts, and related matter should be addressed to **AIR FORCE/SPACE DIGEST**, Advertising Hq., Suite 400, 1750 Pennsylvania Ave., N.W., Washington, D. C. 20006.

EDITORIAL correspondence and subscriptions should be addressed to Air Force Association, 1750 Pennsylvania Ave., N.W., Washington, D. C. 20006. Publisher assumes no responsibility for unsolicited material.

CHANGE OF ADDRESS: Send old and new addresses (including mailing label from this magazine), with ZIP code number, to Air Force Association, 1750 Pennsylvania Ave., N.W., Washington, D. C. 20006. Allow six weeks for change of address to become effective.

MEMBERSHIP RATE: $7 per year (includes $6 for one-year subscription to **AIR FORCE/SPACE DIGEST.**) Subscription rate—$7 per year, $8 foreign. Single copy 60¢. Special issues (Spring and Fall Almanac Issues), $1.25 each.

UNDELIVERED COPIES: Send notice on Form 3579 to Air Force Association, 1750 Pennsylvania Ave., N.W., Washington, D. C. 20006.

AIR FORCE and SPACE DIGEST

The Magazine of Aerospace Power
Published by the Air Force Association

VOLUME 53, NUMBER 4 **APRIL 1970**

DEPARTMENTS

See and hear this new
all solid state VHF/UHF equipment
operate in your environment

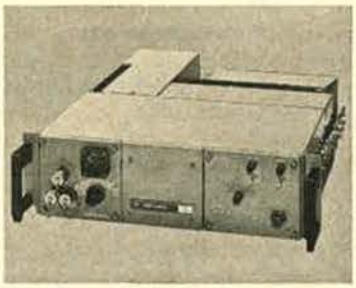
We are now demonstrating the Motorola CM Series—completely solid state including all transmitter final output stages. Engineered to deliver the higher level reliability demanded by the air traffic realities of the '70s. And designed to effect a significantly reduced total cost of ownership over ten years of operation.

40 WATTS OF GROUND-AIR-GROUND COMMUNICATIONS WITHOUT A TUBE.

Module and component interchangeability. The all-new CM Series includes 20 and 40-watt single-channel VHF transmitters, 20 and 40-watt single-channel UHF transmitters; single-conversion, single-channel superheterodyne VHF and UHF receivers; and a 3500-channel, automatically-tuned 20-watt UHF transceiver. Component commonality between and among these all-solid-state units substantially reduces the spare parts inventory needed for full-scale operation.

Other direct results include simplified training of maintenance personnel and shorter downtime for preventive maintenance routines throughout the long equipment life.

40 reliable watts without a tube. The CM-634 and CM-644 are fixed-tuned, single-frequency, crystal-controlled transmitters capable of being tuned from 110-155 MHz and 225-400 MHz respectively. Their all-solid-state stability is not subject to the gradual power degradation typical of transmitters employing tubes in their final output stages.

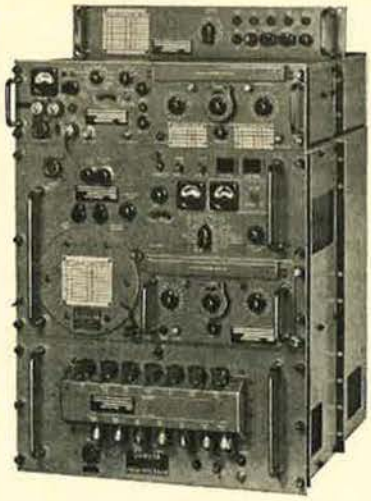


CM-634 VHF transmitter 40 watts, all solid-state, crystal controlled tuneable from 110 to 155 MHz 25 KHz spacing.

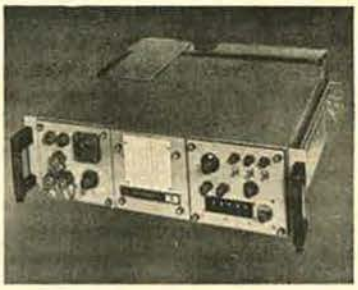
5000-hour MTBF. Both the CM-630 20 watt VHF transmitter and the CM-640 20 watt UHF transmitter are designed for minimum maintenance and tuning time. Channel changing is accomplished with units in rack-mounted position. An output filter limits all spurious radiation—including harmonics—to 80 dB below the carrier. Both are only 5¼ x 15 x 19 inches, weigh under 40 pounds.

100 watts, 3500 channels on-the-move. Motorola's advanced-design CM-Series emanates from the same technical group that produced the Air Forces' air transportable tactical UHF Communications Center, AN/TRC-87 and its offspring, the 100-watt, 3500-channel AN/URC-67 Automatic Receiver/Transmitter—a tested veteran of Vietnam jungles and Arctic tundra.

CM-610 VHF Receiver Single Channel-Compact-Lightweight (also available in UHF as CM-620).



URC-67 AUTOMATIC RECEIVER/TRANSMITTER.



CM-520 UHF Transceiver 3500 channels 50 KHz spacing 22 automatically tuned channels 20 watt output all solid-state.

Another communications gap closed. The CM-Series is the latest Motorola dividend in a 25-year tradition of communications leadership: from the Walkie-Talkie and Handie-Talkie® of WWII fame...police and fire department two-way radio systems...the helmet receiver...to the complete S-band package for the Apollo program. The astronauts count on us to be their Moon-to-Earth voice/data link. Now you can bank on us to be your VHF/UHF link.

MOTOROLA
Government Electronics Division
8201 East McDowell Road, Scottsdale, Arizona 85252

☐ I want to see and hear for myself. Call me at _____ (area code) _____ (telephone) to arrange a demonstration date.

☐ Send me literature and full specifications for evaluation.

NAME _____ TITLE _____

AFFILIATION _____

STREET ADDRESS _____

CITY _____ STATE _____ ZIP _____

TELEPHONE _____

(Can't wait for the mail? Call us collect (602) 949-2798)

An Editorial

We Will Not See Quite Their Like Again

By John L. Frisbee

SENIOR EDITOR, PLANS AND POLICY

THE development of air and aerospace power during the past thirty years is a phenomenon unique in military history. The course of that development was charted and steered by a small group of extraordinary men.

Almost no one outside the Air Force can appreciate the psychological, intellectual, and physical stresses to which they were subjected during the past three tumultuous decades. Almost no one—these men included—would have predicted the effects that an interlocking chain of events was to have on Air Force thinking.

And almost no one has stopped to count the nation's good fortune in having had stable and responsible Air Force leaders in whose hands, almost overnight, was placed the greatest aggregate of raw power the world has known.

In order to put in perspective the immensity of the challenges these airmen met, it is necessary to go back to the 1930s when recent and current Air Force leaders were young in the service. The history of air warfare was then less than twenty years old, in contrast to the several millennia of human experience in land and sea warfare. In truth, accepted ideas about air warfare had advanced relatively little since 1918, and equipment not much more.

Then there began a series of discontinuities, traumatic in their magnitude. The first was World War II, when our air arm expanded from fewer than 50,000 men to more than 2,000,000. In a few frantic months, junior officers assumed the responsibilities if not always the rank of generals, and formed the nucleus of the postwar Air Force. They and their seniors perfected concepts of strategic bombardment and fighter tactics that had grown out of World War I. Airpower proved a decisive element of victory.

The war ended with a second discontinuity—the atomic bomb. The bomb increased the destructive power of military aircraft by several orders of magnitude, threw laboriously developed strategic formulations into the trash can, and injected into military affairs moral questions of an unprecedented kind.

This second great discontinuity was followed almost immediately by a third—the emergence of an era of non-war/non-peace—the Cold War. For the first time this country was vulnerable to attack by enemy bombers, soon to be nuclear-armed.

It is not surprising that while the United States had a monopoly on nuclear weapons there sprang up a small, never very influential group of airmen who advocated preventive war. Their objective—not conquest but rather ensuring lasting peace through a nuclear Pax Americana—was simplistic and morally indefensible, however well intentioned. It was overwhelmingly rejected by Air Force and civilian leaders. We turned instead to the grinding, nerve-racking, seemingly endless job of keeping the peace by instant readiness round the clock, day in and day out. The cost was high in money, in technical and managerial talent, and in aircrew lives. For nearly ten years, the Air Force—less than twenty years removed from its shoestring and collar-button days—was the sole guarantor of US immunity to nuclear attack.

A final link in the chain of discontinuities was forged by the advent of intercontinental missiles. Strategies with which no one had real experience had to be altered to accommodate military capabilities that were even further beyond human experience. In the midst of these upheavals in strategy, tactics, and management, the Air Force fought two bitter, frustrating wars in which airpower could not be used to its maximum effectiveness.

This is the bare-bones outline of an achievement without parallel in military annals.

The pre-World War II Air Corps from which Air Force leaders came had tended to attract adventurous, technically oriented, apolitical men. There were notable exceptions, of course, and all were carefully selected. But few observers of the 1930s would have predicted that the handful of men, probably not more than 500, who survived World War II and emerged as leaders would be the architects of the most powerful and responsible military force of all time. Or that they would foster analytical systems and management practices that would set standards throughout government and industry. Or that their thinking would dominate military strategy during the most difficult and dangerous transition in military history. Or perhaps even that they would have the balance, moral courage, and patience to reject an illusory road to security through nuclear dominance of a war-torn world.

In their formative years, these men had some advantages on their side. Unencumbered by tradition, they were the military radicals of their day. They had little to work with; hence much incentive to invent, adapt, and innovate. They had time to think and experiment. And they were pioneers in a new field, with the zeal and faith of pioneers. They made mistakes, but mistakes that the country could live with, not that it might die by. The service they performed for this country in later years was heroic in its proportions.

This is an age of anti-heroes. The remarkable men who built the Air Force will not be canonized now—perhaps never. It is doubtful that many of them consider this an injustice, and that says more than all the tributes that could be spoken.

The new leaders who stand in the wings are a different breed: more broadly educated, more thoroughly trained, more slowly seasoned. Each group, the old and the new, is the product of a particular time, with opportunity to help mold for the better the character of its own time.

In our fascination with the "now," airmen will not forget—and we who support the Air Force should not forget—the "then." History is a continuum in which the future is an ever-changing reflection of the past. That reflection will do honor to those airmen who built well, in the three turbulent decades just ended. The Air Force will not see quite their like again.—END

The secret we shouldn't have kept

Our 6 years experience in Airborne Data Links

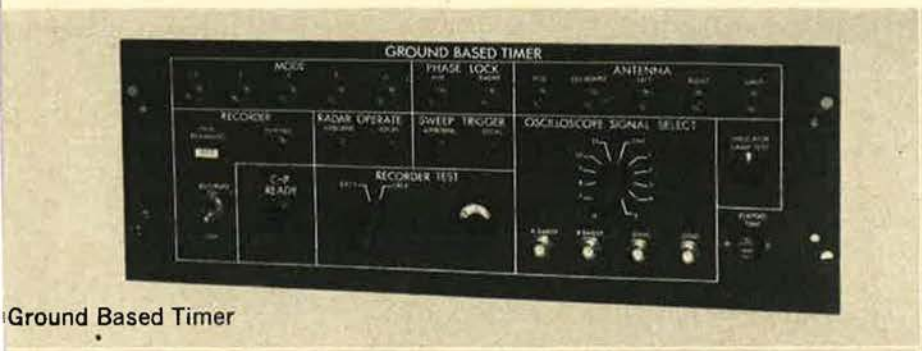
n 1964 we said we could deliver, nd we did. We've been manufactur- ng and improving operational Wide- and Data Link total systems for the ast six years.

But to some people it's still a se- ret that we're old timers in the irborne Data Link business.

It's high time we told everyone: There's no need to await further R and D or prototype equipment.

- Dual channels in a single RF spectrum without the use of time or frequency multiplexing
- Video bandwidths approaching 1000 MHz
- AM transmission for RF spectrum conservation
- Auxiliary data carrier with DME
- Multisensor capability

We can deliver—right now. For more information, write Goodyear Aerospace Corp., Akron, Ohio 44315, or Litchfield Park, Arizona 85340.



Ground Based Timer

Radar Operator Control


Ground Based Antenna


Airborne Data Link Transmitter

When we say it, we mean it

GOODYEAR AEROSPACE

We said our side
all-weather

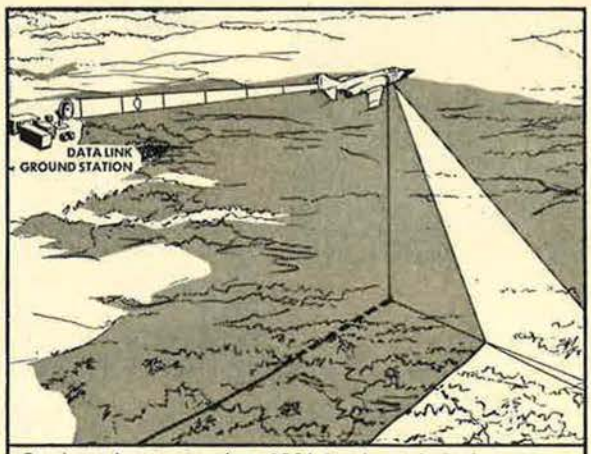
Our side-looking radar does it.

Wayne Wiant, Goodyear Aerospace Systems Manager for radar said it, and he meant it.

His team achieved major advancements in reconnaissance radar by providing high quality, near photo sharp-imagery independent of range . . . developed small high performance antennas for installation within aircraft fuselage envelopes, such as the RF-4C, and delivered the systems to the Air Force to specification and on schedule.

When we say it, we mean it.

For more information on Goodyear's proven system capabilities, write Goodyear Aerospace Corporation, Akron, Ohio, or Litchfield Park, Arizona 85340. Department 910VP.

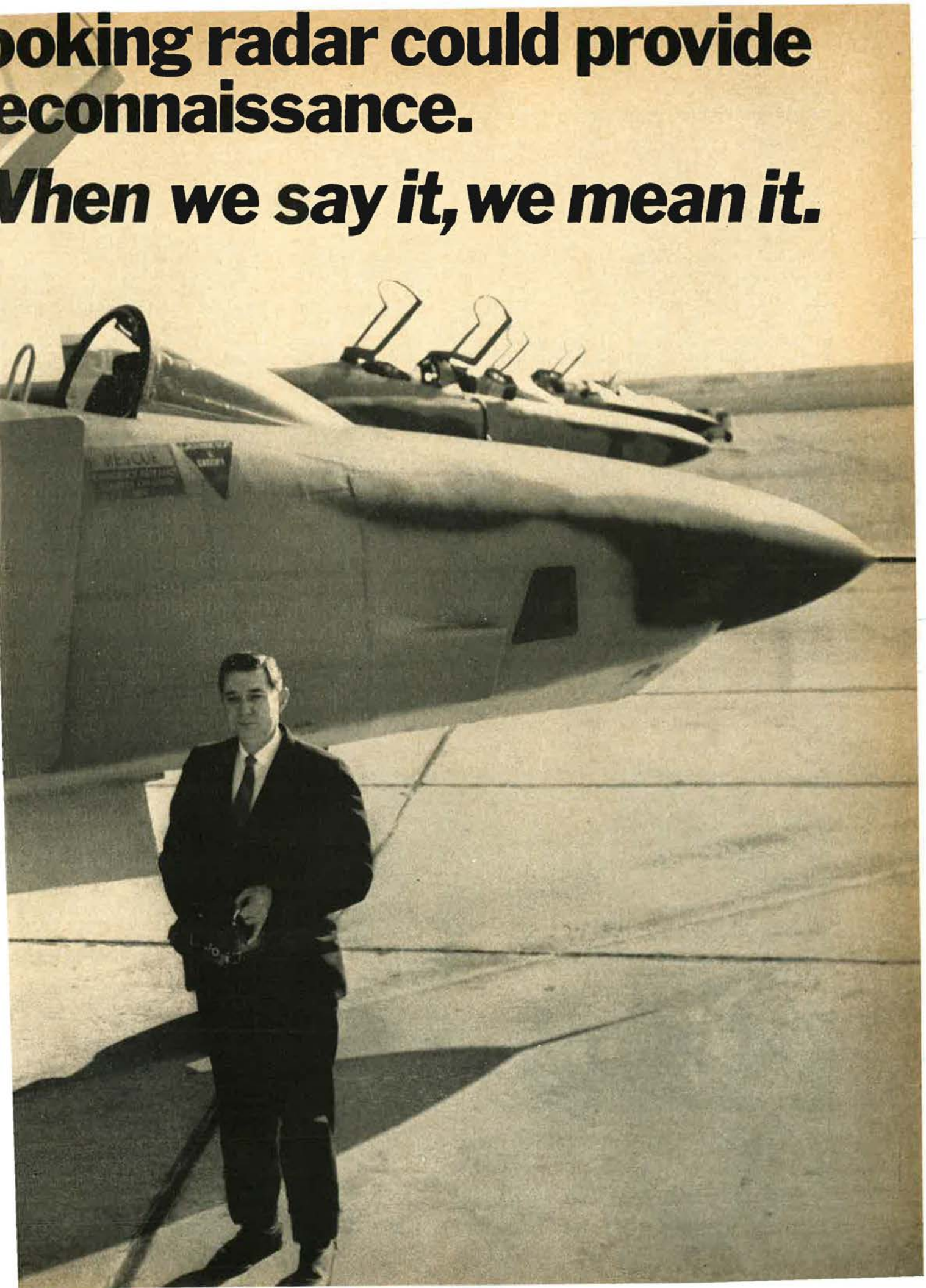


Goodyear Aerospace, since 1964, has been designing, manufacturing and improving operational WIDEBAND DATA LINK total systems which give tactical information in "real-time."

GOODYEAR AEROSPACE

ooking radar could provide econnaissance.

Vhen we say it, we mean it.



AIRMAIL

View from Above

Gentlemen: I've been reading an engrossing book [*Overview: A Lifelong Adventure in Aerial Photography,* by Brig. Gen. George W. Goddard, USAF (Ret.)]. It tells the story of one man's ceaseless efforts to bridge the gap of understanding among his superiors of the importance of photography to the successful application of airpower in wars, hot and cold.

If that association appears natural or self-evident to us today, the credit is due in no small measure to Brig. Gen. George Goddard, who climbed the ladder of achievement when the rungs were sometimes pretty far apart. Maybe George Goddard had a pretty thick skin, for he did not discourage easily. Perhaps we should all be very thankful that he pressed forward, against sometimes discouraging odds, his strip camera and other technical projects.

They came in mighty handy to commanders in many crises. At Normandy, for example, they exposed the hidden German obstructions to the landing craft. Often since the war, when technical wizardry in the field of aerial photography has been needed, our leaders wisely "left it to George," and he came through in the clutch.

Therein lies a tale. George Goddard was never accused of being a shrinking violet, but the nature of his genius required him to work behind the scenes, so most of the headlines went to others. Therefore, his story needed to be told. This he has done in his own way with spirit and professionalism. I commend it to my friends and former associates in the US Air Force.

GEN. J. P. MCCONNELL, USAF (RET.)
Arlington, Va.

New-Town Concept

Gentlemen: I was delighted by AIR FORCE/SPACE DIGEST's concern for our environment ("An Idea for a City—Born of the Space Age," by William Leavitt, January issue), but your endorsement of this particular project is misguided. Mr. [Robert G.] Smith's innovative plan based on NASA's desire to diversify in the post-Apollo era, a large tract of NASA land in search of a future use, and a national need for future spatial decentralization, is ill conceived.

First, it would be grossly inefficient to put NASA into the urban-planning business, creating duplication of HUD's efforts. HUD could hire the relevant experts (from NASA?) at a lower overhead cost and, in effect, achieve the same results that a NASA-based program would.

Second, the present ownership of the land in question by NASA means little. Surely an intragovernmental transfer to an agency better equipped to handle it could easily be arranged. Most importantly, a new town needs to be designed around a larger and more diverse employment creator than an urban R&D center. The intense competition for new firm location is an overwhelming obstacle that Mr. Smith recognizes but does not cope with. Without a solution to this problem, a new town is just a pipe dream.

Studies have shown that think tank types and their families rank amenities high in their job-location decisions. Areas already having these amenities can attract these people at lower salaries than the area Mr. Smith proposed.

This is not to say that a new town at that location would not work. If someone were given unlimited funding they could make a delta city rise from the dust. But better alternatives could be suggested with an eye to cost. One such alternative for this site could be a comprehensive training and rehabilitation center similar to the one for Indians at Roswell, N.M., on the former Walker Air Force Base site. Conceivably, this would benefit the local people and the country as a whole to a greater extent than Smith's proposed "instant city."

LT. N. DANN MILNE
Economics Department
University of Texas
Austin, Tex.

• *Mr. Smith, originator of the new town plan described in Mr. Leavitt article, replies:*

There is no intention to duplicate HUD's efforts. The article suggests that NASA would play a major planning role, but leaves the overall planning and operation of the composite new town-urban research and develo

(Continued on page 10)

Who's this crew? This photo was taken November 11, 1943, "somewhere in England," of the B-17 "Royal Flush," part of the Eighth Air Force's 390th Bomb Group. On August 11, 1944, a B-17F with the same nickname, piloted by Lt. Alf Aske, Jr., of the 418th Squadron of the 100th Bomb Group, was shot down by German flak near Paris. A young Frenchman, Leon Croulebois, saw the crash and now, years later, has managed to contact survivors of Aske's crew. M. Croulebois is now trying to locate the original crew of the "Royal Flush," shown above. Anyone with information is urged to contact this magazine's Managing Editor.

SCIENCE/SCOPE

The U.S. Air Force's new TV-guided Maverick, an 8-foot, 500-lb., air-to-ground missile, successfully completed its first guided test flight recently. The pilot of an F-4D Phantom flew toward the target until it appeared on a TV screen in the cockpit, then locked the missile's guidance system on to the target. After launching the missile he veered away as the electro-optical homing device in Maverick's nose guided it to a direct hit.

The cost/schedule planning and control system which Hughes developed for Maverick's design, development, test, and evaluation phase has been accepted without modification -- the first time the Air Force has validated a C/SPCS on initial submission by a contractor.

Millimeter wave frequencies -- which offer great promise for future space communications and data links -- will be studied in an experiment Hughes is building for NASA's ATS-F satellite. Advantages include: wide bandwith, plasma penetration, reduced spectrum crowding, reduced size and weight of components. The Hughes-built equipment for the experiment includes the millimeter-wave tube.

A multimode digital doppler signal processor developed by Hughes promises major improvement in the capability of airborne radars for airborne moving-target indication and high-resolution ground mapping. The new digital processor has demonstrated significantly greater sub-clutter visibility than was possible with earlier analog techniques. It can be packaged in less than one cubic foot of space for tactical aircraft applications. The processor will be used in the Forward Looking Advanced Multimode Radar Program (FLAMR).

14 soldiers hit the bullseye on their first TOW missile shot during a brief training course at Redstone Arsenal, Ala., recently. Only one man in the class of 15 needed a second shot to score a hit with the wire-guided anti-tank missile, which is automatically steered to the spot at which a gunner aims. The TOW system, a lightweight, portable, heavy-assault weapon for use by the infantry, can be fired from a ground tripod or a variety of vehicles and helicopters.

The world's most powerful ultraviolet laser was delivered to the U.S. Army Electronics Command recently by Hughes research laboratories. The continuous-wave laser uses doubly-ionized argon as the lasing material. It produced a maximum output of 2.3 watts during a one-year program of research, development, and fabrication. UV lasers are expected to find use in data recording and display, spectroscopy, and photochemical research.

The first AWG-9 Phoenix weapon control system, reconfigured for the new F-14A fighter, was delivered to the U.S. Navy recently by Hughes. Its weight has been pared from 2,000 lbs. to less than 1,400. It is the only air-to-air system with a track-while-scan radar mode that enables it to launch up to six Phoenix missiles and keep them on course while searching the skies for other possible targets.

ment center to a yet-to-be-developed "interagency mechanism," which would include NASA, HUD, HEW, DOT, OEO, and private industry.

I am sure that the job challenges and opportunities at the proposed center would attract the right people, as government and industry experiences at the Marshall Space Flight Center in Huntsville, Ala., and the AEC-created new town-research and development centers in Los Alamos, N.M., and Oak Ridge, Tenn., have indicated.

The term "instant city" was not used at any point in the article. Rather, it is suggested that the urban R&D center be established first, with the new city to be built over a period of several years.

Unpublicized Pressures

Gentlemen: Twice in recent months I feel you have stopped short of the major contribution that could have been made by a military journal during a time of great stress. Most recently your editorial entitled "On My Lai," in the January 1970 issue, made no attempt at explaining the circumstances of My Lai which indeed might have caused even seasoned troops to be trigger-happy. "Alleged despicable behavior of the few" are not words with any built-in compassion for troops operating under psychological pressures hard to contemplate from the security and warmth of your editorial chair in Washington.

"The US Involvement in Vietnam—How and Why," by Mark Swenson, of June 1969, also left much to be desired. It would have been easy to strengthen that presentation by providing additional background on societal weaknesses that crept into the total equation.

MILLARD HARMON
Delmar, N.Y.

A New Noisemaker?

Gentlemen: The English Electric Ltd. engineering design team that conceived the Canberra aircraft toward the end of WW II must have noticed with interest the artist's conception of the AX aircraft in your January issue ["AX: Lethal, Accurate, Agile, and Cheap," by Edgar E. Ulsamer.]

At first glance, the proposed AX appeared to be a B-57 equipped with three vertical stabilizers. Closer examination revealing the two turboprop main engines and two auxiliary jet engines made it appear the aircraft could possibly develop into an airborne super noisemaker. Being admittedly unknowledgeable of the state of the art of aircraft engine developments or the finite specifications of the AX design, I believe one of the features of the B-57 that added to its effectiveness while utilized for close and direct air support in Vietnam may possibly be overlooked in the AX design. The J-65 engines used in the B-57 (D and F models excluded) are basically quiet operating engines during most flight envelope power settings.

As one who participated in 260 combat missions in the B-57 in Vietnam, there's no doubt in my mind that the excellent survivability record of the B-57 in 37-mm and 57-mm defensive environments, particularly during night operations, was due in part to the minimum noise level created. Normally, ground fire was only received when full engine power was used during dive-bomb recoveries. This situation evolved into interesting cat-and-mouse games with the air and gun crews, entailing shrewd use of oriental philosophy and bombing roll-in and recovery techniques.

It will be interesting to follow the development of the AX. With four engines and three rudders, the AX will not likely receive the initial poor reputation gained by the B-57 as a result of demanding single-engine characteristics.

MAJ. ROBERT L. LINCE
Kirtland AFB, N.M.

Blundering Project Officers

Gentlemen: As a junior officer with a technical background, I was glad to see Gen. John C. Meyer's article ["Managing the USAF: The Now and Future Challenges," January '70 issue]. However, I think that many senior officers have failed to recognize some of the most important issues: system-generated problems.

When any of the top technical staff of a corporation submit resignations, the manager is held responsible. I have seen Air Force supervisors virtually push all their junior officers out of the service with nary a shrug on the part of the commander. Why? Because losing talent will not reflect on an individual's effectiveness report, or short-range organizational effectiveness. What would happen if officers were held accountable for their subordinates requesting a DOS?

I don't recall a single case where any of over ten of my contemporaries that I know personally (all eligible now have a DOS) were at any time complimented by their commander or in any way encouraged to make the service a career. . . . It's easy to try to cajole someone into doing something you want when you know they can't slap a resignation on your desk for which you will be held accountable. The attitude I have universally encountered has been: "I don't care what you do, I can always get a replacement."

I personally believe that the major cost overruns encountered in new systems are to a large extent caused by the project officer's lack of expertise. It's easy for a contractor to hoodwink the government when the project monitor doesn't even know the meaning of the terms, much less the system concepts involved! Is it really cheaper in the long run to enlist a new lieutenant every four years to fill a technical slot than to retain a trained and capable officer with incentive pay, promotion, and good supervisory relations? From my point of view, the Air Force certainly seems to think so.

1ST LT. BRIAN A. BERENBACH
APO San Francisco

UNIT REUNIONS

Jolly Green Pilots Association
The second annual reunion of officers who flew HH-3E "Jolly Green" and HH-53 "Super Jolly Green" choppers in SEA will be held April 24-26 at Fort Walton Beach, Fla. Officers who flew A-1E "Sandies" or HC-130 "King" (formerly Crown) aircraft and Rescue Coordination Center officer-controllers who served in SEA are eligible to join the Jolly Greens as associate members. Contact is

Maj. Dale Weedon
666 Fairway Ave.
Fort Walton Beach, Fla. 3254
Phone: Advon 928-3426

Stalag Luft III Kriegies
Alumni of Stalag Luft III, Air Force Officer Camp at Sagan, Germany, WW II, will hold their twenty-fifth annual reunion April 24-25 at the Netherland-Hilton Hotel in Cincinnati, Ohio. Contact

David Pollak
P. O. Box 15327
Cincinnati, Ohio 452

2d Air Division
The 2d Air Division, Eighth Air Force, WW II will hold its twenty-third reunion at the Carrousel Inn, Cincinnati, Ohio, on June 19-21. Contact

Bob Halpin
6002 Werk St.
Cincinnati, Ohio 452

366th Tac Fighter Wing
The Gunfighters of the 366th TFW are having their first practice reunion for all officer members in Tampa, Fla., June 19-21. All members, past and present, are requested to write for details and submit their addresses to

Gunfighters
Box 6586
MacDill AFB, Fla. 33

AIRPOWER IN THE NEWS

By Claude Witze
SENIOR EDITOR, AIR FORCE/SPACE DIGEST

The Agonizing Appraisal

WASHINGTON, D.C., MARCH 10

There has been a veritable deluge of pronouncements out of the executive branch of the government in the past month. The desk of every editor in town is piled high. The commentators and pontificators are putting up a bold front, but they are not doing well. Even with an interest confined to national security, it is a monumental task to keep track of what the Administration says and what other people say about the Administration.

If there is anything common or fashionable about what the Administration says, it is that today's atmosphere lends new importance to the kind of priority we put on our selected expenditures. Congress talks about it; so do the White House, the Bureau of the Budget, and the Pentagon. Senator J. W. Fulbright, the Arkansas Democrat who heads the Foreign Relations Committee, was on a television quiz show a couple of days ago. He said we should get out of Southeast Asia, and the reason is that we need the money to solve domestic problems. He also disclosed that he had not visited SEA in twelve years, despite his position as chairman of the committee, and that he gets most of his information from the newspapers. Further, he said that the Indo-Chinese carried on well for 2,000 years without our help and he thinks they can continue. There was no mention, in the Fulbright discourse, of colonialism and the fact that China, Japan, and France have dominated the nations over there for most of the 2,000 years he was talking about. Even twelve years ago, it would have been hard to avoid the observation that anything resembling culture in Vietnam was, basically, of Chinese or French origin. If we wait long enough, it will be Chinese, French, or Russian.

As we reported last month, President Richard M. Nixon said in his budget message that US spending on "human resources" soon will exceed spending on military projects. Since then, he has sent a message to Congress on the subject of education. Almost all the papers missed his point in this presentation. What he said was that the national budget for education is about $65 billion a year, which puts it in the same ball park with defense. And, the President added, the cost-effectiveness of this effort is deplorable. He is demanding the same kind of review of how our education dollars are spent that Mr. Fulbright and his sympathizers demand for military expenditures. Neither the Department of Health, Education and Welfare nor your local state, city, or county governments that provide most of the annual $65 billion, has an office of Systems Analysis. Of course, the local governments do not buy aircraft carriers, airplanes, or missiles, and they do not support armies trained to fight in jungles. But they do collect taxpayers' dollars and spend more of them for health, education, and welfare than the federal government. If you don't believe it, look at the budget for the state of New York or California. There are fifty states, and uncounted local jurisdictions, all contributing.

If you listen on Capitol Hill, particularly to men like Senator William Proxmire, it is possible to come up with the idea that the Pentagon is oblivious to all national requirements unrelated to defense. Yet, on February 20, Defense Secretary Melvin R. Laird disclosed a new format in his first Posture Statement before a joint session of the Senate Armed Services and Appropriations Committees. One of the opening sections is devoted to "Priorities and Resource Allocation," wherein he reviews what he has done to the defense budget and says that the cuts "have been more than matched by increases in other federal programs."

Mr. Laird offers a frank evaluation of the Nixon Administration's dilemma. After a reference to the President's new National Goals Research Staff in the White House, he told the Senators:

"National-security studies and analyses, conducted under the aegis of the National Security Council or unilaterally by the Defense Department, can provide a good deal of information about our worldwide commitments and basic security needs. But in the past, when such analyses were made, they almost never addressed the other parts of the equation, that is, our nondefense objectives and the resources available to attain them.

"Since studies within the NSC and the Department of Defense focus on requirements, there is a built-in tendency to request more resources than are available. Although our predecessors took steps to mitigate this tendency through the Planning, Programming, and Budgeting System within the Department of Defense, we cannot and should not expect the Department of Defense or the NSC to decide on the final allocation of resources between defense and nondefense activities. The President and ultimately the Congress must make these decisions."

He went on to say the Nixon Administration is trying hard to make rational choices, but warned against having the pendulum swing too far into unacceptable risk.

An unexpected source of support for what Mr. Laird is telling us, as well as what Mr. Nixon spelled out in his message on education, comes from an economist named Arthur M. Okun, who was Chairman of the Council of Economic Advisers in the last Administration. In his book, *The Political Economy of Prosperity*, he says:

"The absurd battle between defense and the cities arises because we insist on rather stable tax rates and hence on a relatively constant federal share of our national product.

"Thus, defense and nondefense programs are plunged into a direct tug-of-war for a fixed volume of budgetary resources. This is surely the greatest paradox of resource allocations in our society.

"Defense spending—with its nine percent of the gross national product—is pitted against nondefense federal, state, and local expenditures—with their fourteen percent of the GNP—while the big seventy-seven percent of our GNP that goes into private spending remains a bystander.

"And because controllable federal civilian spending is concentrated in aid to cities and the poor, the bulk of the pressure is exerted on about five percent of our GNP.

"When defense goes down, efforts to assist the cities and the poor can go up. When defense goes up, we seem to expect the belt-tightening to be concentrated in these social programs."

The author then concludes that the nature of the conflict is what forces those working for social programs to

(Continued on following page)

lead the attack on the military and portray men in uniform as a bar to social progress. His solution is that the money for nondefense spending should be earmarked and taxes should go up or down, depending on the military requirement of the moment.

It is not necessary to agree with Mr. Okun in every detail—nondefense spending has been going up, not down, while we fought in Korea and Vietnam—to see merit in his concept. There are men on Capitol Hill, notably Senator John Stennis, now Armed Forces chairman, who argued long and loud during the height of the Robert S. McNamara regime at the Pentagon, that the cost of our venture in Southeast Asia was not given an honest accounting. What is threatening now is that the belt-tightening will entail a risk to national security in the mid- or late-1970s.

To combat this approach, Mr. Laird is being forced to disclose more information about the nature of the threat, a factor that defense critics tend to ignore. While he is cutting the defense budget, Moscow is not following suit. Further, the Secretary says, the rapid Soviet deployment of major strategic systems continues, and by the mid-1970s could place us in a second-rate position. He hopes the SALT talks in Vienna, beginning in April, will bring dividends, but:

"If the current Soviet buildup continues, we will need additional costly steps to preserve an effective deterrent. Pending the outcome of SALT, we must continue those steps which are necessary to preserve our current strategic position."

Here, the Secretary got into the subject of the Safeguard ABM program and gave the opinion that the Nixon decision to go ahead with a modified Phase II effort "will enhance the prospects for the success of SALT because, in the short run, it allows us to exercise greater restraint in matching a continued Soviet buildup of offensive systems with actions involving our own offensive systems. Safeguard has the added advantage of doing this with minimal spending in FY 1971."

Secretary Laird's appearance at the Capitol followed by only two days an elaborate special message from President Nixon to Congress on foreign-policy objectives. The document ran 40,000 words and quickly won the title of a "State of the World" document. In it, the White House set the stage for the Defense Secretary. Mr. Nixon said the goal of peace, and a durable peace, calls for partnership, strength, and negotiation. That, he said, is the unifying theme of his report.

On the subject of strength, he said peace is not a thing earned by good will alone:

"In determining the strength of our defenses, we must make precise and crucial judgments. We should spend no more than is necessary. But there is an irreducible minimum of essential military security; for if we are less strong than necessary, and if the worst happens, there will be no domestic society to look after.

"The magnitude of such a catastrophe, and the reality of the opposing military power that could threaten it, present a risk that requires of any President the most searching and careful attention to the state of our defenses."

The President then looked at the change in the balance of power. From 1945 to 1949 we monopolized atomic weapons. From 1950 to 1966 we had overwhelming superiority. From 1967 to 1969 we retained significant superiority. Today, for all practical purposes, there is a parity. The Russians claim it, and there is no persuasive denial.

Mr. Nixon pointed out that the Soviet effort in both research and development and production has resulted in

THE CONTRACTOR LOOKS AT TOTAL PACKAGE PROCUREMENT

On March 2, in an unprecedented corporate step, Lockheed Aircraft Corp., the nation's top defense contractor, told the Pentagon it must stop work on four programs unless it receives more than $600 million in interim financing.

In a letter to Deputy Secretary of Defense David Packard, Daniel J. Haughton, Lockheed chairman, said the company cannot proceed while litigation continues over disputed payments involving the contracts.

The four systems are the USAF C-5A transport, the Army's Cheyenne or AH-56A helicopter, rocket engines for the SRAM short-range attack missile, and Navy ship construction. As presented by Lockheed, the choice is to pay or do without the equipment. The Pentagon said the request is getting "priority consideration."

It seemed clear that the Defense Department released the text of Mr. Haughton's letter because it had been disclosed on Capitol Hill and inevitably would have been made public there, probably by Pentagon critics.

Of top interest to contractors and procurement officers who lived through the management revolution brought about by Robert S. McNamara in his years as Defense Secretary, were the Lockheed observations on the fruits of that regime. Neither were they ignored in Congress, where one staff man saw a paradox in the fact that "after a near-decade of McNamara reforms, the situation in weapon systems acquisition seems to be worse than ever before."

Lockheed Chairman Haughton admitted company deficiencies but said the common ingredient of the four programs now in distress "is the fact that under the Total Package Procurement procedure, development was required to be undertaken under a fixed-price-type contract with concurrent production commitments with respect to price, schedule, and performance.

"Although it was assumed that state-of-the-art advances were not required in these programs, it is generally admitted that these assumptions were incorrect. Although industry generally, including our company, perhaps erred in competing for contracts under this system, the system itself and its use were the responsibility of the military departments."

The departments, of course, took their direction from Mr. McNamara, who as recently as 1968 told the House Armed Services Committee he looked for "further progress in the procurement area" by wider use of the total package approach.

Mr. Haughton believes the procedure "imprudent and adverse to our respective interests." He said the hazards were not appreciated when it was applied to the Cheyenne project, and nobody foresaw the kind of controversy that would erupt around the C-5A. He was emphatic:

"Despite the growing awareness that the total package method utilized in these programs is virtually unworkable there seems to be little disposition to correct existing contracts on terms which most contractors can accept or to recognize that litigation is a seriously inadequate avenue.

For 1969, Lockheed has reported a corporate loss of $32.6 million against a 1968 profit of $44.5 million.

ıore and better missiles. Warheads are more accurate, enetration aids have been added, multiple warheads are nder test, and their ABM is being improved. He did not ention the most lethal Fractional Orbital Bombardment ystem (FOBS), but Mr. Laird did; it is under develop- ent in Russia, no deployment estimates are available; the ooster is the SS-9, and it is possible that a small number ready are deployed in SS-9 silos.

President Nixon gave this tabulation on forces:

Operational US and Soviet Missiles

	1965 (Mid-year)	1970 (Projected for Year-end)
Land-based ICBMs		
US	934	1,054
Soviet	224	1,290
Submarine Launched		
US	464	656
Soviet	107	300

Looking at these figures, he attributed the shift to the evious Administration's "Assured-Destruction" theory and e reasoning that if we show restraint, the Russians will ow restraint.

The President went into this in more detail. He said this dministration fears that if it cuts back sharply on stra- gic systems, it might provoke the opposite Soviet reac- on. He recognizes that unilateral strategic disarmament ould spur the Russians and eliminate any hope for an ms agreement.

On the other hand, the Administration feels that any arp increase in US strategic power "might not have any gnificant political or military benefits." Soviet positions ight harden and there would be no hope for an arms greement. Mr. Nixon says, at this point, that he does not ow which way we may have to go. There is no recogni- on, at any point in his presentation, of the Soviet pre- lection to use negotiation, when they agree to it, as a ntinuation of conflict. Or, that they might respond to rategic superiority, as in the case of the Cuban crisis.

The White House paper uses this background to lead to the ABM question. The President was satisfied to re- w what he said on the subject last year, adding only that is convinced the Soviet threat continues to be serious. announced that Mr. Laird would have more to say on subject, which he did. The Defense Secretary went to Hill less than a week later to plead for a "Modified ase II" Safeguard program. He seeks authorization for e new ABM site, at Whiteman AFB in Missouri. In Fis- 1971, this would require less than $100 million in addi- n to what Congress already has approved. The program o recommends starting long-lead-time work at five other s, without a commitment that they will be activated. e areas favored are Northeast, Northwest, National Cap- Area, Warren AFB in Wyoming, and Michigan/Ohio.

A heated argument over this program already has started Washington, fed in part with fuel from Moscow. Most ently, *Pravda,* the Communist newspaper, has printed authoritative attack, charging that the Nixon-Laird pro- m endangers the prospects for an agreement. This view ıtrasts sharply with the experience at the first SALT sion in Helsinki, where the Reds indicated they are dy to bargain about ABM programs, giving our dele- s good reason to believe that Safeguard promises to d strength to their position.

t is equally probable that someone in the Kremlin is r to fertilize the fields in this country where the uni- lateral disarmament seeds have been sown. America's ABM critics do not reject help from anywhere abroad. And Moscow never was reluctant to influence an internal US debate on such a subject.

Last year ABM survived its Senate test by a single vote. There will be some realignment this year. Illness and defections that develop in the year of a congressional election will contribute. Already, there are task forces being set up on both sides of the Capitol to educate legislators and their aides. The lessons center on the assumptions Mr. Nixon has made in his "State of the World" message and the Laird Posture Statement. It is reported that the critics are resolved to do a better job than in 1969, and come up with their own alternatives to the Administration program.

There is a feeling that the only real cut in defense spending is the cut that results from our slow pullout in Vietnam. Those who believe this are going to concentrate their fire on the Pentagon's determination to look ahead, and they are being helped by some really prestigious organizations, such as the Brookings Institution. There will be efforts to cut the research and development funding proposed for such systems as the B-1 bomber, the F-15 air-superiority fighter, and improved missilery. The thing that is different is that the attack will be made through the government's foreign-policy statements, and not just with shotgun blasts at weaponry and the tired argument that it is provocative.

The situation is producing some unexpected reactions. Senator John O. Pastore of Rhode Island and Senator Henry M. Jackson of Washington were among those who put highly critical questions to Mr. Laird when he testified. Both of them argued for the ABM last year. On the other hand, C. L. Sulzberger, an editor of the New York *Times,* pleads that Safeguard is a diplomatic requirement, even more than it is military. The *Times,* of course, usually is sympathetic to the cooing of the doves. But Mr. Sulzberger, whose main concern is the preservation of NATO, says the only way to keep that alliance credible is to install a valid ABM system in this country. If we do not thicken the shield, he says, we will not have any allies left by 1980.

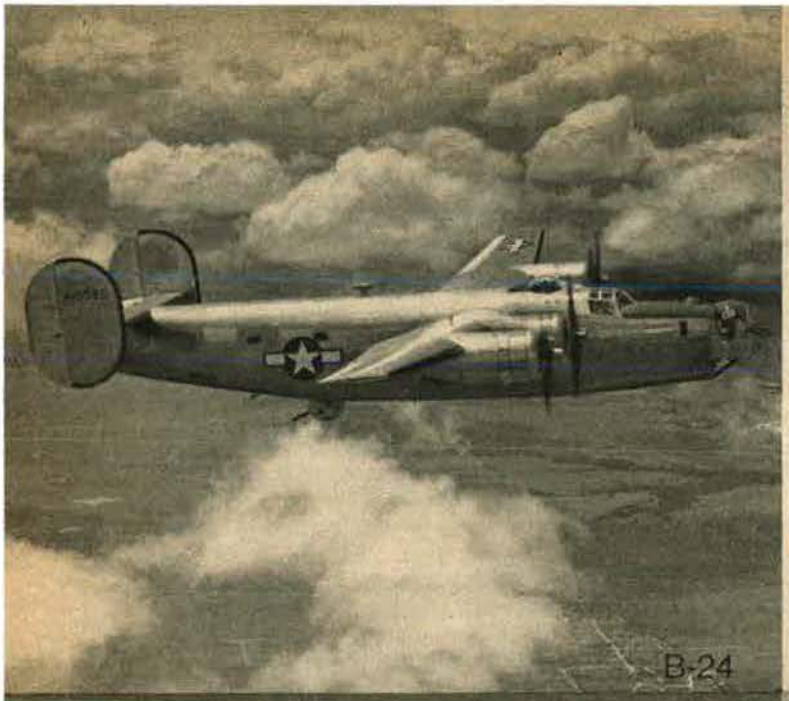
The Wayward Press (cont.)

In *The Nation* for February 16 there is a book review under the byline of Richard F. Kaufman. The magazine identifies Mr. Kaufman as a member of the staff of the Subcommittee on Economy in Government, chaired by Senator William Proxmire, "which has been investigating profits and costs in defense procurement."

Staff member Kaufman deplores, in his review, "the Air Force's relationship with General Electric and Westinghouse, which have a near monopoly on aircraft engines."

This, we are sure, was startling news to Westinghouse, which does not build aircraft engines, as well as to the Pratt & Whitney Division of United Aircraft Corp., and the Allison Division of General Motors, which, of course, do build aircraft engines. The jolt must have been particularly tough on GE and Pratt & Whitney, whose relationship, at the moment Mr. Kaufman displayed his expertise, was that of almost bloodthirsty competitors, with USAF as the umpire.

In addition to providing a clue to the kind of staff work done for the Proxmire Subcommittee, *The Nation* inadvertently performed another service. It told us that its star, Mr. Kaufman, has written a book on war profiteering that will be published later this year. The contributions from this volume to The Wayward Press will be appreciated, although space limitations may pose a problem.—END

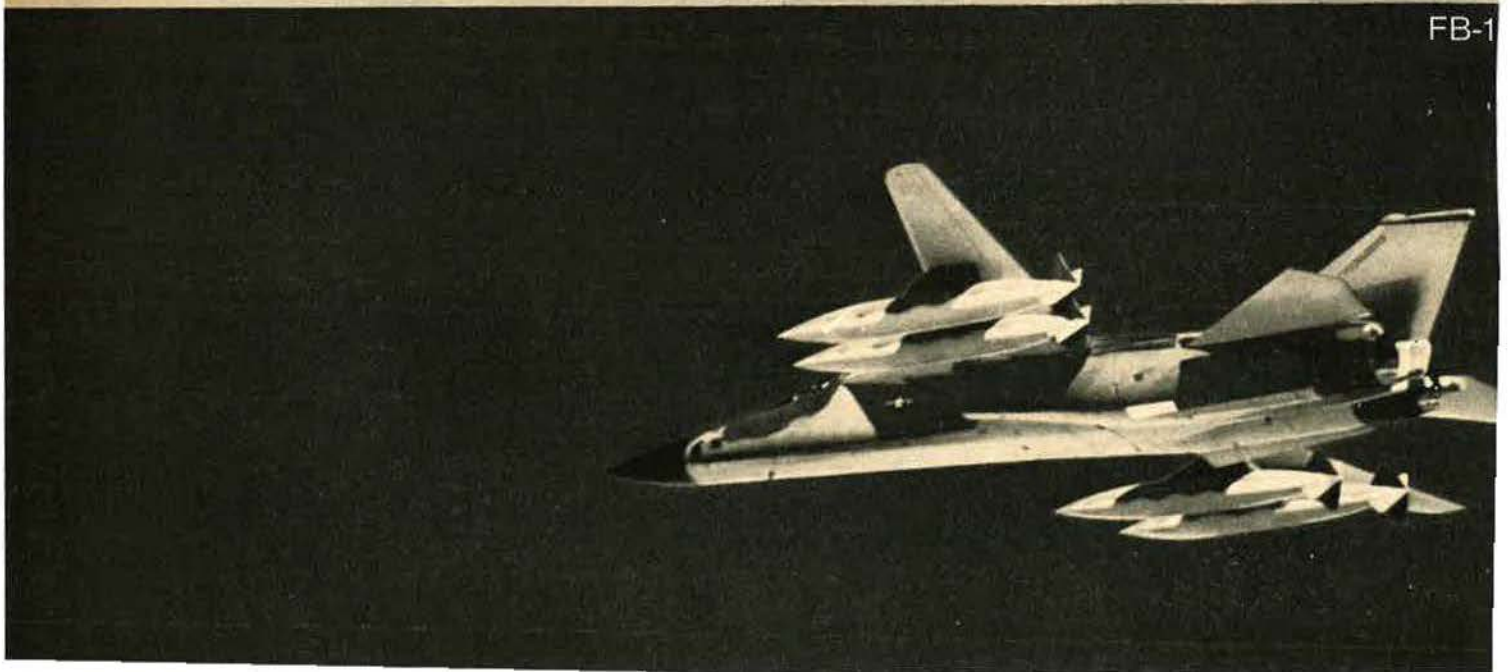


B-24

B-

B-36

B



FB-1

The next generation of strategic aircraft will have some famous ancestors.

ome of them look like pretty distant re-tions. But being able to build the next eneration of bombers could depend on ssons learned from each of them.

The B-24 is primitive by today's stand-ds. But we built more than 10,000 of em. And it was the first production mber to use the tricycle landing gear d to incorporate a low-drag, high-lift ng.

Then the requirements got tougher. To-ard the end of World War II, the call was r a larger aircraft, able to fly farther and ster. And our B-32 was delivered on hedule.

Our B-36 had the range and payload eded to give the U.S. Air Force true in-continental bombing capability and ade global strategy a reality. It flew un-fueled for 10,000 miles and carried a ,000-pound payload.

In the 1950's, we developed for SAC e delta-winged B-58, the world's first ersonic bomber. Its advanced design ade extensive use of aluminum honey-comb panel construction techniques to reduce weight and heat effects at Mach 2 speeds. Air Force crewmen flew the B-58 to 19 official world performance records.

Today, General Dynamics is producing the FB-111A for SAC. It's the only strategic aircraft being built in the U.S. It can fly high or low a lot faster than other bombers. With its terrain-following radar and advanced navigation-bombing system, it can penetrate enemy defenses in fair weather or foul, day or night. Armed with a variety of modern weapons, the FB-111A can knock out targets with unmatched accuracy.

Five generations of strategic bombers have rolled off our assembly lines over the past 30 years. Each has pushed technology to new frontiers and each has provided new operational capabilities. Now we're planning for the next generation.

GENERAL DYNAMICS

1 Rockefeller Plaza, New York, N.Y. 10020

AEROSPACE WORLD

News, Views & Comments

By William P. Schlitz
NEWS EDITOR, AIR FORCE/SPACE DIGEST

WASHINGTON, D.C., MARCH 8

The 192d Tactical Fighter Group of Virginia's Air National Guard is among a host of groups and individuals supporting the effort to obtain humane treatment for Americans held prisoner in North Vietnam.

At Byrd Field, Sandston, Va., home of the 192d, more than 600 officers and airmen in late January signed a petition of concern about the prisoners. The event was initiated by Maj. W. P. Lemmond, Jr., a 192d pilot.

Major Lemmond said he got inspiration for the idea from AIR FORCE/SPACE DIGEST, which is conducting a campaign for POW relief. The petition, as AF/SD suggests, will be sent to the ambassadors and editors of leading newspapers of seven foreign countries that might bring influence to bear on North Vietnam to observe the Geneva Conventions of 1949. The countries are: Cambodia, France, India, Poland, Romania, Sweden, and the Soviet Union.

A special visitor for the signing was Mrs. Phyllis E. Galanti, whose husband, Lt. Paul E. Galanti, USN, was shot down over North Vietnam in 1966 and is held prisoner by the North Vietnamese.

In signing the petition, Mrs. Galanti said: "I think this is just great for so many people to show concern for men being held by the North Vietnamese, and I appreciate the effort of the members of the 192d on behalf of my husband and the other Americans being held prisoner. As citizens of the United States, we owe our men in Vietnam all the support we can give them."

Members of the 192d hope that other Air and Army Guard units throughout the country will follow suit on POW petitions.

Mrs. Phyllis Galanti, wife of a Navy pilot held captive by the North Vietnamese, signs a petition urging humane treatment for American POWs. Behind her stands Maj. W. P. Lemmond, Jr., who originated the idea of the mass signing by the men of his unit—Virginia Air National Guard's 192d Tactical Fighter Group. The 192d urges other units to initiate POW petitions.

☆

Secretary of Defense Melvin R. Laird has approved the consolidation, reduction, or closing of some 370 military installations and activities in the US, Puerto Rico, and overseas.

The actions, recommended by the Secretaries of the Air Force, Army, and Navy, and the directors of defense agencies, when completed are expected to cut DoD expenditures by more than $914 million annually. Some 35,300 military and 58,600 civilian personnel will be affected.

The move was sparked by congressional approval of a reduction of more than $4 billion in the FY 1970 budget and cuts anticipated in the FY 1971 budget now pending before Congress.

Secretary Laird said that a maximum effort would be made to assist individuals and communities in easing the impact brought about by the economy actions.

☆

The Air Force has issued Requests for Proposals (RFPs) to eight companies for design and development of the new International Fighter air-superiority aircraft the US plans to build for its allies. (Previously, the plane was to have been called the "Free World Fighter.")

Responses to the RFPs are due this month, and the USAF has set up a source-selection evaluation group at Air Force Systems Command's Aeronautical Systems Division, Wright-Patterson AFB, Ohio, to oversee competition on the contract. It is estimated that friendly countries will need a total of 325 International Fighters in the next five years to update their forces.

Receiving the RFPs were Fairchild Hiller Corp.; General Dynamics Corp.; LTV Aerospace Corp.; Lockheed Aircraft Corp.; McDonnell Douglas

Gen. Bruce K. Holloway, SAC Commander, accepts a $15,000 check from the Eugene C. Eppley Foundation presented by long-time AFA Director Arthur C. Storz for forwarding to the USO. Witnessing the event are Sgt. Jack R. Oilar and A1C Mary Eberhardt, two young members of the armed forces who benefit from USO facilities worldwide.

—Wide World Photos

Defense Secretary Melvin R. Laird, with L. Mendel Rivers (D-S.C.), Chairman of the House Armed Services Committee, following a March briefing on the posture of US forces worldwide. Late in February, the Secretary announced DoD plans to extend the Safeguard antiballistic missile system to provide additional protection against enemy attack.

Corp.; Grumman Aircraft Engineering Corp.; North American Rockwell Corp.; and Northrop Corp.

With many of the competitors certain to field strong contenders, it is difficult to determine if anyone has the edge. This is especially so in light of recent history, when the Air Force picked McDonnell Douglas to develop and build the F-15 advanced tactical fighter, thereby confounding many observers who expected Fairchild Hiller or North American to get the nod.

As for the F-15's propulsion, late in February it was announced that United Aircraft Corp.'s Pratt & Whitney Division had been selected over General Electric to build the engines.

The Air Force is to manage a jointly funded effort with the Navy to develop the engines, which will go into the Navy's F-14B as well as the F-15. Actually, the end result will be two engines with high commonality. They will be in the 20,000- to 30,000-pound-thrust class, with a common gas generator, but will differ in size of fans, afterburners, and other details.

The Air Force's engine version will offer less thrust than the Navy's engine, because emergency power for aircraft-carrier operation is not needed.

Very important money is potentially involved in the engine project. Aside from the initial $47.4 million in FY 1970 funds, program sources say the total engine buy could come close to $4 billion. This is calculated on a planned production of 1,300 planes—700 Air Force and 600 Navy.

☆

The Air Force took another step in its plan to develop an air-to-air missile that eventually may replace all such missiles now in inventory.

Requests for Proposals recently were issued to eleven companies for system definition of the proposed missile, known as AIM-82 (for Air Intercept Missile). Air Force visualizes the short-range tactical AIM-82 as a heat-seeking infrared-guided weapon, similar to the Sidewinder weapon system presently in use.

From those firms submitting RFPs, Air Force will select two or more to undertake more detailed studies. Following that, two companies will be singled out to produce prototype AIM-82s for test purposes. Production contracts, which could be substantial, then would go to the company with the best weapon, provided the program continues to win approval.

This "fly-off" contracting approach is in line with current DoD policy that requires resolution of a new weapon system's major technical problems before large sums of money are committed. In the past, several projects required expensive modification after large-scale production had begun.

☆

Man's flights to the moon have run so smoothly thus far that they evoke comparison with the recent solar eclipse: It would be surprising if things didn't go as predicted.

Hopefully, there will be no unpleasant surprises to complicate the upcoming Apollo-13 mission, the third lunar landing, scheduled to take place April 15. Plans call for the lunar-landing craft *Aquarius*, manned by Astronauts James Lovell and Fred Haise, to set down in the hilly region known as the Fra Mauro formation. Astronaut Thomas Mattingly is to remain on station in the orbiting command vehicle.

Among other chores at Fra Mauro, Lovell and Haise will drill as deep as ten feet into the moon's crust to acquire lunar samples.

Biotests have uncovered no forms of life in lunar material inspected previously, but because of the depth of Apollo-13's drilling, the National Academy of Sciences has recommended that quarantine procedures, which were to end with Apollo-12, be continued for Lovell, Haise, and Mattingly when they return to earth—just to be on the safe side.

☆

Japan became the fourth nation to launch an earth satellite when a 21,000-pound Lambda-4S rocket orbited a twenty-five-pound radio beacon earlier this year. Success came after the failure of four previous Lambda-4S launch attempts.

A more sophisticated 170-pound scientific satellite is being readied for launch by an 88,000-pound Mu-4S rocket, which is in the Minuteman I ICBM class.

The Lambda and the Mu have been in development for about five years on an extremely limited budget; total Japanese expenditures on rocket vehicle research, development, and production are estimated at less than $25 million in the last decade, when more than twenty-five configurations of solid- and liquid-fuel engines and flight vehicles were built. They ranged from sounding rockets weighing a few kilograms, to the first stage of the Mu-4S —the M-10 solid-fuel motor, which delivers nearly 100,000 pounds of thrust.

The Japanese space program has speeded up in recent years, however.

(Continued on following page)

The budget is about $28 million for the current fiscal year and is due to climb above $35 million next year. The major focus of the new program is construction of still larger rockets, which would make Japan the third space power, behind the US and USSR. Major projects in the planning stage include the "Q" and "N" rockets.

TRW Inc. of Redondo Beach, Calif., has been awarded a $1 million contract by Japan's newly formed National Space Development Agency (NASDA), an organization set up to consolidate Japan's splintered space effort. TRW is working closely with Mitsubishi under a new Japanese/US technical exchange agreement being monitored by the US State Department, DoD, and NASA.

According to one official, the intent is to assist Japan in developing efficient space-launch vehicles and accurate guidance systems, without opening the door completely to US technology.

TRW will handle initial systems engineering and integration tasks on the "Q" rocket, which will have first-stage thrust of nearly 250,000 pounds, the first Japanese rocket with an inertial-guidance system. The Lambda and Mu vehicles' primitive guidance systems precluded their use for military purposes. If the new family of Japanese vehicles is to be commercially attractive, however, accurate, up-to-date guidance systems are mandatory and US know-how will be applied.

Preliminary plans call for the "N" rocket to have nearly one million pounds of thrust in the first stage. It is to be ready for flight in 1974, shortly after the "Q" rocket.

The Japanese predict a large market for communications satellites in Asia and in this regard have high hopes for their "Q" and "N" rockets.

☆

The deeper that science digs into laser technology, the richer the potential harvest it uncovers. New applications, theoretical and practical, are regularly being found.

In Seattle, scientists at the Boeing Scientific Research Laboratories, working with personnel from the University of Washington's Department of Aeronautics and Astronautics, have successfully used a laser to cut holes in lab-made fog. It seems that when the laser beam passes through the fog, it deposits energy on the fog's moisture droplets; this energy becomes heat, which eliminates the fog by evaporation.

This phenomenon suggests that a future and presumably fairly large-scale application might be possible in clearing away natural fog that plagues commercial airports, military airfields, and other outside areas of activity.

Of course, a power source capable of developing a laser strong enough to produce minimum runway clearance at an airport would have to be tremendous and is probably years in the future, say researchers. In theory, such a laser would punch narrow corridors in a fog bank shrouding an airport, allowing aircraft to make fog-free landings.

In terms of power, scientists estimate the requirement at one million watts, compared to the strongest known laser, which has a power source of about 9,000 watts. The fog-destroying laser, expanded as it would be to encompass a wide area, shouldn't prove dangerous to people in aircraft or others on the ground.

Considering the growing costs in both military security and commercial airliner operations, any breakthrough in fog-dispersal techniques is encouraging, no matter how theoretical.

☆

NASA and the Air Force have established an eight-man committee to oversee the joint development of an earth-to-space-orbit shuttle, a project officially known as the Space Transportation System (STS).

According to the agreement, the committee's purpose is to make sure that the proposed space-transport system will be of maximum use to both the Defense Department and NASA. To this end, it will conduct a continuing review of the project as development goes along, making recommendations regarding various aspects of the program, such as objectives and interagency relations.

With last year's cancellation of plans for a Manned Orbiting Laboratory, STS is the Air Force's only ongoing manned space project, although USAF is highly active in such other space ventures as the use of sensors for specialized missions, and satellite communications.

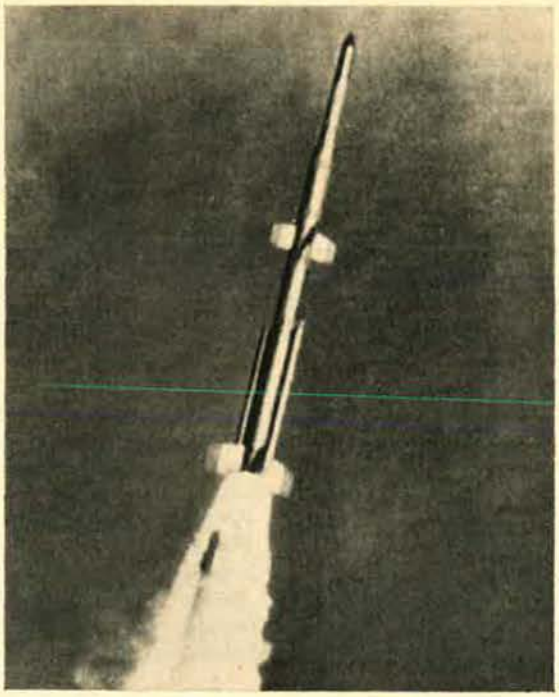
The new committee, to be co-chaired by NASA Associate Administrator for Manned Space Flight Dale Myers and Assistant Air Force Secretary for R&D Grant L. Hansen, will also include three NASA and three Air Force representatives.

☆

NASA is working on another project that could produce substantial economic returns in the future.

Scientists at NASA's Goddard Space Flight Center, Greenbelt, Md., plan to place aboard their Nimbus-E satellite, scheduled for launch late in 1971, electronic equipment that will help map from orbit the earth's mineral resources.

The gear, called a High-Resolution Surface-Composition Mapping Radi-



Japan became the fourth nation to orbit a satellite when its Lambda-4S rocket roared aloft bearing an "Ohsumi" radio beacon. The shot followed the failure of four earlier tries. Japan has beefed up its space budget under the stimulus of such potential applications as comsats.

—Wide World Photos

ometer, will determine surface composition by measuring residual infrared radiation — heat absorbed from the sun by mineral deposits during daylight hours.

Nimbus-E will operate in a pole-to-pole orbit at a normal altitude of about 700 miles. Data collected by the radiometer system, to be built by ITT's Aerospace/Optical Division, Fort Wayne, Ind., under $1.1 million contract to NASA, will be telemetered to earth for analysis.

☆

Economic relief seems in the cards for the nation's financially strapped airports. But the help is coming the painful way—through higher airport-user taxes.

In legislation receiving final attention in Congress, overseas flights would cost an additional $3 a seat in tax, and tax on domestic tickets would rise from three percent to eight percent. The bill's approach is to tax airport users—airlines, passengers, and private aviation—in much the same manner that users of the nation's highways are taxed to pay for them.

Congress hopes that the overall scheme will help provide an airport/airways improvement fund of $15.6 billion, the major part of the cost of a planned ten-year renovation and expansion program. General tax revenues from local or state authorities would pay the rest.

Attached to the bill passed by the Senate was an amendment that makes the effects on the surrounding environment a major factor in selecting airport sites.

☆

Air Chief Marshal Lord Dowding, architect of the RAF victory in the Battle of Britain, died at his home in Tunbridge Wells, Kent, in mid-February. He was 87.

When the epic air battle began in the summer of 1940, it seemed as if Lord Dowding had spent a large part of his life preparing himself — and England—for it. He was instrumental in developing the Hurricanes and Spitfires that won the victory. His many other innovations included the radar net that vectored those planes to their Luftwaffe targets.

But Lord Dowding's battles were not confined to the enemy air force. During his tenure as chief of the Fighter Command, his own air arm and the Air Ministry itself were rife with intense personality conflicts and infighting.

In November, 1940, Lord Dowding was abruptly dismissed from his post.

It wasn't until last year that Lord Dowding was afforded wide-scale public recognition for his part in a turning point in British history.

He is succeeded by his only son, Wing Commander Derek Hugh Dowding.

☆

NEWS NOTES — A distinguished "member of the student body" of the **University of Southern California** early this year completed the academic requirements for his master's degree upon delivery of a lecture entitled, "Lunar Landing: Techniques and Procedures." The student: Astronaut **Neil A. Armstrong.**

—Wide World Photos

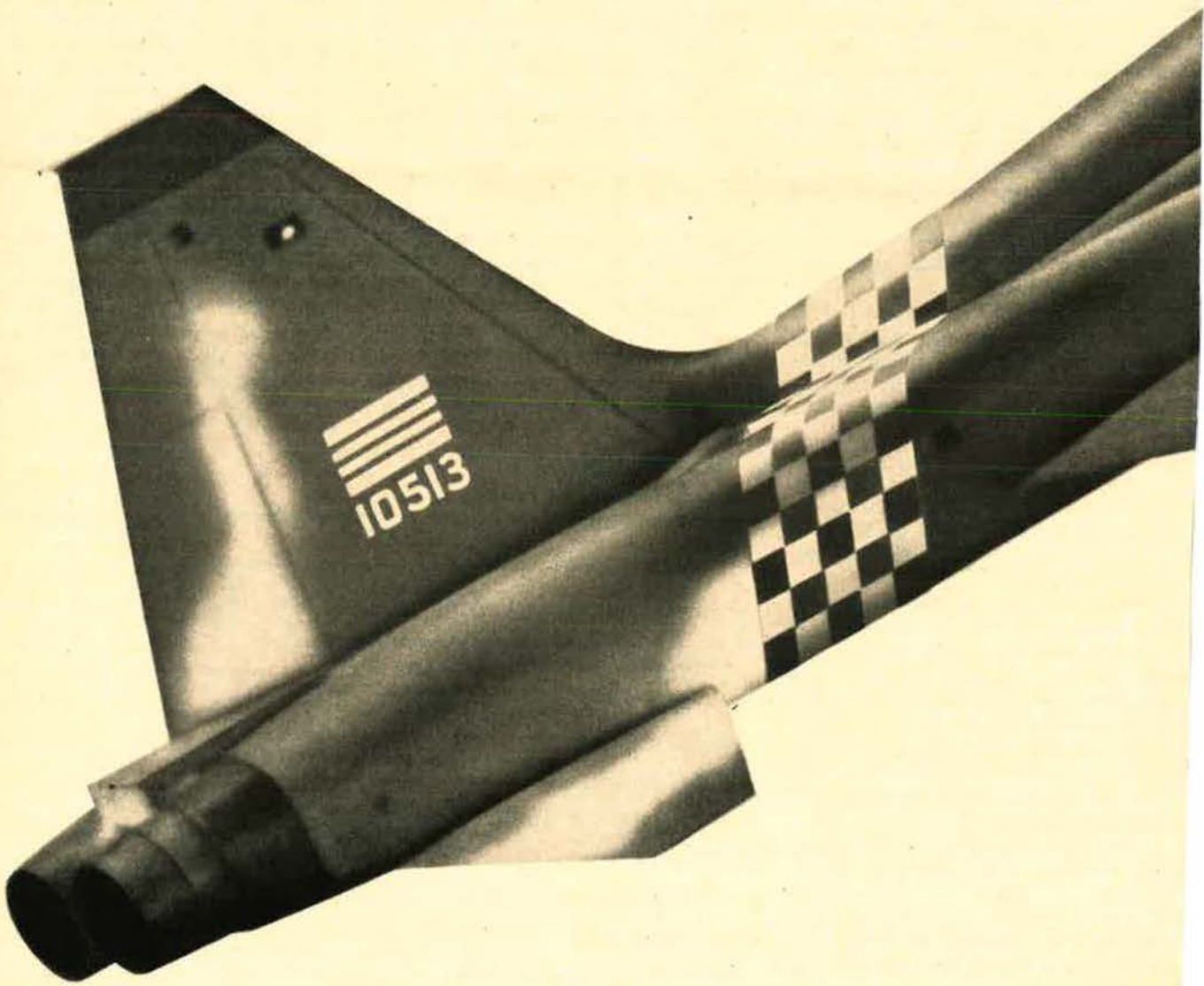
Propeller-driven T-28s of the Laotian Air Force receive new bomb loads after conducting airstrikes against enemy forces in control of Laos's strategically situated Plain of Jars. Widespread controversy was kicked up when it was revealed that, besides the use of US airpower in the Laos conflict, Americans were apparently also engaged in the ground fighting. North Vietnamese troops have long used Laos as a semiprotected infiltration route to South Vietnam.

The Air Force will keep its **F-111s** grounded for three to six months while they are put through a **testing program** more intensive than any yet devised. USAF scientists recommended this following an investigation of the F-111 crash near Las Vegas, Nev., in December, which killed two men and brought about the current grounding of the F-111 fleet.

USAF has tentatively reopened **Zaragoza AB,** in Spain, pending negotiations with the Spanish government. The base, to be jointly operated with Spain, will perform the **training mission** previously conducted by Wheelus AB, Libya, which is closing at the request of Libya's revolutionary government.—END

INDEX TO ADVERTISERS

The F-5's Mission



A proven idea that gets better with the times.

n five years of service the F-5 has become the most widely-used high performance aircraft in the Free World – on duty with 15 nations. It is the supersonic backbone of air forces in six Asian countries.

Day after day, it serves these highly capable air forces as an air superiority fighter, as a fighter-bomber, as an interceptor, as a reconnaisance aircraft.

The mission of the F-5 has been to perform these tasks effectively and to do it with a minimum of men, money and materials. This is a vital mission in today's world, when the real measure of a nation's strength is the effectiveness with which it can use its resources.

A newer version of the aircraft carries this principle forward into another decade. Known as the F-5-21, it has been underway for over a year. Its more powerful engines have been tested since March 1969, and it brings together many aerodynamic improvements in service on other F-5 versions. The net result: Significantly greater performance and maneuverability.

Fully compatible with F-5's now in operation, this new fighter can be put into service quickly and efficiently. It can be a key factor in helping Free World nations maintain independent strength on into the future.

NORTHROP

LETTER FROM EUROPE

By Stefan Geisenheyner
AIR FORCE/SPACE DIGEST EDITOR FOR EUROPE

Good Progress on Europe's MRCA

MRCA (Multi-Role Combat Aircraft), Europe's tri-nation $600 million aircraft project, is forging ahead. In mid-1969, Germany, Britain, and Italy decided to combine their financial and engineering capabilities to produce a combat aircraft to be the mainstay of the three nations' air forces in the late 1970s and throughout the 1980s.

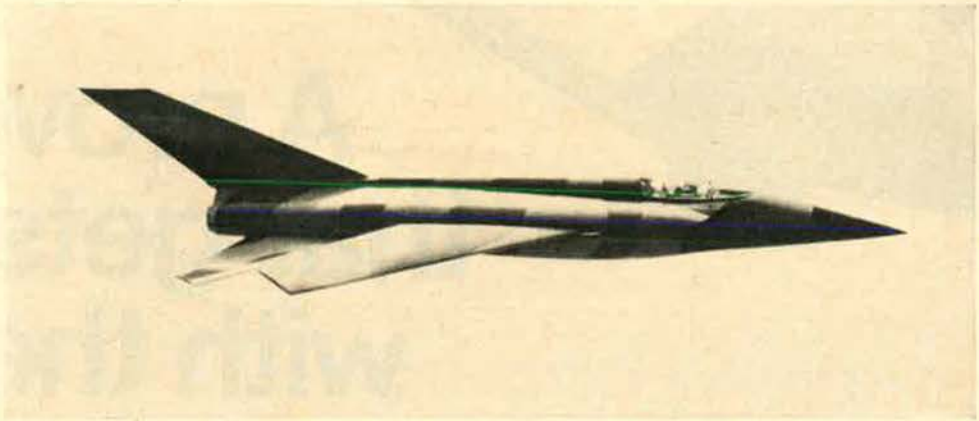
The formidable management problems involved in such a large-scale international venture necessitated the formation of a special company to coordinate and manage the project and oversee finances. This combine became operational last year under the name Panavia.

The three nations participate financially in Panavia proportionally to the total number of MRCAs to be bought by each nation's air force. The project, far beyond the financial capacity of the involved companies, has to be largely government-financed. Among the participating companies, Messerschmitt-Bölkow-Blohm (MBB) of Germany has a 48.4 percent share of the airframe workload, British Aircraft Corp. (BAC) 37.2 percent, and Fiat of Italy 14.4 percent.

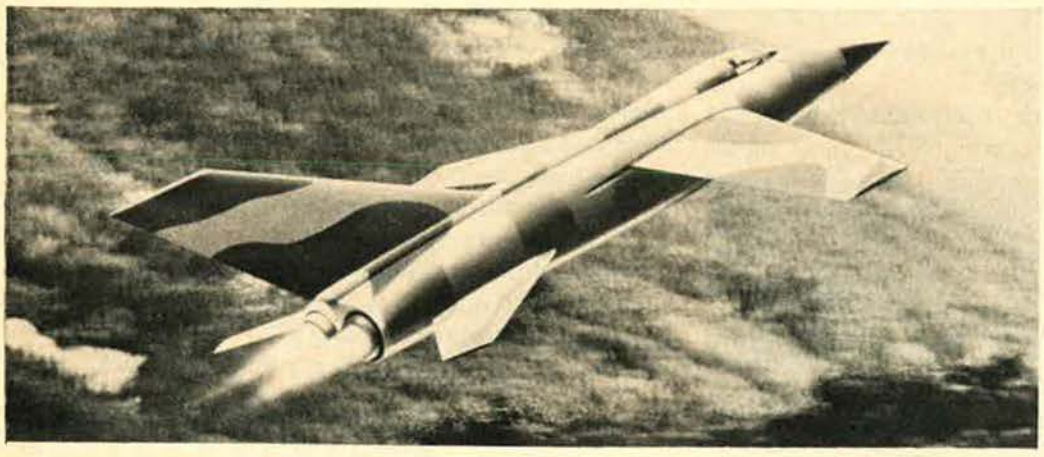
A similar system was devised for the development and construction of the aircraft's engines. Late last year Panavia decided to equip the MRCA with the advanced Rolls-Royce RB.199 three-spool turbofan, which should be available toward the end of 1973. Three firms, Rolls-Royce, Motoren & Turbinen Union of Germany, and Fiat, will share in engine production on the same percentage basis applied to airframe construction. Excluding possible export orders, a total production run of at least 3,000 engines is expected.

Both single-seat and two-seat versions of the MRCA are to be built. Present forecasts suggest that Germany will require a total of about 600 two-seater fighter-bombers and single-seat close-support fighters. The RAF is scheduled to receive 385 two-seat, low-level strike aircraft and some trainers. Italy will need at least 200 air-superiority fighters.

This list demonstrates the MRCA venture's basic problem. Each nation wants the aircraft for a different role, requiring radically different performance parameters. The only common requirements are STOL capability and simplicity. The designers were hard pressed to satisfy the mili-



The Anglo-German-Italian combine known as Panavia is developing the Multi-Role Combat Aircraft (MRCA), shown here in flight as depicted by an artist's conception. Common requirements of the three nations are simplicity of design and STOL capability.



Artist's conception shows MRCA in STOL takeoff mode. Production responsibilities are divided among the three countries developing the craft. Although target cost per copy is about $3 million, it may go up to $5 million.

tary planners of the three air forces, but this difficulty has largely been overcome. The project-definition phase ended in February, two months ahead of schedule, and the plans are being scrutinized by the future users. If the proposed aircraft meets its design requirements, a development program involving thirteen aircraft is expected to be launched later this year.

The twin-engine MRCA will incorporate a variable-geometry wing and feature short takeoff and landing capability. Design is still largely classified, and Panavia spokesmen will say only that the aircraft will not resemble USAF's F-111 layout and will be much smaller and less sophisticated. It will be equipped with "tailerons" and have full-span flaps and slats.

Still an enigma is the aircraft's final price. Spokesmen decline to quote a concrete figure. Gen. Johannes Steinhoff, CinC, Luftwaffe, explained recently to this writer that it is impossible at such an early date to arrive at a price when even the development work on the aircraft has not been concluded.

The target price, however, at the moment is set at $3 million per aircraft, to which can be added at least $1 million for ground equipment, spares, development costs, and training. It is a safe guess that eventually the MRCA system will cost about $5 million per combat-ready aircraft. Panavia is responsible for preventing any price escalation beyond unavoidable increases fostered by the constantly rising European cost of living.

Of particular interest is the division of production among the participating countries. Fiat and its subcontractors are to design and build the aircraft's wings and also develop a modified fuel system specified by Britain's RAF for its MRCAs. The RAF version will carry fuel in its wings while the German and Italian aircraft will not. This is due to the RAF's requirement for long combat range which is not needed by the other air forces. Another Fiat responsibility will be to design the basic fuel system and avionics of the air-superiority fighter. Two of the developmental single-seaters will be assembled in Italy.

Germany's MBB will design and build the front fuselage of the single-seaters and such subsystems as the nose-wheel gear. In addition, the firm is responsible for the center fuselage, the swingwing pivot, all flight controls, some avionics, and the main undercarriage. Five single-seaters of the development program are scheduled for assembly in Germany.

BAC's share of the project will cover construction of the two-seater's nose fuselage and the rear fuselages of all aircraft, the tailerons, plus fin and rudder. Practically all of the aircraft's "plumbing," air conditioning, hydraulics, electrical system, ejection seats, and secondary power supplies will be produced in Britain. BAC is scheduled to assemble all six two-seaters to be built in the development phase.

The external weapon-stores carriers, the armament, avionics, and other equipment will be divided among the industries of the three nations according to their capability and know-how. The initial assembly program is indicative of how and where the aircraft will be built once mass production gets under way. Before that point is reached, however, the MRCA program will almost certainly have to weather some rough storms.

In particular, its future political aspects are not encouraging. The governments of the three participating nations are short of money. Each will probably face serious social unrest during the 1970s. Much of the available finances is earmarked for programs designed to create internal stability, leaving less money than ever before for defense purposes. Also, any significant cost increase in the MRCA program may force its cancellation.

In any event, a new combat aircraft for the mid-1970s is considered by many as a necessity if the three participating nations are to stave off obsolescence of their respective air forces. While the RAF is not seriously pressed for new equipment, the present aircraft of the GAF and IAF will have reached the limit of their operational life in 1975–77. Development of MRCA is considered vital if a deterrent posture is to be maintained.

On the plus side, however, is industry's strong interest in the MRCA program, which is viewed as a potential catalyst for future joint civilian and military ventures. Additionally, the MRCA could well become a major export item since its intrinsic design flexibility would lend itself to any modern air force requirement.

Despite prospective political and financial problems, the MRCA program has an excellent chance of success. Panavia's chairman, Mr. A. Greenwood, of BAC, explained recently: "We are confident now that this aircraft will most ably meet the requirements of these [three] air forces in its various roles. There has been no compromise on its capabilities nor any sign of any unexpected cost increase. We have reached some very important milestones [in its development]. By any standards this constitutes a very considerable achievement in European collaboration. Let no one say [that] we in Europe cannot get things done quickly. The program is on time, even ahead of schedule, and results look extremely promising."

The BAC/Breguet Jaguar strike-trainer program is proceeding. This is the Jaguar S.06 version on the runway. It carries a 264-gallon fuel tank and is armed with two 30-mm cannon. The aircraft's flexible design fits it for a variety of operations: tac support, recce, and training tasks.

New Addition to Fan Jet Falcon Line

One of the most successful executive jets in service today is Avions Marcel Dassault's Fan Jet Falcon, or Mystère 20 as it is known outside the Americas. The French firm's Mystère 20 originated as a private venture in January 1962, and incorporated the considerable experience gained in construction of the Mystère series fighter-bombers, forerunners of the famous Mirage III. The Mystère is still a basic component of the French and Israeli Air Forces.

The Mystère 20 is a twin-jet executive transport seating eight to ten passengers in its standard configuration. In addition to a crew of two, it can carry up to fourteen passengers in a high-density version. The aircraft flew for the first time in May 1963 and initially was powered by two Pratt & Whitney JT12A-8 engines.

These engines were replaced in all subsequent models

(Continued on following page)

Dassault's Mystere 20, the Fan Jet Falcon, shown at right, now has a junior partner, the Mini Jet (see text), which is smaller than the Fan Jet Falcon but which incorporates aerodynamic improvements that give it better performance and allow operations at airports with marginal conditions.

with General Electric CF700-2 turbofans, which considerably upgraded the aircraft's overall performance. Cruising at 466 mph at 40,000 feet, its range is 2,175 nautical miles with a reserve of forty-five minutes of flying time. Payload over this distance is 1,600 pounds. The Mystère 20 has chalked up two international speed records.

Shortly after the Mystère 20's first flight in 1963, Pan American World Airways became sales and service agent for the aircraft in North and South America. Pan Am placed an initial order for forty aircraft and opted for 120 more. Pan Am also rechristened the aircraft the Fan Jet Falcon.

In the past seven years, 270 of the aircraft have been sold by Dassault and Pan Am, and Dassault presently holds options for an additional 106. Pan Am's sales effort alone accounted for 205 firm orders and 105 options.

Dassault maintains an extensive service network for maintenance support at practically all important airports in the Western world. Several air forces fly the Fan Jet Falcon as a trainer and VIP transport, and some airlines use it as a navigation trainer.

Since the formula for the aircraft was obviously successful, Dassault decided in the late 1960s to design and produce a scaled-down and aerodynamically refined version of the Fan Jet Falcon, hoping to open hitherto untapped markets. The new aircraft is aimed at customers for whom the Fan Jet Falcon was too big and for whom its dependence on concrete runways precluded its use at airports offering marginal operating conditions.

The new aircraft, named Mystère 10 and officially known as the Falcon 10, quickly acquired the catchy nickname "Mini Falcon." The exterior of the Falcon 10 is quite similar to that of its predecessor, with aerodynamic design remaining largely the same except for its reduced size.

The new aircraft's advanced engines, landing gear, and other equipment give the smaller aircraft much better performance than the Fan Jet Falcon. The Mini Falcon is not designed to replace the older model which, in its present form, will continue to be useful, efficient, and attractive to many customers requiring a medium-size business jet.

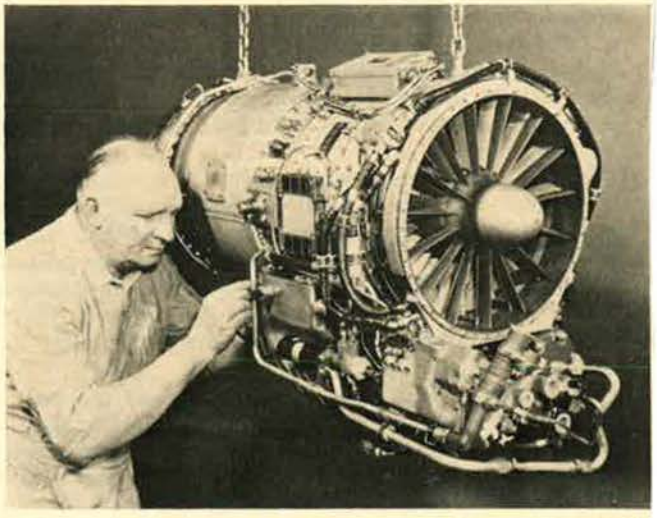
The twin-jet Mini Falcon is designed to carry four passengers and a crew of two. A high-density model seating seven passengers is also available. The Mini Falcon is to have a maximum range between 2,100 and 2,800 nautical miles. Its maximum speed at altitude will be 559 mph.

Depending on customer preference, the Mini Falcon can be equipped with three different types of jet engine: the SNECMA/Turbomeca Larzac turbofan of 2,200 pounds of thrust; the Garrett TFW 731-2 advanced turbofan; or the General Electric CJ610-9 (the last two in the 2,500- to 3,000-pound-thrust class). Initial production models presumably will use the General Electric engine since the two other powerplant designs are still in final development.

The aircraft is fitted with very sophisticated high-lift devices consisting of double-slotted flaps and leading-edge slats. A parachute brake for emergency or short-field use is standard equipment. The landing gear and low-pressure tires allow takeoff and landing on hard, grass strips and other semisolid runways. Estimated takeoff distance depends on engine type and varies between 4,400 and 4,900 feet.

First flight of the Mini Falcon is scheduled for September of this year, and first production aircraft are to be delivered in the fall of 1972. The program was given considerable impetus by Pan Am's decision to order forty Mini Falcons and place an option for an additional 120. This contract, signed in January 1970, indicates the aircraft's good prospects in the business-jet market.

Dassault presently is studying another advanced executive-jet design, tentatively designated Mystère 30. It would be considerably larger than the Fan Jet Falcon and would cater to customers needing very long-range, large-capacity jets. Should this project become a reality, Avions Marcel Dassault could offer three types of business jets, designed or adaptable for a variety of purposes in this swiftly expanding market.—END



Initial production models of the Mini Falcon will probably be powered by General Electric's CJ610-9 engine, shown above. Two other propulsion systems—the SNECMA/Turbomeca Larzac turbofan and the Garrett TFW 731-2 advanced turbofan—are also expected to be available to customers

LETTER FROM LOS ANGELES

By Irving Stone

WEST COAST EDITOR, AIR FORCE/SPACE DIGEST

Space-Shuttle Theoretics

Prospective prime system contractors and their team members have undertaken extensive analysis in preparation for the National Aeronautics and Space Administration's projected orbital shuttle—the space agency's big, hopeful effort to initiate low-cost space transportation.

Highlights of one conceptual approach—by McDonnell Douglas Astronautics Co.—were presented by W. E. Mosley, the company's Eastern Division (St. Louis) Launch Operation's Director, at the recent American Institute of Aeronautics and Astronautics' Launch Operations Meeting at Cocoa Beach, Fla.

The logic of applying airline maintenance and operations techniques to future space-shuttle operations is underscored by the inclusion on the McDonnell Douglas team of Pan American Airways, which would contribute such support as airline maintenance, logistics, and crew selection and training. McDonnell Douglas will be one of at least four primes (along with Boeing Co., North American Rockwell Corp., and Grumman Aircraft Engineering Corp.) to compete for the shuttle task.

McDonnell Douglas' concept incorporates the booster and orbiter (shuttle) in a "piggyback" arrangement, with the booster acting as the launch vehicle, which would also accelerate the shuttle to staging at an altitude of about 200,000 feet, where the shuttle's propulsion system would inject it into an initial elliptical earth-orbit of forty-five by 100 nautical miles.

Additional orbital burns would circularize the orbit at 100 nautical miles and be followed by a transfer trajectory to a 270-nautical-mile orbital altitude for rendezvous and docking with the space station.

Meanwhile, the booster would have decelerated and returned at subsonic speeds to the centralized-operations landing strip, with turbofan engines powering the return flight and controlled landing.

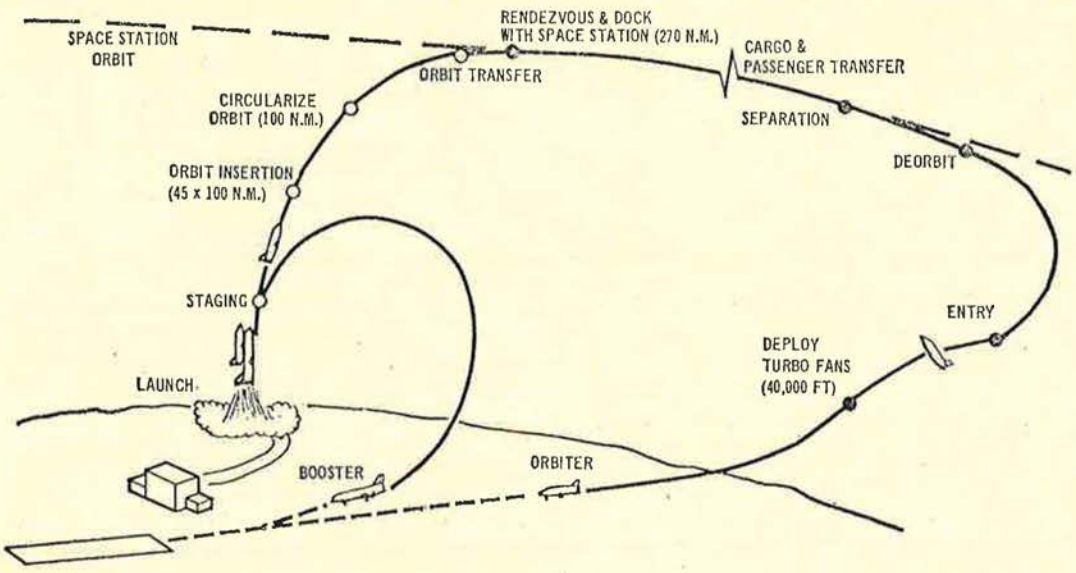
The shuttle could remain at the space station for one week to discharge and take on cargo and personnel. After communicating with the prime landing site for weather information and to coordinate its return, the shuttle would deorbit, using its ascent propulsion system. Residual hydrogen, as a monopropellant, would provide the required stabilization for attitude and rate control. Atmospheric entry would be at a sixty-degree angle of attack, utilizing the shuttle's bottom surface as a heat shield. Upon reaching 40,000 feet, the shuttle's turbofan engines would power the return and landing.

Because entry temperatures may reach 3,000 degrees Fahrenheit, and considering the brevity of the subsonic cruise, the shuttle would have stored significant heat in its thermal structure. On landing, caution may have to be exercised in removing crew, passengers, and cargo; cooling by water spray might expedite and simplify this problem, Mr. Mosley declares.

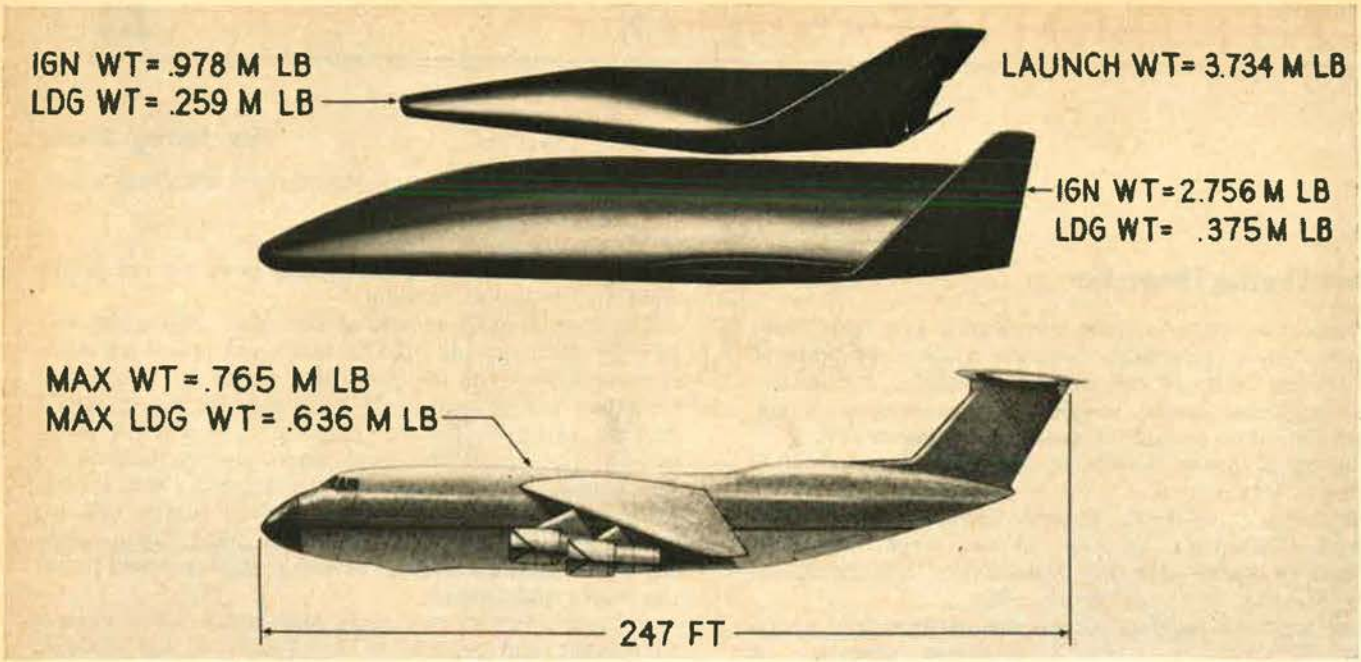
Simplified Launch Activities

The logistics required to sustain a space station place a heavy burden on the system's flight operations, since fifty to 150 launches per year may be required; hence, current concepts of space-vehicle prelaunch operations are in need of overhaul, Mr. Mosley says. The present method of scrutinizing vast amounts of data on displays and recording devices to allow subsystem specialists at mission control to determine the space vehicle's condition is prohibitive in view of the proposed ten-year operational life of the space-shuttle system, he underscores. Space-shuttle performance must be evaluated essentially at the

(*Continued on following page*)



McDonnell Douglas' concept of space-shuttle mission plans staging at an altitude of about 200,000 feet. Two orbit changes are involved—to circularize at 100 nautical miles, and to achieve a 270-nautical-mile altitude to dock with the space station. Both booster and orbiter (shuttle) would employ turbofan power for controlled landing.



The Lockheed Corp.'s concept of the space-shuttle system is shown in comparison with the company's C-5A transport. The booster (lower stage) would be approximately the same length as the C-5A. In comparison with the aircraft's takeoff weight, however, the weight of the booster will be much greater at blastoff because of the enormous quantity of fuel required for the launching. Lockheed is teamed with Boeing Co. in the space-shuttle system competition.

system level rather than by performing extensive functional component-level testing externally, as is done today.

Each succeeding generation of manned spacecraft has become more complex, and support manpower has increased accordingly, Mr. Mosley points out. The activity involved in the one to three launches per week necessary to support a space station must be simplified, he declares, and, additionally, the extensive overtime and "forced draft" atmosphere of today's Saturn/Apollo launches are completely unacceptable for the future shuttle system, he believes.

Current launch-operation costs are estimated at thirty-five percent of a vehicle's total cost, Mr. Mosley points out. It appears, he says, that shuttle maintenance and operation costs per flight could be slashed to approximately one percent of vehicle cost. Even with this significant economic improvement, the effects of vehicle reuse and high launch rates cast a different light on the subject. Based on twenty flights per vehicle each year for ten years, the maintenance and operation costs go up to 200 percent of a vehicle's total cost.

Airline-Shuttle Transfusion

In the McDonnell Douglas concept, shuttle-pilot proficiency would be emphasized, rather than the super-capabilities required of astronauts. Prime crew duties would be to determine whether or not a vehicle was ready for flight, perform the mission including cargo transfer, and return to earth. Scientific experimentation and other space-station tasks would be conducted on a system-specialist basis, Mr. Mosley says.

Mr. Mosley believes that valuable training can be attained by having operational pilots participate in the flight-test program. This also would allow early evaluation of the man and machine to improve the combination. Simulated rendezvous and docking would be much like that training required in the Gemini and Apollo programs. However, transfer of the cargo module between the orbiter and the space station and return of orbit data, equipment, and passengers are new techniques that require appropriate training and simulation to develop pilot proficiency, Mr. Mosley declares.

In the overall view, development of a space-shuttle system in the mid-1970s is attainable. Mr. Mosley believes, without relinquishing the high standards of safety and system-performance excellence of the current manned space programs. This could be brought about most effectively with reusable vehicles, commercial airline techniques, on-board checkout, centralized ground operations, simplified design and operation, and pilots instead of astronauts.

Mr. Mosley theorizes that, as this revolutionary approach to space-vehicle operations progresses, any mishap would be measured against current spacecraft practices. It also will be difficult, he says, for those who have monitored and evaluated system performance to admit that a shuttle flight crew can do the job as proficiently. But the fact is, he says, that commercial airliners fly without the benefit of any "systems expert's" having assessed the aircraft's flightworthiness. In this instance, the plane's crew has performed that function.

Space-shuttle personnel (both customer and contractor) must be reeducated to take full advantage of airline techniques, Mr. Mosley declares. Present space programs allow for essentially no discrepancies in the vehicle at launch time. On the other hand, a commercial airliner crew, headed by its captain, frequently undertakes a flight without demanding that the aircraft be letter-perfect, Mr. Mosley points out. This is safe and practical partly because it is common practice to overdesign some subsystems in order to reduce expensive downtime. Further, in spite of aircraft-component failures, commercial pilots are aware of which flights can be made, with the full approval of airline flight operations offices and the Federal Aviation Administration, Mr. Mosley says.

"A great challenge lies in devoting our energies and

technical talents to developing and operating a space-shuttle system [that] performs with the regularity and safety of a commercial airline. This innovative approach will be the economic savior of our space-exploration programs. Maintaining a low earth-orbiting space station for . . . scientific and engineering endeavors is enhanced by enabling [the] station to act as a staging area for vehicles on planetary missions," Mr. Mosley declares. The expense of these activities would be completely prohibitive, he adds, if present methods were applied to any future space-shuttle system.

USAF Experiments Support

The Space Experiments Support Program (SESP), a continuing DoD project, is providing an economical outlet for exploratory, technological, and engineering investigations in a broad spectrum of aerospace applications that could lead to the development of future space systems and subsystems.

Agencies having received SESP's services include the Air Force, Army, Navy, Defense Atomic Support Agency (DASA), and the Advanced Research Projects Agency (ARPA). A line item in the federal budget, SESP has been funded through Hq. USAF, as Project 4625 under USAF's Systems Command, for $16 million in Fiscal 1970, allocated to studies, long-lead-time items, and booster acquisition.

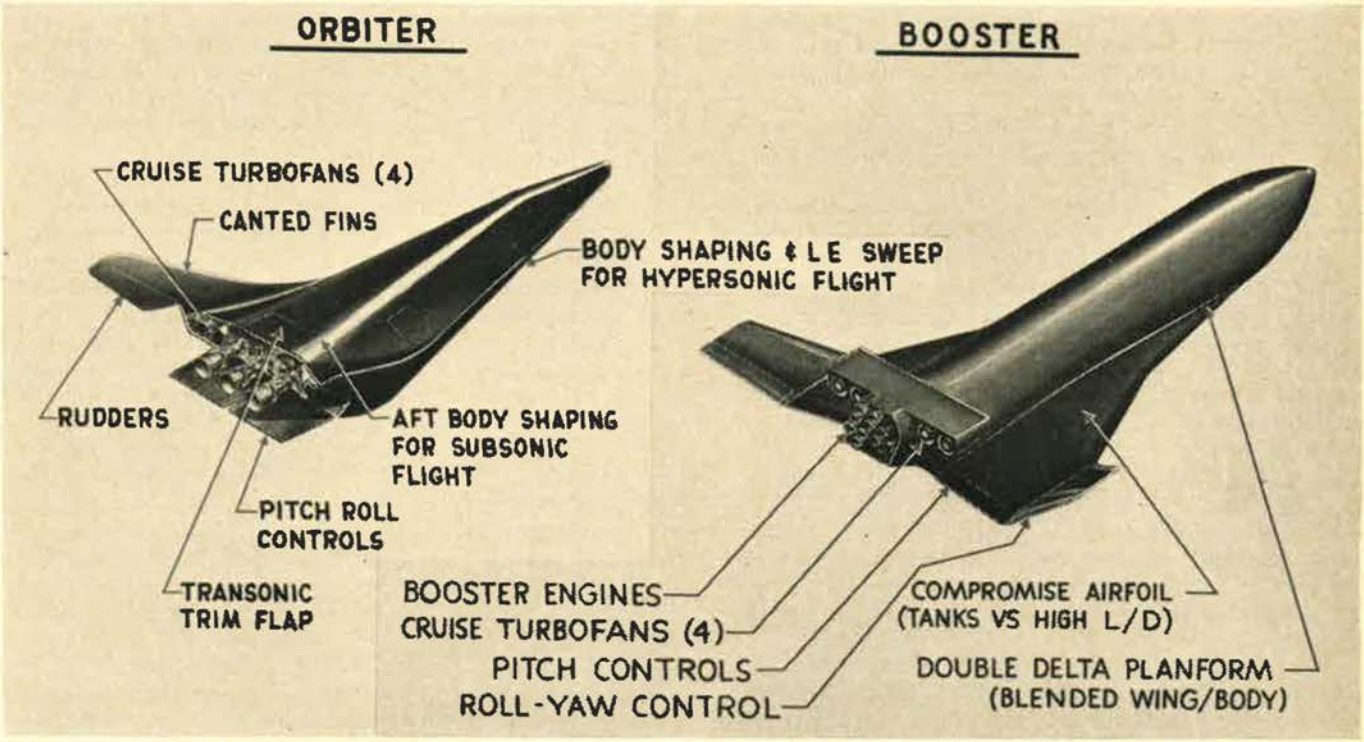
SESP activities also include launch of operational satellites; validation of subsystem performance in the engineering-development stage; research to obtain environmental knowledge for application to future aerospace systems and subsystems; use of research satellites for the acquisition of pure scientific data; and the inclusion of interested organizations' piggyback payloads on programmed vehicles.

Specifically, SESP is responsible for spacecraft (satellite) design, systems engineering of spacecraft payloads, and integration of spacecraft and booster. Hq. USAF undertakes executive management of SESP, while actual "housekeeping" management is performed by USAF's Space and Missiles Systems Organization (SAMSO), and systems engineering and technical direction functions are performed by the nonprofit Aerospace Corp.

SESP's schedule and tasks for the next three years follow:

- Flight 72-2. (Usually the first two numerals in such designations indicate the year, and the third numeral the SESP flight in that year.) Launch of this payload with a Titan IIIC booster is scheduled for the fall of 1972 from the Eastern Test Range in Florida. The payload will be the Lincoln (Laboratory) Experimental Satellite 7 (LES-7), sponsored by DoD. This is the prototype of an advanced communications system for extended capacity and lifetime, used to demonstrate multiple-beam capability, null steering, and side-lobe control, among other things. Two other Lincoln Experimental Satellites (LES-5 and LES-6) are now operating in orbit.
- Undesignated satellite, sponsored by the Office of Naval Research (ONR), to be launched in the spring of 1972 from the Eastern Test Range into a 69,000-nautical-mile equatorial orbit. Payload will include a radiation sensor to detect X rays and particles from the sun, to accumulate data for the prediction of solar activities. This launch would be in addition to an initial SESP launch in 1972, but no payload for the first launch has yet been defined.
- Flight 71-2. This is a typical example of SESP's economical approach in integrating various experiments into a single launch. Proposals to design and build the spacecraft, together with the integration of its experiments,

(Continued on following page)



Lockheed's pictorial representation of the booster and orbiter shows the main operational features of each component of the combined vehicle. The booster and orbiter will each incorporate four cruise turbofans for the return cruise and to make controlled landing possible. The orbiter configuration is for both hypersonic and subsonic flight.

were submitted to SAMSO by five contractors January 20, with contractor selection scheduled for about April 1.

Payload for this launch will consist of four experiments. One will be an Air Force Aero Propulsion Laboratory project, designated RTD-806, which involves a flexible solar array extending 400 inches after its deployment, which follows launch and orbit achievement as a roll-up package. The array is expected to afford about 1,000 watts of power. Objective of the experiment is to determine the spacecraft dynamics associated with the extension and retraction of the array, the capability to produce the rated power, and the operational differences between fixed and extendable arrays. Hughes Aircraft is the contractor for the solar array *(see* AF/SD, *June 1969, page 87).*

A second experiment, designated SAMSO-002 Celestial IR, will function to obtain background measurements of the celestial sphere, using a mechanically cooled infrared sensor developed by Hughes Aircraft. The experiment also will compare the mechanically cooled sensor with a cryogenic sensor used in an earlier experiment and developed by North American Rockwell's Autonetics Div.

A third experiment, ONR-001 Input-Output, will include a series of sensors to measure the electromagnetic wave propagation of the ionosphere between altitudes of sixty and 250 kilometers (approximately thirty-seven to 165 miles). The "Input-Output" label reflects the effects on the ionosphere of such external phenomena as solar emissions.

The fourth experiment, NSA-101 BATSON, is a classified project sponsored by the National Security Agency, a DoD component.

Launch will be from Vandenberg AFB, Calif., into a nominal ninety-degree polar orbit. The potential contractor proposers were to suggest the use of an ascent stage to act as both the upper-stage booster and a long-life, stabilized platform, or the use of a separable spacecraft acting as a long-life, stabilized platform. The ascent stage/spacecraft concept would be limited to a Thorad/Agena (uprated version of the Thrust-Augmented Thor, with an Agena second stage), Atlas/Burner II, or Atlas/OV-1 propulsion module. The separable-spacecraft concept would be limited to the use of an Atlas/Burner II launch-vehicle system.

• 70-2. The payload for this experiment is now being defined, but must be approved by Hq. USAF. Probability is that it will be launched no earlier than the spring of 1971 from Vandenberg AFB. This would cause no conflict with Flight 71-1, also to be launched from Vandenberg, because the latter's payload has not been defined.

Flight 70-2 will include three experiments—another example of economic grouping. One experiment, for the Army, will be the Lincoln Laboratory Calibration Sphere, a highly polished, forty-four-inch-diameter passive device to present a standard radar cross-section of one square meter. It would be used as a calibration unit for advanced radar systems.

A second experiment, designated 901, is an Office of Aerospace Research (OAR) project to measure atmospheric density. The sensor, an 800-pound ball, twenty-six inches in diameter, would house a three-axis accelerometer. The density would be determined by comparing the drag at a low-altitude perigee with that at a high-altitude apogee.

A third part of the payload will be USAF's Avionics Laboratory experiment AVL-802, which would include a two-foot-diameter solid surface used as a calibration check for a seven-foot-diameter "Echo-type" sphere, and two seven-foot-diameter wire-grid spheres having different wire spacing.

• Flight 70-1. This experiment is scheduled to be boosted into polar orbit from Vandenberg in December 1970. Industry proposals for the test were submitted to SAMSO February 9. This will be a prime USAF experiment for an environmental survey to map the celestial sphere, using the North American Rockwell Autonetic Div.'s cryogenically cooled infrared sensor.

Atwood

Rockwell

Anderson

Lee Atwood Retires

Aerospace pioneer J. Leland (Lee) Atwood, who reached his sixty-fifth birthday last October, relinquished the stewardship of North American Rockwell Corp. with his retirement February 19 as president and chief executive officer, after thirty-six years with North American and forty-two years of association with aircraft activities.

Mr. Atwood continues as a member of the board of directors and consultant to the corporation. Board Chairman Willard F. Rockwell, Jr., became at the same time NR's chief executive officer, and the company's executive vice president, Robert Anderson, was elected president and chief operating officer.

Lee Atwood's contribution to the aerospace industry, his genuine warmth, and pleasant personality have gained him many admirers in civilian and military circles. Following his graduation as a civil engineer in 1928, he served as junior airplane engineer with the Army Air Corps at Wright Field, Ohio. Two years later he joined Douglas Aircraft Co. as a design engineer, and in 1934 he joined North American Aviation (NAA) as chief engineer and vice president.

In 1938, he was named assistant general manager and in 1941 became first vice president, going on to the NAA presidency in 1948, and later also becoming chairman of the board. In 1967, after the merger of NAA with Rockwell-Standard, he assumed the presidency of NR and also became its chief executive officer.

During his long career in aerospace, Mr. Atwood worked hand-in-glove with the renowned J. H. (Dutch) Kindelberger to diversify the NAA organization, which has made distinct contributions in development of aircraft, spacecraft, rocket engines, electronics, and atomics. Kindelberger headed NAA until 1948, and was chairman of the board when he died in 1962.

In addition to the Apollo spacecraft, huge rocket engines for the Saturn booster, and other critical developments, aircraft created during Lee Atwood's tenure included the T-6 Texan trainer, P-51 Mustang, B-25 Mitchell bomber, B-45 Tornado bomber, F-86 Sabrejet, F-100 Supersabre, T-39 Sabreliner, RA-5C Vigilante carrier-based reconnaissance aircraft, X-15 hypersonic research plane, XB-70 Mach 3 bomber, T-2B Buckeye trainer, and OV-10 Bronco counterinsurgency aircraft.

Lee Atwood and those who worked with him have made a distinct contribution to progress in aerospace.—END

Special Savings for AFA Members on pertinent paperbacks

Reg. price: $.75 Your price: 60¢

U6012 FULL CIRCLE: THE TACTICS OF AIR FIGHTING 1914-1964 by Group Captain J. E. Johnson.

U6026 THE DESTRUCTION OF DRESDEN by David Irving.

U6057 THE THOUSAND PLANE RAID by Ralph Barker. The story of the first massive air raid launched by the R.A.F. Bomber Command — 1046 bombers against the city of Cologne.

U6067 BLACK THURSDAY by Martin Caidin. The epic story of the most savage air battle ever fought . . . the Flying Fortress attack on Schweinfurt, October 14, 1943.

U6106 NIGHT FIGHTER by C. F. Rawnsley and Robert Wright. The fascinating and chilling war, fought by lone pilots in radar-equipped planes, who stalked their German prey in the high darkness.

U6127 CURRAHEE! by Donald R. Burgett. D-Day, 1944—a young paratrooper's terrifying eyewitness account of the invasion of Normandy in World War II.

U6240 LIFE AND DEATH OF THE LUFTWAFFE by Werner Baumbach, Commander of the German Bombers.

72127 DEFEAT IN THE WEST (Rev.) by Milton Shulman

01574 TWELVE O'CLOCK HIGH by Beirne Lay, Jr. and Sy Bartlett, Jr.

01580 THE FALL OF BERLIN by Marshal Vasili I. Chuikov, Supreme Commander of Soviet Land Forces.

SCIENCE FICTION

For the science fiction aficionados—these five excellent books by a real master of science fiction, Arthur C. Clarke.

01558 CHILDHOOD'S END
01559 EXPEDITION TO EARTH
01560 EARTHLIGHT
01561 REACH FOR TOMORROW
01562 TALES FROM WHITE HART

Reg. price: $.95 Your price: 75¢

01877 THE DIVINE WIND: JAPAN'S SUICIDE SQUADRONS IN WORLD WAR II by Rikihei Inoguchi, Tadashi Nakajima and Roger Pineau. The most carefully documented and accurate account of the suicide fliers, their lives and thoughts. 16 pages of photographs.

01704 "BATTLE OF BRITAIN": THE MAKING OF A FILM by Leonard Mosley. The fascinating, in-depth story of the biggest war film ever made.

01710 REACH FOR THE SKY by Paul Brickhill. An inspiring, magnificent story of Douglas Bader, legless fighter pilot who led men to victory in the Battle of Britain.

01719 WING LEADER: FROM THE BATTLE OF BRITAIN TO THE LAST SORTIE by Group Captain J. E. Johnson, top-scoring ace of the R.A.F.

01720 THE FIRST AND THE LAST by Adolf Galland, Germany's Commander of Fighter Forces. The rise and fall of the Luftwaffe: 1939-1945.

01721 SQUADRON AIRBORNE by Elleston Trevor. A superbly realistic novel of the R.A.F. in the Battle of Britain.

Reg. price: $1.00 Your price: 79¢

ILLUSTRATED HISTORY OF WORLD WAR II SERIES

For the aficionado and collector of the history of World War II, this new paperback selection of original works offers the most complete and authentic coverage of the war. Every aspect of the war is covered in depth—each selection, extensively researched, is written by an expert. Supplementing the test of each of the selections are many photographs, maps and diagrams carefully selected from rich, authentic sources.

01688 THEIR FINEST HOUR: THE STORY OF THE BATTLE OF BRITAIN, 1940 by Edward Bishop.

01689 D-DAY: SPEARHEAD OF INVASION by R. W. Thompson.

01691 ME-109 by Martin Caidin. The story of the most consistently great aircraft in aviation history.

01740 SPITFIRE by John Vader with an introduction by Air Vice-Marshal "Johnnie" Johnson. A superb combination of combat, technology, and illustration on THE fighter of the R.A.F.

01739 GERMAN SECRET WEAPONS: BLUEPRINT FOR MARS by Brian Ford. The fascinating story of Hitler's "wonder weapons".

01868 LUFTWAFFE by Alfred Price. A superb description of the fliers, the planes, the strategy and the disastrous command decisions of the Luftwaffe during six years of combat.

Reg. price: $1.25 Your price: 99¢

01541 FLYING FORTS by Martin Caidin. The authoritative account of the B-17 Flying Fortress — the most formidable heavy bomber of World War II. 32 pages of photographs.

01897 HORRIDO! FIGHTER ACES OF THE LUFTWAFFE by Trevor Constable and Col. Raymond F. Toliver. The full story of the fighter aces of the Luftwaffe—the great names with combat records and awards. Vivid, authoritative, filled with personal details and the excitement of aerial combat.

01724 THE LUFTWAFFE WAR DIARIES by Cajus Bekker. A prodigious, exhaustive history of the Luftwaffe in World War II, filled with combat narratives and based on solid research. Over 100 rare photographs.

01679 APPOINTMENT ON THE MOON by Richard S. Lewis. The full story of Americans in space from the Explorer 1 to the Lunar Landing—and beyond.

Air Force Association
1750 Pennsylvania Avenue, N.W.
Washington, D. C. 20006

Minimum Order $5.00
4-70

Please send the books whose numbers I have circled below:

U6012	U6240	01560	01679	01719	01740
U6026	U1704	01561	01688	01720	01868
U6057	01541	01562	01689	01721	01877
U6067	01558	01574	01691	01724	01897
U6106	01559	01580	01710	01739	72127
U6127					

Name _____

Address _____

City _____

State _____ **Zip Code** _____

I enclose $..... plus 25¢ postage and handling.

THE BULLETIN BOARD

News and Comment about Air Force People . . .

(AF/SD Military Affairs Editor Col. Jackson V. Rambeau, USAF (Ret.), is on indefinite leave of absence, due to illness. Until his return, this column is being edited by AF/SD News Editor William P. Schlitz.)

22d Annual Arnold Air Society Conclave

Mrs. H. H. Arnold, widow of the late Gen. H. H. "Hap" Arnold, and her three sons—Col. Henry H. Arnold II, USA; Col. William B. Arnold, USAF; and Col. David L. Arnold, USAF—head a list of distinguished guests scheduled to attend the Arnold Air Society's 22d National Conclave in Anaheim, Calif., April 13-15. More than 2,500 AAS cadets and members of their affiliate, the Angel Flight, will participate. They will represent 163 colleges and universities from across the nation.

A motion picture on the life of General Arnold, for whom the Society is named, will be premiered during the conclave.

Gen. J. P. McConnell, USAF (Ret.), former Chief of Staff, will be present to accept the post of Honorary National Commander for the year 1970-71. AFA's President George D. Hardy and Executive Director James H. Straubel will make formal presentations to the conclave. Former AFA President and now National Director Howard T. Markey will make his ninth appearance before the conclave and seventh consecutive assignment as Master of Ceremonies for the conclave's formal banquet on the evening of April 14.

The Society's top award recipients this year are Gen. James Ferguson, Commander, AFSC (H. H. Arnold Trophy); Sen. Henry M. Jackson (D-Wash.) (Paul T. Johns Trophy); Lt. Col. John R. Boyd, AFSC (Gen. Hoyt S. Vandenberg Trophy); Col. (Brig. Gen. selectee) Daniel "Chappie" James, Jr., new Deputy Assistant Secretary of Defense for Public Affairs (Eugene M. Zuckert Trophy); and Apollo-11 Astronauts Neil Armstrong, Edwin Aldrin, and Michael Collins (John Fitzgerald Kennedy Trophy). The recipient of the Theodore C. Marrs Trophy had not been determined at this writing.

USAF Supports AFA JOAC Recommendations

Lt. Gen. A. J. Russell, DCS/Personnel, Hq. USAF, has advised that all recommendations submitted to the Air Force by AFA's Junior Officer Advisory Council were "met with favorable consideration," and action has been taken to implement those items not already in effect. The Air Force advised that:

- A follow-on assignment program (in conjunction with assignments to SEA) will be implemented at the earliest practicable date, consistent with the capability to reliably predict worldwide personnel/manpower requirements.
- The Limited Resource Specialty (LRS) has been eliminated and AF Manual 36-11 has been changed to allow any officer to request a change in duty specialty. Training has been reserved for officers who have indicated a desire for continued active duty.
- Action is continuing with respect to rated officers requesting cross-training in lieu of separation.
- USAF supports the basic thesis that the Air Force wife plays a vital role in her husband's career decision, and her needs will continue to be of prime interest to those in the career-motivation area.
- With respect to funded travel to accompany dependents on consecutive intratheater tours, USAF has urged the Department of Defense, in the event this proposal can't be supported on a worldwide basis, to restrict applicability to the Pacific Theater and seek immediate enactment of legislation.

In response to the Council's recommendation that the Air Force schedule a National Junior Officer Conference once a year in conjunction with AFA's National Convention, AF officials advise that the USAF welcomes programs of this nature and that scheduling of the next conference remains for mutual USAF/AFA determination of requirements. Consideration also will be given to conducting a National Noncommissioned Officer Conference in alternate years.

New Reserve Personnel Center Chief

USAF's Air Reserve Personnel Center, Denver, Colo. has both a new commander and a new vice commander following retirement of Col. Leland A. Walker, Jr., Commander, and his Vice Commander, Col. Thomas W. Abbott. Both retired after thirty years of service.

The Center's new chief is Col. Benjamin S. Catlin III with twenty-eight years of service and 169 combat missions in Vietnam. His Vice Commander is Col. Willard W. Stukey, a Reserve officer recalled to active duty last September. He is a former civilian management analyst Hq. USAF.

Individual Augmentee Program

Brig. Gen. Earl O. Anderson, Deputy to the Chief o Air Force Reserve, announced that Lt. Col. Ole P Flaa has taken over the important task of establishing policy and guidance for the Air Force Reserve Individua Augmentee Program.

This assignment, a distinct entity within the Air Force management structure, "came about only after muc study and coordination by several DoD agencies" and th support of the Air Force Association, General Anderso said. He added that Colonel Flaa's appointment was first step toward improvement of the organization ar management of this important resource.

1969 a Record Breaker for CAP

Civil Air Patrol volunteers logged a record-shatteri 27,369 hours flying Air Force-authorized search-and-re cue missions in 1969, Brig. Gen. Richard N. Ellis, N tional Commander, announced. That's 2,512 hours mo than in 1968.

In 1969 thirty-seven persons were saved by CA aerial and ground searches, and the CAP provided assi ance to 1,529 afflicted by such national and local disaste as Hurricane Camille. CAP also helped in the evacuati of another 149.

USAF Adds Junior ROTC Programs

The Air Force plans to establish Junior Reserve Offic Training Corps units at an additional twenty-one hi schools during the 1970-71 school year. The program designed to cover all important aspects of aviation a

Air Force Secretary Robert Seamans, Jr. (left) presents Maj. Gen. Robert J. Dixon, former Commander, USAF Military Personnel Center, the 1969 Eugene M. Zuckert Management Award as former Secretary Zuckert looks on.

space. School selections are based on their proximity to college-level ROTC units or Air Force bases, demonstrated interest in aerospace education, and necessary enrollment facilities to support the program.

The program was authorized under the ROTC Vitalization Act of 1964, with twenty schools having programs in 1966. Additional schools have been added each year, bringing the current total to 165.

Limit Removed on Savings Program

The President has signed Public Law 91-200, a measure passed by both Houses of Congress, which removes the $10,000 limit on deposits in the Overseas Savings Deposit Program in the case of any member of the uniformed services who is a prisoner of war, missing in action, or in a detained status during the Vietnam conflict.

SENIOR STAFF CHANGES

B/G Harry C. Bayne, from Chief, European Div., Directorate of Plans & Policy, J-5, OJCS, to Cmdr., 45th Air Div., Loring AFB, Me., replacing B/G Madison M. McBrayer . . . **M/G Gordon F. Blood,** from DCS/O, USAFE, Lindsey AS, Germany, to DCS/O & Intelligence, AFCENT, Brunssum, Netherlands, replacing M/G William T. Daly . . . **B/G Robert E. Brofft,** from Dir. Per. Resources & Distr., to Dep. Asst. DCS/Personnel for Mil. Per., USAFMPC, Randolph AFB, Tex., replacing B/G (M/G Selectee) Robert W. Maloy . . . **B/G Richard C. Catledge,** from IG, to Asst. DCS/O, TAC, Langley AFB, Va., replacing B/G George W. McLaughlin . . . **B/G William J. Evans,** from Dep. Dir. for Concepts & Oper. Readiness, Def. Comm. Planning Gp., to Spec. Asst., SENSOR Exploitation, Office, C/S, Hq. USAF.

Col. (B/G Selectee) Robert H. Gaughn, from DCS/O, 15th AF, SAC, March AFB, Calif., to Cmdr., 4th Strat. Aerospace Div., SAC, Grand Forks AFB, N.D., replacing B/G Clifford W. Hargrove . . . **M/G Ernest C. Hardin, Jr.,** from DCS/O, PACAF, Hickam AFB, Hawaii, to DCS/O, PACAF, Tan Son Nhut Airfield, VN, replacing M/G James F. Kirkendall . . . **B/G Clifford W. Hargrove,** from Cmdr., 4th Strat. Aerospace Div., SAC, Grand Forks AB, N.D., to C/S, 2d AF, SAC, Barksdale AFB, La., replacing retiring B/G M. A. Bywater . . . **Col. (B/G Selectee) Richard J. Hartman,** from Asst. Cmdr., ADC, 4645th Sup. Sq., SAGE, ADC, Custer AFS, Mich., to Dep. Dir., Jt. Continental Def. Systems Integration Planning Staff, OJCS, Washington, D.C.

B/G James A. Hill, from Cmdr., 60th Mil. Airlift Wg., MAC, Travis AFB, Calif., to DCS/O, MAC, Scott AFB, Ill., replacing M/G William V. McBride . . . **B/G (M/G Selectee) Earl L. Johnson,** from Vice Cmdr., 3d Air Div., SAC, Andersen AFB, Guam, to Asst. DCS/Plans, SAC, Offutt AFB, Neb., replacing B/G Douglass T. Nelson . . . **M/G James F. Kirkendall,** from DCS/O, 7th AF, PACAF, Tan Son Nhut Airfield, VN, to Dep. Cmdr., 7th AF/13th AF, Udorn Airfield, Thailand, replacing M/G Robert L. Petit . . . **B/G Leo C. Lewis,** from SAC IG, Offutt AFB, Neb., to Vice Cmdr., 3d Air Div., Guam, replacing B/G (M/G Selectee) Earl L. Johnson . . . **B/G (M/G Selectee) Robert W. Maloy,** from Dep. Asst. DCS/P for Mil. Per., USAFMPC, Randolph AFB, Tex., to Cmdr., 314th Air Div., PACAF, Osan AB, Korea, replacing B/G Arthur W. Holderness, Jr.

B/G Madison M. McBrayer, from Cmdr., 45th Air Div., Loring AFB, Me., to SAC IG, Offutt AFB, Neb., replacing B/G Leo C. Lewis . . . **M/G William P. McBride,** from DCS/Materiel, TAC, to DCS/O, TAC, Langley AFB, Va., replacing M/G Albert W. Schinz . . . **M/G William V. McBride,** from DCS/O, MAC, to C/S, MAC, Scott AFB, Ill., replacing M/G Courtney L. Faught . . . **M/G Robert L. Petit,** from Dep. Cmdr., 7th AF/13th AF, Udorn Airfield, Thailand, to DCS/O, PACAF, Hickam AFB, Hawaii, replacing M/G Ernest C. Hardin, Jr.

B/G Bryan M. Shotts, from Cmdr., 93d Bomb Wg., SAC, Castle AFB, Calif., to C/S, 15th AF, SAC, March AFB, Calif., replacing retiring B/G W. B. Kyes . . . **B/G Robert V. Spencer,** from Asst. Cmdr., to IG, TAC, Langley AFB, Va., replacing B/G Richard C. Catledge.

PROMOTIONS: Nominated to **Major General** (ANG): Frank A. **Bailey;** James W. **Carter;** William H. **Pendleton;** Robert S. **Peterson;** Charles W. **Sweeney;** George H. **Taylor.**

RETIREMENTS: B/G Richard G. **Bulgin,** Jr.—END

Air Force Academy Cadet Gregory S. Martin displays the trophy he won in leading an Academy team to the National Collegiate Parachuting Championship of the US. The cadet parachute team won the cup for the second year in a row.

USAF Astronaut "Buzz" Aldrin and former USAF Thunderbird flyer Bob Beckel represented all the flying members of the Air Force aerospace team at . . .

The Iron Gate Chapter's Gala Seventh Annual Air Force Salute

The first Air Force officer to walk on the moon and a veteran of aerial combat in Southeast Asia were the honored guests at the Iron Gate Chapter's Seventh Annual Air Force Salute, held February 20 in New York City.

Air Force Col. Edwin "Buzz" Aldrin, Apollo-11 moonwalker, and Maj. Robert Beckel, a former member of the Thunderbirds aerial demonstration team, who has also flown more than 200 missions in Southeast Asia, represented all flying members of the USAF's aerospace team at the Salute honoring "Men in Their Machines," and, in their behalf, accepted the Iron Gate Chapter's Bronze Eagle Award.

Walter Cronkite, CBS newscaster and a member of the Chapter, emceed the ceremonies. Peter Duchin and his orchestra, Warrant Officer Bob Bunton and the Airmen of Note, the USAF Bagpipers, and the USAF's Good Timers provided music and entertainment for a host of dignitaries representing the Air Force, industry, and New York society.

Among the many dignitaries not shown in the accompanying photos were Senator Barry Goldwater (R-Ariz.); Congressmen Alvin E. O'Konski (R-Wis.), Alexander Pirnie (R-N.Y.), and Bertram L. Podell (D-N.Y.); Gen. Jack J. Catton, Commander, Military Airlift Command; Gen. James Ferguson, Commander, Air Force Systems Command; Gen. Seth J. McKee, Commander in Chief, NORAD; Gen. William W. Momyer, Commander, Tactical Air Command; AFA National Directors Gen. J. P. McConnell, USAF (Ret.), and Maxwell A. Kriendler, one of the founders and the first president of the Chapter; Col. Jeanne Holm, Director of Women in the Air Force; and Lt. Col. Donn Eisele, Apollo-7 Astronaut.

Col. Edwin "Buzz" Aldrin (left center) and Maj. Robert Beckel (right center) accept Bronze Eagle awards from Secretary of the Air Force Robert C. Seamans, Jr. (left), and Air Force Vice Chief of Staff, Gen. John C. Meyer.

Iron Gate Chapter President James Austin, left, visits with, from left, General Meyer, Air Force Vice Chief of Staff, Air Force Secretary Seamans, and AFA President Hardy.

Mrs. John C. Meyer (left) and Mrs. Robert C. Seamans Jr., draw winning tickets at the Salute, while J. Gilbert Net tleton, Jr., Chairman, looks on. Top prize, an around-the world trip for two, was won by Brig. Gen. J. W. Harrell, Jr. Cmdr., 438th Military Airlift Wing (MAC), McGuire AFB

Proceeds from the $100-a-plate white-tie dinner, whicl was held in the Grand Ballroom of the New York Hilto Hotel, will go to Air Force- and USAF-related charities The six previous Salutes sponsored by the Iron Gat Chapter have benefited Air Force-related charities wit donations of more than $450,000. Chief beneficiaries hav been the Air Force Aid Society, the Aerospace Educatio Foundation, the Air Force Village Foundation, the Falco Foundation at the Air Force Academy, the Aerospace His torical Foundation, and the Air Force Enlisted Men Widows and Dependents Home Foundation, Inc., spor sored by the Air Force Sergeants Association.—END

A program manager understands our kind of systems simulation

Systems simulation is a function of AUTOMATION INDUSTRIES

Arms Length Objectivity: Because Vitro does not supply production hardware, the program manager can be sure of completely objective analyses and unbiased judgments with regard to the hardware used in the program.

We can simulate a city or an ocean, a post office or a hospital, a transportation system or a defense system. These mathematical models can then be used by the program manager to anticipate and solve problems and avoid costly, time-consuming delays. They can be used throughout the life span of a system in making realistic appraisals to:

Formulate design concepts

Evaluate proposed hardware in design

Predict system performance

Validate system changes

Develop modification and modernization programs

Establish logistics, maintenance, and training requirements

Vitro maintains complete computer, laboratory, shop, graphics and publications facilities staffed to support an entire program or any specific phase or subsystem. For complete information contact: Joseph C. Kinsey, Vitro Laboratories, 14000 Georgia Ave., Silver Spring, Maryland 20910.

Vitro

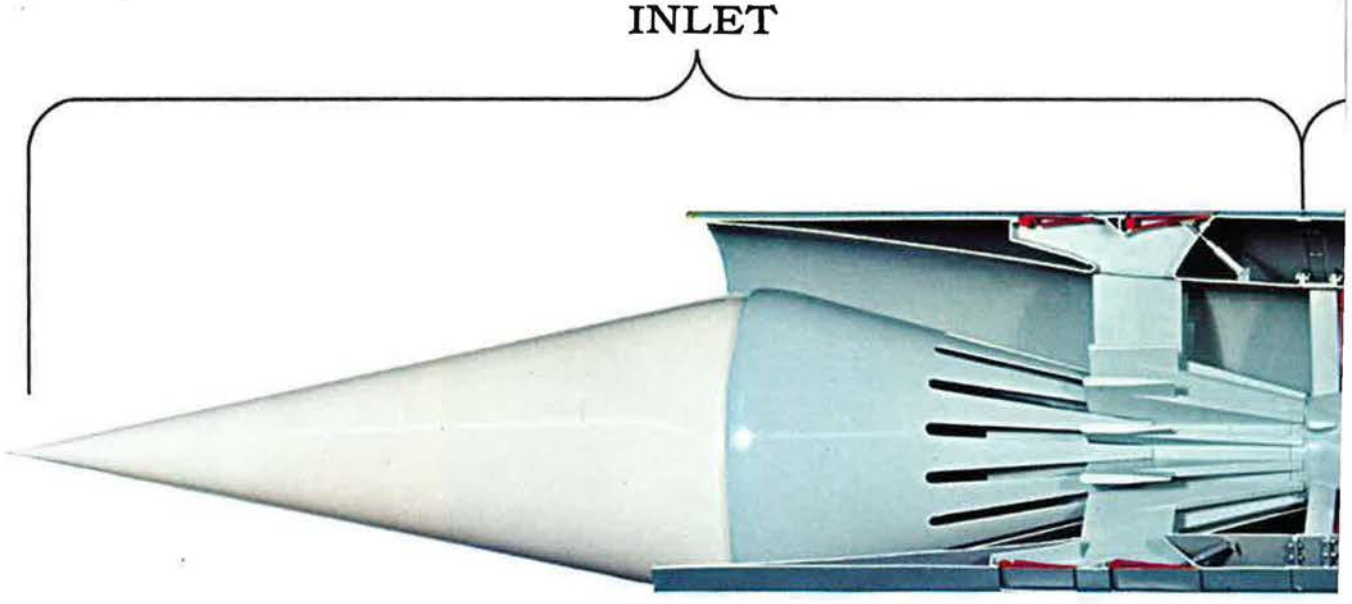
TURNS SCIENCE INTO SERVICE

If things are to
shouldn
designe

It depends. A stereo system, maybe not. But an aircraft propulsion system, definitely yes.

Because an engine has to do more than perform beautifully on the test stand. It must also jibe with the air inlet, exhaust nozzle and airframe, throughout the flight envelope.

That's why Pratt
Whitney Aircraft has
worked so closely with
Air Force on propulsio
system and airframe a
integrated unit. We're
working on new ways
predict in advance hov
supersonic augmented



work together, hey be ogether?

bofan will perform after installed. And we're eloping additional lities and techniques to ck those predictions. is way, with data being hanged between selves, the airframe nufacturer and the itary service involved, a new plane gets off the ground a lot faster. With a lot less trouble.

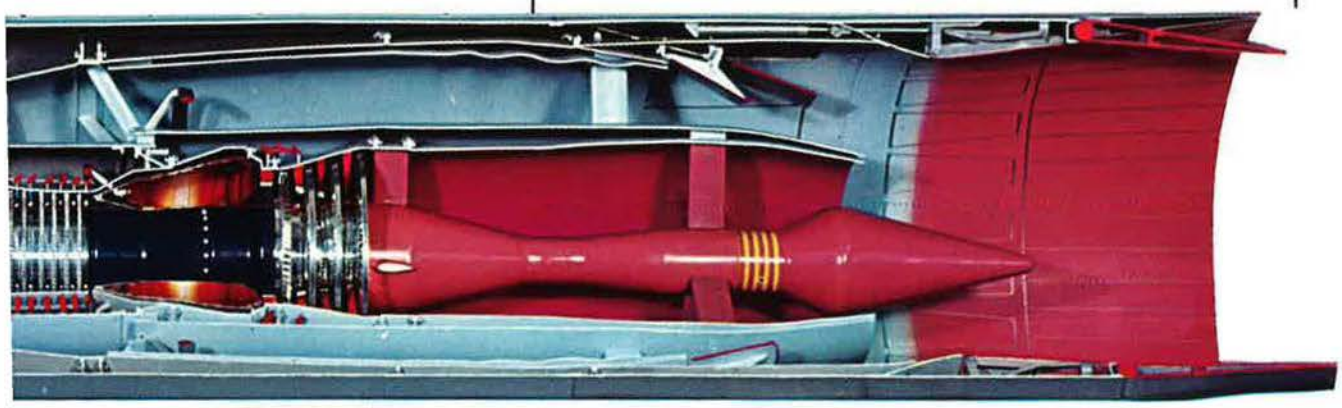
Everything works out better when people work together.

Pratt & Whitney Aircraft

DIVISION OF UNITED AIRCRAFT CORPORATION

ENGINE

EXHAUST NOZZLE



seeing Eyes:

The Fairchild KA-56 panoramic camera installed in the forward section of an Air Force RF-4C for low level intelligence gathering or reconnaissance missions.

Eyes that see . . . photograph . . . and furnish high resolution imagery for interpretation and evaluation. They're aerial camera systems designed and built by Fairchild. Surveillance cameras like our forward firing panoramic KA-60 which scans the terrain for 180° coverage. Vertical cameras for strike assessment like our KA-71 and KB-18A. Cartographic cameras like our KC-6A for world-wide mapping photography. Visual imaging, data processing and interpretation systems. We are today's leaders in their design and production . . . a leadership which will continue tomorrow in such areas as . . .

Eyeing Scenes:

Advanced Image Interpretation Stations provide the necessary rapid availability and extraction of information acquired by aerial sensors. The IIS system shown at right is an example of the Fairchild modular design concept offering a variety of configurations to suit most applications. This one includes a dual film transport system, direct viewing display, film projection system, map chip projector, map and film cursor systems with computer and manual links, code matrix reader which automatically reads MIL STD-782B code blocks.

When the image is critical, Fairchild is in the picture.

Imagery Interpretation System

FAIRCHILD

SPACE AND DEFENSE SYSTEMS

A DIVISION OF FAIRCHILD CAMERA AND INSTRUMENT CORPORATION

300 ROBBINS LANE, SYOSSET, NEW YORK 11791

PHONE: (516) 931-4500 • TWX: 510-221-1858

AIR FORCE
APRIL 1970

Because of a gestation period of nearly eight years, which involved countless studies and extensive advanced design and test, the B-1, the Air Force's next strategic bomber, enters full-scale engineering development with a high degree of assurance that the aircraft and its vital systems will meet all expected performance and reliability features. Because the B-1 is to have a useful service life of at least twenty years, it is being designed to accommodate substantial change and growth in its weapons, payload, avionics, and performance, thereby easily making it . . .

USAF's Most Versatile Bomber

By Edgar E. Ulsamer

ASSOCIATE EDITOR, AIR FORCE/SPACE DIGEST

ON OR about May 18, the Air Force plans to let contracts for engineering development of its next strategic bomber, the B-1, to include the fabrication and test of five flying test aircraft in addition to one static and one fatigue-test airframe.

The aircraft is intended as an updated replacement for the Air Force's strategic B-52, the recently phased out B-58, and the interim FB-111. Development of the B-1, along with that of the F-15 air-superiority fighter, is rated as the Air Force's top-priority manned weapon-systems program today.

The Air Force describes the B-1 as a four-engine strategic bomber in the 350,000- to 400,000-pound gross-weight class, with the ability to deliver large nuclear or nonnuclear payloads over great distances (more than 6,000 miles). The bomb bay will hold considerably more ordnance than that of the aging B-52s the B-1 will replace. In addition to gravity bombs, the B-1 will have a higher standoff capability than the much larger and slower B-52 because of its greater internal complement of attack missiles.

In order to penetrate the sophisticated defenses postulated for the 1980s, the B-1 is to carry the latest electronic countermeasures (ECM) and be able to carry such other penetration aids as decoys and bomber-defense missiles. The aircraft will have greater preaunch survivability through wide dispersal than present bombers, quick-reaction capability, and nuclear hardening, meaning that its airframe and electronic circuits can function in an environment of severe overpressures and high atomic radiation. The aircraft will be able to take off from short, austerely equipped fields not usable by the B-52.

The B-1's engineering-development contracts will be a step toward but not actually a commitment to production of the aircraft. This procedure is in accord with the Department of Defense's new development and procurement "milestone" policy, which seeks to fully secure the ground covered by one successful development step before the next is undertaken.

First stated as a requirement and defined in 1962 by two separate study groups—Project Forecast and a general-officer panel—the B-1 program struggled slowly through several metamorphoses in substance (as

(Continued on following page)

Lt. Gen. Otto J. Glasser, USAF's new Deputy Chief of Staff for Research and Development, says that because of extensive "homework," the Air Force has full confidence that the B-1 program is ready to enter hardware development.

This AF-furnished artist's conception shows a swingwing B-1 design in a conventional warfare role. While designed for an assured-destruction role as a key component of the three-pronged US nuclear deterrence, the B-1 will provide a substantially improved limited-warfare capability. The B-1, which carries no external stores, can penetrate at supersonic speed and, because of its sophisticated avionics, can function in heavily defended airspace.

well as in acronym—AMPS, LAMP, and AMSA among them) before the current engineering-development phase could be initiated. But today many Air Force and industry leaders associated with the program concede that the B-1's protracted and painstaking study phase may well prove to be a blessing in disguise, since it has led to one of the Air Force's most thoroughly reasoned and comprehensively planned development efforts.

Lt. Gen. Otto J. Glasser, the Air Force's Deputy Chief of Staff for Research and Development, told AF/SD that "the pun that AMSA stands for the 'Air Force's most-studied airplane' happens to be based on solid fact. But we can now say with a high degree of confidence that we are ready to enter hardware development. This program, in spite of its demanding technological nature, is in better technical shape than any previous Air Force program—going all the way back to the B-29 of World War II—has ever been at this juncture."

The B-1 program has evolved in accord with DoD's concept-formulation (building-block concept) standards but is unusual in that in its earliest stages all high-risk areas requiring advanced development work were identified and explored.

Essential state-of-the-art advances were not only accomplished but also "brass-boarded," and in most cases flight-tested, *before* engineering development. The total system-development risks have thereby been sharply reduced.

Since 1964 the Air Force, in addition to its own in-house and other governmental research, has worked closely with some thirty aerospace companies to arrive at the best design concept and performance features for the B-1, whose life cycle is to extend at least twenty years from the time of initial introduction into the inventory.

Over the past five or six years, preliminary-design and system-integration studies have been conducted by the Boeing Co., General Dynamics Corp., and North American Rockwell Corp. These three companies are also the present competitors for the B-1 prime contract.

At the same time, General Electric Co. and United Aircraft Corp.'s Pratt & Whitney Div. not only conducted intensive studies of the B-1's propulsion system, but fabricated and tested advanced turbofan engines which, in the aggregate, have accumulated more than 400 hours of running time. In addition, North American Rockwell's Autonetics Div. and IBM were selected to perform studies in the avionics field which, in turn, led to some sixteen avionics companies constructing brass-board hardware, flight-testing, or conducting research in seven advanced-development areas.

More than $143 million has been spent on "buying confidence" in engineering development, about half of which went into propulsion (the F-15 engine development has been "drawing very heavily" on the advanced engine research of the B-1 program). Of the remainder, about two-thirds was allocated to the avionics area and one-third to airframe and other factors such as survivability/vulnerability, and advanced penetration-aids studies.

When the decision to enter the engineering-development phase was made in November 1969, "We not only knew all the systems requirements backward and forward but, because we had studied and restudied all possible uses of the B-1 for several years, we also were in an unusually good position to incorporate a high degree of basic flexibility into the design," General Glasser explained.

General Performance Characteristics

Flexibility in terms of operating modes and adaptability to varying mission and weapon systems is the principal design and performance feature of the Air Force's new bomber. This, according to Maj. Gen. J. M. Rogers, Deputy Chief of Staff for Development Plans, AFSC, prompted the Air Force to "quantify and specify the widest possible combination of qualities and growth capabilities of the basic system, consistent wi

reasonable costs," with the result that the B-1 will be "optimized for two basic penetration modes—high and supersonic as well as low—at the high end of the subsonic regime."

General Glasser explained that "it would be a mistake to design a future strategic bomber for a single-purpose role, with only limited ability for adaptation to different missions. The B-52 [designed as a high-altitude penetrator but modified at great cost for low penetration] taught us that it simply is not possible to specify with clarity what a weapon system such as the B-1 will be actually used for ten or fifteen years from now. For that reason we decided that it should be equally well suited for low- and high-altitude penetration in a nuclear environment."

One basic performance question was fought over hard because of conflicting views within the defense community: Should the B-1 be able to cruise supersonically at altitude, a capability increasing its estimated ten-year system costs between twenty and thirty percent? Given the proposition that the aircraft will be used in a single-sortie, nuclear role, DoD's Systems Analysis office during the Johnson Administration had rejected the supersonic capability as "not cost-effective," a view hotly contested by the Air Force for a number of reasons.

Foremost among them is the B-1's increased survivability and productivity in conventional warfare, plus the flexibility to cope with changes and the uncertainty of future defense requirements in the nuclear environment.

"Putting only one arrow into the B-1's quiver would be indefensible, from the point of sound military doctrine," according to General Rogers. A similar view had been expressed earlier by former Secretary of the Air Force Harold Brown, who argued that in view of the unpredictability of technological developments, high and fast penetration capability could prove vital.

Late last year Deputy Secretary of Defense David Packard, at the urging of the Secretary of the Air Force Robert C. Seamans, Jr., ruled that the B-1 should have supersonic speed capability.

By contrast, the Air Force could not find full justification for paying the relatively high price in structure, weight, engine complexity, and cost incurred by providing supersonic capability on the deck (initially envisioned at about Mach 1.2). "In plotting penetration probabilities as a function of on-deck penetration speeds of either about Mach 1.2 or high subsonic speeds, there isn't much of a wiggle on the chart. On the other hand, the price extracted for such a capability is extremely high, in money as well as in increased technical difficulties," General Rogers pointed out.

The decision to forego supersonic on-deck capability was also influenced by the recognition that multi-Mach Soviet fighters of the Foxbat and MIG-21 types are held to speeds of about Mach 0.85 because of structural limitations when operating at treetop level and, therefore, are slower than the B-1. (Their missiles, of course, could outrun the B-1 even at Mach 1.2, assuming that the interceptor could indeed detect the penetrating bomber in the ground clutter.)

Yet a third speed factor had been considered at length in determining the B-1's mission profile: the ability to cruise supersonically on a sustained basis from takeoff through penetration.

This factor, too, was rejected by Air Force planners because the B-1 is "not easily conceived" or specifically designed to function in a damage-limiting role where the time in reaching the target becomes a paramount factor. A series of parametric studies furnished convincing data that even at high supersonic cruise speed, the bomber was no match for vastly faster ICBMs and SLBMs in performing that role.

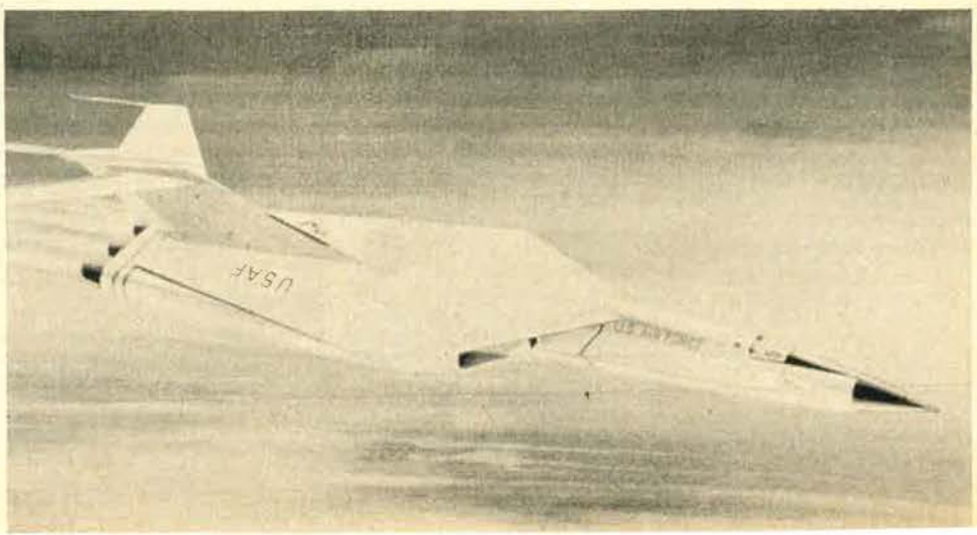
Obviously, the lesson taught by the B-70's unsuccessful bid to compete with ICBMs represented a considerable factor in arriving at that decision.

The B-1's Assured-Destruction Role

The B-1's primary function is deterrence. The new bomber, according to General Glasser, is "to serve as an integral element of the Assured-Destruction capability of the United States. It will be able to flush on warning [believed to require less than four minutes] from dispersed airfields, or through dispersal to survive any undetected attack, and have a high probability of survival during penetration for precise delivery of weapons on preplanned targets."

The ability to survive in a nuclear environment, both during prelaunch and penetration, is designed into the B-1 and cannot be readily obtained with such aircraft as the B-52, B-58, or FB-111. This involves a variety of factors ranging from rapid-reaction capability (including warning system, command/control, and air-

(Continued on following page)



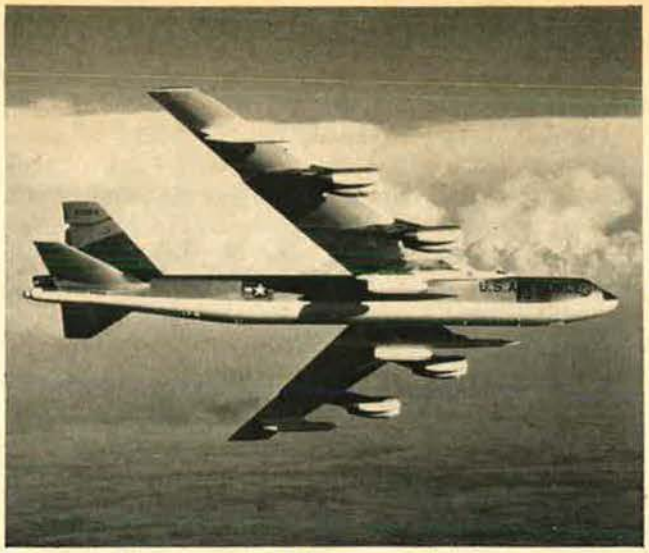
An Air Force artist depicts another B-1 configuration possibility employing a variable-sweep wing. The four-engine heavy bomber sought by the Air Force to replace the aging B-52 and the interim FB-111 will be in the 350,000- to 400,000-pound weight class and carry a greater payload than the larger and heavier but slower B-52.

craft characteristics), to short takeoffs to permit deployment from austere airfields, as well as nuclear hardening and advanced electronic countermeasures.

In a typical mission, a B-1 attack force upon deployment and refueling would cruise subsonically at altitude until within range of enemy surveillance systems (likely at about 200 miles off his shoreline and involving enemy AWACS aircraft). Knowing it was being tracked, the B-1 probably would accelerate to supersonic speed to reduce exposure time while in the enemy's extended (over-water) area-defense zone and, concurrently, would attempt to destroy the hostile AWACS by employing the B-1's active defense capability.

Simultaneously, the B-1 would likely deploy such penetration aids as ECM jamming, chaff, infrared (IR) flares, and SCADs (Subsonic Cruise Armed Decoys), and then drop to low-level penetration to avoid enemy SAMs and interceptors while also adding to the headaches of hostile radar.

"Riding the nap of the earth" with the aid of its computerized terrain-following radar system, the B-1 would penetrate on the deck toward the terminal defense zone. It also might use IR surveillance suppression. Its SRAM system could be used to detect and destroy SAM sites as the B-1 fought its way in. *(See "A New Dimension in Nuclear Deterrence,"* AF/SD, *Dec. '69, page 65.)*



For years the mainstay of US manned deterrence capability, the B-52 Stratofortress will be almost twenty years old when the B-1 replaces it in the operational inventory of SAC.

A number of performance characteristics would assist the B-1 during this critical phase and further dilute enemy defenses. Its radar and IR cross sections will be designed from the outset to make detection as difficult as possible. The B-1's maneuverability (aerodynamic response) will be optimized for ground-hugging flight *without* unacceptable ride qualities. (Ride quality is one important B-1 design criterion because undue harshness degrades crew and systems performance, and sluggish response to the terrain-following radar/computer systems under certain topographical conditions could cause the aircraft to leave its ground-clutter concealment.)

Of recent aircraft, the B-58, whose crew compartment was located at a node (a relatively vibration-free point in the structure), serves as a model in providing best low-altitude ride qualities.

Also likely is that the B-1's terrain-following system will include adjustment features that permit the pilot to adapt the terrain-following flight profile to existing combat requirements. This could include a "combat ride," which, while straining both men and machine, may prove the only way for the aircraft to penetrate highly defended areas. The B-1's lowest possible penetration altitude specified in the RFP is classified but is believed to be below 400 feet to make use of ground clutter and to be able to hide behind the curvature of the earth to the fullest extent possible.

Approaching the enemy's terminal-defense zone, the B-1 could either launch its SRAMs from beyond the defense perimeter or also penetrate to the target and release its gravity bombs.

As an alternative, but dependent on future improvements in ECM technology, the B-1 could fly the same mission at altitude supersonically from detection to arrival on target.

In either case, the aircraft's range capability enables it to attack from any direction all major target complexes in the Soviet Union. Because of the peculiar combination of range capability and geography, the B-

Initial B-1 Avionics Studies

At a cost of more than $41 million, the Air Force, in concert with IBM and North American Rockwell's Autonetics and with the assistance of many electronics industries, has studied and carefully defined the B-1's avionics requirements and examined seven advanced development tasks.

They are:

- Advanced Development Task No. 1: **Inertial navigation and transfer** to facilitate long-range, precise navigation, accurate SRAM launch, and low-level flight. **Contractors:** Autonetics (NR), AC Electronics (GM), Singer-General Precision. **Status:** Flight tests completed.
- Advanced Development Task No. 2: **Forward-looking radar resolution** to improve low-altitude fix-taking. **Contractors:** Autonetics (NR), Philco-Ford. **Status:** Flight tests completed.
- Advanced Development Task No. 3: **Doppler radar damping** to improve Doppler radar performance for damping inertial navigators and reduce bias and noise errors of Doppler radars. **Contractors:** General Precision Labs (GPL), Laboratory for Electronics. **Status:** Flight tests completed.
- Advanced Development Task No. 4: **Infrared surveillance** to provide track-while-scan detection and tracking capability of enemy aircraft based on infrared emissions of their propulsion systems. **Contractors:** Hughes Aircraft, Aerojet-General. **Status:** Flight test complete.
- Advanced Development Task No. 5: **Radio frequency surveillance** to provide passive warning, location, and tracking capability on radiating enemy threat systems. **Contractor:** Dalmo Victor. **Status:** Flight test now in process; to be completed May 1970.
- Advanced Development Task No. 6: **Integrated controls and displays** to ease the crews' tasks and workloads and to provide better human-factor interface with avionics. **Contractors:** IBM, Autonetics (NR). **Status:** development and simulator testing completed.
- Advanced Development Task No. 7: **Multimode radar** to provide simultaneous capability for a variety of air-to-air and air-to-ground radar functions in a single radar equipment. **Contractor:** Raytheon (Lexington, Mass.). **Status:** development and laboratory test complete; flight test began March 1970.

and its nuclear missiles represent an omnidirectional threat to the Soviet Union against which no complete defense appears possible.

Several other factors, in the view of Air Force planners, favor the B-1's penetration capability and survivability:

- Its large and flexible payload of avionics and weapon systems, coupled with the basic high accuracy of all its systems;
- Its ability to detect and destroy mobile missile systems and mobile radars;
- Its outstanding ability to survive and function in a nuclear environment because of improved penetration aids and ECM equipment; and
- The nuclear hardening of all mission-critical equipment and the ability to "see" during periods of nuclear flashes, with the help of its electro-optics (low-level-light TV or similar systems).

As a result, the B-1 would be a considerably more effective deterrent to the Soviet Union or other potential aggressors than any combined force of B-52s, B-58s, or FB-111s.

Versatility and Corollary Missions

In congressional testimony Secretary of Defense Melvin Laird has singled out as a unique and necessary capability the advanced bomber's power of "discrimination and decision in real time [by determining] the requirement for restrike, and, if necessary, immediately launching an air-to-ground missile to destroy the target." In that sense, the B-1 will be able to undertake damage-limiting and recon-strike missions against such enemy reserve forces as portions of the original missile force, launchers reloaded after the initial strike, and mobile missile forces.

General Glasser stressed that "the B-1 will be well suited for recce strikes by validating the destruction of preplanned targets."

The Conventional Role

In addition to its intrinsic operational flexibility for nuclear warfare—including recall after launch, attack on multiple targets in a single sortie, and reusability—the B-1 enjoys another operational advantage over intercontinental missiles: It can be deployed effectively for conventional warfare. Air Force spokesmen testified that the B-1's capability for conventional missions will be "significantly better than that of the B-52" because the B-1 will be the only supersonic bomber capable of performing deep interdiction with very large payloads, and close-support functions in the face of modern defenses.

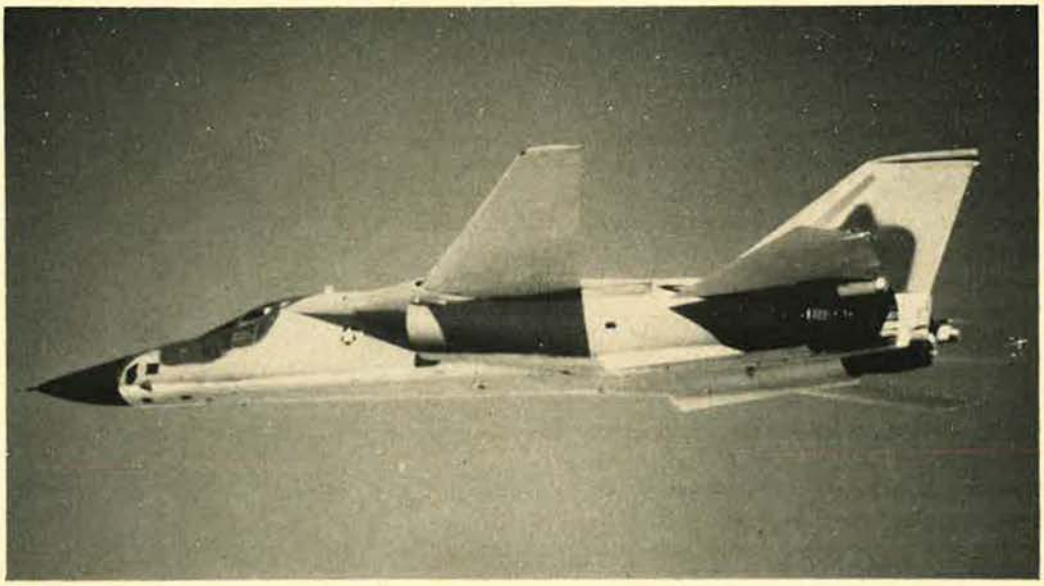
Existing aircraft assigned to a conventional bombing role are not able to penetrate at supersonic speed because of external stores, a problem obviated by the B-1's ability to carry internally about twice the B-52's bomb load from, say, Guam to South Vietnam in 1½ hours; in comparison, B-52s require 4½ hours to make that trip. From southern Thailand, the B-1 would reduce response time to half an hour, vs. 1½ hours for the B-52.

Also, the high accuracy of its sophisticated avionics will stand the B-1 in good stead in limited warfare because its CEP (circular error probability) will be substantially better than on existing systems. The aircraft can be deployed against such fixed targets as bridges, industrial structures, and power plants. By combining the features of a good penetrator (speed, good ECM, and low radar and IR signatures) with a high ton-mile economy (more than ten F-4s, F-105s, or A-7Ds are required to deliver one B-1 bomb load), the B-1 will be able to perform with a high degree of cost-effectiveness in limited warfare.

Design Constraints and Options

Meeting the B-1's exacting and varied requirements represents an enormous challenge, despite extensive advanced development and preliminary design work, according to General Glasser. For that reason, and because the Air Force believes that "contractors should earn their fee by bringing to bear their utmost ingenuity," the engineering-development program is structured to encourage participating aerospace and electronics firms toward a high degree of creative initiative.

(Continued on following page)



The FB-111, designed and built by General Dynamics' Fort Worth Division, which competes with Boeing and North American Rockwell for the B-1's engineering-development contract, has confirmed the feasibility and flexibility of the swingwing principle. The FB-111 is shown here with wings extended for subsonic flight.

Some features of the airframe, propulsion system, and avionics, therefore, will not be firmly established until source selection is completed. As this is written, it is not known whether the B-1 will be of fixed-wing or swingwing design, although odds heavily favor the latter. The Request for Proposals left this to the contractor.

While the Air Force has closely monitored the US SST program, which shifted from variable to fixed-wing design because of an array of technical problems, it does not consider the much larger and presumably faster civilian aircraft a valid pattern for the B-1 design. The B-1, for instance, can place its four engines and landing gear on the fuselage, a "design luxury" denied the SST.

The Air Force views the swingwing as "promising" because it appears to provide the required short-field takeoff capability, essential ride quality, subsonic cruise range, and favorable L/D (aerodynamic lift/drag coefficient) in supersonic cruise, not easily attainable with a fixed-wing configuration.

Also currently unresolved is what materials will go into the B-1's basic structure and whether the plane's maximum cruise speed will exceed the minimum specified by the Air Force. This figure, classified except to say that it is between Mach 2 and Mach 3, can be assumed to be closer to Mach 2 than Mach 3 on a sustained basis.

Air Force spokesmen stress that they do not expect the B-1 to be an all-titanium airplane. Kinetic heating inhibits sustained supersonic flight above Mach 2.35 by aircraft built largely of conventional materials. General Glasser said he expected the winning contractors "to come up with a judicious use of titanium but not use this expensive material capriciously. The Air Force would be loath to see a contractor spend the government's money unnecessarily just to come up with a top speed a fraction of a Mach number faster than we have specified."

Limited amounts of titanium or high-grade steel will be used to improve the aircraft's fatigue life and to reduce weight.

Regardless of whether the winning airframe design (the source-selection board has been in session since January 12 evaluating separately the airframe/systems integration and engine proposals) will be swing- or fixed-wing, the basic challenge as seen by General Glasser "will be to keep aircraft weight under control and to integrate all its systems without shortchanging any of the vital performance criteria. Once the aircraft is sized we simply see no way of retreating from the [empty] weight factor without sacrificing performance in range, payload, or by having to fly slower, all of which are unacceptable."

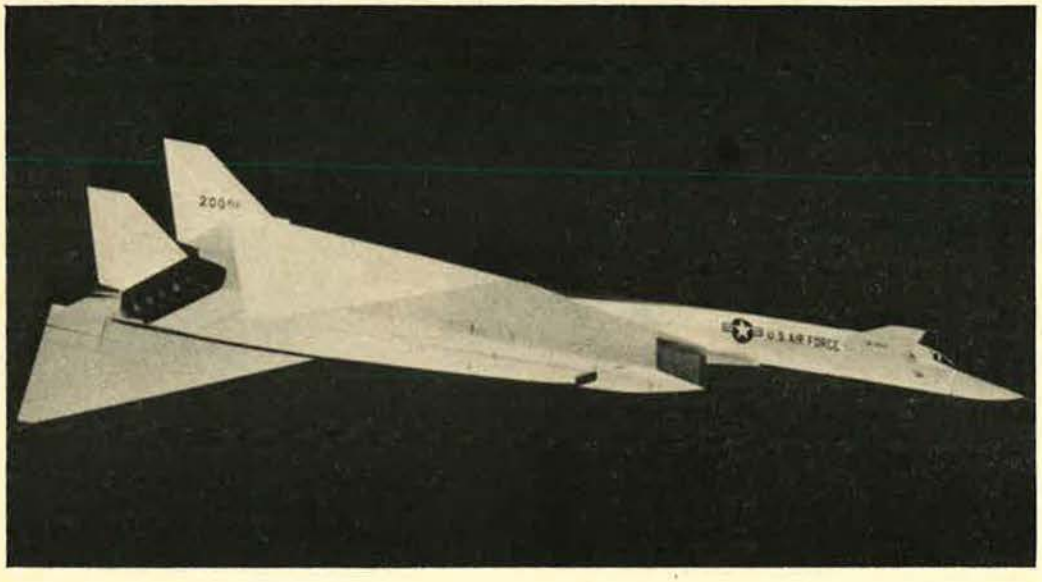
In line with stimulating the industrial contractors toward design ingenuity, a number of "trade-off" features (contractors proposing them have to demonstrate their cost-effectiveness) have been suggested, among them the so-called fly-by-wire principle that employs redundant nuclear-hardened electronic linkages to the control surfaces, instead of bulky, vulnerable hydraulic connections.

The source-selection criteria by which the competing designs are being judged fall into three basic areas: Soundness and adequacy of preliminary design concept and technical approach; soundness and adequacy of the acquisition and management program; and reasonableness and realism of cost proposals.

In terms of specifics, the following proposal areas rank high in importance: Technical competence; systems analysis; airframe design; performance; systems integration; avionics RFP; system development and test program; life support; mission suitability and effectiveness; configuration suitability and survivability; and—in the management area—schedule and critical milestones; and the contractors' facilities and relationship with subcontractors. Finally, the source selection will focus on cost to the government.

The B-1's Engines

The B-1's advanced technology engines, more efficient than any operational engine in terms of fuel consumption and the paramount thrust-to-weight ratio, will benefit from a continuous Air Force development effort, the advanced turbine-engine gas-generator program. Specifically, according to General Glasser, this advanced development program nurtured the now-



XB-70 Valkyrie, six-engine Mach 3 prototype aircraft designed and built by North American (now North American Rockwell) and powered by General Electric YJ93 engines in the 30,000-pound-thrust class, provided invaluable test and design information for the B-1 program. The B-70 program, while technically successful, was canceled because of the rigid, single-mission orientation of the basic design

defunct US/F.R.G. cooperative V/STOL fighter program with West Germany, which in turn gave rise to advanced engine developments from which both the B-1 and the new F-14B/F-15 engine developments branched off and profited.

The two competing contractors—General Electric and Pratt & Whitney—working under contract and in concert with the Air Force Systems Command's ASD Propulsion Laboratory, have built and run advanced turbofan engines tailored to the B-1 mission. One type of test engine employs the so-called duct-heating approach in which thrust augmentation takes place in the bypass air. The other is a mixed-flow type, which channels the combined core engine and bypass air flows into an essentially conventional afterburner. The primary advantage of duct burning is greater cycle flexibility. The advantage of mixed-flow is reduced infrared-detection possibility because such an engine emits relatively cooler air.

Because of the B-1's requirement for prolonged subsonic as well as supersonic flight, coupled with short-field takeoffs, a turbofan rather than turbojet is considered requisite. The bypass ratio, "somewhere between that of the F-15 engine under construction by P&W and GE's TF39 powering the C-5," will be closer to the former than the latter.

Air Force propulsion experts stated that because of reliability, maintainability, and basic cost considerations, the use of variable bypass ratios, or variable compression ratios technology is considered unlikely.

The engine contractor is scheduled to be selected simultaneously with the prime contractors on May 18. The decision to provide the engine as government-furnished equipment rather than leave the choice to the prime contractor was made because of cost considerations (primarily the fee-on-fee escalation that is incurred when the prime contractor acts as a middle man) plus the Air Force's extensive in-house capabilities and test facilities.

General Glasser stressed that, because the prime contractor specifies the interface accord outlining how propulsion systems—basically existing hardware—mate with the airframe, it is unlikely that problems encountered on previous development programs will be duplicated. Competing prime contractors have been asked to state an engine preference in their proposals, but what influence this factor will have on the Air Force's engine-contractor selection is unknown.

B-1 Avionics

As part of their proposals for the B-1's engineering development, the three competing prime contractors submitted their suggested RFPs to the electronics industry, including lists of companies to be solicited for the B-1's initial avionics package. With some exceptions, the avionics will be made up of contractor-furnished equipment.

The Air Force plans to leave contracting and management of the avionics acquisition to the contractor and will intervene only if the prime contractor makes a decision that is "obviously and egregiously wrong." The logic underlying the subcontractor approach, General Glasser said, "is the inherent difficulty of integrating the avionics into the airframe, which fundamentally affects the airframe's design." Especially in the ECM area, he said, "if the Air Force were to present the contractor with equipment which he can't readily incorporate and which, therefore, might not work, it would be next to impossible to establish who's at fault."

Now phasing out, the B-58 Hustler, a medium-size, medium-range deltawing bomber, entered SAC's inventory a decade ago, and had the kind of ride quality now sought for the B-1.

Upon award of the prime contract, the winning airframe manufacturer is to release his avionics RFP to the electronics companies selected by him and approved by the Air Force. These in turn have two months to prepare responses, and the prime contractor another month to select subcontractors and negotiate contracts. This procedure was instituted by the Air Force to prevent potential prime contractors from "teaming up, and to assure that there is open competition."

Complicating the picture is that in December 1969 Autonetics and IBM were awarded Air Force contracts to reexamine the requirements for the B-1's initial avionics package and to submit their recommendations to the Air Force by March 1970. These findings, following evaluation by the Air Force, will be used to amend the RFP that the prime contractor will release to the electronics industry, if necessary.

Because avionics requirements historically change more frequently and extensively than other subsystems, a two-stage approach is to be used. The initial production aircraft will carry only the initial avionics system keyed to the "currently visible" enemy threat but because of modular design will be able to be expanded to a much larger and more capable avionics system if and when that becomes necessary and feasible.

The airframe is designed from the outset to eventually accommodate an avionics system which in terms of weight would be about twice the initial avionics suit. (The B-52's avionics package grew about 500 percent over a period of years in weight requirements.)

The initial avionics package is to provide:

- Capabilities better than the FB-111 and B-52 taken together.
- Compatibility with standards of the Strategic Air Command.
- Capability to grow in performance, especially in the penetration-aids area.
- Accurate long-range navigation, terrain-avoidance,

(Continued on following page)

and weapon-delivery capability against strategic targets of any kind.

- Worldwide communication capability.
- Versatile digital-computer controls, including displays to facilitate the crew's job.
- Penetration-aid capabilities required for successful penetration of enemy defenses.

The electronic countermeasures (ECM) are to include barrage, noise, and deception jamming to span the entire electronic frequency spectrum. They are to degrade performance of hostile nonnuclear-armed SAMs to the extent that sufficient "miss distance" exists for the B-1 to survive.

All so-called mission-critical components, including the digital computer which programs the terrain-following operation as well as aircraft defense, are to be hardened against nuclear radiation, neutron flow, ionization, and electromagnetic pulse to standards more stringent than is the case with ICBMs.

Growth from the initial to the standard system will involve three specific areas:

- Lethal defense, mainly bomber-defense (air-to-air) missiles to be used against advanced, nuclear-equipped enemy defensive systems.
- New penetration-aid techniques as they become available, to counter enemy performance advancements.
- TACSAT airborne terminals to improve the B-1's worldwide communication capability through use of future military communications satellite links. (*See box on page 40 for advanced development efforts involving B-1 avionics.*)

Basic Contracting Approaches

The B-1's engineering-development (research, development, test, and evaluation—RDT&E) contract will be a cost-plus-incentive-fee (CPIF) instrument to avoid both the inflexibility and pitfalls of total-package procurement. This type of contract, General Glasser stressed, makes it possible for the Air Force as well as the contractor to initiate, subject to mutual accord, changes without cumbersome renegotiation. "CPIF contracts are tailored to an environment of change and therefore [are] ideal for programs with a heavy technology content such as the B-1," he said, stressing, however, that proposed changes will be "examined meticulously and critically because the Air Force plans to authorize or initiate only measures which will lead to cost savings in the replicative phase or are clearly necessitated by cost-effective technology advances."

He added that the Air Force, subject to satisfactory progress during the first half of the seven-year engineering-development phase, plans to launch full-scale production in about four years—early during flight-testing of the five test aircraft. (First flight will take place during 1974, assuming that the technical milestones which pace the RDT&E program are met on time.)

A production decision early during the flight-test program could lead to first operational availability of the B-1 in 1978, with significant numbers entering the inventory several years later.

The production contract, General Glasser said, will be a fixed-price instrument because "at the time we enter into it, we will have had four years of design-and-development experience behind us. We as well as the contractor will fully understand and have documentation of the cost factors connected with manufacturing the aircraft by virtue of the data and audits obtained during the development phase."

The Air Force is under no legal obligation to award the production contract to the company conducting the RDT&E program but, as General Glasser put it, "in a practical sense it would appear to be next to impossible that we could change teams in midstream."

Cost estimates regarding the engineering-development program, arrived at by the Air Force without benefit of contractor estimates, approach about $2 billion, not allowing for inflation. Based on an assumed production buy in excess of 200 aircraft (the final number will be set when the production contract is let), total program costs are expected to range between $12.5 and $13.3 billion in 1970 dollars. This includes aircraft costs, ground- and other support equipment as well as costs for ten years of operation. This places the B-1's unit flyaway cost at $24 million to $27 million. These estimates, Air Force spokesmen emphasized, are highly tentative and will not develop into "hard figures until the actual contracts are negotiated."

The Basic Management/Cost Challenge

The critical attitude toward defense procurement under which the armed forces have been living for a year or more, General Glasser stressed, "has made it very, very clear to all of us that excessive cost overruns and bad management simply cannot be tolerated by the Air Force.

"Under the new management [of DoD], we won't have any excuses because we [the Air Force] are solely responsible for Air Force programs. We are being given a chance to do the whole job ourselves. So from now on any performance or price factors, which we formally submit and on the basis of which program go-ahead is granted by DoD, will have to be lived up to or our feet will be held to the fire.

"These conditions impose on all program personnel the unequivocal obligation to communicate all uncertainties to their superiors and, from there, to the Chief of Staff, the Secretary of the Air Force, and so on up the line, because you can't expect management to pledge its soul concerning system performance without knowing all the relevant contingencies. What is called for is total candor, in spite of the fact that it is hard to achieve because of the natural tendency to shrug off difficulties with the assumption that they will be solved in short order. But even after applying total candor about all uncertainties, we remain confident that we should go ahead with the B-1 program and accept the management challenge we face. In the interest of national security, we strongly believe the B-1 is needed as a replacement for our aging bomber force and, therefore, have a great incentive to do a good management job."

Because of the amount and quality of "homework" done by the Air Force and industry, USAF's new strategic bomber should be able to look forward to a service life at least as long and productive as that of the venerable B-52 it is to replace.—END

The strategic bomber adds to the credibility of US deterrence in several frequently discussed ways, and in at least one that has had remarkably little attention. Recent Soviet technical developments and a new definition of US deterrent strategy combine to enhance the value of . . .

The B-1—Blue Chip in The Deterrent Stack

By John L. Frisbee
SENIOR EDITOR/PLANS AND POLICY

THE B-1, USAF's heavy-bomber candidate to replace the B-52, was conceived in 1963 as AMSA (Advanced Manned Strategic Aircraft). Ever since, there have been almost continuous attempts to destroy it in embryo.

The B-1 has been attacked on grounds of nonutility, marginal utility, and disutility. Its critics have ranged from Whiz Kids to members of Congress to intellectuals of the campus, the think-tanks, and the mass media. Their analytical methods cover the spectrum from slip-stick and computer to gut reaction. Notably—almost uniquely—the opposition has included no military men of renown from any of the services. The B-1 has been more than thrice-blessed by the Joint Chiefs of Staff.

Not even the most dedicated B-1 opponent has questioned the ability of the US aerospace industry, with the technology of the 1970s, to build a better bomber than the B-52, basically a product of the early 1950s. Rather, B-1 critics have questioned the rationale underlying the requirement. Their key question has evolved from, "Will we need *this* bomber ten years hence?" to "Will we need *any* bomber by the end of the decade?"

So far, a majority of legislators has answered "Yes" to both questions, or has at least been unwilling to say "No" to either. And so the B-1 has survived. In mid-May a prime contractor will be selected to produce five prototype and two test models. If all schedules are met, the first true strategic bomber to be developed in this country in nearly two decades will fly in 1974. This says much for the viability of a concept that has been under siege for seven years.

But the B-1's greatest battle is yet to come—the fight for a go-ahead on production. If that battle is won, the new bomber could begin to join SAC's operational forces in 1978. By that time, the newest B-52s—the G and H models—will be from sixteen to eighteen years old. Their maintenance and modification costs, though not precisely predictable, are bound to be extraordinarily high.

The B-52 could, certainly, be kept operational for another ten years—perhaps longer—if we were willing to pay the cost. But how effectively it could penetrate Soviet defenses a decade from now is quite another question.

Visualize the odds against the B-36 (the newest of which would have been sixteen years old in 1970) in penetrating today's Soviet defenses. The performance gap between the B-36 and the B-52H is comparable to that between the B-52H and the B-1. And a weapon system that will not perform creditably *in* war is not a credible deterrent *to* war.

This brings us back to the key question, "Will we need *any* bomber by the end of the 1970s?" It is primarily a conceptual—not a technical—question. The answer will be affected by economic considerations (how soon and how many), but, fundamentally, a decision must be based on need.

The question of need has to be examined in the context of US defense strategy, which is in a state of transition. During most of the past decade, our strategy has been to deter nuclear war by Assured Destruction—the ability of US strategic forces to survive an enemy attack, and in retaliation cause unacceptable damage to the aggressor. A corollary of Assured Destruction has been Damage Limitation, or the capacity to hold down

(*Continued on following page*)

the level of damage an attacker could inflict on this country. Damage Limitation received considerably less attention than Assured Destruction. Until recently, we have not had the technical means to defend against enemy missiles or to construct bomber defenses that promised to stop a high percentage of attacking aircraft.

Assured Destruction was achieved through a combination of land-based missiles, sea-based missiles, and bombers. As the missile forces grew in size and reliability, the bomber was thought by earlier Administrations to contribute less and less to deterrence. Bombers took several hours longer than missiles to reach their targets. The bomber was believed easier to defend against, and to some it appeared needlessly duplicative of the destructive capacity of the missile forces.

Nevertheless, a reduced number of bombers was retained in the deterrent forces as insurance and because of certain characteristics unique to the bomber. It could, for example, be used effectively in a show of force, as in the Cuban missile crisis. It could carry much larger weapons than missiles, and was acknowledged to be useful against very hard targets that could not be destroyed by smaller warheads delivered less accurately by missiles. In this respect it provided a Damage Limitation dividend, as a counterforce system to be employed against hardened enemy missiles that might be held in reserve after an initial attack. The bomber also could be launched on ambiguous warning and recalled if the warning proved to be false. And the continued existence of US bombers forced the USSR to invest heavily in air defense systems, presumably diverting resources that might otherwise be used to build stronger offensive forces. Finally, the bomber force was regarded as a hedge against Soviet technological breakthroughs that might cancel or reduce the value of our missile forces.

All of these reasons for keeping the bomber alive and well were valid. And they will remain valid, along with other bomber contributions to deterrence, which will be noted later.

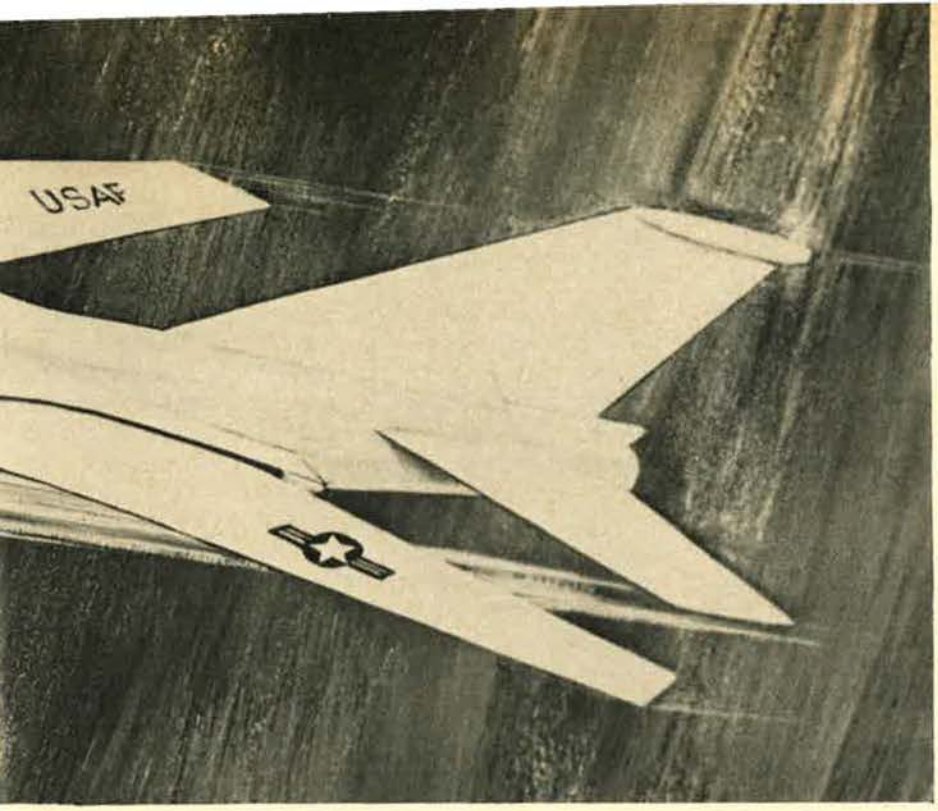
Nevertheless, many—probably a majority—of those who believed the bomber only marginally useful were convinced that a relatively low level of US Assured Destruction capability (perhaps twenty to twenty-five percent of the Soviet population and industry) was enough to deter nuclear war regardless of how many Americans might die in a Soviet attack on this country. Therefore, they questioned the need for *any* bombers and rejected the requirement for a new bomber to replace the B-52. This rejection has come to a head at a time when the bomber has, in fact, assumed more, rather than less, importance. The reasons relate both to strategy and to conceptual changes caused by technology.

For many months the Nixon Administration has been conducting an exhaustive study of national-security policy and strategy. There have been vague but persistent rumors that the President intended to revive a strategy resembling the "Massive Retaliation" of the Eisenhower-Dulles years, though it was difficult to understand the feasibility of such a strategy in view of the size and sophistication of Soviet strategic forces.

The first comprehensive, but still general, statement of the new Administration's defense policy was contained in President Nixon's "State of the World" message to Congress—UNITED STATES FOREIGN POLICY FOR THE 1970s: A NEW STRATEGY FOR PEACE. Many questions were left unanswered, but the message roughed in a nuclear strategy that is neither Massive Retaliation nor Assured Destruction at a minimum level.

Several passages in the President's message are pertinent to the future makeup of our strategic force. (*Italics have been added.*)

> . . . the overriding purpose of our strategic posture is political and defensive: to deny other countries the



In three wars, no major USAF bomber mission has been turned from its target by enemy action. The B-1, with its high speed, high/low altitude capability, and sophisticated penetration aids, promises to insure that proud tradition—if enemy aggression should trigger a war—for at least a decade after it joins the SAC deterrent forces in 1978. But the likelihood of deterrence failing will be greatly reduced by the B-1's ability to survive an attack and reach enemy targets with an impressive array of missiles and bombs.

ability to impose their will on the United States *and its allies* under the weight of strategic military superiority. We must assure that all potential aggressors see unacceptable risk in contemplating a nuclear attack *or nuclear blackmail or acts which could escalate to strategic nuclear war,* such as a Soviet attack on Europe.

* * *

For the foreseeable future Europe must be the cornerstone of the structure of a durable peace.

* * *

. . . our NATO allies . . . view the US commitment to deter Soviet aggression as being based mainly *on our maintenance of a powerful strategic posture.*

* * *

The United States will keep all its treaty commitments. We shall provide a shield if a nuclear power threatens the freedom of a nation allied with us, or of a nation whose survival we consider vital to our security and the security of the region [referring to Asia] as a whole.

* * *

[*And in the section on General-Purpose Forces*]: The prospects for a coordinated two-front attack on our allies by Russia and China are low because of the risks of nuclear war and the improbability of Sino-Soviet cooperation. *In any event, we do not believe that such a coordinated attack should be met by US conventional forces.*

A US strategic posture adequate to prevent other countries from imposing their will not only on us, but on our allies, must meet two tests if it is to be credible to a potential aggressor. First, it must leave no doubt in his mind that the US would emerge from a nuclear exchange with some relative advantage over the attacker, in a position to defend itself against third nations, and able to recover more rapidly than could the attacker. Second, other nuclear powers must believe it a reasonable possibility that the US would take some form of positive strategic action against them if they were to threaten really vital US external interests. Such a US force should have a stabilizing influence because of its multiple deterrent effect and since it could not be used rationally to initiate unprovoked aggression.

The strategy outlined in the President's message will require relatively large and versatile strategic forces, including a bomber that can retain its effectiveness well into the future. Also, some of the Soviet technological advances that the bomber has helped insure against have actually occurred. Since they threaten principally the effectiveness of US strategic missiles, they have the effect of enhancing the value of the bomber as a deterrent system. For example, the security of our land-based missiles is sensitive to the accuracy and warhead yield of enemy missiles. The unexpectedly rapid expansion of the Soviet missile force—particularly of the very accurate SS-9, which can carry a twenty-megaton warhead or three five-megaton weapons—is a real and present threat to American ICBMs.

The invulnerability of our sea-based missiles is sensitive to enemy antisubmarine warfare. In his Fiscal Year 1971 Posture Statement, Defense Secretary Melvin R. Laird stated that our Polaris submarines are still invulnerable, but that he could not guarantee continued invulnerability beyond the next five to seven years. For that reason, advanced developmental work was proposed on the Underseas Long-Range Missile System (ULMS), which would enable our missile-carrying submarines to operate in a vastly larger ocean area and still hit targets in the USSR or China.

The now-modest Soviet ABM system has an undetermined growth potential, and hence poses a future threat of uncertain proportions to both land-based and sea-based missiles. While ULMS will increase the Soviet problem of *detecting* US missile submarines, the longer flight time of ULMS probably will simplify the

(*Continued on following page*)

Soviet ABM *defense* problem so far as submarine-launched missiles are concerned.

In view of these Soviet counterforce developments, it would be a dangerous risk to allow the bomber element of the US strategic forces to deteriorate through obsolescence.

One of the bomber's greatest values as a deterrent has been given all too little attention. The bomber, in combination with missile forces, creates an almost impossible timing problem for an enemy planning an attack on the US. Put yourself in the shoes of the Soviet tactician considering a first strike to disarm the United States. The situation might look something like this:

Any one of the three US strategic systems, if used independently of the others, can cause an unacceptable level of damage to the USSR. For a surprise attack on the US, I must, therefore, plan it so that his missiles and bombers are reduced in effectiveness to a point where my defenses can handle them. It's particularly important that I get his bombers, since I want to hit only military targets. The bombers, because of their accuracy and high-yield weapons, have by far the best capability to hit my own hardened or mobile military targets in return. If I knock out the US bombers, the American President's options are reduced pretty much to attacking my cities with missiles. It then becomes a war against populations—a hard choice for any President. He may prefer to negotiate with us. How shall I plan my attack?

- Now, US officials have said that they will not fire their missiles at my country until one of my warheads has actually exploded over US territory. It's reasonable to assume they mean this. Launching missiles on warning that may be ambiguous—perhaps even false—is simply too risky for them.
- I'll use my land-based ICBMs with high-yield warheads against the hardened US land-based missiles. My submarine-launched missiles (SLBMs) are shorter range, less accurate, and have smaller warheads, but they will do very well to destroy his bombers if I can catch them on the ground.
- The US Ballistic Missile Early Warning System (BMEWS) gives the Americans about twenty minutes' warning of attack by my ICBMs. Other US warning systems can pick up my SLBMs five to ten minutes before impact on SAC bases.
- I'm going to optimize my surprise attack so my ICBMs will *arrive* over the enemy's missile silos at the same time my SLBMs hit his bomber bases. But wait a minute. That won't work. His radars will pick up my ICBMs even before I launch my SLBMs from a few hundred miles off the US coast. He'll flush his bomber force under positive control and, after my missiles have exploded over US territory, he'll give his bombers a go-ahead. And his surviving missiles, too.
- Let's try it the other way. I'll optimize my attack against his bombers. I'll have to launch SLBMs and ICBMs for simultaneous *detection* by the US so as to not flush his bombers on warning. But that won't work either. If all goes very well for me, US radars will detect my SLBMs five to seven minutes from the most exposed SAC bases. Simultaneously, his BMEWS radars will see my ICBMs about twenty minutes' flight time away from US missile sites. That leaves the Americans twenty minutes to alert their National Command authority and maybe fifteen minutes after my first SLBM detonates over a SAC base to make a final decision, transmit orders, and launch their ICBMs.

Let's leave the Soviet planner with this dilemma. It will get worse for him when our satellite warning systems are perfected and when the B-1 becomes operational, with its faster reaction time, ability to disperse widely—even to highways if necessary—vastly improved penetration capability, and varied load of stand-off and gravity weapons.

Several leading B-1 opponents have suggested that our need for a bomber may be obviated if the US adopts a policy of launching missiles on warning of an attack. That proposition can be put in a different way. If we do not have a bomber with a credible ability to penetrate Soviet defenses, *we would have to* launch missiles on warning, accepting the horrifying possibility, however remote, that the warning might be fallacious. That is a sobering thought.

Another plus for the strategic bomber is its usefulness in limited conventional warfare, as the B-52s have proved in Vietnam. Where heavy, concentrated firepower is needed, there is no substitute for the big bombers. The B-52s have had no fighters to contend with and very little ground-to-air opposition. But equally ideal conditions will not always be present. The B-1's supersonic speed, low-altitude capability, and advanced electronics will allow us to continue to use heavy bombers in a far less permissive conventional-war environment if future contingencies demand it.

But the B-1, a sophisticated and expensive aircraft, can be justified only if it makes a major contribution to the primary task of our strategic forces—deterrence of attack on the US and our allies.

The fundamental question, "Will we need *any* bomber by the end of the 1970s?" has been answered affirmatively by the Nixon Administration. So, it appears, has the next logical question, "Will we need *this* bomber—the B-1?" An economy-minded Administration is not likely to endorse a nearly $2 billion investment in developing and testing the prototype of a system unless it believes that system essential to national security. A reversal by DoD is unlikely unless there should be a gross reduction in the Soviet/Chinese threat, perhaps as a product of the SALT talks. The decisive arena has shifted from DoD (until two years ago strongly anti B-1) to Congress (until two years ago overwhelmingly pro-B-1).

In his "State of the World" message, President Nixon said:

> Because planning mistakes may not show up for several years, deferral of hard choices is often tempting. But the ultimate penalty may be disastrous. The only responsible course is to face up to our problems and to make decisions in a long-term framework.

There is no decision on weapon systems to which that warning applies more pointedly than to the B-1.

—END

If you give a man a fish, he will have one meal. If you teach a man to fish, he will eat all his life. . . ." This was the credo behind the community action programs set up by the Air Force's first full-time, full-tour Civic Action officer in South Vietnam . . .

How Captain Blair Helped People Help Themselves

By Sgt. John W. Gunkler, USAF

"IF you give a man a fish, he will have one meal. If you teach a man to fish, he will eat all his life."

This proverb from the Oriental philosopher Kwan Tzu summarizes the idea Air Force Capt. Richard S. Blair brought to his job as the first full-time, full-tour Civic Action officer in Vietnam.

Now Director of Administration for Hq. Aerospace Rescue and Recovery Service (ARRS), Scott AFB, Ill., Captain Blair operated from Bien Hoa AB, Vietnam, during 1967.

From the outset of his tour Captain Blair intended that the generosity of US servicemen and the American people back home, who contributed more than 120 tons of commodities to hospitals, schools, orphanages, and refugee camps in Bien Hoa Province during his year there, would be used to the best advantage of the Vietnamese people.

To assure this, Captain Blair insisted that the Civic Action office align itself "only with those people who would help themselves"—no glib phrase, but an absolute working philosophy.

Volunteers from Bien Hoa often went into Cong Thanh, Duc Tu, and Tan Uyen districts, tools in hand, to aid building projects. But if the local villagers did no more than squat in the shade to watch, the US servicemen moved on to some other project.

In other cases, volunteer civic action teams col-

(Continued on following page)

At first, before the self-help concept jelled, the tendency was for the Americans to do the work, as Captain Blair (in T-shirt, foreground) and his men did during their first civic-action project—construction of a chicken coop. But it soon became clear that for civic-action programs to have real meaning, the Vietnamese needed to do the jobs themselves.

The medical civic action program (MEDCAP) provides much-needed medical help for villagers in remote areas of Vietnam. If you bring in the needed skills, you can set up a clinic anywhere, anytime. Here an Air Force medic checks a child's throat in a Bien Hoa provincial village. The self-help concept includes, besides actual examinations and care, instructions in hygiene and basic preventive medicine that villagers can put to work on their own.

lected discarded bomb crates and took them to villagers needing wood to build homes. When a team returned to check the villagers' progress, it often found some villagers had used all the wood given them while others hadn't even gone to the trouble to break their crates apart. The hard workers were given more wood.

With thirty-five to forty projects going on at all times, Captain Blair explained, there were always willing Vietnamese who could use help. "I didn't intend to cultivate any sort of 'rice Christians,' " he said wryly.

With little precedent to guide him, Captain Blair had to rely on his background in education and administration, as well as on his conscience. In his view, the purpose of the often misunderstood—and sometimes maligned—Civic Action program was to help the Vietnamese people build a workable society.

In Bien Hoa province, the people were unused to (or else alienated from) an orderly way of life. Refugees from the war-torn Mekong Delta emigrated north, and refugees from Communist terrorism fled south into Bien Hoa. Many had known only hand-to-mouth existence, where the craftiest and most selfish survived.

They had never known or had long forgotten necessities of civil management such as adequate channel of self-government, cooperation with neighbors to reach community goals, or trust in civic leadership.

It was evident to Captain Blair that encouraging refugees to depend wholly on American aid could not be the role of Civic Action. The Air Force officer encouraged them to solve their own problems through the community structure, but at times he had to provide help.

Subsistence above starvation level, good health, sanitation and cleanliness, and education—these were the foundations Captain Blair sought to provide through the offices of established village leaders.

Soap, books, scrap wood, used clothing, captured Viet Cong rice, and toys for the children were part of the supplies given to the village leaders for distribu

Kids are kids anywhere and they like getting gifts. The kids in the Mau Tam Orphanage in Bien Hoa province gather here like bears around honey to get soap, clothing, food, and candy from SSgt. Dick Charest. Units in the area needed little urging to make visits to village schools, orphanages, and remote villages to bring gifts and friendship to the youngsters.

ion. With the gifts, however, there went one admoni-ion: "Give this to the people for their use. Do not ell it."

Since the village leaders were encouraged to make heir own decisions, complaints about the equity of listribution were taken to them for settlement in the ocal community rather than distantly. The Civic Ac-ion office's only further involvement was to keep lose check to see that the local leaders were honest in nanaging the material given them.

One of Captain Blair's most successful Civic Action rograms was an example of local initiative in solving community problem—the construction and operation f Thang Long School, in the village of Tam Hiep.

A local Vietnamese teacher, Nguyen Xuan Tho, or-anized the school because the regular public school vas too small to handle the many elementary and unior-high-school youngsters who thronged into Tam Hiep as refugees. Tho hired several local teachers, vhose salaries he paid by charging tuition, but his reatest concern was the lack of classrooms. Captain Blair's office learned of the problem.

Education was a project already dear to the Civic Action men. More than forty Air Force volunteers vere teaching conversational English to 400 Viet-amese teen-agers at the Ngo Quyen High School in Bien Hoa. So it was not unusual that Captain Blair vas determined to help the Thang Long School.

He arranged for scrap wood from bomb crates to be aken to Tam Hiep, with a suggestion that Tho sell half o provide money for the main timbers of his school ouse. Captain Blair did not volunteer men to build he school, for he knew that if the villagers themselves ndertook the project, the Viet Cong would be less kely to burn the building. He was also confident that uch a project would help instill in the Vietnamese a ealthy pride of ownership and a sense of responsibility or the school's success.

Tho hired more teachers to handle the expected iflux of students; and teachers, parents, villagers, nd the school's Boy Scout troop pitched in to build ie school.

Education, even at the grass-roots level, requires oney. More than $12,000 was donated by Bien Hoa ase personnel to the "Dollars for Scholars" scholar-ip program set up for the school. Tuition was made ailable for 515 refugee students at the school.

In return for tuition grants, Tho demanded that ch student sign a statement promising to attend class id be diligent in his studies. Disciplinarian Tho also sisted that each student maintain a monthly B aver-e if his scholarship were to continue.

Each month the donors from the base visited the hool to meet with the students and give them the xt month's tuition. The students then carried the oney to Tho, their "principal." This brought home the students the personal involvement of their bene-

And fathers are fathers anywhere—even for a day. On "Papasan" day at Bien Hoa province, Captain Blair and his men gave of their affection to orphans who needed it.

factors and emphasized the students' own participation in the proceedings.

Gen. William W. Momyer, then Seventh Air Force commander, called the scholarship program one of the first truly long-lasting Civil Action projects to be initiated. He suggested all Air Force units in Vietnam establish such programs.

There can be no stopping a determined people, and at times there is no holding in check the generosity of US servicemen, especially if children are involved. One such burst of generosity at Bien Hoa culminated in the celebration of a uniquely American holiday—Father's Day.

"Operation Papasan" provided an Air Force father-for-a-day to all fatherless children in the area. Father's Day morning saw men from every squadron at Bien Hoa head for an orphanage, hospital, or refugee camp. Each "dad" had his pockets full of presents—picture books, pencils, dolls, and that notorious child-spoiler, candy. The happy shouts that welcomed them broke the language barrier.

This sort of spontaneous generosity is sometimes hard for the Vietnamese to understand, after their long trial of war and deprivation. For example, Captain Blair once spent a long session with the mother of a Thang Long student, trying to explain the scholarship program. The woman insisted he tell her what was expected in return.

The Air Force captain carefully explained to her that the men at Bien Hoa loved children, that many of them were themselves fathers who had been away from their own children for many months. He told the woman that the only reward the Americans wanted was the deeply personal satisfaction that comes from seeing a happy child—equipped with a proper education and the hope and promise that learning offers.

When the woman finally understood what Captain Blair was talking about, tears of joyous disbelief welled up in her eyes. That, Captain Blair said later, was one of the most moving moments of his military career.

"If you teach a man to fish. . . ."—END

---

e author, Sgt. John W. Gunkler, is an Information chnician at Hq. Aerospace Rescue and Recovery Service, Scott AFB, Ill. A 1968 graduate of the Defense Infor-tion School, he attended the University of Michigan for ee years. He has asked that his check for this article be t to Bien Hoa for use in civic action projects.

A Presidential Commission, headed by former Secretary of Defense Thomas S. Gates, has recommended the creation of an all-volunteer military force and has proposed a set of policies to help bring about such a change. Veteran military writer Lou Stockstill reports on . . .

An All-Volunteer Force

The Plans . . . The Prospects . . . The Problems

By Louis R. Stockstill

CREATION of an all-volunteer military force, as recommended by a special Presidential Commission, would have far-reaching implications for everyone on active duty, as well as Reservists, retirees, and dependents.

The Commission, headed by former Secretary of Defense Thomas S. Gates, has called for an end to the draft, and for immediate and substantial pay raises for first-term officers, and first- and second-term enlisted men.

Of equal or greater interest to the present career force, the Commission report also endorses:

- Adoption of a military "salary" system for all those in uniform.
- Modification of the present retirement system, to include "vesting" privileges for officers and enlisted (equivalent to those provided Civil Service employees).
- Increased hostile-fire pay ($200 per month).
- Substitution of a substantial number of civilians for officer and enlisted personnel. ("The potential is greatest in the Air Force" where it was estimated that some 11,000 officer billets and 72,000 enlisted spaces could be civilianized.)
- Expenditure of additional service resources on recruiting (keeping top recruiters longer in such assignments and improving their incentives with extra pay, bonuses or accelerated promotion).
- Major upward-revision of "special pay" for military physicians (to $12,600 per year extra, after eight years' service).
- Possible "civilianization" of military hospitals, or adoption of a broader civilian medical-insurance program for some portion of the retired and dependent population.
- Provision of $35,000 "stipends" to medical students over a seven-year period, in exchange for three years' active duty as military physicians. ("If the draft is eliminated, dramatic action will be required to insure the continuation of health care now provided.")
- Reorientation of the active Reserve to reduce the number of men in paid drill status, increase the pay of those remaining, and recruit more Reservists from "younger, less well-educated groups."

These are some of the highlights of the Commission's 211-page report, soon to be supplemented by a volume of "background studies."

The fifteen-member group, aided by a staff of fifty-one, began work last May after President Nixon announced that he had "directed the Commission to develop a comprehensive plan for eliminating conscription and moving toward an all-volunteer armed force." The Chief Executive also told the group to "determine" what standby draft machinery would be required in a national emergency and asked Commission members to "give serious consideration" to Reserve requirements.

In handing the Commission findings to the President Mr. Gates said the group unanimously concluded "that the nation's interests will be better served by an all-volunteer force, supported by an effective standby draft; . . . that steps should be taken promptly to move in this direction; and that the first indispensable step is to remove the present inequity in the pay of men serving in their first term in the armed forces."

The pay increases recommended for the first-termers will approximately double the amount enlisted men now receive and give officers a twenty-eight percent boost in basic pay during their first three years of service. The Commission recommends that the new rates take effect on July 1 of this year.

Total estimated cost of the proposal—based on a 2,500,000-man force—would be $3.24 billion, of which the government would recover about $540 million in taxes for a net budgetary cost of $2.7 billion for Fiscal '71.

Increases in basic pay would total $2.68 billion. In addition, $210 million is earmarked for proficiency pay, $150 million for the Reserves, $120 million for the Medical Corps, and $80 million for recruiting, ROTC, and the like.

For a force of 2,500,000 men, the Commission said costs would drop to about $2.1 billion beginning in Fiscal '7

The study, however, makes "no allowance for inflation."

In moving to an all-volunteer force, the Commission said it would be helpful to:

- Extend "skill" pay differentials to first-termers.
- Provide "pro-pay" for men in critical occupations after satisfactory completion of advanced training.
- Offer higher grades upon service-entry (and speedier promotion thereafter) to those with special skills or unusual aptitudes.
- Eliminate present obligated terms of service for enlisted personnel.
- Expand programs giving enlistees a choice of occupation as a condition of enlistment.
- Institute more "lateral hiring" (taking skilled civilians into the service at ranks commensurate with their training and experience).
- Extend family travel allowances and dislocation allowances to all enlisted personnel.

By thus improving pay and conditions of service, the Commission said it should be possible to meet armed forces manpower requirements on a strictly volunteer basis.

The Commission's rationale: Since a volunteer force would reduce personnel turnover, not more than 325,000 men would have to be enlisted annually to keep 2,500,000 in uniform. Because 250,000 (or about half) of those enlisting annually in recent years are "true volunteers" who would have joined military ranks even without the draft, the annual enlistment deficit is only 75,000. "Reasonable improvements in pay and benefits in the early years of service," the Commission said, "should increase the number of volunteers by these amounts."

Present physical, moral, and mental requirements would be retained, but the services would be expected to continue accepting up to twenty percent of enlistments from the lowest (Group IV) mental group.

Observing that the US "has relied throughout its history on a voluntary armed force except during major wars and since 1948," the Commission said, "a return to an all-volunteer force will strengthen our freedoms, remove an inequity now imposed on the expression of the patriotism which has never been lacking among our youth, promote the efficiency of the armed forces, and enhance their dignity."

The Commission said the volunteer concept provides a "system for maintaining standing forces that minimizes government interference with the freedom of the individual to determine his own life in accord with his values."

Although the Commission made numerous calculations for varying strength projections for an all-volunteer force (2,000,000 men, 2,250,000, 2,500,000, and 3,000,000), the 2,500,000-man force was utilized most frequently in illustrations.

This force would not literally consist of two and one-half million military bodies, however. The Commission said it could save 60,000 spaces as a result of reduced travel, training, and separations, and still have a force that would be as "effective" as a 2,500,000-man military organization utilizing the draft.

Civilian Substitution

Further reductions would be made through civilian substitutions, once post-Vietnam force levels have been achieved. The Commission said the substitution program should be "initiated and carried out over a three- to four-year period." For a 2,500,000-man force, the "substitution potential" for each service would be as follows:

Service	Officer	Enlisted
Army	6,600	0
Navy	6,200	10,800
Air Force	11,300	72,200
Marine Corps	800	8,900

Thus, the 2,500,000-man force would shrink to 2,440,000 with the 60,000 spaces saved by reduced travel, training, etc., and to 2,323,200 with the substitution of civilians for 24,900 officers and 91,900 enlisted men.

Officer Procurement

Although most officers have been recruited from among college graduates in recent years, the Commission said this "somewhat arbitrary" action stemmed partly from a favorable, draft-produced recruiting climate. Under the volunteer concept, the Commission assumes that ten percent of the officers entering the service would not be college graduates.

At the same time, the Commission made the assumption that ROTC "will continue to be the major source of new officers for the Army and Air Force." And the report endorses a $25 million to $30 million program to boost ROTC scholarships to 10,000 annually for each service—almost double the number now available.

But since "fewer students" are likely to enter ROTC, particularly in the first two years after adoption of the volunteer concept, the Commission said many schools may have to drop ROTC, thus making it advisable to establish "area training centers."

The Commission also made these comments about other officer-procurement programs:

- Serious consideration should be given to increased use of scholarship and nonscholarship Reserve Officer Corps and Platoon Leaders Class (PLC) type programs.
- The services will "doubtless" seek to attract "somewhat older civilians who desire to enter specialized and less physically demanding branches."
- Advanced officer grades should be given to civilians commissioned in noncombat skills.
- Greater use can be made of warrant officers, limited-duty officers (LDOs), and temporary officer grades.
- "If difficulty is experienced in recruiting new college-graduate officers, . . . serious consideration should be given to expanding the noncollege officer-commissioning programs."

Standby Draft

In the event of an emergency after a volunteer force is in effect, the Commission recommended "standby" draft machinery that would provide (1) a register of draft-eligible males; (2) a system for selecting inductees; (3) procedures for notification, examination, and induction; (4) an administrative organization; and (5) a requirement that the standby system could be invoked only by Congress at the request of the President.—END

. . . AND COMING IN JUNE

Only the highlights of some of the more significant features of the recommendations of the President's Commission on an All-Volunteer Armed Force are offered on these pages. A more detailed and analytical survey of the Commission report will appear in the June '70 issue of AIR FORCE/SPACE DIGEST. The longer analysis will also be written by Louis R. Stockstill, the author of the special report on American prisoners of war, which appeared in the October '69 issue of this magazine.

Blue Steel to Blowpipe

The British, whose aerospace skills have always been recognized as first-rate, have managed to develop a broad array of missile weapon systems—some of which have attracted the interest of and been put into service by other nations' forces. Here's a special report on . . .

BRITISH MISSILES
A Versatile Armory

By Stefan Geisenheyner

AIR FORCE/SPACE DIGEST EDITOR FOR EUROPE

WHEN German V-1 and V-2 weapons became operational in 1944, England became the world's first nation to experience attacks by modern missiles. The V-1, a simple drone with a high-explosive warhead, was potent, but Britain's conventional defenses were effective against it. No defense was possible against the second weapon, the V-2—the world's first ballistic missile.

The collapse of the Third Reich saved British cities from extensive damage. The seriousness of ballistic missiles' potential threat provided the basic postwar incentive to embark on a wide-scale, guided-weapon program that eventually gave British forces adequate defensive and offensive missile capabilities, though they were not carried to operational status in some cases.

Sometime in the mid-1950s, Britain's first modern missiles underwent testing or became operationally ready. These weapons differed considerably from their US contemporaries because British designers pursued concepts of their own. For example, the RAF's first-generation air-to-air weapon, the Fireflash, used two strap-on boosters that brought the unpowered core containing the guidance package and warhead to operational speed. The boosters were jettisoned after burnout, allowing the missile to coast to its target.

The same missile incorporated a guidance package containing a very advanced beam-riding homing head. The application of ramjet propulsion, a field in which Britain excels, was and is widespread. It can be assumed that the largely secret guidance methods also were developed independently of outside sources.

The Decision of 1957

A turning point for the British missile industry came in 1957 when Duncan Sandys, then Britain's Minister of Defense, in a major policy decision, downgraded the role of manned aircraft and entrusted the primary defense of the Commonwealth to guided missiles.

This fateful action was based on the promising performance of missiles in the air defense role and the good progress made in constructing long-range ballistic missiles. Thus, at the end of the 1950s, Britain's missile production program covered the whole range of modern guided weapons, from intermediate-range ballistic missiles (IRBMs) right up to wire-guided antitank weapons.

In retrospect, Mr. Sandys' decision proved a disaster. Many promising aircraft projects were canceled or stretched out, and the RAF's flying commands still have not fully recovered from the blow. Early in the 1960s it was concluded that an effective defense could not be mounted without modern fighters and their associated command centers. Furthermore, it began to be accepted that a credible strategic deterrent could not rely only on missiles (which then were not hardened,

were liquid fueled, and were slow to react) and that, to achieve maximum flexibility, retention of manned bombers was mandatory in the overall defense effort.

For financial reasons it proved impossible for the British government to pursue the ambitious missile program simultaneously with a crash program initiated to regain lost ground in advanced aircraft development. As a result, the offensive missile programs were canceled. This included British Aircraft Corporation's (BAC) Blue Water, a highly mobile medium-range missile, and Hawker Siddeley Dynamics' (HSD) Blue Streak, an IRBM. Work on the latter had progressed to the point that the weapon could be offered to the NATO-affiliated European Launcher Development Organization (ELDO) as first stage for the then-planned Europa satellite launcher. It actually fills this role today and represents the basis for Europe's ambitions in space exploration.

Blue Steel

However, if British foreign policy were to be effective, a credible nuclear deterrent was required. Thus, Britain decided to participate in the US Air Force's ill-fated Skybolt air-launched ballistic missile (ALBM) program. When this program was canceled by President John F. Kennedy in 1962, the RAF found itself without the means for a future long-range nuclear capability. This led to the large-scale introduction of the Blue Steel air-launched standoff missile, originally developed as a stopgap weapon until Skybolt became operational.

Built by HSD, Blue Steel became fully operational in 1963 and gave a new lease on life to the RAF's jet-bomber fleet. The weapon carries a thermonuclear warhead and can be launched from low-level flight at targets more than 200 miles distant. The liquid-propelled missile is guided by an inertial system impossible to jam. Though most of Blue Steel's performance and weight characteristics are classified, it is public knowledge that evasion courses and altitude changes can be preprogrammed into the weapon's guidance system.

Supersonic speed at all flight levels gives Blue Steel a high survival rating in a hostile environment. For nearly eight years Britain's only strategic weapon, Blue Steel has been backed up since 1969 by Royal Navy nuclear submarines armed with US-developed Polaris ballistic missiles. After cancellation of domestic offensive missile programs, British industry concentrated on air defense guided weapons both for naval and land-based use, short-range air defense missiles, and air-to-air weapons. In all these sectors, remarkably efficient weapons were developed and mass-produced.

Firestreak

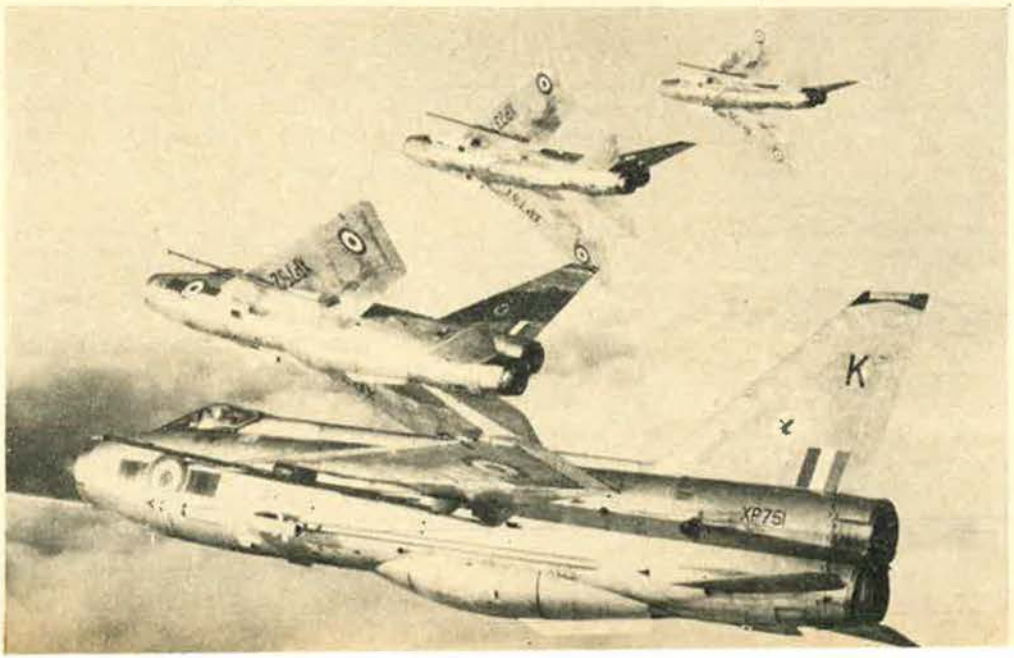
HSD has produced all British air-to-air missiles in service with the RAF and some foreign customers today. Building on the extensive experience gained with construction of a variety of infrared (IR) guided missiles, the firm developed the then very advanced Firestreak weapon system which, through more than a decade in use, still serves with the RAF and the Royal Navy Fleet Air Arm. All HSD-built air-to-air weapons use IR guidance systems and IR proximity fuzes. Such systems offer several advantages over radar guidance systems: They cannot be jammed electronically; they are more accurate; and they need no radar illumination of the target aircraft (which would warn the enemy of impending attack).

An IR guided missile allows the launching aircraft to break off the engagement as soon as the weapon is on its way. Drawbacks of an IR missile include lowered efficiency in bad weather and marginal performance close to the ground. HSD and the RAF are convinced that the advantages outweigh the negative factors and therefore opted for development of IR guided air-to-air missiles exclusively.

The Firestreak is a typical first-generation IR weapon, with a launching weight of 300 pounds and a range of five nautical miles. The official minimum range of only 0.75 nautical miles is a remarkable feature, highly desirable in any dogfight situation. The relatively heavy weight is due to a sophisticated guidance system, which in complexity far surpasses the US's Sidewinder system.

The missile is put on a rough course to the target by an IR scanner in the nose. Two rings of IR optics mounted further back on the body come into operation

(Continued on following page)



Firestreak air-to-air missiles shown aboard British Lightning fighters. Built by Hawker Siddeley Dynamics, the infrared guided weapon cannot be jammed electronically and is highly accurate. Drawbacks to all infrared missiles are their lowered efficiency in bad weather and marginal performance when close to the ground.

Hawker Siddeley Dynamics' Red Top missile has a speed of Mach 3 and a range of eight nautical miles. It has been called the most sophisticated infrared guided weapon in the Western world today.

The Mk.2 Bloodhound makes up an important part of Britain's nationwide air defense system. Although primarily a high-altitude weapon, Bloodhound missiles have chalked up intercepts as low as 1,000 feet.

as soon as their sensors can lock on target. They continuously feed two series of angular measurements into the guidance system, which from these data calculates a target's range and bearing. This seemingly circumstantial method allows early detection of evasive action, which can be dealt with by the missile without violent maneuvering. The warhead is then detonated by a proximity fuze. The missile is a pursuit-course weapon, which considerably limits its tactical use.

Red Top

It soon became clear that optimal tactical positions to launch Firestreak against supersonic targets could rarely be achieved. The RAF at this point demanded development of a new missile that could allow attacks from all angles. This weapon, originally called Firestreak IV, later was renamed Red Top. It retained the proved aerodynamic configuration of Firestreak but incorporated all available scientific advances in missile technology made in the first half of the 1960s.

Red Top was increased in speed to Mach 3 and in range to eight nautical miles. Its refined IR system allows attacks from all angles, including the use of collision-course tactics. Red Top is probably the most sophisticated IR missile in the Western world today.

Aircraft equipped with Red Top can be fitted with both simple and complex fire-control systems. The system used by the RAF's Lightning interceptors presents the pilot with aircraft radar-generated steering commands to reach a favorable firing position in relation to the target. The system prepares the missiles for launching, runs up their gyros, and automatically fires a weapon upon attaining an optimal position. In a simplified system the target may be acquired visually by the pilot, who can fire manually with an excellent chance of success.

Tail Dog

Tail Dog, the successor to Red Top, is currently in development. Its designers hope to construct a missile suitable for medium-range intercepts and with excellent capability at minimum dogfight ranges. The missile will be small and highly maneuverable, and will combine simplicity with reliability.

Tail Dog's particulars are secret. It can be assumed, however, that, with HSD's extensive expertise in IR systems, the missile's guidance is based on this technology. There are indications that the novel, patented guidance system may also include electromagnetic components.

The weapon is designed to fit an equipment pack that can be attached to any existing fighter aircraft in the form of an autonomous weapons package. This allows the use of Tail Dog for self-defense on close-support aircraft or on interceptors as secondary armament for dogfights if other missiles are carried for long-range attacks.

Two land-based, surface-to-air weapons were developed for British forces by BAC—Thunderbird and Bloodhound. The latter became operational in its initial Mk.1 version in 1958. It has since been replaced by the improved Mk.2 variant, which features longer range, improved guidance methods, and more powerful engines.

Bloodhound

The Mk.2 Bloodhound is a stationary long-range weapon for use in a nationwide air defense system. It is a semiactive homing missile. Utilizing difficult-to-jam continuous-wave (CW) radar guidance, it is relatively immune to enemy electronic countermeasures (ECM).

The missile is brought to its supersonic cruise speed by four strap-on solid-fuel boosters. As soon as the missile's main propulsion units—two Bristol Aerojet ramjets—cut in after having reached their operating speed, the boosters are discarded. The fuel capacity of the twenty-five-foot-long missile is sufficient to attain a range of at least fifty miles.

Though the missile is primarily a high-altitude weapon, low-level intercepts down to 1,000 feet have been successful. Bloodhound is in service with the RAF home defense system, the Swedish Air Force, the Royal

Australian Air Force, and the Swiss air defense network.

Thunderbird

The second long-range air defense missile built by BAC—the Thunderbird—is, according to the manufacturer, the most versatile antiaircraft system in the world today. The complete system is fully mobile, designed to withstand cross-country travel, and is compact enough to be air transportable. Thunderbird can serve as a stationary defense weapon or can just as efficiently provide air defense over beachheads or in fluid battlefield situations.

The Mk.1 version of this solid-fuel missile with strap-on boosters became operational with the British Army in 1960. The improved Mk.2 Thunderbird replaced the earlier models in 1965. This version's guidance system is essentially the same as Bloodhound's, but its radars, guidance equipment, ground power, and associated installations are fully air transportable. The Thunderbird was purchased by Saudi Arabia in 1966.

Thunderbird, another long-range air defense missile in Britain's inventory, is fully mobile and has been designed with its associated equipment for cross-country travel and air mobility.

Seaslug

The long-range naval missile field is HSD's exclusive domain. Few pertinent facts have been made public about the two missiles built by this firm for the Royal Navy. The first, the Seaslug Mk.1, has been in service on the first four *County*-class destroyers since 1962. A Mk.2 version is being introduced presently and will eventually replace all Mk.1s on the older ships.

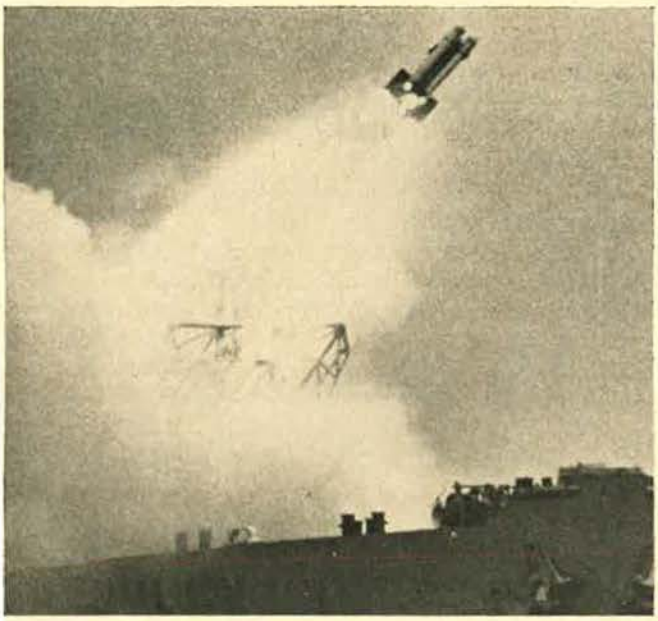
The Mk.2 offers an improved overall performance. Seaslug is designed to intercept aircraft, at all flight levels, over longer ranges. In addition, it has an excellent surface-to-surface capability and is the main armament of all modern British destroyers. The missiles are fired from a rather unwieldy twin launcher, fed automatically from below-deck magazines. Targets are acquired by radar and are plotted for range, height, and bearing.

The fire-control system positions the start ramps and the missile is ready for launching if IFF (Identification, Friend or Foe) interrogation of the target confirms it as hostile. The weapon is a beam-rider and utilizes a solid-fuel rocket as sustainer and four strap-on rockets as boosters. Its total length is twenty feet, and its range is estimated at twenty to twenty-five miles.

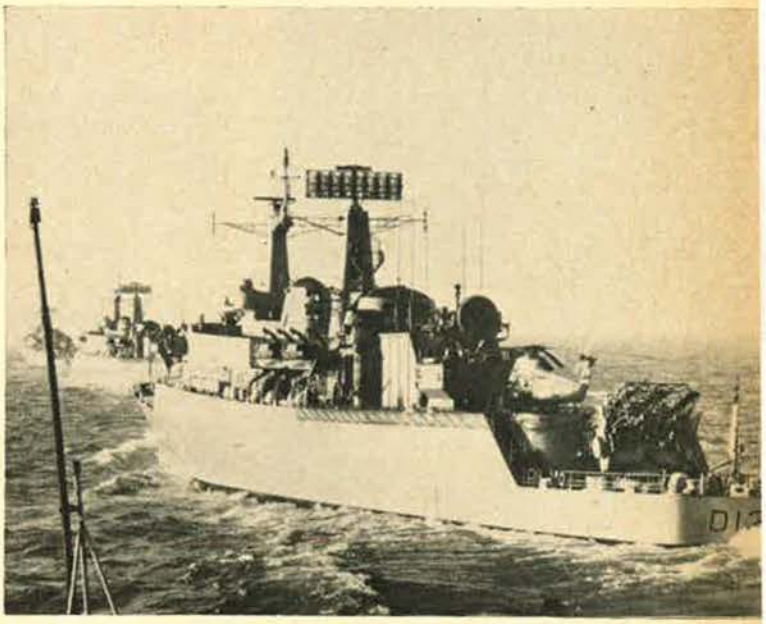
Sea Dart

The successor to this widely used weapon is HSD's Sea Dart, on which development began in 1962. It is expected to become operational this year. Though the

(Continued on following page)



Long-range naval missiles are Hawker Siddeley Dynamics' exclusive domain. Seaslug, designed to intercept aircraft at all altitudes, also has surface-to-surface capability.



Seaslug is the main armament of such modern British destroyers as these *County*-class types. Radar acquires targets and plots them as to range, altitude, and bearing.

two-stage, fourteen-foot missile is considerably smaller than Seaslug, its performance is reportedly much better. Its range should be at least thirty miles, and at launch it uses one booster, which is jettisoned as soon as the sustainer, a Rolls-Royce ramjet, reaches operating velocity.

Sea Dart is an area-defense weapon. Because of its relatively small size, it can be used on ships much smaller than the 3,500-ton *County*-class destroyers. It will be the main armament of the Royal Navy's new Type 42 missile destroyers. The compact turrets from which the missiles are fired are an important integral part of the system and can be installed on virtually any type ship large enough to house the magazines and the extensive radar and guidance gear.

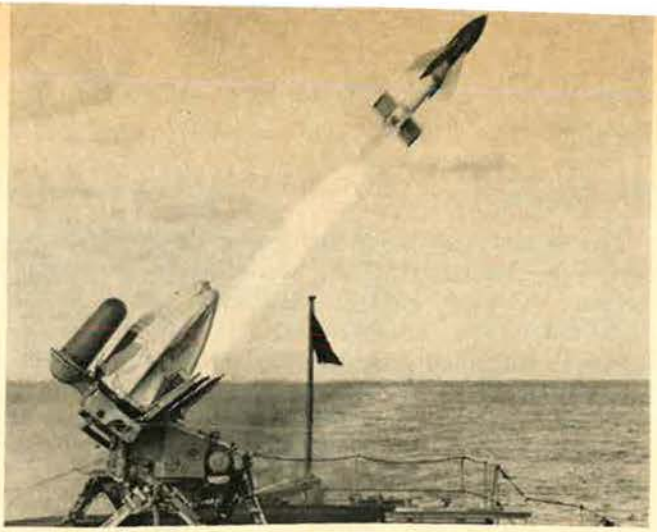
The sophisticated fire-control equipment allows simultaneous selection of several targets. The missile is a beam-rider with proximity fuzing, and its speed probably is well above Mach 3.

The missile's first test firings began in 1965; results achieved so far have been excellent. The system is hard to jam, and the manufacturer claims a high hit probability against any type of aerial target, including hostile missiles. The hit probability against surface targets over very long ranges approaches 100 percent.

The missile is very reliable, due to its relative simplicity and automatic checkout equipment that is standard on all parts of the system. Sea Dart enters service with the Royal Navy in 1971 and has been approved for export to friendly nations. A highly mobile land-based version is presently under study.

Close-Quarter Air Defense

By far the most unusual missiles produced by the British aerospace industry are the short-range air defense missiles for use on land and sea. Equipment planners for British forces stressed, from the very beginning, the need for close-quarter air defense. It was assumed that total air superiority cannot be fully guaranteed by any air force in modern warfare. Some enemy intruders would always be able to stage quick but very damaging attack runs by eluding radar surveillance, interceptors, and long-range missiles. This has led to the development of low-priced weapon systems for short-range point defense, which would allow deployment on a quantity basis. The pacesetter in this particular field has been Short Brothers & Harland.



Short Brothers & Harland's Seacat close-range ship-to-air missile being fired for the first time from a newly developed lightweight launcher. The weapon's new regime means that even small naval craft can mount such missiles.

In the mid-1950s, the firm initiated development of a short-range air defense missile of utmost simplicity, laid out for visual target tracking and radio-link command guidance. The test vehicle for this concept was the SXA. 5 missile, which proved the feasibility of the system. Tests were so successful that in 1958 Shorts was awarded a contract for continued development and mass production.

Expected to become operational this year is HSD's Sea Dart, an area-defense weapon that also can be used on ships of a size large enough to house the magazines and extensive radar and guidance gear. The Mach-3 weapon is a beam-rider with proximity fuzing.

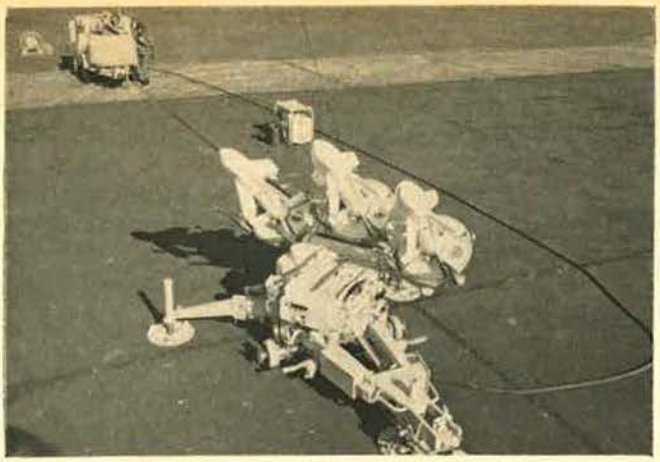
Seacat

The weapon system, called Seacat, was destined for use on ships. The original system consisted of a guidance turret with a two-man crew, a quadruple launcher, and the transmitting antenna system. The launcher carries four five-foot-long, 140-pound, solid-fuel propelled missiles. The firing sequence is simple: A target is acquired and tracked visually after a radar warning about its heading, altitude, and IFF status is given to Seacat's operators. The missile then is fired manually as soon as the target is in range.

Seacat has a maximum range somewhat under five miles at optimum conditions and can be used down to a minimum range of 0.9 miles. It is guided by a simple radio link. The steering commands originate from a manually (thumb) operated joystick attached to the optical tracking device. The system requires minimal operator training.

Tigercat

Seacat has proved such a success in Royal Navy service that Shorts decided to develop a land-based version, called Tigercat, operating along Seacat's principles. To-



Shorts's Tigercat is a highly mobile antiaircraft missile towed by two Land Rovers. The Seacat/Tigercat weapon system is said to be the most widely used close-quarter air defense missile among the world's military services.

An upcoming close-quarter air defense system is BAC's Rapier, which promises competition for Tigercat. The supersonic weapon, designed for one-man operation, is highly mobile and can be mounted aboard tanks or APCs.

day, Tigercat is used for airfield defense by the RAF and five foreign customers. This weapon employs a simplified Seacat system featuring a triple launcher, associated guidance equipment, and power supply. It has no integral radar surveillance capability and relies on visual observations or the findings of other surveillance equipment for early-warning purposes. The system is fully mobile—two jeeps with trailers give it cross-country capability.

A helicopter-carried Seacat system, named Hellcat, for use against ground targets was studied but has not yet been adopted by the services. Continued development of the original system led to improvements of the guidance system and, in particular, to lightweight launching equipment based on the Tigercat launcher but destined for use on smaller ships.

Since the original Seacat uses visual tracking, it is obviously a fair-weather daytime weapon. Thus, it was inevitable that the military would demand a radar-controlled variant for all-weather purposes. Such a system also would reduce human error and shorten reaction time considerably.

Shorts and several electronic companies subsequently developed a new Seacat system. It proved to be relatively easy to slave the system to a ship's radar installations while retaining the option for full visual and manual control if the combat situation or equipment malfunctions demanded it. In the Seacat II system, the visual observation of the missile's flight takes place in a ship's command center via a TV link. Steering in the manual mode is then performed by remote control. Though the radio link is very easy to jam, the danger of that is minimal because the electronics, switched on for the few seconds of the missile's flight, give an enemy's ECM operator only a marginal chance to react.

Twenty services in seventeen nations use Seacat or Tigercat. During the 1960s, the weapon system became the most widely used close-quarter air defense system in the world, and the Royal Navy plans its deployment well into the 1980s. The Seacat system still is without a true operational competitor in the field, but the new decade should see large-scale introduction of BAC's Rapier land-based, close-quarter air defense system and BAC's naval system, Seawolf. Both are second-generation weapons of the close-quarter air defense class and offer considerably increased capability if compared with Seacat. Still classified is a similar short-range missile for land and naval use, under development at Shorts and tentatively called Seapipe.

Rapier

Rapier is a highly mobile, air-transportable weapon system operated by a one-man crew. A crew of five normally mans the system for deployment and to provide relief operators. Rapier can be mounted on tanks or armored personnel carriers, or towed by jeeps. The seven-foot-long supersonic missile is propelled by a solid-fuel rocket engine and has an estimated weight of not more than sixty to seventy pounds. The exact figures are classified.

Rapier is radio-command-controlled and is extremely accurate. It is, in fact, so accurate that the designers were able to adopt the most lethal of all forms of warhead—one that penetrates and detonates *inside* the target. To achieve comparable lethality, less accurate systems are obliged to use much heavier warheads and proximity fuzes, with inevitable penalties in system weight, size, and performance.

The weapon's maximum and minimum ranges have not been made public, but it can be assumed that it is effective between one and six kilometers. The exceptionally high maneuverability of the missile enables the system to engage fast-crossing targets at long range as well as approaching targets. Thus, good area defense can be provided in addition to point defense.

Test firings of Rapier have been conducted since 1967 and are reportedly very successful. The system is being mass-produced for the British Army and Royal Air Force. A number of overseas contracts are understood to be in an advanced stage of negotiation.

Rapier includes a very compact and efficient surveillance radar that warns a missile operator upon acquisition of an aircraft. If the target's IFF response is not satisfactory, the missile-launcher turret carrying four

(Continued on following page)

Rapiers is automatically trained, together with the optical guidance system, in the direction of the potentially hostile aircraft. The operator tracks the target visually through the system's binoculars. A missile then is fired, and its course is slaved to the movement of the optical equipment. As long as the operator can keep the target centered in his optics, he will score a hit. A digital computer calculates whether or not the enemy is within range and tells the operator when he may press the firing button. The computer also calculates the commands, which are transmitted to the missile by the radio link, to keep it on the target sight line.

Rapier is a fair-weather weapon, but no major difficulty exists in slaving it to a radar installation for fully automatic foul-weather operations.

Seawolf

It can be assumed that BAC's naval weapon, Seawolf, is fully automatic, with an operator having only a supervisory and decision-making capacity. When Seawolf becomes operational on Type 42 destroyers, it will provide a fast-reaction capability against any target, ranging from missiles to helicopters. Seawolf's surface-to-surface capability with the right type of warhead should be excellent and fully automatic. The Royal Navy's Type 42 destroyers will pack considerable punch. Long-range offense and defense are provided by HSD Seadarts; close-quarter defense is the responsibility of Seawolf; and antishipping capability is carried in the form of the Penguin missile under development by Kongsberg of Norway with BAC collaborating. Penguin is so secret that even its shape has not been disclosed as yet.

Blowpipe

The most unusual and probably most effective close-range air defense weapon for one-man operation existing today is the Blowpipe system, under development at Short Brothers & Harland. The weapon seems to be an infantryman's dream. It is compact and, in firing condition with associated guidance equipment, weighs barely forty pounds. Range of Blowpipe is about two miles, and it can be fired at targets ranging from ships to supersonic aircraft. It is also highly accurate when used by any man with minimal training. Blowpipe even has built-in IFF capability to prevent potshots at friendly aircraft.

Blowpipe is packed in a container that serves as both transport case and launcher. It is shockproof and can be handled like any other round of ammunition. An aiming and guidance unit weighing about ten pounds is slipped on the packaged missile round. This unit contains the tracking optics, guidance transmitter and antenna, firing mechanism, batteries, and a joystick that fires and guides the supersonic missile to a target.

The complete Blowpipe system is actually a miniaturized Seacat system incorporating the latest developments in electronics and missile technology. The same basic guidance methods, consisting of radio-link and visual tracking, are used, giving Blowpipe great accuracy. It can be used from any angle against aerial targets, which in most cases is not possible with other one-man operated missiles based on IR technology.

Blowpipe employs a proximity fuze, and can be fired from trenches, ships or boats, trucks, turrets with automatic reloading, or even from multiple launchers. A retractable launcher for submarines is in an advanced development stage. It will enable submerged vessels to fire the missile at air or surface targets from periscope depth.

The weapon is cheap, easy to operate, and deadly. Blowpipe, the first all-purpose personal missile armament, will give the foot soldier unprecedented firepower. For this reason alone, the weapon is bound to find a worldwide market.

It is impossible in limited space to discuss the many finer points of the British missile family, or even to scratch the surface of British design philosophy. It is hoped, however, that this report has conveyed some appreciation of the capability of Britain's missile industry. In the past two decades, that industry has produced a large number of very high quality weapons for national defense.—END

Currently under development at Shorts is Blowpipe, a man-portable supersonic missile that rounds out Britain's inventory of air defense missiles. An infantryman's dream, it can be fired from the shoulder, and, weighing only forty pounds, can be air-dropped to ground units in multiround packs.

"A Surfacing of More Positive Attitudes"

Here's an account of ROTC's ups and downs on one midwestern campus —by the University of Cincinnati's Air Force ROTC Professor of Aerospace Studies . . .

The ROTC Scene at Cincinnati

BY COL. D. P. JONES, USAF

THE University of Cincinnati (U.C.) is the second oldest and the second largest of America's municipal universities. The Reserve Officers Training Corps (ROTC) has existed as a formal program at the University for more than fifty of the 150 years since its founding, and the Air Force ROTC (AFROTC) has operated as a separate program for more than twenty-one years. Both the Army and Air Force programs are voluntary.

I was to learn all this after I received orders in early 1968 to report to the University of Cincinnati as the Professor of Aerospace Studies (PAS).

My preassignment impression of the University was of a midwestern "street-car college" with a reputation as a national collegiate basketball power. Also, I was vaguely familiar with its cooperative system of education, which I understood it had pioneered—alternate terms of study and of work on a job in the student's major field of concentration.

These impressions changed dramatically after my first visit to the campus. The number of foreign students, the obviously cosmopolitan character of the faculty and student body, set against a background of high-rise dormitories, with the towering Brodie Engineering Center highlighting the Cincinnati skyline, quickly changed my "street-car-college" ideas.

Dr. Walter C. Langsam, a dynamic scholar-administrator, now in his fifteenth year as President, has been credited with divesting the University of its local, parochial image. During our first meeting he further enlightened me on U.C.'s history. And I was pleasantly surprised to learn that Dr. Langsam is an enthusiastic supporter of ROTC and is himself a product of the program.

Reassurance from the University President was doubly comforting. My orientation briefings at the Air University and discussions with the former PAS when I arrived suggested that ROTC on most campuses, including U.C., was in trouble. Things had changed since the days when ROTC had been accepted as a fact of life on campuses.

In June of 1968, anti-ROTC agitation around the country had not reached its crescendo. That came later, in the fall of 1968 and the winter and spring of 1969. But during 1967 there had been enough dissident activity at several universities to cause concern among those involved in administering the program.

(Continued on following page)

University of Cincinnati President Langsam takes salute from Air Force ROTC Cadet Col. Paul Ruffin as Cadet Corps passes in review during the 1969 President's Review.

A World War II bomber veteran, Colonel Jones served for eighteen years in SAC, progressing from aircrew member to Chief of Policy at Hq. SAC. Before coming to the University of Cincinnati, he was Director of Policy for PACAF, 1965-68. He wrote "The Case Against *CINCSEA" for the October 1967 issue of* AIR FORCE/SPACE DIGEST.

Anything military is a target for campus demonstrators these days. During the 1969 President's Review, protesters marched—peacefully—through the ranks of the Cadets. After making their point, they quickly left.

A newly assigned Professor of Aerospace Studies is as sensitive to his particular campus climate as a newly assigned commander is to the morale of his unit. Examination of the U.C. atmosphere told me that although the University had not, up to that time, suffered any headline-making disruptions, members of the ROTC staff had been verbally challenged by small dissident elements on campus. Also, occasional unfavorable comment in the University newspaper and campus pamphleteering was contributing further to the ROTC staff's uneasiness about the future of the program at U.C. What effect these attacks had on the drop in officer production during 1968 is purely conjectural.

Events at U.C. during the 1968-69 school year proved Air University forecasters disconcertingly accurate. The tempo and incidence of anti-ROTC activity on college campuses across the nation made big headlines. The University of Cincinnati was no exception. Although militant activity at U.C. was only a fraction of that experienced at some other campuses, there were marked increases in anti-ROTC agitation.

During the 1968-69 school year, the Army ROTC weathered one passive sit-in in the halls outside its offices. There were formally organized student-faculty discussions on ROTC held in the main campus auditorium with limited attendance. During the President's Annual Review of both Corps in May, thirty or forty demonstrators (including several individuals who were neither students nor faculty) marched silently through the cadet ranks carrying antiwar placards and then quickly left the fieldhouse, the whole tenor of the performance reflecting more bravado than resolve.

Overt opposition by some faculty members to the ROTC program at U.C. began with an attempt by a small group of professors in the Arts and Sciences College to eliminate all credit for ROTC courses. With far less than a majority of the faculty present, the proposition was narrowly defeated.

Campus Analysis of ROTC

The most serious threats to the program at the University occurred in May of 1969. In separate but successive actions, the Student Senate voted to review the propriety of the ROTC program's remaining on campus, and a faculty committee of the local chapter of the AAUP (American Association of University Professors) prepared to examine the "academic merit" of the ROTC curricula offered at U.C.

Along with the increase in anti-ROTC activity, Air Force and Army ROTC enrollment fell off substantially, and the number of cadets commissioned was down for the second straight year.

Overall ROTC enrollment at the University at the beginning of the school year had traditionally run some 750–800 students, divided about equally between the Air Force and the Army. We had been advised that this enrollment regularly dropped about fifty percent by the beginning of the spring quarter. Such a decline, we were told, was not disproportionate to the overall national average for schools providing similar four-year programs. This decline in enrollment resulted from such factors as students leaving college, academic difficulties, or, as I was to discover through conversations with students, often the result of "just giving it a try for Mom and Dad." Our experience during the fall and winter of 1968-69 proved these projections reliable. We sustained the predicted drops in enrollment and something more.

The 1968-69 school year ended in June with the outlook for the ROTC programs at the University far from cheerful.

To see if we could more clearly fix the reasons for the 1968-69 decline in the program, we reviewed in detail the detachment's recruiting activities for the year. Comparing the campaign with prior years, we found that our media exposure—radio, TV, and local newspaper advertising space—had been substantially greater. Our high school recruiting program had been extensive. Cadet briefing-team presentations and detachment staff visits were up substantially over prior years although student attendance at these meetings was down, an indication that high school interest had waned—certainly not a happy omen. We saw that our recruiting efforts, as vigorous as they had been, had not succeeded in sustaining previous enrollments.

In September of 1969, we readied ourselves for the

Despite the protests and confrontations, ROTC survives on campus and with it some of the social aspects of the program. This was the annual U. of Cincinnati dining-out in January 1970. Cadet Col. Michael Zettler is proposing a toast to the President of the United States.

new school year, facing a further decrease in preterm enrollment of freshmen and anticipating a more militant and anti-ROTC campus climate than we'd faced the previous year.

Then something happened in late September that changed the momentum and direction of both the Air Force and Army ROTC programs at U.C. In an action not anticipated by either the University administration or the faculty (or the PAS), the Student Senate Committee that had been investigating ROTC since May reported to the full Senate an endorsement of the ROTC program and recommended retention of both ROTC units in their current form. The Senate supported the resolution by a vote of twenty-two to five. Reactions were apparent almost immediately. The AAUP faculty group, not insensitive to the Student Senate decision, did not meet during the fall quarter to examine the academic merit of ROTC. And, as of this writing, they have yet to meet.

A faculty luncheon was scheduled for October 1969 to provide a platform for the Army and Air Force ROTC heads on campus. The turnout for similar occasions during the previous year and a half had not been encouraging. However, much to our pleasant surprise, faculty attendance on this occasion was the best in several years. At the same time, freshmen dropouts for the fall quarter turned out to be but a small percentage of prior years, although total enrollment, following the national trend, had been down.

It is much too early to predict a final outcome at U.C., but it may be the beginning of a shift in campus attitudes regarding ROTC. Or perhaps, more accurately, we may have seen a surfacing of more positive attitudes not generally detectable in recent years.

Cadet Group Commander Gregory Strobl receives an award from University President Langsam at the 1969 President's Day Review. President Langsam is an ROTC graduate.

Beyond the Frontal Attacks

Undoubtedly the use of ROTC by student activists and other radical elements as a scapegoat for the Vietnam War and as a focus for polemics against the military-industrial complex has had a major impact on student attitudes toward the military services. But beyond these immediacies, we have witnessed a critical examination by university students of the higher-education apparatus. It takes only a few days spent on any college campus to learn that the youth of today are skeptics. They challenge long-accepted precepts, beliefs, and ways of doing things. In this respect, they are all "from Missouri." Many shibboleths of the academic community are being questioned. Some will survive, some won't.

The students' most frequently articulated concern with the traditional college curriculum is "relevance." Although we rarely hear engineering majors, business majors, or medical students complain that their educations are meaningless, many liberal-arts students are concerned with what they view as ambiguity in liberal-arts programs. Some critics attribute this shortcoming to the fact that the typical liberal-arts college is lacking in clearly defined goals. Supporters counter that, historically and by design, a liberal-arts program is supposed to be that way and that a B.A. degree in its present form is properly nonprofessionally and nonvocationally oriented in the main.

In this search for relevance, ROTC is being re-

(*Continued on following page*)

Brig. Gen. James Stewart, USAFRes (Ret.), inspects the University of Cincinnati's Air Force ROTC Honor Guard on arrival for visit to the Arnold Air Society's unit at U. C.

viewed along with many other institutionalized university functions. But unfortunately on some campuses, the examination has not been straightforward. Instead, there often has been a purposeful confusion of two issues: the relevance of university-sponsored military training in a liberal-arts education, and the repugnance toward an unpopular war. Yet on those campuses where decisions were *not* made under the stress of emotion and threats of further and more extreme militant action, mature and responsible students and faculty have found the ROTC program relevant. At U.C., the Student Senate Committee actually exhibited a greater sense of objectivity and responsibility than many faculty elements. The Committee found the Vietnam conflict to be "a separate and transient issue"—with no relevant bearing on the propriety of a university providing its students an opportunity for preprofessional military training in the service of their country.

The student body at the University of Cincinnati was one of the first on the nation's larger campuses to react positively to the current challenge to ROTC. Since then, several more student bodies and faculties have endorsed the ROTC program on their campuses. In fact, far more student bodies endorsed ROTC than rejected it in the highly emotional crescendo of campus dissent during the spring of 1969. There are indications that this trend will continue.

What seems to have happened is that the larger, less vocal body of students and faculty is registering its interest in preserving the right of all students to "do their own thing," whether it be readings in Sanskrit or ROTC.

Our judgment is that ROTC at the University of Cincinnati will *not* become a casualty of disinterest, apathy, or the Vietnam War. The University has a long heritage of service to the country and of partnership with the armed forces. ROTC aviation units have existed at the University since the inception of the program during World War I. The Arnold Air Society was founded at the University of Cincinnati in 1948, and its contributions to the Air Force in particular and to aerospace affairs in general are well known. Hundreds of graduates of the AFROTC program at the University have served with honor and distinction. We believe that this tradition will continue at U. C. as well as at all those other universities and colleges that exhibit similar support of the ROTC program in times of adversity.

What the University of Cincinnati has experienced by way of anti-ROTC campaigns has happened on many of the campuses that host Air Force ROTC programs across the nation. By and large, the experiences have varied only in emphasis and timing.

More Needs to Be Done

While we may hope that the program has passed its crisis, there is much that needs to be done to improve ROTC. Several worthy suggestions have been offered by the Benson Committee (*see next page*). Some of these recommendations may require enabling legislation. But at least the most important improvements can be undertaken by ROTC managers themselves. There is an ROTC faculty consensus that the foremost need is an increased understanding of ROTC by faculties and students. Despite all the headlines, there is a general lack of knowledge among both groups about the actual operation and function of the ROTC program. Too many professors have frozen memories of classes in map reading, practice in field-stripping automatic weapons, and endless hours of close-order drill. Too many people on campuses are almost completely ignorant of the actual content of the current ROTC curricula.

To improve in this vital respect, we must move in every way possible to raise the level of understanding about the Air Force ROTC program, not only among the university family but also among interested or potentially interested members of the public.

Our experience with the recruitment program at U.C. tells us that there is an optimum leveling-off point for even the most vigorous recruiting campaign. At that point, additional effort might better be expended in enlightening the people and agencies most influential in formulating student attitudes. These include not only university faculty and administrators but also student body leaders. Neither can we neglect the counselors, teachers, and principals of our high school and preparatory schools. That's where our candidates come from.

It has not been easy for a college student to wear an ROTC uniform on campus these past two years. To those of us administering ROTC, the recollection of eager young freshmen, perhaps on their first day on campus, drawing their uniforms one day, carrying them to the dorm, and then turning them in the next day is evidence enough of the problem.

Such experiences are likely to affect in some way any student's attitude toward ROTC. Our youth of today are highly peer-oriented. They are extremely sensitive—one might say oversensitive—to group reactions. In the case of ROTC, only the most highly motivated persist, while others drop out before ever really giving it a try.

While the likelihood of improvement from the present position is good, the odds on ROTC attaining its pre-Vietnam stature at the University of Cincinnati, or at most other universities, are not likely to be favorable for some time.—END

ROTC, once taken for granted on the American campus, has been under siege by antimilitary activists, and the program has been driven from a number of prestigious universities. Beyond that, enrollments have dropped. But the picture is not totally grim. Out of the tumult has emerged, thanks to the reasoned response of ROTC managers and many university officials, a new concept of campus-military partnership geared to ensuring not only ROTC's survival but also the creation of improved and more relevant curricula . . .

The Keys to Survival Are Reform and Relevance

By William Leavitt

SENIOR EDITOR/SCIENCE AND EDUCATION

FOR the past couple of years, ROTC on American campuses has been under siege. A mixed bag of student revolutionaries, faculty members hostile to any military presence on campus, and moderates won over to the anti-ROTC position by harangue—and in some cases by fury over police actions against campus demonstrators—has campaigned with considerable effect to drive officer training from a number of prestigious colleges and universities. ROTC is finished or on its way off the campuses of Harvard, Dartmouth, Brown, Columbia, Colgate, and Tufts.

Why ROTC? The answer is both simple and complex. To the student revolutionaries, inflamed by their resistance to the Vietnam War, ROTC is a living symbol of the US armed forces and a prime source of university-trained military officers who can be expected, in many cases, to take part in that war. They reason that if they can cripple ROTC, they will have sharply reduced the effectiveness of the American military, which they regard as a self-perpetuating war machine.

The relatively small core of student revolutionaries has not been alone in the assault on ROTC. With considerable skill, they have recruited allies on campus, with the argument that ROTC feeds the unpopular war effort in Vietnam and also with charges that ROTC is the academic spearhead of the so-called military-industrial complex on which they blame most of America's social ills. They have won adherents to their cause with declarations that ROTC represents a corruption and militarization of the academic world. Further, they have pressured faculty people into attacks on the academic merit of ROTC programs. Also, they have successfully exploited campus crises, which often they themselves have carefully orchestrated in order to "radicalize" the larger body of students who ordinarily are far more interested in their own day-to-day academic pursuits.

It has not been a pretty sight, this tableau of protest and response. On several occasions, fanaticism has been met with overreaction, further feeding the fires of confrontation.

Yet despite the protests, the clashes, and even terrorism—fires have been set at some ROTC offices—ROTC is still very much alive. As of this writing, there

(*Continued on following page*)

Reasoned response has been the method of Defense Secretary Melvin R. Laird in the face of campus attacks on ROTC. The appointment of the Benson Committee to analyze the history and shortcomings of the program and to suggest improvements was a reflection of that policy.

are 511 units (all services) on 353 campuses across the country. The overwhelming majority of these programs is voluntary. Indeed, what seems to be happening *(see also the article starting on page 61)* in the wake of the attacks is the development of a reformed and improved set of ROTC programs. The returns are not all in yet. No one can predict what will happen by way of campus confrontations in the next academic year. But the present indications are that ROTC will emerge a better institution for its ordeal.

There are reasons for this new and hopeful situation. For one thing, while the campus revolutionaries have in some cases been able to galvanize feelings against ROTC, their tactics have, in a lot of other cases, sharply "turned off" many of their peers. ROTC managers have been heartened by referenda on some campuses in which students and faculties have voted to *keep* ROTC, on the simple grounds that students ought to have a personal, not imposed, choice, as to the availability of university-based officer training.

There is another and important reason for today's cautious optimism. The response of the services and the Pentagon to the campus wars against ROTC has been a reasoned one. Although there were some congressional voices demanding vengeful sanctions (withdrawal of federal support from colleges and universities where ROTC was under heavy attack), Defense Secretary Melvin Laird set a quieter tone. He made it clear that the Pentagon would examine ROTC in detail and dispassionately with an eye to strengthening the *quality* of ROTC and creating a stronger dialogue on the issue between academia and the Pentagon. His medium was the Benson Committee, named after its chairman, Dr. George C. S. Benson, then President of Claremont (Calif.) Men's College.

After months of work, the Benson Committee, made up of distinguished academics and uniformed people familiar with ROTC, issued its report in September 1969 and circulated its findings widely in the academic world. The Benson Report made clear the committee's understanding that opposition to ROTC on campus stemmed largely from opposition to the Vietnam War. But it also pointed out that beyond antiwar agitation there were "many specific, thoughtful, and objective criticisms and proposals" for improvement of existing ROTC programs.

"These criticisms and proposals," the Benson Committee declared, "range from comments on certain confusing and seemingly needless differences among the programs of the three services to the fundamental problem of the propriety of an 'outside-directed' program within the framework of an otherwise autonomous academic community."

The Benson Committee, declaring that its task transcended the present Vietnam dilemma, saw its main job in terms of making recommendations that would strengthen ROTC academically. The committee also asserted its strong belief that colleges and universities *do* have a responsibility to national security and that ROTC, where the government and the campus can come to terms, *does have* a proper place on campus:

The committee declared:

"In considering this unique relationship, one overriding priority must be recognized, namely the national security of the country. Closely related to [this] is the

Dr. George C. S. Benson, former President of Claremont Men's College and now Deputy Assistant Secretary of Defense (Education), headed the committee that analyzed ROTC. His Pentagon office now serves as a principal link between the military and the campus.

institutions' consideration of [their] students' desires to prepare for service. Without national security we have no basis for pursuing our multiple and diverse activities. The national government can properly look to the public institutions, supported as they are by the taxpayer, to provide leadership in safeguarding the entire population.

"Nor can the nation's privately supported universities be exempted from a part of the responsibility. Their tax-exempt status in itself constitutes a notable governmental subsidy, and many of them receive extensive [illegible] state legislation, each institution must make its own decision with regard to ROTC in accordance with its own processes and priorities, but in the interest of both national security and of general service to society, the committee believes that there is a strong case for the ROTC programs on . . . campuses."

As to the fear of some critics of "militaristic" influence on academia, the committee pointed out that opposition to ROTC on such grounds is "singularly inappropriate" and that abolition of ROTC would actually decrease civilian influences on the military. The committee added that "interaction between civilian and military on campus is an important educational experience for [ROTC students] and . . . also a broadening experience for the ROTC instructional staff."

These philosophical declarations formed the backdrop for the committee's quite comprehensive review of the history and present status of ROTC and its analysis of alternatives to on-campus officer training—ranging from total reliance on military academies to isolated Marine-style summer platoon-leader training.

What emerged was a set of declarations and recommendations. Because of their importance, we reproduce them in full *(see accompanying box)*. All, with the exception of number 12, have been accepted in principle by the Defense Department. Item 12, which calls for federal assumption of virtually all costs of ROTC on campus, is expensive, and is under further study by DoD.

The last of these recommendations has resulted in the creation of a special office in the Pentagon, under Dr. Benson, who holds the rank of Deputy Assistant Secretary of Defense (Education), with the specific responsibility of serving as a bridge between

the academic community and the Pentagon on ROTC affairs and policies.

As can be seen from the list of recommendations (a limited number of copies of the Benson Report is available from Dr. Benson's office in the Pentagon), the committee based its analysis on three basic premises: First, that the presence of ROTC on campuses in no way endangers academic freedom and is a proper contribution of campuses to the national safety; second, that there *have* been rigidities and shortcomings, academic and administrative, in the programs of all three services and that *now* is the time to correct them; and, third—as candidly spelled out in the report—that "there are a number of institutions where faculty and student sentiment are such that these institutions should not strive to support an ROTC unit."

Harvard and other colleges in the Northeast, where student-faculty activism or insufficient production of officers from ROTC programs have led to closing out of the programs, are presumably in that category. What the Benson Committee said, in effect, was that ROTC was not going to indulge in pitched battles to stay on campuses.

But the interesting thing, notes Dr. Benson, is that the overwhelming number of colleges and universities maintaining ROTC programs on campus have *not* followed Harvard's lead. In fact, he says, no major institution has pulled out of ROTC since the issuance

(*Continued on following page*)

The Benson Committee's Twenty-One Recommendations

Here, as released on September 22, 1969, and circulated throughout the academic community, are the recommendations of the Benson Committee that examined ROTC:

1. The committee has carefully considered various methods of officer-procurement alternatives to ROTC. Although several alternative methods can serve useful purposes, the committee recommends that ROTC be continued as a major procurement source of officers for the Army, Navy, and Air Force.

2. The committee believes that ROTC is a highly desirable method of officer procurement for the USA. ROTC has the advantages of
   a. Supporting American concepts of civilian-military relationships.
   b. Providing a blend of civilian and military background for many young officers.

   Therefore the committee recommends that the Department of Defense support ROTC by continuing to develop a viable partnership between the services and the universities.

3. The committee recommends revision of the wording of the ROTC Vitalization Act of 1964 to indicate a cooperative effort between the armed services and the universities in developing the ROTC curriculum.

4. The committee recommends that each host institution assume a great deal more responsibility for ROTC instruction, including the appointment or termination of appointment of ROTC staff. The committee reaffirms the policy that military classroom' teaching should not be performed by noncommissioned officers.

5. The committee commends the services for the use of civilian faculties in some ROTC teaching and recommends further use of these faculties where possible.

6. The committee recommends that appropriate academic credit be given for ROTC courses. The ROTC programs, especially the teaching materials, should be strengthened and improved to go along with other educational opportunities. Credit should continue to be determined by the host institution. Faculty reviews of ROTC credit should be based upon exposure to the classroom itself, as well as the review of materials.

7. The committee commends the services for their frequent and careful reconsideration of their curricula. It recommends more discussion by the services with individual universities, and more discretion to instructors.

8. The committee believes that uniforms and drill are a part of the military profession and should remain on campus. It also believes authority should be given the local ROTC units to determine how much drill should be taught.

9. The committee recommends that the question of appropriate academic rank for ROTC faculty members be resolved by institutional recognition that ROTC programs have a place in the curriculum and the acceptance of officers in a faculty status appropriate to their teaching duties and qualifications.

10. The committee recommends that ROTC be given the status of an academic program organized in the academic structure of the host institution. ROTC instructors should have full opportunity to participate in the academic life of the institution.

11. The committee recommends that each host institution establish a high-level faculty-administration committee to oversee and work with the ROTC programs.

12. The committee recommends strongly that the federal government pay for institutional costs of ROTC.

13. The committee recommends that every host institution list the ROTC course offerings in an official publication equivalent to other curricular publications.

14. The committee recommends that the host institution actively support the ROTC's recruiting effort.

15. The committee recommends that the Navy discontinue its contract requirements for nonscholarship students in the first two years of a four-year program.

16. The committee recommends that the Navy eliminate its bar against marriage of scholarship students.

17. The committee recommends that the number of scholarships be increased and that the summer training pay and monthly stipend for the last two years be increased.

18. The committee recommends that a fraction of scholarships should be made available to two-year students.

19. The committee recommends that scholarship criteria and selection methods assure the services of high-quality students from all classes of society.

20. The committee suggests that all three services have the same rules regarding marriage of cadets, scholarship holders, and contracts, and positive rules about course majors.

21. The committee recommends the establishment of an office in the Department of Defense to secure coordination of service ROTC rules which may affect the relationship of ROTC as a whole within the academic world.

—Wide World Photos

This was the scene at Harvard University on April 9, 1969. Harvard and Radcliffe students are saluting the statue of founder, John Harvard, with clenched fists. One student is carrying a Students for a Democratic Society flag as students hold an anti-ROTC rally in Harvard Yard. Some students seized college administration building during protest.

of the Benson Report, and that, in general, there has been a strong university acceptance of the "partnership concept" his committee advocated, whereby colleges and the military commit themselves to working together to tailor ROTC to the style of the individual campus and to making ROTC's programs understood and accepted, while at the same time serving the military's basic requirements.

Dr. Benson, from his present vantage point, suggests that, if anything, the current problem for ROTC is not dropping out by colleges and universities but rather getting enough qualified young men into the programs. (The current academic year's enrollment is 56,000 less than in the previous school year—a drop of some twenty-five percent.) That is a problem of an entirely different order. And no one can say, for example, how the institution of an all-volunteer military force would affect ROTC. But it is certain that there would be some effect on ROTC in view of the fact that many university students are obviously motivated to enter ROTC because of the pressure of the draft.

On the other hand, he points out, if the recent recommendation by the American Council on Education that the student 2-S deferment be dropped with deferments maintained for ROTC students came into effect, there might be an upswing in enrollments. At the same time, the new draft lottery system, which gives young people a chance to get off the draft hook more easily, is a minus in the present situation. Again, as to the all-volunteer force, it might well turn out that ROTC would have a new role, *i.e.*, the production of a higher percentage of officers for an all-volunteer force, whatever those requirements might be.

As to the Benson Committee's recommendations, which have been, as noted, accepted in principle, they are being worked on one by one by the Pentagon and the universities. One important problem, for example, is the wording of the ROTC law which requires the Service Secretaries to prescribe ROTC curricula. This continues to be an anachronistic legalism that irritates many academics who would prefer to have the concept of military-academic partnership in ROTC curriculum development clearly stated in law.

Of the three services, in some ways the Navy has the toughest problems. Not only are Navy ROTC regulations the most stringent (marriage bars for scholarship students—*see Recommendation 16 in the box on page 67*) but also the Navy's ROTC courses are the most technically oriented and are hurt most by loss of academic credit.

The Army's, and to a lesser degree, the Air Force's ROTC programs, more geared as they are to leadership and exposure to the academic disciplines of the civilian curriculum, are less bothered by loss of academic credit. But the point here is that, under the new partnership concept, the idea is to make *all* ROTC programs academically strong enough, through military and civilian inputs in formulation and teaching, so that, on their merits, they *will* be accredited.

What lies ahead for ROTC? From all indications, a definite future on the American campus—but a future dependent on continued self-examination with the emphasis on flexibility and the development of more incentives. These include increased subsistence for ROTC students, more scholarships, and government recognition of the great financial burden placed on cooperating campuses. In short, the era of ROTC being taken for granted on the campus is over. Like everything else in academia, ROTC is in the process of having to prove itself worthwhile and "relevant" in order to survive.—END

UNIT OF THE MONTH

THE IRON GATE, N.Y., CHAPTER . . .

cited for consistent and effective programming in support of the AFA mission, most recently exemplified in the seventh national "Air Force Salute."

The **Georgia AFA** recently held its annual meeting at the East Inn, Warner Robins, Ga. During the business session, incumbents **William Kelly,** President; **J. D. Walker, Edwin Johnston,** and **Don Develin,** Vice Presidents; **Corley Shearouse,** Secretary; and **Homer Hockenberry,** Treasurer, were reelected.

More than 300 persons attended the evening meeting, which was preceded by a social hour. Congressman **Jack Brinkley** (D-Ga.), a member of the House Armed Services Committee, was the guest speaker.

During the awards portion of the program, **Dr. Dan Callahan,** President of the **Middle Georgia Chapter,** was named the State AFA's "Man of the Year," and the **Middle Georgia Chapter** was selected as the "Chapter of the Year." Airmen honored included **CMSgt. Wilbur E. Bell,** 117th TAC Control Squadron, Savannah, Ga.—"Outstanding Air National Guardsman of the Year"; **MSgt. Joseph B. McGraw,** 19th Bomb Wing, Robins AFB—"Outstanding Airman of the Year at Robins AFB"; and **SSgt. James F. Edmondson, Jr.,** Third Reserve Region, Dobbins AFB—"Outstanding Air Force Reservist of the Year." Dr. Callahan and the three airmen each received a gold AFA watch from President Kelly. **MSgt. John H. Ackerman,** "Outstanding Airman at Moody AFB," was not present but will receive his award at a later date.

In his remarks, President Kelly gave a recap of the State AFA's 1969 events and urged all present to participate in the prisoner-of-war program being sponsored by the State AFA, and to support all AFA policies.

Southeast Regional Vice President **Lester C. Curl** was an honored guest.

* * *

The **Utah AFA's "Project Navajo,"** a community project to provide food, clothing, and toys at Christmas to the Navajo Indians on reservations in Utah, Colorado, New Mexico, and Arizona, was a tremendous success for the second consecutive year.

More than 44,000 pounds of goods was collected by **Utah AFA Chapters,** in cooperation with personnel of Hill AFB, Defense Depot Ogden, Freeport Center, Internal Revenue Service in Ogden, and other organizations. The goods were distributed by AFA leaders under the leadership of State President **Jack Price.** The goods were transported in a large

(Continued on following page)

Utah Air Force Association's "Project Navajo" truck visits the St. Christopher Mission at Bluff, Utah, to distribute Christmas contributions to approximately 800 Navajo Indians at the mission (*see accompanying story for details*).

Among the principals and distinguished guests at Georgia AFA's annual meeting were, from left, J. D. Walker, Georgia AFA Vice President; Brig. Gen. Ralph T. Holland, vice commander, Warner Robins Air Materiel Area; Congressman Jack Brinkley (D-Ga.); and Dr. Dan Callahan, Middle Georgia Chapter President, State AFA "Man of the Year."

Ohio's AFA has set up an award to be presented to each native son who earns one or more awards in USAF's Undergraduate Pilot Training Program. First recipient was 2d Lt. Paul Metz, left, winner of the Commander's Cup, the Flying Award, and the Academic Award at Reese AFB, Tex. State President B. Osborne and Mrs. Metz observe honors.

At a recent meeting of the Northern Virginia Chapter, Rep. Lester L. Wolff (D-N.Y.), right center, receives a citation from Chapter President C. Dougherty, left center. CAP's Col. R. C. Stokes, left, and AFA Central East Regional Vice President A. Paul Fonda, right, witness the award.

AFA leaders attending the Eglin Chapter's Installation ceremonies. From left, Florida AFA President T. Drysdale; Southeast Regional Vice President L. C. Curl; L. R. Terrell, immediate Past President; Eglin Chapter President C. C. Widaman; and AFA Board Chairman Jess Larson.

semitrailer truck furnished by the Whitfield Transportation Co., Salt Lake City.

A remark by a staff member of an Indian hospital at Monument Valley tells the story of the Utah AFA's 1969 "Project Navajo." He said, "This is what Christmas is all about."

We commend the Utah AFA on this outstanding community project which has received a great amount of favorable publicity in the Utah newspapers and on TV, and has further enhanced the image of AFA throughout the nation.

* * *

At a recent meeting, the **Northern Virginia Chapter,** formerly the Arlington Chapter, honored Congressman **Lester L. Wolff** (D-N.Y.) and **Col. Robert C. Stokes,** newly assigned Commander of the National Capital Wing of the Civil Air Patrol (CAP), as well as his staff and squadron commanders of the wing.

Chapter President **Clifford Dougherty** presented a Citation to Congressman Wolff for his "distinguished service to community and country in the field of aviation while an officer in the Civil Air Patrol and a member of the Congress of the United States of America." In his remarks, Congressman Wolff, a CAP Colonel and Commander of the Congressional Squadron (CAP), urged the continued active involvement of concerned people, such as members of AFA and CAP, in the support of those activities that will promote the strengthening of the nation's aerospace power potential.

Special guests included Central East Regional Vice President **A. Paul Fonda** and members of the Civil Air Patrol.

* * *

On January 8 the **Eglin, Fla., Chapter** sponsored a luncheon honoring Congressman **Robert L. F. Sikes** (D-Fla.). During the program, **Jess Larson,** Chairman of AFA's Board of Directors, presented Congressman Sikes an AFA Citation for "outstanding and effective legislative efforts in behalf of the prestige and well-being of the men and women of the military services of the United States of America."

That evening Mr. Larson was guest speaker at the Chapter's installation program. Those installed during the ceremonies were **Col. Taylor Drysdale,** USAF (Ret.), the new President of the Florida AFA, and Chapter officers **C. C. Widaman,** President; **G. P. Brenner,** Vice President; **K. E. Williamson,** Secretary; and **C. A. Tibbetts, Jr.,** Treasurer.

Special guests included **Maj. Gen. J. C. Maxwell,** Commander, Armament Development and Test Center, Eglin AFB; AFA's Southeast Regional Vice President, **Col. Lester C. Curl,** USAF (Ret.); **Col. Herbert "Bud" West, Jr.,** USAF (Ret.), immediate Past President of the Florida AFA; and **Lt. Col. Lee R. Terrell,** USAF (Ret.), immediate Past President of the Eglin Chapter.

* * *

A progress report on the mammoth **Tampa International Airport** construction project was presented by **Stewart Mast,** airport manager, at a recent dinner meeting of AFA's **Florida West Coast Chapter** in the MacDill AFB Officers Club.

Special guests at the meeting were Tampa-area wives and other family members of US servicemen believed to be POWs in North Vietnam.

AFA members and their wives turned out in strength to show their strong support of actions being taken on behalf of POWs and their families. Military leaders in attendance in-

(Continued on page 75)

AFA National Director Jack Withers, center, the principal speaker at the Fresno, Calif., Chapter's award-winning annual Air Force Honors Night Banquet, presents the Chapter's "Man of the Year" Award to Maj. James H. Estep, an Air National Guard F-102 pilot. The Master of Ceremonies, Col. Milton R. Graham, Commander of the 144th Air Defense Wing, CANG, is at rostrum.

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.

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 (nonvoting, nonofficeholding): US citizens on extended active duty with any branch of the United States armed forces—$7 per year.

Cadet Members (nonvoting, nonofficeholding): US citizens enrolled as Air Force ROTC Cadets, Civil Air Patrol Cadets, Cadets of the United States Air Force Academy, or a USAF Officer Trainee—$3.50 per year.

Associate Members (nonvoting, nonofficeholding): 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.

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 principle of freedom and equal rights to all mankind.

PRESIDENT

George D. Hardy
Hyattsville, Md.

BOARD CHAIRMAN

Jess Larson
Washington, D.C.

SECRETARY

Glenn D. Mishler
Akron, Ohio

TREASURER

Jack B. Gross
Harrisburg, Pa.

NATIONAL DIRECTORS

John R. Alison
Beverly Hills, Calif.
Joseph E. Assaf
Hyde Park, Mass.
William R. Berkeley
Redlands, Calif.
Milton Caniff
New York, N.Y.
M. Lee Cordell
Berwyn, Ill.
Edward P. Curtis
Rochester, N.Y.
S. Parks Deming
Colorado Springs, Colo.
James H. Doolittle
Los Angeles, Calif.
Joe Foss
Scottsdale, Ariz.

Paul W. Gaillard
Omaha, Neb.
Martin H. Harris
Winter Park, Fla.
John P. Henebry
Kenilworth, Ill.
Joseph L. Hodges
South Boston, Va.
Robert S. Johnson
Woodbury, N.Y.
Arthur F. Kelly
Los Angeles, Calif.
George C. Kenney
New York, N.Y.
Maxwell A. Kriendler
New York, N.Y.
Thomas G. Lanphier, Jr.
La Jolla, Calif.

Curtis E. LeMay
Bel Air, Calif.
Joseph J. Lingle
Milwaukee, Wis.
Carl J. Long
Pittsburgh, Pa.
Howard T. Markey
Chicago, Ill.
Nathan H. Mazer
Roy, Utah
John P. McConnell
Washington, D.C.
J. B. Montgomery
Tulsa, Okla.
Warren B. Murphy
Boise, Idaho
Martin M. Ostrow
Beverly Hills, Calif.
Earle N. Parker
Fort Worth, Tex.

Julian B. Rosenthal
New York, N.Y.
Peter J. Schenk
Arlington, Va.
Joe L. Shosid
Fort Worth, Tex.
Robert W. Smart
Washington, D.C.
C. R. Smith
Washington, D.C.
Carl A. Spaatz
Chevy Chase, Md.
William W. Spruance
Wilmington, Del.
Thos. F. Stack
San Francisco, Calif.
Arthur C. Storz
Omaha, Neb.

Harold C. Stuart
Tulsa, Okla.
James M. Trail
Boise, Idaho
Nathan F. Twining
Hilton Head Island, S.C.
Robert C. Vaughan
San Carlos, Calif.
Jack Withers
Dayton, Ohio
Rev. Henry J. McAnulty, C. S. Sp. (ex-officio)
National Chaplain
Pittsburgh, Pa.
Charles P. Azukas (ex-officio)
National Commander,
Arnold Air Society
New Orleans, La.

REGIONAL VICE PRESIDENTS

Information regarding AFA activity within a particular state may be obtained from the Vice President of the Region in which the state is located.

A. Paul Fonda
1730 K St., N.W., Suite 905
Washington, D.C. 20006
(202) 338-8282
Central East Region
Maryland, Delaware, District of Columbia, Virginia, West Virginia, Kentucky

O. Earl Wilson
10651 Roanna Court
St. Louis, Mo. 63128
(314) 421-0200
Midwest Region
Nebraska, Iowa, Missouri, Kansas

Edward T. Nedder
1176 River St., Room 22
Hyde Park, Mass. 02136
(617) 361-1113
New England Region
Maine, New Hampshire, Massachusetts, Vermont, Connecticut, Rhode Island

W. M. Whitney, Jr.
708 Francis Palms Bldg.
Detroit, Mich. 48201
(313) 821-7000
Great Lakes Region
Michigan, Wisconsin, Illinois, Ohio, Indiana

Will H. Bergstrom
655 Bridge St.
Colusa, Calif. 95932
(916) 458-2179
Far West Region
California, Nevada, Arizona, Hawaii

Sam E. Keith, Jr.
P.O. Box 5068
Fort Worth, Tex. 76108
(817) 738-0321
Southwest Region
Oklahoma, Texas, New Mexico

Jack T. Gilstrap
10029 Camille Dr., S.E.
Huntsville, Ala. 35803
(205) 453-2340
South Central Region
Tennessee, Arkansas, Louisiana, Mississippi, Alabama

Lester C. Curl
217 Surf Rd., Box 265
Melbourne Beach, Fla. 32951
(305) 723-8709
Southeast Region
North Carolina, South Carolina, Georgia, Florida

Nolan W. Manfull
4880 So. 2575 W.
Roy, Utah 84067
(801) 487-0731, ext. 41
Rocky Mountain Region
Colorado, Wyoming
Utah

Clair G. Whitney
1535 - 79th Pl., N.E.
Bellevue, Wash. 98004
(206) 237-5871
Northwest Region
Montana, Idaho, Washington, Oregon, Alaska

Dick Palen
4440 Garrison Lane
Edina, Minn. 55424
(612) 926-0891
North Central Region
Minnesota, North Dakota, South Dakota

John G. Brosky
712 City County Bldg.
Pittsburgh, Pa. 15219
(414) 355-5424
Northeast Region
New York, New Jersey, Pennsylvania

FIVE GREAT AFA INSURANCE PROGRAMS

complete information by return mail!

no cost! no obligation!

1 MILITARY GROUP LIFE INSURANCE

Offers equal coverage *at the same low cost* for flying and non-flying personnel. No geographical or hazardous duty restrictions or waiting period. Insurance up to $20,000 *plus* $12,500 accidental death benefit. Cost of insurance has been reduced by dividends for six consecutive years. All Air Force personnel, on active duty, in the National Guard and in the Ready Reserve are eligible to apply.

2 CIVILIAN GROUP LIFE INSURANCE

For non-military members of AFA. $10,000 of protection at exceptionally low cost. Double indemnity for accidental death except when the insured is acting as pilot or crew member of an aircraft. Waiver of premium for disability. Choice of settlement options.

3 FLIGHT PAY INSURANCE

Protects rated personnel on active duty against loss of flight pay through injury or illness. Guaranteed even against pre-existing illnesses after 12 consecutive months in force. Grounded policyholders receive monthly payments (tax free) equal to 80% of flight pay—the equivalent of full government flight pay, which is taxable.

4 ALL-ACCIDENT INSURANCE

(now includes pilots and crew members)

Offers *all* AFA members worldwide, full-time protection against *all* accidents—*now even including accidents to aircraft pilots and crew members.* Coverage up to $100,000. Two plans: complete, low-cost family protection under the popular Family Plan (including all children under 21), or individual coverage. Includes medical expense benefits, and automatic increases in face value at no extra cost.

5 EXTRA CASH INCOME HOSPITAL INSURANCE

Puts up to $40 a day *cash* in your pocket for every day you or an insured member of your family is hospitalized. *Cash* benefits for up to 365 days. No physical examination required. You use benefits any way you see fit. All AFA members, *active-duty and civilian,* up to Age 60 are eligible to apply.

RETURN THIS COUPON FOR COMPLETE INFORMATION ON ANY OR ALL AFA INSURANCE PLANS

AIR FORCE ASSOCIATION
Insurance Division

1750 Pennsylvania Ave., N.W.
Washington, D.C. 20006

Without obligation, please send me complete information about the AFA Insurance Program(s) checked at right.

Name .....

Rank or Title .....

Address .....

.....

City .....

State ..... Zip .....

- ☐ Military Group Life Insurance
- ☐ Civilian Group Life Insurance
- ☐ All-Accident Insurance
- ☐ Flight Pay Insurance
- ☐ Extra Cash Income Hospital Insurance

4-70

During a recent meeting of the Florida West Coast Chapter, Mrs. Jean Smith, center, discusses the status of her husband, an Air Force captain held prisoner in North Vietnam. Mrs. Lynda Gray, at the rostrum, introduced other POW wives and expressed appreciation to AFA for its action on their behalf *(see the accompanying story for more details)*.

At a meeting of AFA's New England Regional Council, held recently at Pease AFB, N. H., New England Regional Vice President Edward T. Nedder, center, presents a citation to Peter Augustus III, right, immediate Past President of the Metropolitan Rhode Island Chapter. Participating in the ceremony is Chapter President Matthew Puchalski.

cluded **Lt. Gen. Benjamin O. Davis, Jr.,** Deputy Commander in Chief, US Strike Command; **Brig. Gen. P. P. Douglas, Jr.,** Commander, 836th Air Division (TAC); **Brig. Gen. H. E. Kreidler,** Deputy Director of Operations, and **Brig. Gen. John E. Williams,** USMC, Deputy Director of Plans, Hq. USSTRICOM; and **Col. Clifford Meier,** Commander, 15th Tactical Fighter Wing.

Col. Joe Martin, USAF (Ret.), outgoing Chapter President, reported on AFA's national and local projects supporting an international campaign to exert pressure on Hanoi to release names of prisoners and to abide by the provisions of the Geneva Convention pertaining to POWs.

Chapter officers installed for 1970 are: **Allan R. Scholin,** President; **Col. D. G. Bocock,** USAF (Ret.), and **Miss Marion Chadwick,** Vice Presidents; **Lt. Col. James Weaver,** USAF (Ret.), Treasurer; and **Mrs. Bridget Porter,** Secretary.

* * *

President **George D. Hardy** recently announced the restructuring of the **Organizational Advisory Council** to include a chairman, two Regional Vice Presidents, two State Presidents, and two Chapter Presidents.

Those who have accepted his invitation to serve are: **Nolan W. Manfull,** Chairman, Roy, Utah; **Lester C. Curl,** Melbourne Beach, Fla.; **Sam E. Keith, Jr.,** Fort Worth, Tex.; **Dr. Boyd E. Macrory,** Montgomery, Ala.; **Rodney G. Horton,** Kansas City, Mo.; **Ed Millson,** Los Altos, Calif.; and **Robert Maltby,** Kettering, Ohio.

This Council will advise Mr. Hardy on Field Organization matters pertaining to programming, membership, and inactive and ineffective units.

—DON STEELE

Lt. Gen. Thomas S. Moorman, second from right, Air Force Academy Superintendent, was guest speaker at the Santa Clara County, Calif., Chapter banquet held prior to the Stanford University/Air Force Academy football game in Palo Alto. Other participants, from the left, are California AFA President Gene DeVisscher; Far West Regional Vice President Will H. Bergstrom; Brig. Gen. William T. Woodyard, Air Force Academy Dean of Faculty; Chapter President Edwin H. Millson; and Robert C. Vaughan, who is an AFA National Director.

1970 ANNUAL NATION
AEROSPACE BRIEFIN

Washington, D.C. — September 21-22-23-24

AFA's 1970 National Convention, now combined with its Annual Fall Meeting and Aerospace Development Briefings and Displays, will be held in Washington, D.C., September 21-24. All major Convention activities will be conducted at the Sheraton-Park, Shoreham, and Washington Hilton Hotels. Additional housing also will be reserved at the Windsor Park Hotel. Reservation requests should be addressed to the AFA Housing Office, 1129 20th St., N.W., Washington, D.C. 20036. All reservation requests for rooms and suites must be mailed (no phone calls, please) to the AFA Housing Office. Do not make any reservation requests directly with the hotels.

AFA's 1970 National Convention activities will include a luncheon for the Air Force Chief of Staff, a luncheon for the Air Force Secretary, a reception in honor of the Secretary and Chief, and the Annual Air Force Anniversary Reception and Dinner-Dance. The National Convention also will feature AFA's Business Sessions, Seminars, and several other activities, including a reception in honor of AFA Chapter Officers, the Annual Outstanding Airmen Dinner, and the Chief Executives Buffet Reception.

SCHEDULE OF EVENTS

Sunday, September 20

12:00 NN Registration Desk Open
3:00 PM AFA Board of Directors Meeting

Monday, September 21

8:00 AM Registration Desk Open
9:30 AM Opening Ceremony & Awards
2:30 PM 1st AFA Business Session
7:00 PM AFA President's Reception For Chapter Officers and Convention Delegates

Tuesday, Septe

8:00 AM Registration Desk Open
8:30 AM 2nd AFA Business Session
9:00 AM Briefings & Displays Open
11:45 AM AF Chief of Staff Reception
12:00 NN Briefing Participants Buffet Luncheon
12:30 PM AF Chief of Staff Luncheon
2:30 PM AF Reserve Seminar
6:00 PM AF Secretary & Chief's Annual Reception

Wednesday, September 23

8:00 AM Registration Desk Open
9:00 AM Briefings & Displays Open
9:00 AM Air Force Symposium
11:45 AM AF Secretary's Reception
12:00 NN Briefing Participants Buffet Luncheon
12:30 PM AF Secretary's Luncheon
4:00 PM Briefing Participants Reception
7:00 PM AF Anniversary Reception
8:00 PM AF Anniversary Dinner-Dance

Thursday, September 24

9:00 AM Briefings & Displays Open
12:00 NN Briefing Participants Buffet Luncheon
4:00 PM Briefing Participants Reception

ADJOURNMENT

CONVENTION AND AND DISPLAYS

1970 BRIEFINGS AND DISPLAYS TO BE BEST YET

More than 50 major aerospace/defense companies will participate in the 1970 Aerospace Development Briefings and Displays, to be held in conjunction with AFA's Annual National Convention at the Sheraton Park Hotel in Washington in September. The majority of the companies will display equipment and conduct briefings; however, some companies will exhibit only.

This briefing concept was pioneered by AFA in 1964 and combines displays of equipment with company presentations in the booth to audiences of key military, government and industry personnel. Morning attendees are assembled into parties of 15 to 20 persons each and escorted on schedule to briefings in the group of companies selected. Afternoon attendees may select any of the presentations offered in any order of preference.

Top military and government leaders attend this event annually. Last year, 6,080 attended the Briefings and Displays, with 2,359 escorted to the morning presentations and 3,721 attending in the afternoons. They represented 54 government and military agencies and some 51 companies. With AFA's National Convention being held at the same time this year, the attendance is expected to double.

Space for participating companies is expected to be an early sell-out, as has been the case each year. A few booths are still available for companies that would like to brief or exhibit, or both. A minimum of 300 square feet of booth space is required to conduct briefings. No minimum is required to exhibit only. Companies interested in reserving space should contact AFA as quickly as possible.

TO RESERVE BRIEFING/DISPLAY SPACE, WRITE OR CALL:

AFA Briefing & Display Office
1040 Shoreham Building
Washington, D.C. 20005
Telephone: (202) 347-0425

COMPANIES PARTICIPATING IN '70 BRIEFINGS

The following companies have reserved space in the 1970 Aerospace Development Briefings & Displays. The majority of these companies will exhibit hardware and make presentations in their booths; other companies will exhibit only.

AC ELECTRONICS DIV., GMC
AT&T AND ASSOCIATED COMPANIES
ATLANTIC RESEARCH CORP.
AVCO CORP.
BEECH AIRCRAFT CORP.
BELL HELICOPTER CO.
THE BOEING CO.
BOURNS/CAI, INC.
BUNKER-RAMO CORP.
COCA-COLA USA
CONFERENCE BOOK SERVICE
CONTINENTAL AVIATION & ENGINEERING
CONTROL DATA CORP.
FAIRCHILD HILLER CORP.
GENERAL DYNAMICS CORP.
GENERAL ELECTRIC CO.
GRUMMAN AEROSPACE CORP.
HOWELL INSTRUMENTS, INC.
HYCON CO.
IBM FEDERAL SYSTEMS DIV.
LITTON INDUSTRIES
  Data Systems Div.
  Guidance & Control Systems Div.
LOCKHEED AIRCRAFT CORP.
LTV AEROSPACE CORP.
MARTIN MARIETTA CORP.
McDONNELL DOUGLAS CORP.
NORTH AMERICAN ROCKWELL CORP.
PAN AMERICAN WORLD AIRWAYS
PEPSI-COLA CO.
RAYTHEON CO.
SPERRY RAND CORP.
  Flight Systems Div.
  Gyroscope Div.
  Univac Div.
STANDARD MANUFACTURING CO.
TELEDYNE RYAN AERONAUTICAL CO.
TRACOR, INC.
TRW SYSTEMS
UNITED AIRCRAFT CORP.
WESTINGHOUSE ELECTRIC CO.
WILLIAMS RESEARCH CORP.
WYMAN-GORDON CO.

Make sure that your company is among this distinguished group of aerospace/defense firms at AFA's 1970 Briefings.

Bob Stevens'

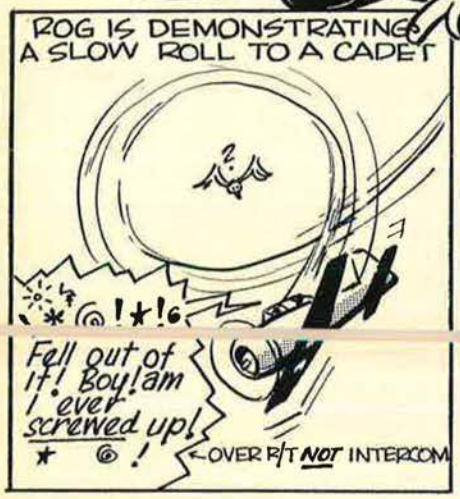
"There I was..."

"The time has come," the artist said,
"To speak of many things . . .
The ups and downs of flying clowns,
And cannons wearing wings."

REMEET ROGER RUDDER!

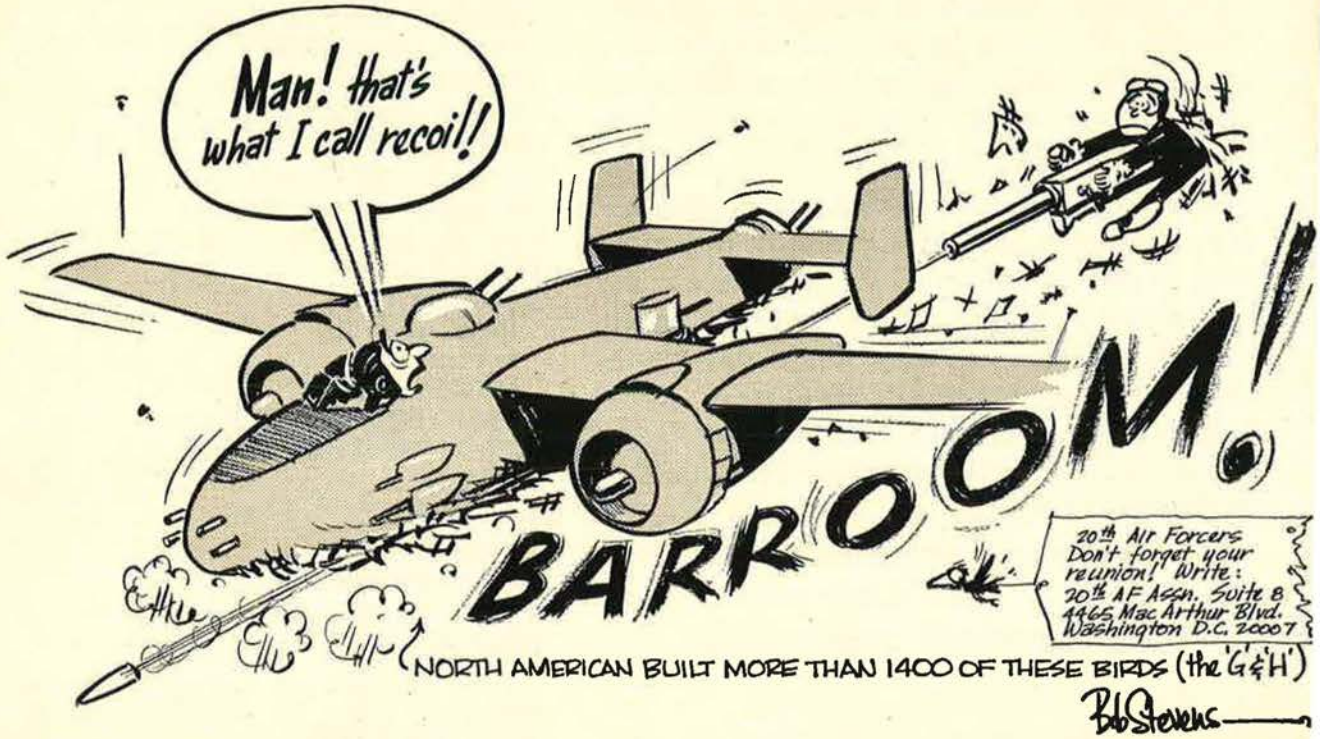
- PILOT EXTRAORDINAIRE!
- BON VIVANT!
- ALL-ROUND GOOD FELLOW!
- and EXPENDABLE!

(BEING A SECOND LOOEY)



THANX TO MAJOR JOHN ZIMA, NEWHALL, CALIF. and CAPTAIN BOB HOWARD, RIALTO, CALIF.

GENERAL GEORGE KENNEY'S WARRIORS IN 5TH AIR FORCE RIGGED UP A **75 MM** CANNON IN A B-25.... IT WAS A REAL RIVET POPPER! ACTUALLY IT COULD FIRE QUITE RAPIDLY AND MADE ONE HELLOFA STRAFING WEAPON!!



NORTH AMERICAN BUILT MORE THAN 1400 OF THESE BIRDS (the 'G' & 'H')

Bob Stevens

a small miracle at $875

The right community relations tool at the right time at the right price. It's *The New Thrust in Education*, a five film library showing how today's exciting breakthroughs in education can help communities attack their most pressing problems: unemployables, drug abuse, illiteracy, student motivation, etc. These motion pictures inform, stimulate, motivate positive action. A small miracle to reach mass audiences. Sets are yours to give to school districts in your plant communities. Your cost? Only $875 per library. We'll add your company credit on each film, if you wish. Produced under sponsorship of The National Laboratory for the Advancement of Education, letters of endorsement have come from the U.S. Office of Education. The National Education Association. Even Encyclopaedia Britannica. Our brochure, *The New Thrust in Education*, tells you everything. Write or phone for a copy.

Audio Productions / Educational Services

Contact: Thomas Pyle, Executive Producer (212) 757-0760

630 Ninth Avenue, New York, N.Y. 10036

a division of NOVO

Makes every life-saving minute count. C-9A Nightingale.

In their first year of operation with the Air Force Military Airlift Command, the jet fleet of aeromedical C-9A Nightingales operated around-the clock at an unprecedented dispatch reliability rate of 99.54%. □ This versatile airframe can also serve as a Navigational Trainer, or a high-performance Test Bed. It can provide airline seating for Special Air Missions. And a convertible configuration can carry passengers or cargo on indirect support missions. □ This sleek twinjet offers the economy of an "off-the-shelf" airframe. And, like its commercial counterpart, the DC-9, it provides fast turn-around with less maintenance and ground support equipment. □ The C-9 is the low-cost, high-value answer to many military needs.

MCDONNELL DOUGLAS