

SEPTEMBER 1974 / \$2

AIR FORCE

PUBLISHED BY THE AIR FORCE ASSOCIATION

MAGAZINE



Carl A. Spaatz
1891-1974

**Once a
hunter.**

**Now the
hunted.**

The F-102 Delta Dagger...delivered to the Air Force in the early '50s...an excellent record as an all-weather interceptor.

Today, 20 years later, Sperry is breathing new life into the old bird. Teaching it a few new tricks. Instead of being the hunter, now it's the hunted.

So new aircraft like the F-15 can be tested in actual air-to-air combat with a full sized aircraft as a target, Sperry is developing the PQM-102 remotely piloted vehicle for the USAF Armament Development and Test Center (ADTC).

Drawing on experience in converting the F-80, F-86, and F-104 for RPV roles, Sperry is making it possible for a ground-based pilot to "fly" the PQM-102 through programmed evasive maneuvers he could not physically subject himself to in the cockpit.

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PHOENIX, ARIZONA 85036



A-10 STATUS REPORT:

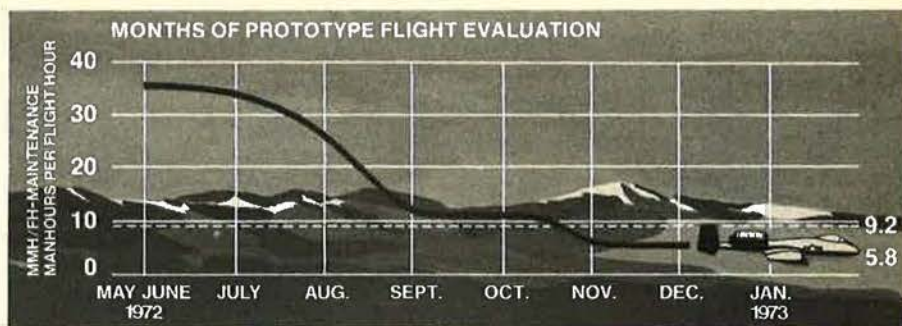
DEMONSTRATED PERFORMANCE PROVES THE A-10 IS READY FOR PRODUCTION

The A-10 is the result of a program that goes back to March of 1967 when 21 companies were asked to provide designs for a low cost fighter to specialize in close air support. Thanks to design-to-cost procurement and fly-before-buy evaluation, today's A-10 has eliminated the element of surprise between prototype and production.



The A-10 first flew in May of 1972. In winning a competitive flyoff against the A-9, it logged more than 300 hours of flight testing while exploring every corner of the performance envelope. After the flyoff, the A-10's continued the flight test program and accumulated additional hours. Earlier this year, four Tactical Air Command pilots flew 80 hours in one prototype in 26 days... and could have flown even more if needed. In all, the A-10 prototypes have logged more than 700 hours of tough, test and combat-type flying. And they continue to pile up additional hours every day.

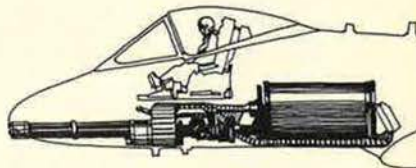
The simple airframe-engine design and austere avionics system of the A-10 will pay off in low support costs. Realization of the 9.2 MMH/FH



(maintenance man hours per flight hour) specification requirement for the mature system is assured based on the performance of the prototypes to date. In the final month of the Competitive Prototype Phase, the A-10 recorded a 5.84 MMH/FH figure. The chart above indicates the results of the low maintenance design concept of the A-10 during the prototype test phase. These results have been further verified during subsequent flight testing. Maintainability goal of the production airplane is 9.2 maintenance manhours per flight hour. Yet in the final month of competitive prototype phase testing, the A-10 required only 5.84 man-hours of contractor maintenance for each hour flown. Over the life cycle costs for the A-10 fleet, the specified low maintenance rate will result in a substantial savings to the taxpayer when compared to other first line fighters in the tactical inventory.

Because the A-10 must operate in a lethal environment to perform its mission, it has gone through extensive survivability tests. Its armored cockpit has been proven able to withstand 23mm hits. Its self sealing, fire suppressive fuel system has been severely tested against the AAA threat. Its triple redundant flight control system includes a manual back up cable and pulley system designed to save aircraft long after hydraulics are gone.

The 30mm cannon and the A-10 have proven to be a compatible weapons system. The largest Gatling gun ever mounted in a fighter, this tank-killer has fired over 80,000 rounds to date. It has fired more than 6,000 rounds in the air and proven its accuracy, and compatibility with the A-10 airplane.



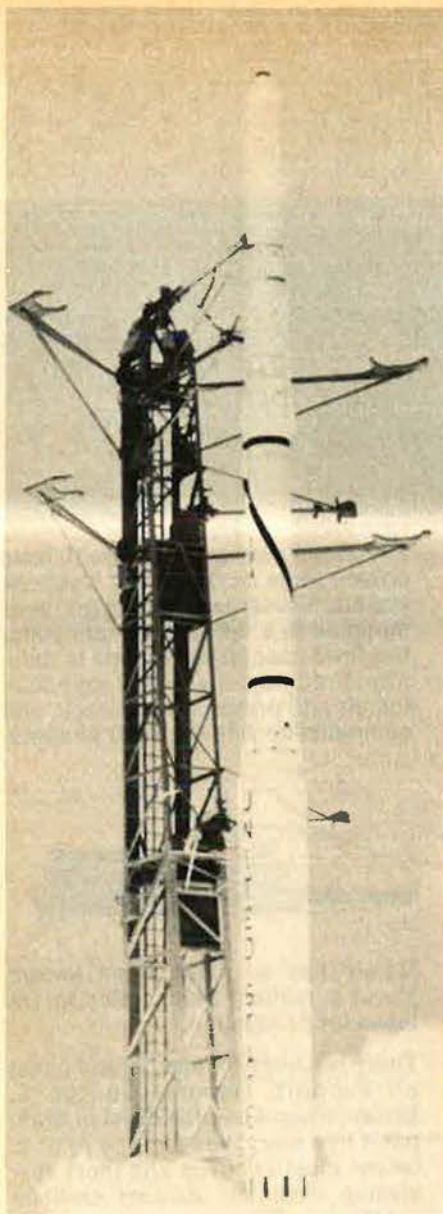
Rarely has so much been known about a military plane prior to release for production.

There is a need for specialized close air support. General George S. Brown, when Air Force Chief of Staff, put it this way: "I expect the A-10 to be the most effective and most survivable close air support airplane yet designed."

In its 700 hours of flight test, ground test, plus extensive operational evaluation—the A-10 has proven itself a weapons system ready to meet that need. The product is ready and Fairchild Republic is ready to produce. We have the facilities, the manpower and most important the "know-how" to deliver a quality product on time.



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The trustworthy Scout. After 32 in a row, 33 was hardly a long shot.

The Scout launch vehicle continues to add to its own NASA record for dependability.

The Scout's 33rd successful mission in a row launched a German AEROS-B satellite into a near-polar orbit. Information gathered will help build a better understanding of upper atmosphere conditions important to radio communications.

This success, however, didn't really come as a surprise.

Because since 1963, the four-stage, solid-propellant Scout has achieved an operational success rate of over 95 percent.

That's one reason the Scout is NASA's lowest-cost orbital launch vehicle, with payload capabilities that have tripled since its inception with NASA and the Department of Defense. And it also has performed missions that include probe and re-entry.

Proven dependability is why the Scout also serves Great

Britain, Italy, France, the Netherlands and the 10-nation European Space Research Organization.

The stakes are too high to risk using anything else.



**VOUGHT
SYSTEMS DIVISION**
LTV AEROSPACE CORPORATION
DALLAS, TEXAS

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In this Anniversary issue, AIR FORCE Magazine salutes the memory of Gen. Carl A. "Toosey" Spaatz, who died this summer at the age of eighty-three. The bust of the General, done in 1966 by Suzanne Silvercruys, is at the Air Force Academy in Colorado, where Bill Ford of our staff took the photo.

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By the time the YF-16 first broke ground,

That's because its engine is the proven Pratt & Whitney Aircraft F-100 which has been flying in the McDonnell Douglas F-15 for two years.

Installing it in the General Dynamics YF-16 takes only a handful of bolts and a couple of adapters.

It's an engine in production and in inventory. With spares in the pipeline. An engine with 15,000 development hours. An engine with maintenance training completed and tech manuals printed. And an engine with its Aerospace

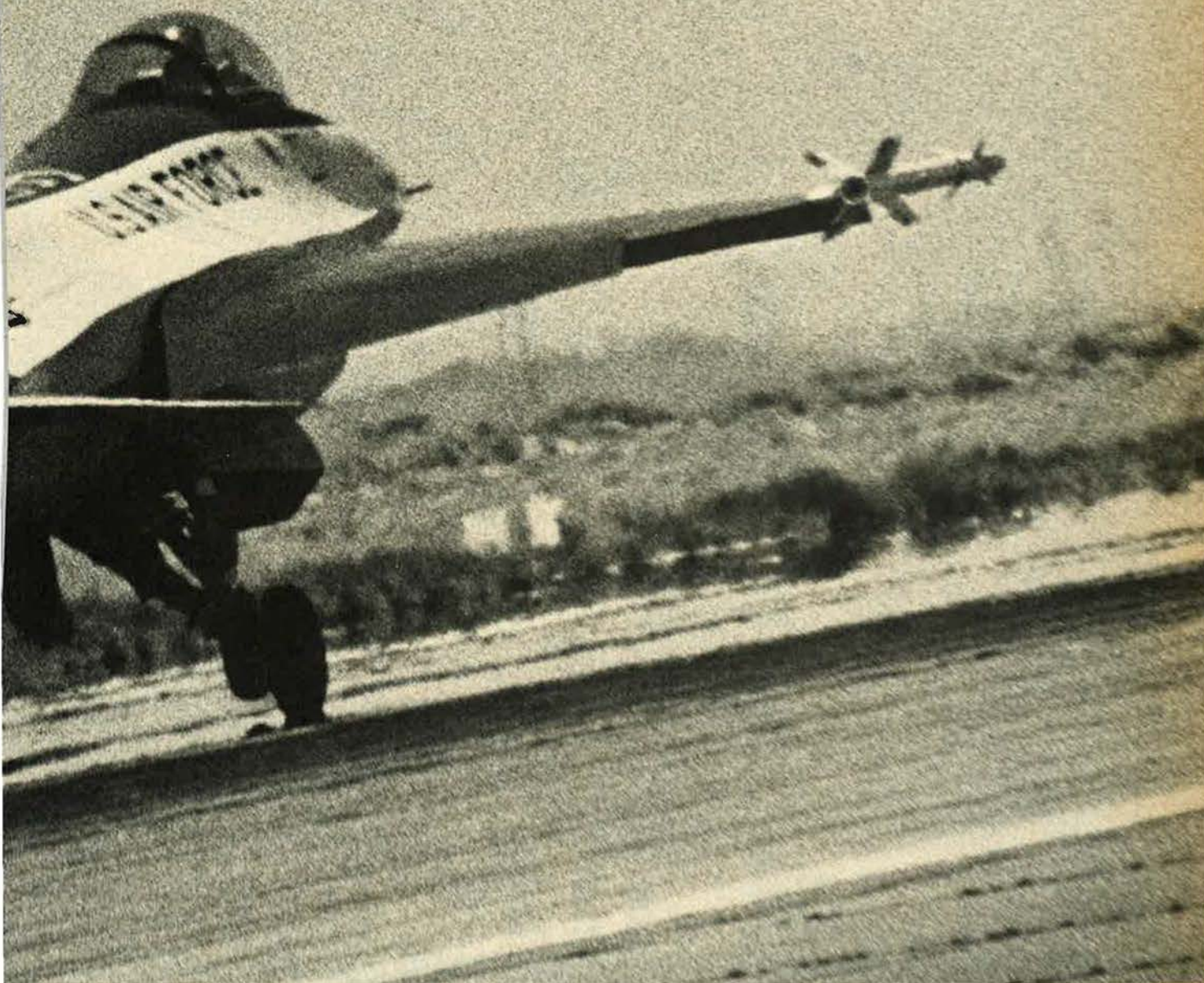


ts engine had spent 2600 hours in the air.

Ground Equipment (AGE) now being deployed.
In short, it's an engine not only with a proud
heritage, but with the built-in leadership,
reliability and technological excellence
synonymous with our name.

An engine, in fact, that proved itself long
before the first YF-16 flew.

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GRUMMAN AEROSPACE CORPORATION

WEAKNESS IS NEVER WARRANTED

By Claude Witze

SENIOR EDITOR, AIR FORCE MAGAZINE

WASHINGTON, D. C. AUGUST 15

It is easy, breathing the fresh oxygen people are enjoying in Washington at mid-August 1974, to sail along euphorically on Cloud Nine. It takes a few self-inflicted pinches to make one realize this ethereal atmosphere is one we have lived in before, almost always at the beginning of a new Administration in the White House.

Gerald R. Ford is welcome as our new Commander in Chief. In the first few days, his broom has swept a clean path into the Oval Office, a path already trod by members of Congress, the Cabinet, an entranced press corps, a delegation of mayors, and even George Meany, who checked his snarl at the gate.

President Ford knows inflation is his No. 1 problem and he also knows he needs the help of all these early guests, as well as the voters, to curb the crazy upswing of the price indexes.

One of the first things Gerald Ford did, even before he was sworn in, was publicly to give the Secretary of State, Henry Kissinger, a continuing appointment. Thus, the world knows our foreign policy is unchanged.

Only hours later, the new Chief Executive went before a joint session of the House and Senate and told the world that this nation stands by its commitments and will not weaken its defenses.

He turned the spotlight on national security:

"A strong defense is the surest way to peace," the President declared. "Strength makes detente attainable. Weakness invites war, as my generation knows from four bitter experiences.

"Just as America's will for peace is second to none, so will America's strength be second to none."

President Ford went on, in firm tones, to give a pledge to such distant allies as Japan, the Latin American nations, and those in Europe and the Middle East. To Soviet Russia and the People's Republic of China, he promised to continue the diplomatic efforts of the past few years. The government in Hanoi, as well as any other adversary, potential or actual, could not miss the message aimed in their direction.

Even as Mr. Ford was speaking, the Senate Committees on Appropriations and Foreign Relations were preparing to announce a test of the new President's charge that they should "avoid unwarranted cuts in national defense." Congress is about to learn what he considers warranted, and what is unwarranted.

The Appropriations Committee, headed by Sen. John L. McClellan, recommended a reduction of \$5.1 billion in proposed Defense Department funding for Fiscal 1975. The Foreign Relations Committee, whose chairman is the lame-duck Sen. J. William Fulbright, cut the Administration's request in the Foreign Aid bill by \$720 million.

These are proposals that traditionally do not carry the seeds of major disagreement and are resolved in conference. Mr. Ford already has asked Congress: Can't we do the job better by reasonable compromise?

He took the first step, and possibly put the first strain on what he hopes will be a "good marriage" and not just a honeymoon, by sending out word that he is disappointed. The President, a spokesman said, hopes Congress will reconsider and recognize the "impact that reductions of that magnitude" would have on US security.

It thus becomes evident that some of the ideas sponsored by Senators McClellan and Fulbright are not acceptable to an Administration that does not want to turn aside from foreign-policy commitments laid down in the Nixon years, and earlier, or from the kind of defense posture that Mr. Ford endorses. His thinking, it should not be forgotten, is reinforced by twelve years of experience on the House Defense Appropriations Subcommittee.

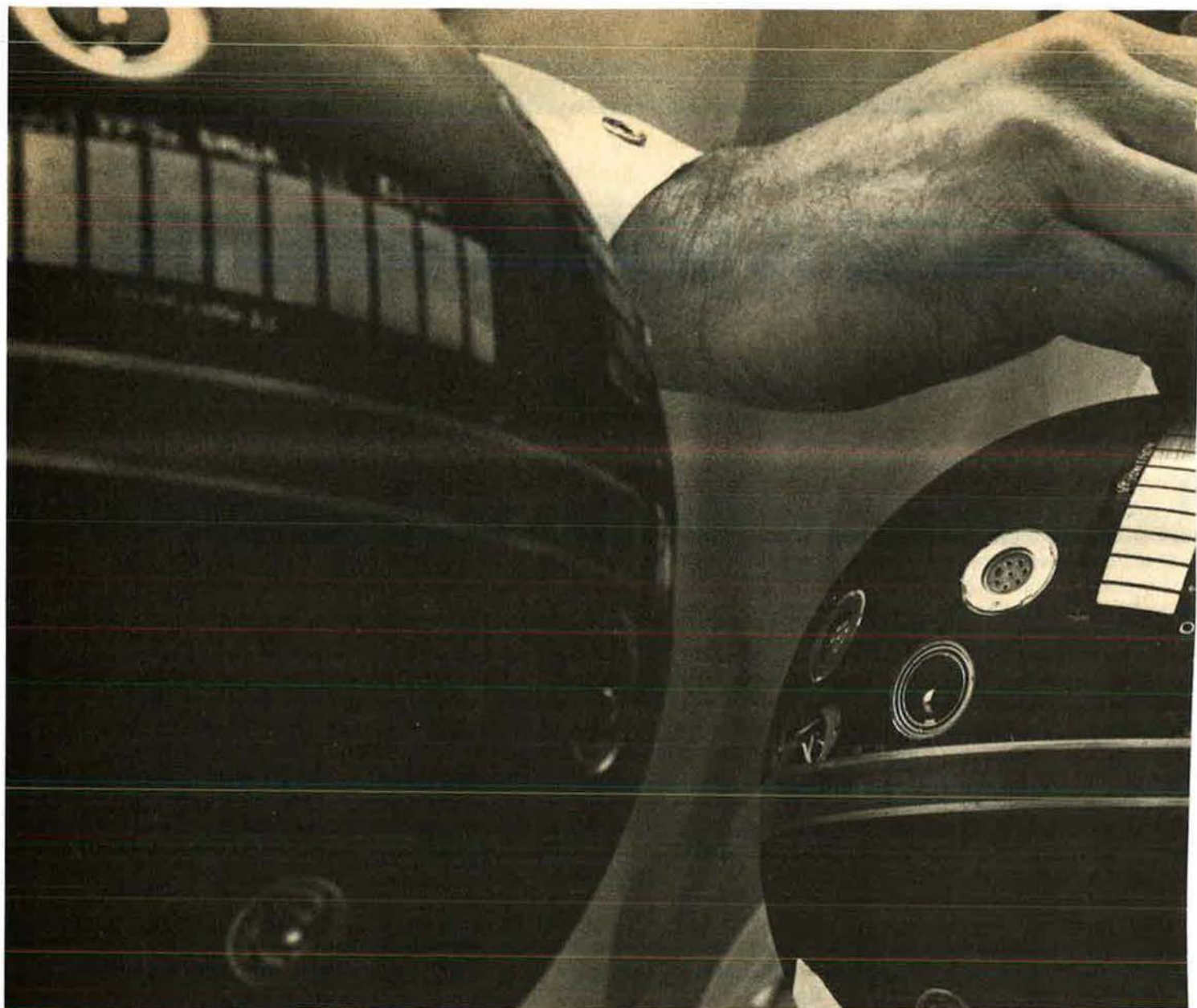
So far, President Ford has not proposed any bold innovations for his approaching showdown with inflation, although some may be hatched in his planned summit conference on the economy. It goes without saying that part of the remedy for our ailment, at least, must lie in curtailed federal spending.

It has been reported that Mr. Ford may press Congress to appropriate about \$10 billion less than it wants to in the entire federal budget for Fiscal 1975.

The suggestion that half of this cut come out of the Pentagon's requirements is one that the President obviously classifies as unwarranted. And so, in truth, will his old companions in the House of Representatives, if previous conferences on appropriations provide any sure guide.

As President Ford has keynoted, a reasonable compromise will do the job better.

What will be significant in the long run is how that compromise measures against the realities of "America's strength . . . second to none."



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The Engine Health Monitor reports data.



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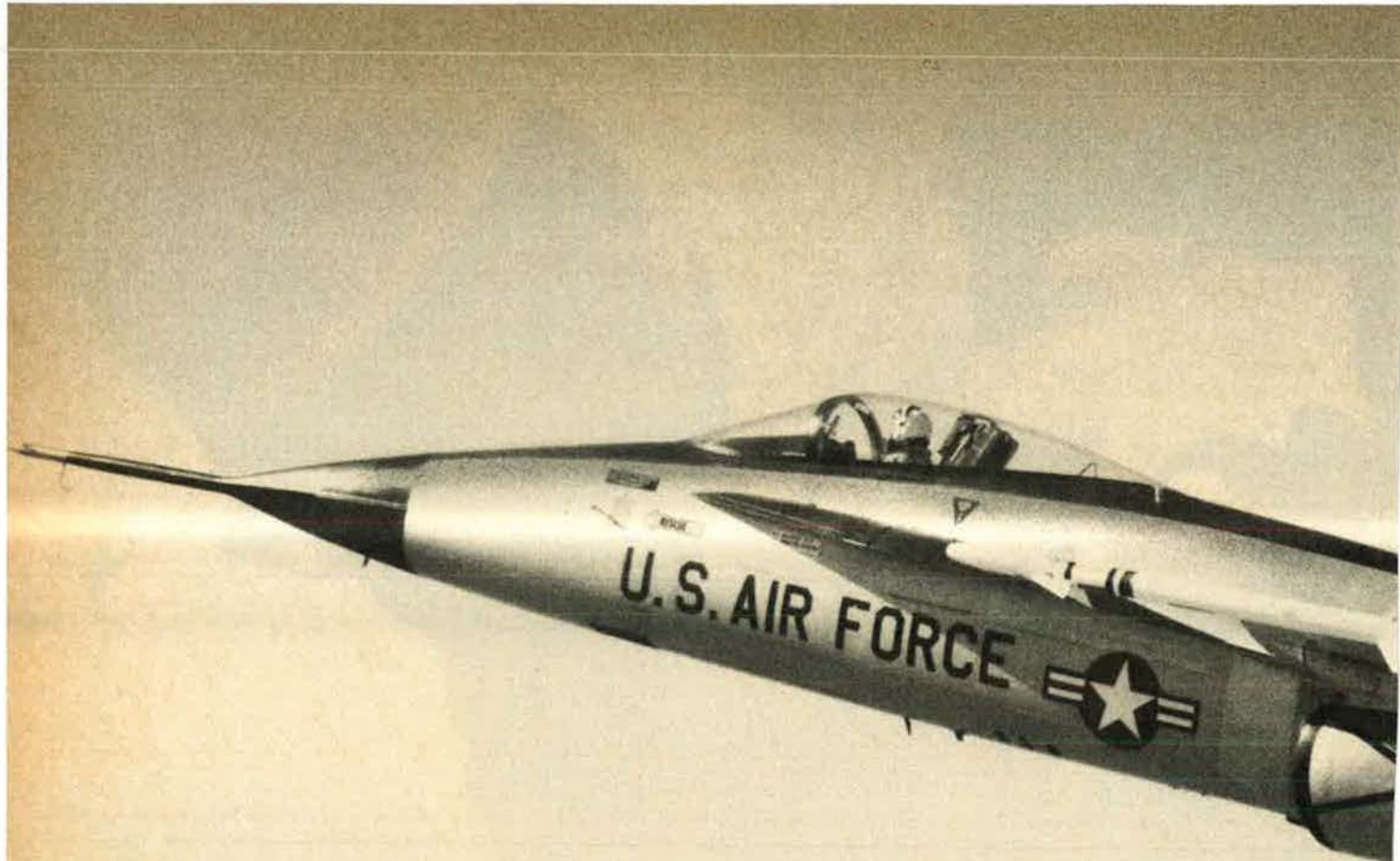


avionics systems with a new Task Oriented Processing System (TOPS) that's smaller, lighter and more economical than conventional airborne computers.

All reflect our concept of cost-conscious technology. Electronics that make sense. More efficient. Less costly to buy, to use, to maintain.

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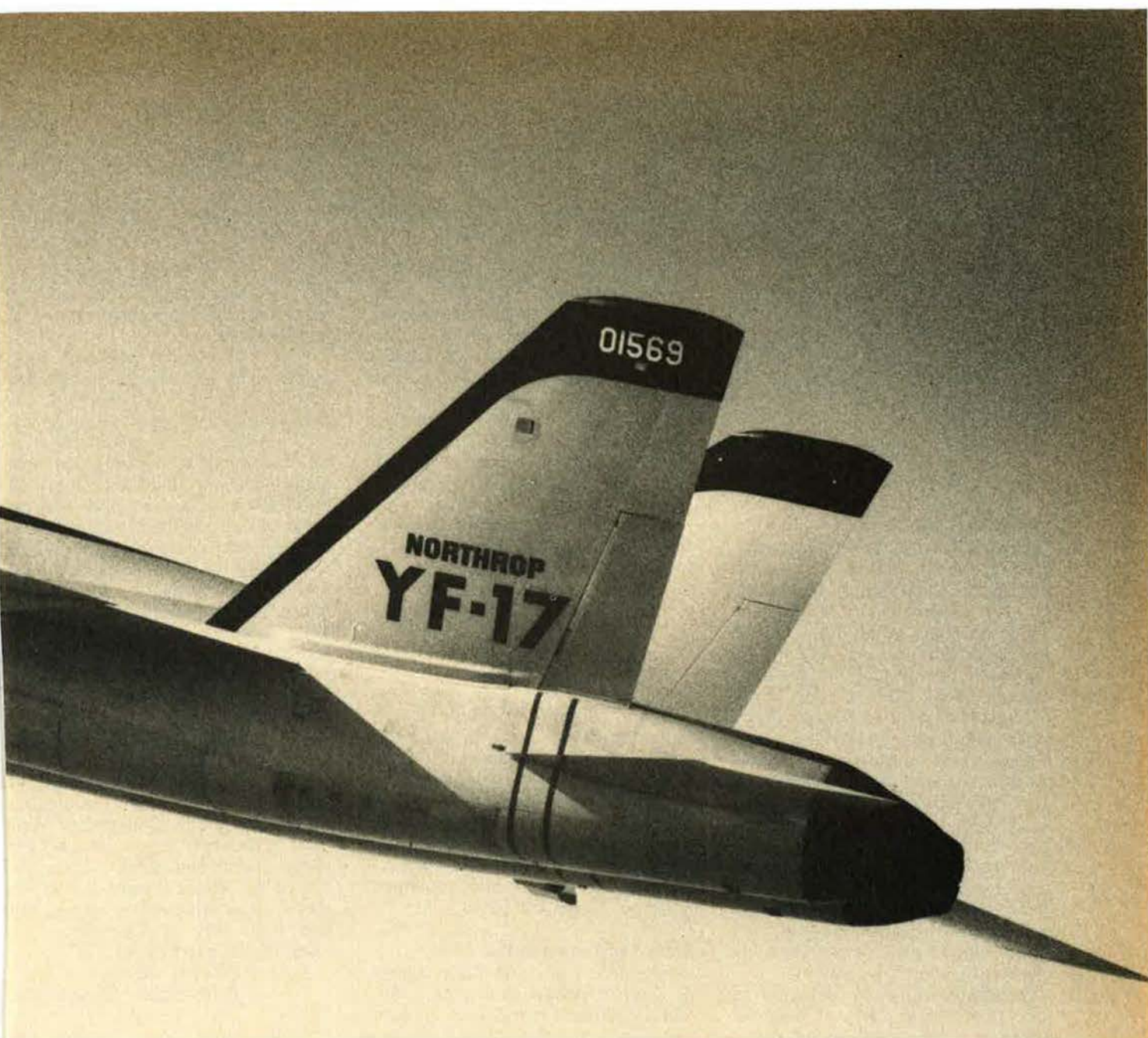
We built over 850 F-5 tactical fighters

for 20 nations. Deliveries as promised. Never had a cost overrun.

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Technology that makes sense. Simpler. More efficient. Less costly to buy, to use, to maintain.



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Airmail

Wrong TC Group

Gentlemen: In Claude Witze's fine article in July ["New Chairman . . . New Chief"] Gen. George Brown is stated to have commanded the 67th Troop Carrier Group. It was the 62d Troop Carrier Group at McChord AFB, Wash.

Col. Edmond L. McCready,
USAF (Ret.)
San Bernardino, Calif.

376th Strategic Wing

Gentlemen: I noted with considerable disappointment the absence of the "Best Flying Wing in the Strategic Air Command for 1973," the 376th Strategic Wing, from the organizational chart of Eighth Air Force on page 84 of the Almanac edition, May 1974. I have commanded the 376th Strategic Wing since September 1972 and have taken great pleasure in many awards and recognition amassed by the outstanding personnel of the wing. Also, I would like to take this opportunity to let our many friends who served TDY with us during operations Bullet Shot and Constant Guard know that "the 376th is alive and well at Kadena." Perhaps they would like to make a pen and ink change to your May edition.

In addition to being selected as the "Best Flying Wing in SAC for 1973," a rare achievement for a nonbomber wing, the personnel of this wing, individually and collectively, have garnered an impressive list of awards. The wing holds six Outstanding Unit Awards, the latest in 1972, with "Combat V" device; three Presidential Unit Citations; Best Field Maintenance Squadron in the Strategic Air Command, 1971; Best Field Maintenance and Organizational Maintenance Squadron in Eighth Air Force, 1972; Strategic Air Command Nominee for the Daedalian Trophy, 1972; and Best Logistics Plans Division in the Strategic Command, 1973.

The most recent combat achievement of the 376th Strategic Wing was during Operation Bullet Shot and Constant Guard, when the wing approached triple permanent party strength with temporary duty personnel.

During the period of March 1972 through August 1973, the 376th Strategic Wing flew aerial refueling missions and reconnaissance missions in direct support of Southeast Asia operations. During Linebacker II, the culmination of the US effort in Vietnam, the 376th Strategic Wing flew aerial refueling missions that enabled the B-52s to accomplish their highly successful missions.

I take a great deal of pride in these outstanding people and I hope you will help us notify our friends that we are still here.

Col. D. G. Kavanaugh
Commander
376th Strategic Wing (SAC)
APO San Francisco

• *The answer is simple, if not necessarily satisfactory. In the interest of accuracy, we base our organization charts in the Almanac issue on information furnished by the major commands and separate operating agencies. We're afraid the omission of the 376th was inadvertent on the part of the command involved.*—THE EDITORS

Rude Awakening in the '80s?

Gentlemen: I enjoyed Capt. James E. Oberg's review of my book, *Soviet Conquest From Space*, in your June issue. If I may make a correction. His comment: "But recent revelations of the backward [not, as James claims, ten years ahead of Apollo] designs of the Soviet manned spacecraft . . . indicates that things are not as black as he suggests," is in error.

I have given the Russians up to a five-year lead over the United States in the design of low-cost, reusable orbit-to-orbit manned spacecraft which will be operational in the early 1980s. This lead considers mission planning and objectives, Russian work in developing reliable, though crude by American standards, reusable spacecraft that can be refueled in orbit using low-performing, earth-storable propellants, and Russian design preference in using modular propellant tanks to increase mission flexibility.

I believe that most people would

agree that the United States leads the Soviets in advanced technology, sophistication, and cost of orbital space systems.

Until our country gets off dead center and realizes that the new arena for conflict between the superpowers is near-earth space; until Congress and the American public accept that technology does not stand still with time and that the hardware we used to land men on the moon was on the drawing boards ten to fifteen years ago, and unless NASA and the Defense Department plan their program in terms of an integrated national space and defense program to serve both our scientific and national security interests at the lowest acceptable cost, our country could be in for a rude awakening in the 1980s.

Your magazine performs an outstanding public service by bringing forth key national security issues in layman's language for the people of the free world to digest. If your fine publication could be sent to every public and school library in the United States, I believe that the views of an enlightened public will find their way to Congress. . . . Keep up the good work!

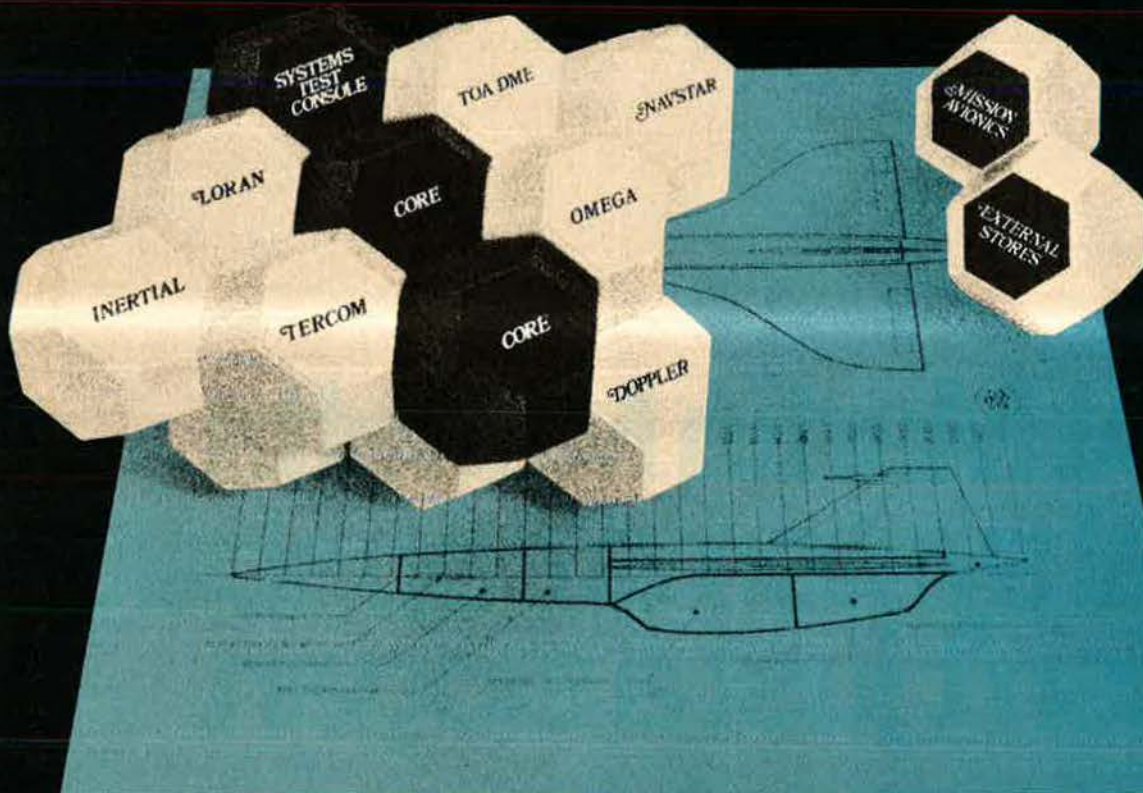
Peter N. James
Palm Beach Shores, Fla.

Capt. James Oberg replies: Mr. James's book praises the capabilities of the Soyuz space capsule and remarks that "the United States has nothing like it." Quite true, since we scrapped the Gemini program almost eight years ago. It may be possible for the Russians to make a quantum leap from five years behind us (the MOL-like Salyut) to five years ahead of us (their new reusable orbit-to-orbit manned spacecraft), but experience in such fields as advanced electronic computers and nuclear fusion research indicates that it is unlikely. But Mr. James has had some excellent contacts and experiences, and I hate to pick on his interpretations when we are in agreement on most facts and implications: the US Space Shuttle program is not a scientific luxury but a vital part of the national defense effort; and the "space

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Airmail

race," far from ending with Apollo-11 five years ago, continues unabated, with crucial military and political overtones for the next decade.

Impossible Acronym

Gentlemen: Your July issue was its usual outstanding edition. However, on page 55, the definition for the acronym DoD AIMS program must have been coined by someone with no knowledge of what this billion-dollar program entailed.

AIMS is an acronym of acronyms. The "A" stands for ATRCBS (Air Traffic Control Radar Beacon System). The "I" stands for IFF MARK X (SIF). The "M" stands for MARK XII. The "S" stands for Systems. (IFF stands for Identification Friend or Foe; SIF stands for Selective Identification Feature.)

The DoD AIMS program was established by DoD September 26, 1962, with the Air Force designated as the Executive Agent. This directive, which supported national military/civil air traffic control and identification objectives, spells out the definition for AIMS.

Please set the record straight on this most important program.

Lt. Col. Carl J. Grabher,
USAF (Ret.)
Fairfax, Va.

• *The identification—Altitude Identification Military System—was provided us by the Air Staff Directorate of Command Control and Communications. It may well be they decided a definition of "an acronym of acronyms" is impossible to condense into a manageable space.*—THE EDITORS

Max Altitude

Gentlemen: Capt. Victor B. Putz's fine article, "The Last B-52 Mission From Guam" [June issue], brought back many memories of flying the Stratofortress while assigned to the Air Force Special Weapons Center at Kirtland AFB, N. M. The nose-low appearance on takeoff climb belied the grace and power of a truly superb aircraft.

My last duty assignment prior to retirement in December 1963 was Chief, Flight Test Division at the

Air Force Special Weapons Center. Our role of dropping nuclear test devices in the Pacific Test Range in the late fifties and early sixties is fairly well known. However, we did perform a variety of test missions in other fields for the other services and government contractors.

Noting the "Facts and Figures" box in Captain Putz's article prompted thoughts of test programs flown for Lockheed (Sunnyvale) and General Electric testing the reentry characteristics of nose cones. On several occasions we operated 013, a B model, and 620, a D model, at altitudes above 55,000 feet. The top altitude that I flew was 58,500 over Stallion Site on the White Sands Missile Range in 1962. Needless to say, our weight was at a minimum. On the particular mission I flew, our fuel weight at takeoff was 35,000 pounds, 14,000 pounds at drop, and 6,500 pounds on landing. I would be interested in knowing the maximum altitude at which the B-52 has been flown.

It is my understanding that B-52 013 has been retired to a place of honor at Sandia Base in Albuquerque, N. M.

Lt. Col. Charles A. Pinney,
USAF (Ret.)
Executive Manager
Chamber of Commerce
Hermosa Beach, Calif.

• *The Air Force doesn't maintain any "official" records of the maximum altitude attained by various models of the B-52. The highest altitudes that SAC has recorded for A, G, and H models, respectively, are: 58,000, near 60,000, and more than 60,000 feet. We were not able to get figures for the other models.*—THE EDITORS

B-24 in Flames

Gentlemen: Relative to the article by Herman S. Wolk, "The Bomber Offensive," in your June issue, I noted with interest the picture of the B-24 on page 63.

That B-24 was a member of the 725th Bomb Squadron of the 451st Bomb Group, located near Foggia, Italy. I have a print of the published photo as well as two pictures taken a few seconds before that one, as the plane was attacked by 109s. The plane's serial number appears to be 295379, although the last digit could be an 8—there is damage in the tail section from the fighters and it is partly obscured.

I was Group Operations Officer of the 451st and was in the plane from which these pictures were taken.

A note on the back of the third photo says, "22,000 feet near Vienna, Austria." My records indicate they would have been taken on one of the following missions:

(a) "July 24, 1944, to Linz, Austria. Target—Hermann Goering tank



Walkey's deputy wing lead aircraft, top, receives hits in left wing, tail section, and fuselage. Front and belly turrets are traversing, with only one gun barrel visible. Two barrels now showing in turrets, center, and No. 1 engine is afire. Engulfed in flames, lower, plane and crew are lost.

works; 7 hours long—heavy losses by fighters."

(b) "August 23, 1944, to Vienna, Austria. Target—unknown; 7 hours long—attacked by fighters."

I am inclined to think it was on the Vienna mission.

Thomas E. Walkey
Silver City, N. M.

Airmail

UNIT REUNIONS

Combat Glider Pilots

The World War II Combat Glider Pilots Association will hold a reunion at the Don Ce Sar Hotel, St. Petersburg, Fla., October 24-26. Please contact

Tip Randolph
136 North Main St.
Freehold, N. J. 07728

Tactical Airlift

The sixth annual Tactical Airlift reunion will be held in Atlanta, Ga., November 1-3, at the Hyatt Regency Hotel. All those who have had anything to do with Tactical Airlift or the support thereof, past and present, are encouraged to participate. For further information contact

Lt. Col. Rocky Bouldin
P. O. Box 9707
Pope AFB, N. C. 28308
or
C. W. Scott
726 Prescott Circle
Newport News, Va. 23602

A-1E/H

The sixth annual A-1E/H reunion will

be held November 8-10 at the Menger Hotel in San Antonio, Tex. Spads, Sandys, Hobos, Fireflies, Zorros, downed or rescued crew members, and any other interested parties are encouraged to attend. Send inquiries to

A-1 Skyraider Association
Box 41
Randolph AFB, Tex. 78148

7330th Flying Training Wing

The Fürstenfeldbruck 7330th Flying Training Wing will hold its 20th reunion in San Antonio, Tex., in November. Please send current addresses of all Fursty Tree Movers to

Fr. William L. Travers
2326 Fairfield Ave.
Fairfield, Calif. 94533

NEW ZEALAND CALLING

Here are parts of an exchange of correspondence with two young readers in New Zealand. We like their enthusiasm and take this means of sharing it with our readers.—THE EDITORS

March 26, 1974

Gentlemen: We have been reading the May 1973 issue of your magazine, which we ordered from you. . . .

We are particularly interested in military aircraft, but it is almost impossible to obtain up-to-date information on the USAF here in New Zealand. Your magazine is the most detailed we have ever seen. . . . Is it possible to get a subscription, and how much would it cost?

. . . We would be extremely grateful, as it would be a great asset to our collection and study of air forces. We both hope to join the RNZAF as pilots.

David and Peter Gill
Christchurch, N. Z.

April 9, 1974

Dear David and Peter: . . . I have attached an application blank if you wish to subscribe to AIR FORCE Magazine. In any case, we will send you, with our compliments, a copy of the 1974 Almanac issue. . . .

John L. Frisbee
Executive Editor

April 21, 1974

Dear Mr. Frisbee: . . . At the moment our finances do not allow us to get a subscription to your magazine. . . . However, we would like to take up your generous offer of the next Almanac issue, as it is an extremely interesting manual, and we are very interested in military aviation. . . .

David and Peter Gill

May 17, 1974

Dear Mr. Frisbee: Thank you for sending us the latest Almanac issue of AIR FORCE Magazine.

Not only did it have the complete run-



Peter Gill (left) and his brother David—subscribers, avid readers, and, hopefully, one day pilots in the Royal New Zealand Air Force.

down of the USAF, but also some very interesting articles, and we would now like to get a subscription to the magazine. We enclose a draft for US \$12.00 for a year's subscription. It certainly is good value at NZ 66¢ per copy. . . .

David and Peter Gill

May 22, 1974

Dear David and Peter: Many thanks for your draft and subscription order. . . . I must warn you that the magazine will come via surface mail, so don't give up hope. . . .

Almost twenty years ago . . . one wall of my office was covered by a gigantic map of the world. My desk was placed alongside New Zealand. That was the start of a love affair with a country I've never seen. It must be the most beautiful of all countries, and I do hope to visit it one day. If that happens before you're off somewhere flying jets for your Air Force, I'll be sure to give you a call.

John L. Frisbee

June 14, 1974

Dear Mr. Frisbee: . . . We have been deciding whether or not it is worth having the magazine sent air mail, and have decided it is. . . . We have enclosed a check. . . . We will be particularly pleased to have the up-to-date information on the USAF, and also the unit reunions. We write to them for the

old aircraft manuals, and it was a successful reply from one of these which prompted us finally to have the magazine sent air mail.

You're certainly right about New Zealand being one of the most beautiful countries. We had planned originally to go to England to join the RAF, but have decided that it doesn't compare to New Zealand. . . .

Peter and David Gill

June 21, 1974

Dear David and Peter: Since you're among our more unusual subscribers, we would like to print excerpts from your letters. If you have a snapshot available, we'll be most grateful. . . .

John L. Frisbee

July 13, 1974

Dear Mr. Frisbee: We were most surprised that you intend printing parts of our letters. . . . We would greatly appreciate it if you could mention that our hobby, besides flying, is collecting flight manuals. Perhaps some of the readers have old manuals as souvenirs, which they would be willing to part with. . . .

David and Peter Gill

Any of our readers who wish to help David and Peter may reach them at P. O. Box 26-030, North Avon, Christchurch, New Zealand.

SCIENCE/SCOPE

Video-command equipment for the U.S. Air Force Pave Strike guided glide bomb will be designed and built by Hughes. The units, which are both transceivers, establish a data link between the bomb and the launch aircraft. One relays to the pilot a picture of the target taken by a TV camera in the nose of the bomb; the other enables him to transmit directional changes that guide the bomb to its target. An outgrowth of technology developed by Hughes for the U.S. Navy's Condor missile data link, the units are designed to be produced at low cost. Hughes will build two data links for launch aircraft and 30 to be carried by the glide weapons.

Turning a half-somersault after launch to intercept enemy aircraft or missiles attacking from any direction -- even from the rear -- will be the forte of a future air-to-air defense missile for which Hughes is helping to develop the technology for the U.S. Air Force. Two systems of directing the rocket motor thrust to effect the mid-air "about-face" are now being evaluated in advanced wind tunnel testing: mounting the principal thrust nozzle on a gimbal and installing a series of movable jet tabs to deflect motor thrust as needed. As conceived by the Air Force, the air-slew technology would be mated with a missile airframe designed for hypersonic operation.

The National Society of Professional Engineers has chosen ERTS (Earth Resources Technology Satellite) as one of the top ten engineering accomplishments of 1973, based on benefit to mankind, creative significance, and contribution to technology. The multispectral scanner system aboard ERTS, developed for NASA by Hughes and its subsidiary, Santa Barbara Research Center, records solar energy reflected from Earth to produce photos which indicate the health of fields, forests, rivers, and lakes. ERTS was launched in 1972 by NASA's Goddard Space Flight Center and is still operating. It circles Earth every 103 minutes in a polar orbit.

A dual-mode display for tactical aircraft, developed by Hughes, uses a single high-brightness cathode ray tube to provide full-performance head-up and head-down displays when the cockpit is too small for two conventional displays. In its head-down mode it displays radar, infrared, and television sensor data and flight-data symbology in a TV raster format. In its head-up mode, calligraphic symbology written on a small area of the cathode ray tube is optically magnified and projected, collimated, and presented on a combining glass in the pilot's field of view. Automatic brightness control maintains symbol clarity at ambient light levels up to 10,000 foot candles.

The U.S. Air Force has ordered an additional 6,000 TV-guided Maverick missiles from Hughes. The missiles will be delivered during 1975, making a total of 17,000 Hughes will have built at its Tucson, Arizona, facility since the program began in 1968. The air-to-ground missile, guided by a tiny television camera in its nose, has demonstrated high accuracy against armored vehicles, buildings, and field fortifications. An imaging infrared-guided version for night operations is presently undergoing captive flight testing at Holloman Air Force Base, New Mexico.

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HUGHES

HUGHES AIRCRAFT COMPANY

Airpower in the News

By Claude Witze

SENIOR EDITOR, AIR FORCE MAGAZINE

The First Vote on Money

WASHINGTON, D. C., AUGUST 12

A few days ago, the House of Representatives approved a Fiscal 1975 Defense Department appropriation of \$83,393,570,000. The news was washed away as the nation survived the paroxysm of presidential abdication.

The missing headlines would have featured the vote, which was 350 to 43, followed by the fact that the House slashed \$310.8 million from the figure recommended by its Appropriations Committee. And the committee already had cut \$3.8 billion from the Administration's request.

The Senate Appropriations Committee is scheduled to present its report tomorrow. Now that Watergate is out of the way, there should be no great delay in getting down to the budget business.

A major cut made by the House was \$300 million slashed from proposed military aid to South Vietnam. The \$1 billion request was cut to \$700 million by a vote of 233 to 157 on an amendment offered by Rep. John Flynt of Georgia. Even as the vote was taken, there were new reports from Indochina that the Communists were increasing their military pressure on Saigon.

This bore out a warning from Secretary of State Henry Kissinger that the proposed cut might affect the ability of South Vietnam to withstand pressure from the invader. Warned the Secretary: "Further cuts would weaken them to the point that Hanoi might be tempted to launch another 1972-type offensive."

He did not prevail against the opinion of Mr. Flynt: "I feel that we must communicate to the government of Vietnam and to President Thieu that the American people are not going to continue to pay \$2 billion a year or \$1 billion a year to enable him to avoid the political realities of his own country."

On the floor, the House also eliminated \$5.8 million for an Army program to develop a capability to utilize binary nerve gas in warfare, and \$5 million for contingencies.

The Air Force had requested a total of \$27.3 billion. The House voted \$25.7 billion. There were no amendments offered aimed at specific USAF weapons. This means the congressmen approved the Appropriations Committee recommendation that \$320.6 million be added to the USAF coffers for twenty-seven A-7D attack aircraft and twelve F-111F fighter-bombers that were not requested. Full funding was provided—\$370.7 million—for the Boeing AWACS program. Also approved was \$159.2 million for thirty aircraft to launch the Fairchild A-10 program, and \$455 million for three prototype Rockwell International B-1 bombers. The fourth prototype, requested by USAF, had been deferred by the House earlier in its authorization bill.

There were three interesting amendments that suffered defeat on the House floor. The one that lost by the narrowest margin, 182 to 219, sought to delete a \$82.5 million item for the Army's Safeguard ABM sys-

tem at Grand Forks, N. D. Under the new ABM agreement accepted by the Nixon Administration in July, the US is limited to this single site, on which \$5 billion already has been spent.

In another vote, 69 to 328, the House refused to eliminate \$169.5 million for research to upgrade the accuracy and lethality of US nuclear missiles. The proposal came, for the second time, from Rep. Bella S. Abzug of New York, who argued that the achievement of pinpoint accuracy will add nothing to US security, but will increase the danger of war and inhibit arms limitation.

One of the congressmen supporting Ms. Abzug was Robert L. Leggett of California, himself a member of the Armed Services Committee. Mr. Leggett was highly critical of Defense Secretary James R. Schlesinger's proposal to improve our counterforce capability with the improved missile program. Part of the argument Mr. Leggett offered in the floor debate of August 6 is worth quoting:

"There are only five things wrong with this [counterforce] strategy of Dr. Schlesinger's. First, we do not need to. Second, the threat does not exist. They cannot take out our missiles. It does not work nearly as well in practice as in theory.

"Third, the theory is not any good either. Fourth, if we ever try to use the counterforce capability, it may backfire on us and cause the United States to sustain the exact damage we are trying to avoid.

"Fifth, even if we do not use it, it could greatly place in jeopardy American national security by increasing the probability of accidental nuclear war."

In his speech, Mr. Leggett examined these points in detail, lecturing in deprecatory terms about Soviet capability. He made no reference to the continuing Russian effort in weapons development and deployment. Appropriations Committee Chairman George Mahon of Texas was the lone speaker in defense of the proposal. He pointed out that the effort to stop the development already had been voted upon, in the authorization debate, and had been rejected at that time, 370 to 34. The new vote, on the appropriations amendment, showed that Ms. Abzug had picked up thirty-five votes, but still lost by a wide margin.

The third amendment that was turned down came from Rep. Joseph P. Addabbo, also of New York. He was defeated, 178 to 216, in an effort to clamp a ceiling of \$81.2 billion on defense spending in Fiscal 1975. There will be other efforts of this kind in the Senate. Sen. John V. Tunney of California already has announced that he will try to cut every appropriation bill by five percent, to "break the back of inflation."

The report of the Committee on Appropriations itself contains observations essential to the record.

At the outset, the committee says there are strong reasons for pruning spending, but "the security of the nation remains the paramount function of government and funds for this purpose must get highest priority."

The committee, on which Gerald R. Ford, the new

President, served for many years as the senior Republican, then warned:

"The international situation has not yet reached that status that would permit a unilateral reduction in military strength on the part of the United States.

"The Soviet Union continues to upgrade its already powerful military forces. Several Soviet advances in the area of intercontinental ballistic missiles are under way simultaneously. New ships and new classes of ships regularly enter the Soviet fleet. Advances in weapons modernization of tactical ground and air forces do not indicate reductions in the maintenance and modernization of Soviet tactical forces.

"In the face of active military force modernization on the part of the Soviets, the committee believes that the military forces of the United States must also be modernized."

The report then cites what has happened or is happening in the Middle East, Southeast Asia, and Cyprus.

Further data on USAF, from the committee report:

The budget provides, for the end of Fiscal 1975, an active force of sixty-nine tactical fighter and attack squadrons and thirty-four strategic and tactical airlift squadrons. The number of active aircraft in the inventory will be 10,145, down from 10,749 on June 30, 1973, and 10,339 on June 30, 1974. The Minuteman CBM force will be kept at its current strength of 1,000 launchers, but more of the weapons will be improved with MIRV warheads on Minuteman III.

So far as personnel are concerned, USAF's end strength next summer will be 618,000. This is 12,345 fewer than requested. The Army will be cut by 1,500 men, the Navy by 6,500, and the Marines by 500.

The committee says it is worried about "the generally deteriorating quality of military personnel enlisted in recent years." Last year, the committee included a provision in the law limiting the number of nonhigh-school graduates that could be enrolled. This year, the provision has been dropped because it proved controversial. But, the committee made clear, the high-school graduate is considered the better employment risk and Congress will be watching closely the caliber of its soldiers, sailors, and airmen.

The New Commander in Chief

We have, at long last, passed through the tortures of Watergate, and Gerald R. Ford, a man whose credentials have won votes only in the Fifth Congressional District of Michigan, now is Commander in Chief of the armed forces.

Almost by chance, it turns out that the new President has a record that can only be described as quiet in almost every area except national defense. He served in World War II in Navy aviation—two years on an aircraft carrier and in the Naval Aviation Training program.

In his quarter century as a member of congress, he rose to be minority leader. But that came only after years of service on the Defense Subcommittee of the House Committee on Appropriations. A perusal of old hearing transcripts, going back into the 1960s, discloses that Congressman Ford did his homework as the senior Republican on that subcommittee.

The record is replete with evidence that the generals and admirals and civilian Secretaries under cross-examination could expect questions from Mr. Ford that required facts for a reply. Unlike many of his fellow committeemen, he did not use the hearings as a rostrum to preach his own opinions. The only exception we could find concerned the case of a

subcontractor in Grand Rapids who claimed he had been treated unfairly by a prime. Here, Mr. Ford was persistent, but only in making the Pentagon justify the decision.

His voting record—he rated a zero on his liberalism from the Americans for Democratic Action—has been solidly in support of key defense programs. In recent years, this has included votes in favor of the Space Shuttle and the supersonic transport.

As he took office at the White House, it was clear his most pressing problem is inflation and that he is going to cut expenditures as a first step. The goal is reported to be modest—possibly a \$3 billion cut instead of the \$7 billion Congress threatens to add to the \$305 billion proposed federal budget.

According to *The Wall Street Journal*, President Ford sees promise in détente and hope in the SALT negotiations. At the same time, he is wary of "unilateral concessions in the name of détente. His instinct is that we can only negotiate with the Soviets from a position of strength, and his strong support of military appropriations is a derivative of this."

The *Journal* further learned in an interview that Mr. Ford is not ready to specify where any cut will



—Wide World Photos

Gerald R. Ford takes the oath of office as President of the United States. The oath was administered August 9 in the East Room of the White House by Chief Justice Warren Burger as Mrs. Ford looked on.

be made, a reluctance explained by the fact that the President is a working politician:

"He talks only generally about reducing government personnel from attrition, a possible 'slowdown' in spending for space, military, and government subsidies to local services, with perhaps some unspecified savings in welfare expenditures."

And:

"We are beset by inflation because [in the President's opinion] we tried to spend too much with too little regard for the costs. . . . From civil rights to welfare, we have created problems and divided the country because we tried to do too much, too fast in rectifying ancient problems not solvable overnight."

There is another clue to the Ford approach in USAF records. In 1962, when he already was a prominent member of the House Appropriations Committee, the Michigan Republican was invited by Gen. Bernard Schriever, then Commander of the Air Force Systems

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Airpower in the News

Command, to speak at an AFSC Management Conference in California.

The guest took a look at the present Fiscal 1963 budget, then before Congress, and compiled his own set of statistics showing what had happened in the ten years between 1953 and 1963. Spending for national defense, he found, had increased twelve percent. The increase in nondefense expenditures was ninety-four percent.

The new President, looking at these figures in May of 1962, gave this opinion to his USAF audience.

"In my judgment, the public doesn't appreciate these facts, and regrettably most of the adverse comment that you get from taxpayers about this time of year is, 'What can we do about holding down our expenditures for the three military services?'"

"I think it would be well for somebody, somehow, to cast some suspicion at the increase, the percentage increases, that have taken place in nondefense expenditures in recent years. This, I feel, is an area that needs plenty of public attention and action."

In the same speech, Mr. Ford made it clear he considered Congress an integral part of the defense team. He called its role that of a Board of Directors for the Department of Defense, and portrayed the taxpayers

as "the real stockholders in this massive business operation."

He said that the Defense Appropriations Subcommittee was "concerned with policy, with programs, and, most importantly, results."

Then-Congressman Ford also had a word of reprimand for the military and some of their contractors. He was critical of witnesses from the Pentagon who had not read his committee's report for the previous year and demonstrated this failing when they got on the stand. He was irritated by the military job rotation that forces witnesses to testify in defense of decisions made three or four years before, by different military officers. He was most upset by faulty cost estimates and called on industry and the military services to find a contracting technique providing rewards for cost reduction, delivery on schedule, and performance according to specification.

Last year, President Ford made one statement in which he described himself as a "reformed isolationist." He also looked skeptically toward "experts [who] say we should encourage [peaceful coexistence] by a more tolerant attitude toward communism."

"Unfortunately, it is a theme based on hope, not reality. . . . We will pay dearly for such mistaken theories. We have paid dearly for them in years past."

And, under congressional examination for his appointment when chosen by President Nixon to be Vice President, Mr. Ford said:

"I would say I am a moderate on domestic issues, a conservative in fiscal affairs, and a dyed-in-the-wool internationalist in foreign affairs."

The Wayward Press

At a couple of press conferences, in Washington on June 6 and in Salzburg, Austria, on June 11, Secretary of State Henry Kissinger, who knows how to play the press like an organ, was deeply upset. He was probed, in a rude fashion, about the role he played in the Nixon Administration's wiretap surveillance of journalists and some employees of the National Security Council.

Mr. Kissinger was so upset, in fact, that he threatened to resign, at that critical point, if his name was not cleared and commentaries reflecting on his "public honor" did not stop.

The complaint was defined by John Osborne, a reporter who writes for *The New Republic*. He's worth quoting:

"Kissinger had the misfortune to encounter Peter Peckarsky, aged 27, who represents himself to be the Washington correspondent of *The Tech*, a publication that according to Peckarsky appears twice a week and has a circulation of about 8,000, principally on and around the Boston campus of the Massachusetts Institute of Technology."

"Peckarsky has applied for congressional and White House press credentials and holds temporary credentials, pending a determination that he is entitled to permanent accreditation."

"He turned up in the White House press room last April and in my intensely biased opinion has identified himself with some of his questions there as one of those characters who mistake their press cards for licenses to abuse, indict and malign public officials who do not enjoy their approval. . . ."

"Although many of my colleagues will think me stuffy and reactionary for saying so, I argue that such reporters as Peckarsky and Clark Mollenhoff [*Des Moines Register* and *Tribune*], the veteran and distinguished brutalitarian who also shook Kissinger at the June 6 press conference, really ought to go back to school for cram courses in journalism, courtesy and the civil rights of other people."

"At the close of long and complex questions—these journalistic prosecutors tend to ask long questions—Peckarsky asked Kissinger 'whether or not you have consulted and retained counsel in preparation for a defense against a possible perjury indictment?' It was a disgraceful question. . . ."

"Mollenhoff followed with four belated demands that Kissinger acknowledge that he had recommended the wiretaps of his former NSC assistants. . . ."

Well, the Senate Foreign Relations Committee has cleared Mr. Kissinger of the allegations that he had lied to them about the wiretap issue. This has left the Secretary of State gratified and apparently willing to continue serving his country.

As usual, there are no signs that the press will profit from the experience. Few persons, maligned and outraged by inky prosecutors, can seek and find a restoration of their credibility as easily as Mr. Kissinger. The incident illustrates again the requirement for the press to find some way to discipline itself, and a cram course in journalism is not the answer. Professional decency is not something to be learned; if it comes in the news trade, it will have to result from discipline. Violators must lose their access to typewriters and microphones, a step that is easy to take without menacing the press freedom we all enjoy.

Gerald R. Ford, the new President announced at the outset that Mr. Kissinger will be retained in his new Administration. Mr. Ford still will have to face reporters who want to abuse, indict, and malign. He has the advantage of more experience than most of his probable adversaries.

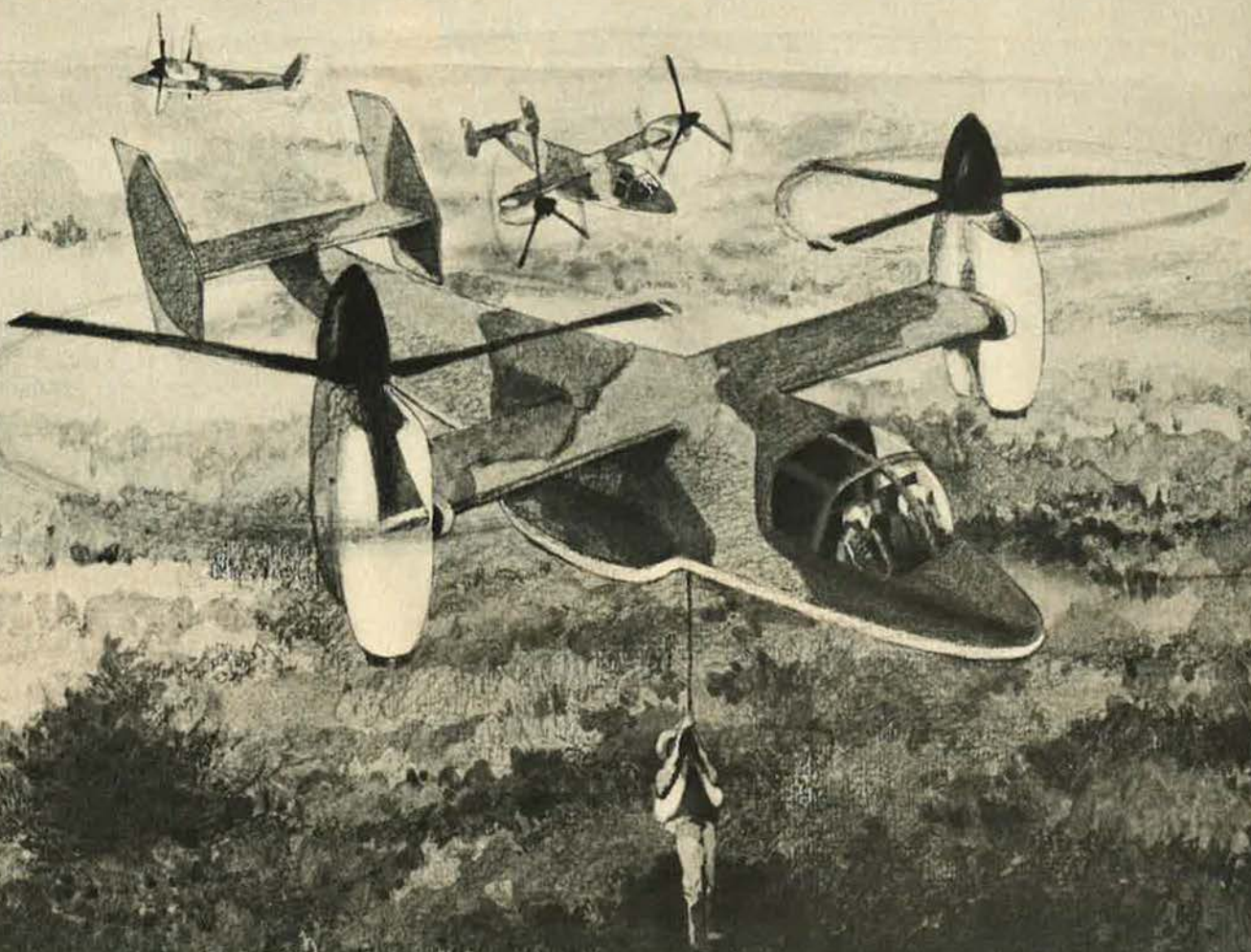
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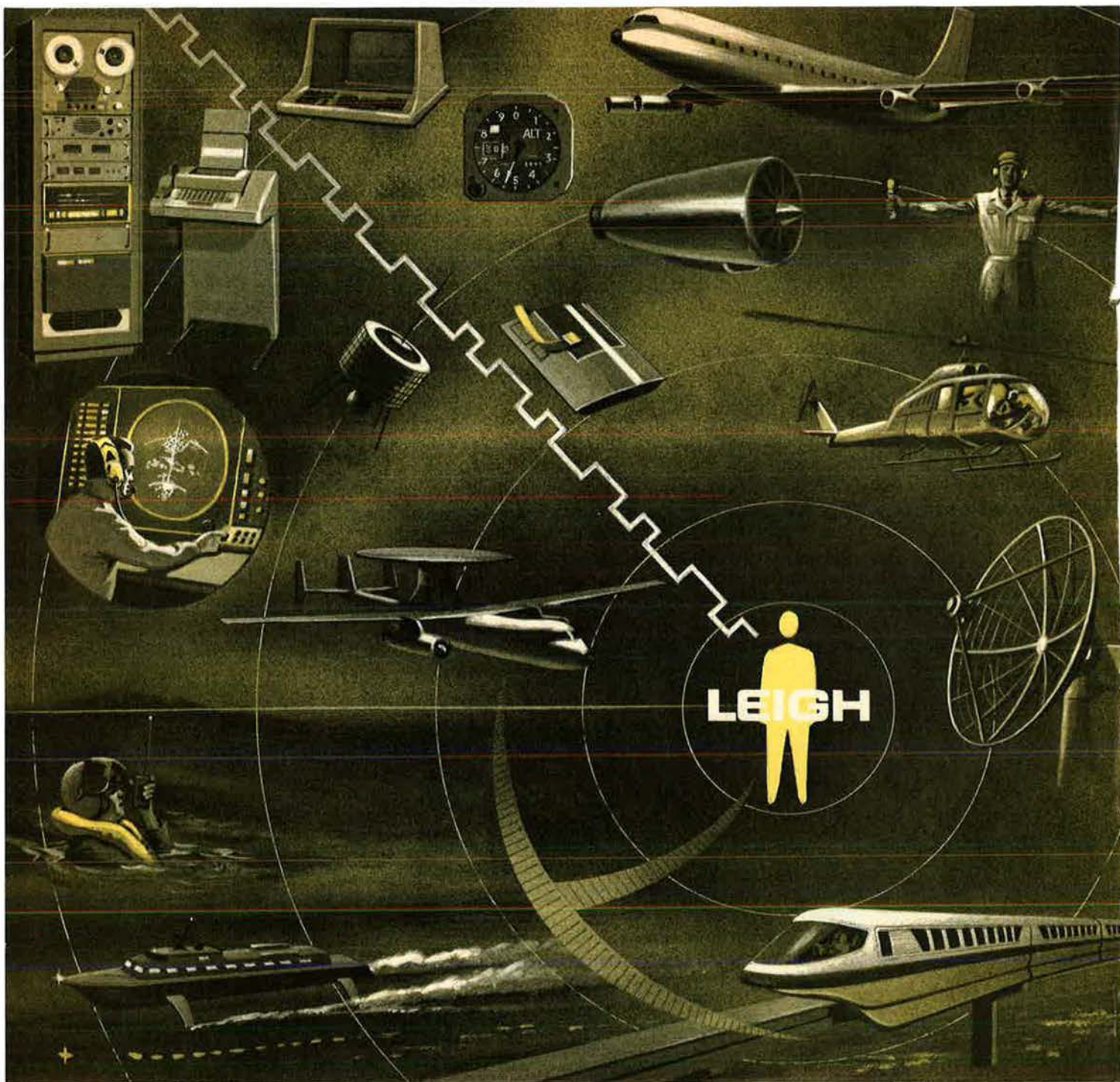
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By William P. Schlitz

ASSISTANT MANAGING EDITOR, AIR FORCE MAGAZINE

WASHINGTON, D. C., AUGUST 9

On August 8, Vice President Ford presented a posthumous Medal of Honor to Mrs. Linda Bennett, of San Antonio, Tex., on behalf of her husband, Air Force Capt. Steven L. Bennett.

Captain Bennett was killed in June 1972 in Vietnam. At last year's National Convention, Mrs. Bennett accepted an Air Force Association Citation of Honor in recognition of her husband's heroism in combat. Captain Bennett also received the Cheney Award for 1972.

After his OV-10 FAC aircraft was shot up near Quang Tri by a sur-

USAF to begin procurement of initial production versions of Fairchild Republic's A-10 close-support fighter.

Thus, the A-10 has emerged as USAF's choice in a flight-evaluation contest with LTV's already operational A-7, as far as the close-air-support role is concerned.

The A-10 program calls for the production over the next several years of 729 aircraft, plus fourteen to be used in research. The total cost, including R&D, could come to an estimated \$2.5 billion. Of this, DoD has now released \$39 million in FY '75 funds to produce long-

Navy plans a heavy expenditure in new technology for the craft. "Trident will be quieter, faster, and better equipped with improved sonars and other features, all of which will greatly enhance survivability," Navy said.

The Trident missile under development is known as the Trident I or C-4, and is Poseidon missile size to allow it to be carried in Poseidon subs if that is deemed necessary.



According to USAF, the delivery of the last of 130 new solid-state instrument landing systems (ILS) to

Then-Vice President Gerald Ford presents a posthumous Medal of Honor to Mrs. Steven L. Bennett and her daughter, Angela, in ceremonies in Washington, D. C. Air Force Capt. Steven L. Bennett died in a crash water landing that saved the life of his crewman in June 1972 in Vietnam. AFA recognized his heroic deed at last year's National Convention.



—Wide World Photos



A new close-air-support addition to USAF's combat inventory is the A-10, built by Fairchild Republic. Initial procurement of the production version was given a go-ahead in late July (see item).

face-to-air missile and with his backseat crewman's parachute damaged beyond use, Captain Bennett unhesitatingly set the aircraft down in the Gulf of Tonkin, with full knowledge that no OV-10 pilot had ever survived such a water landing. Captain Bennett died and his crewman lived and was rescued.

Captain Bennett's Medal of Honor was the tenth awarded to members of the Air Force for actions during the Vietnam War.



Late in July, DoD authorized

lead-time items, with the initial procurement set at thirty aircraft.



For its part, Navy gave General Dynamics Corp.'s Electric Boat Division, Groton, Conn., the go-ahead to build the first Trident SLBM-firing submarine.

The planned ten Trident subs, each armed with sixteen MIRVed missiles, would stand as Navy's first-line strategic weapon of the 1980s and beyond, and could replace the current fleet of Polaris missile-firing undersea craft.

Air Force and FAA facilities around the world marks "the most significant improvement to aircraft landing equipment in twenty years."

With a range of twenty-five miles, the new ILS allows instrument landings under airport weather visibility conditions of 100 feet vertical and 1,200 feet horizontal, thereby cutting the visibility conditions of older systems by half.

With such systems initially tested and operational at six Air Force bases, the remaining instrument guidance systems will be installed and checked out over a span of

Aerospace World

about two years, USAF said. They will then be USAF's primary landing approach system worldwide; no changes in cockpit instrumentation or pilot training are necessary.

Specialized Air Force Communications Service crews are installing the new ILS systems, built by Texas Instruments, Dallas, Tex., under a \$20 million contract.



Study contracts have been let on two projects very important to the future of the US military and civilian space programs.

Under the joint NASA/DoD project, the contracts involve various aspects of the interim Orbit-to-Orbit Shuttle (OOS) planned for the early 1980s as well as the Space Tug, to be ready by the mid-1980s.

The OOS and Space Tug—both unmanned—will work in conjunction with the Space Shuttle. The OOS would travel from the orbiting Shuttle to place objects in geosynchronous orbit. It is likely to be expendable; the more advanced Tug would return to the Shuttle for reuse.

The contracts: to General Dynamics' Convair Division for Tug/Shuttle compatibility; United Aircraft's Pratt & Whitney for Tug engine performance verification; Martin Marietta's Denver Division, Tug fleet operation and controls; also General Dynamics for Tug avionics; McDonnell Douglas, Huntington, OOS/Tug payload requirements compatibility; and IBM, Huntsville, orbital operations and mission studies.



NASA also is preparing the next advance in its manned orbital laboratory program. Called "Spacelab," the reusable new facility will operate in conjunction with the Space Shuttle, also under development and scheduled for missions by 1980.

Unlike Skylab, its independently launched predecessor, Spacelab will remain within the cargo compartment of the orbiting Space Shuttle for missions up to thirty days and return with it for conventional landings.

Spacelab, to be manned by as many as four technicians, will rely

on the Shuttle for crew living quarters and support systems. Hence, it will be cheaper and less complex to operate than Skylab.

The lab, as now envisioned, will probe earth resources, solar studies, astronomy, materials processing, and other areas of interest that only orbiting vehicles are capable of investigating.

Spacelab is being developed by the European Space Research Organization (ESRO).

In one instance, the lab will consist of a pressurized module, providing a shirt-sleeve atmosphere, connected to the Shuttle's cabin section by a tunnel. A second version of Spacelab will be a structural pallet supporting instruments operating in the space vacuum and controlled from the Shuttle cabin or from earth. A third Spacelab configuration combines the two.



Next year, USAF plans to modify with up-to-date navigational gear twelve DC-130s tagged for use by SAC, TAC, and the Air Force Systems Command as "motherships" in launching and controlling remotely piloted vehicles (RPVs).

The \$6 million program, dubbed "Busy Pelican," will provide the precise navigational capability "required for launching preprogrammed RPVs at selected map coordinates and accurately guiding them to their targets," Air Force said.

Lear Siegler, Lockheed Aircraft Services, and Univac will install the new gear.



Pratt & Whitney's much maligned F100 engine successfully passed its 5,000th flight hour in mid-July at Edwards AFB, Calif.

There, the engine is powering two aircraft: the McDonnell Douglas F-15 Eagle, USAF's new air-superiority fighter, and the YF-16, General Dynamics contender in the Lightweight Fighter prototype competition.

The test programs are being pushed hard. In order to accomplish the more than 5,000 flights the F-15s have made thus far, officials said, each aircraft has averaged one flight every working day since it entered the program, and an F-15 has made as many as six flights in one day. A YF-16 has made four.

A bench mark in the engine's development, according to officials, is that it reached operational status in less than two years after its first flight. Most of the 5,000 flight hours

were accomplished in the Eagle. The F100 was subjected to 15,000 hours of severe ground testing to demonstrate durability, and, so far during the flight-test program, has never been "shut down because of a mechanical failure in the basic engine," P&W said.



The Air Force Systems Command hopes soon to have completed a vast DoD program involving air traffic control and identification equipment for more than 30,000 military aircraft of all the services.

Acting as Defense Executive Agent, the Command's Electronic Systems Division, Hanscom AFB, Mass., has been responsible for developing, acquiring, and installing the electronic gear aboard the aircraft, as well as setting up associated ground and shipboard radars. Twenty-nine prime contractors participated in the undertaking. The price tag: some \$1 billion.

For other details about AIMS—for Altitude Identification Military System—and the electronic Air Force now abuilding, see the special section in the July 1974 issue.



The Air Force announced that early in September it will put one of its multimach SR-71 reconnaissance aircraft on the line in an attempt to break the transatlantic speed record.

While a new record is one objective of the planned flight between New York and London, USAF has described the operation as "a routine overseas training mission." The SR-71, while in England, will be on static display at the Farnborough International '74 air show.

The previous speed record between London and New York has been held by an RAF F-4K that set a mark of four hours and forty-six minutes. Air Force hopes to halve that time despite the requirement for an aerial refueling.



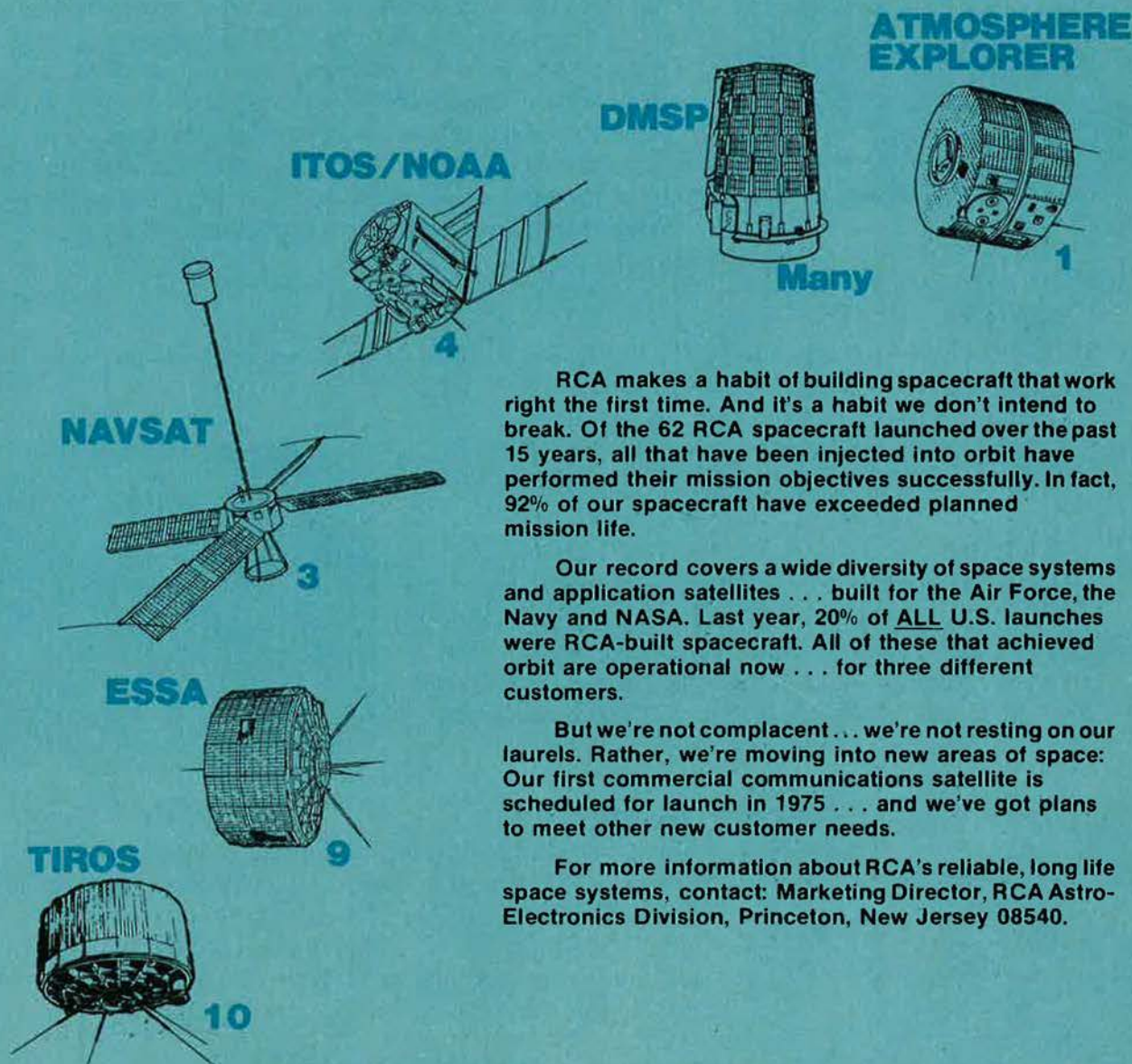
A sleek and swift new feline has come to pay us an extended visit. She is Jaguar, a supersonic strike aircraft jointly developed by the British and French and the most recent addition to the RAF's combat inventory.

With the cooperation of USAF, the Jaguar now in the US will undergo "hot and dry" trials at Nellis AFB, Nev., and "hot and humid trials" at Eglin AFB, Fla.

In the latter part of its six-month stay, the aircraft will be tested in

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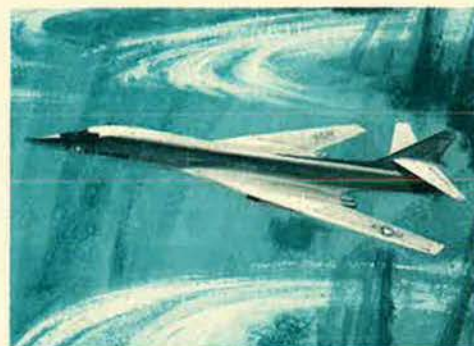
The jobs to be done in free world defense are tough. And getting tougher. Aircraft engine requirements have never been so diverse, or so specialized. They involve availability of a broad spectrum of power classes. The standards of performance not only call for reliability and maintainability ... but survivability as well. And each aircraft must have the speed, tactical maneuvering, and range for the mission to be completed. General Electric is building the engines that will meet these needs for a number of different aircraft.

The TF34

The Fairchild A-10, designed to fill the Air Force's vital close air support role is powered by twin General Electric TF34 high bypass turbofans. The TF34's low fuel consumption increases loiter time in the mission area. Its high thrust improves short field takeoff capability.

The F101

The USAF Rockwell International B-1 strategic aircraft is the first such program since the mid '50's. So its four advanced technology GE F101 augmented turbofan engines were designed to provide the B-1 with Mach 2 speed, greater payloads, and an improved range over today's intercontinental system.



The J101

The lightweight air superiority fighter's environment demands the utmost in maneuverability and response. Its engines must be capable of rapid acceleration. For the USAF Northrop YF-17, twin General Electric J101 turbojets are the answer. Advanced technology engines to meet the high performance needs for combat fighters.

**These are the jobs that need to be done.
And General Electric is building the engines to do the job.**

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cold-weather conditions, courtesy Canadian Armed Forces.

On July 11, Jaguar was the star attraction during an appearance at Hq. SAC, Offutt AFB, Neb. The aircraft, specifically designed for low-level strike missions, is already in service in France. Of the nine RAF Jaguar squadrons planned, five will be allocated exclusively to NATO under the Supreme Allied Commander Europe (SACEUR).

RAF has given the new aircraft high grades in performance, reliability, and maintenance.



SAC has scheduled its 1974 Bombing and Navigation Competition for November 10-16 at Barksdale AFB, La. (In conjunction, AFA will sponsor, on November 13-14, "New Dimensions in Strategic Deterrence," a symposium for civic leaders, industrial executives, and military planners.) The meet was last held at McCoy AFB, Fla., in December 1971, at which time AFA conducted a far-reaching symposium on strategic requirements; commitments in SEA forced cancellation in 1972 and '73.

SAC's best bomber and tanker crews will compete in seven categories, with RAF Vulcans also again invited to participate. Some three RAF and fifty-one SAC crews are expected.

In the competition, each bomber will fly two missions, involving scoring in navigation and bombing for both high and low altitudes. Radar-rated electronic impulse will simulate dropping real bombs. Tankers will fly two missions and compete for navigation and top wing honors.

Among a number of trophies to be awarded this year is a new one: the Linebacker Memorial Trophy, which will go to the B-52 unit attaining the highest score in high-altitude bombing. It is dedicated to those SAC B-52 crewmen who were killed during the 1972 bombing campaign over North Vietnam.



Of what use are rocket engines that measure 6½ inches in diameter by fourteen inches long and produce only *one-thousandth* of a pound of thrust?

Perhaps considerable, if the test-

ing that began in June proves out. Two of these electric "ion" rocket engines are aboard NASA's Advanced Technology Satellite-6 (ATS-6), in earth orbit since its launch in May (see *August issue*, pp. 20 and 59, for word on the amazing ATS-6).

Many orbiting satellites must be equipped with special engines to put them back on their precise paths when the gravitational attractions of the sun and moon cause them to stray.

The drawback to using conventional rockets in this job is the fuel supply they need, which adds considerably to launch weight. For example, 500 pounds of hydrazine fuel would be required for ten years of satellite control by conventional rockets. On the other hand, according to Xerox Corp. scientists, their ion engine would require only twenty-five pounds of fuel for the same task. In space, weight is worth more than its weight in gold.

The Xerox ion engine works by emitting a stream of electrically charged particles—enough thrust to move the big satellites in the weightlessness of space.

If the ion engines test out aboard ATS-6, they will be candidates for thrust sources in such satellites as the international Intelsat series and the many other satellites planned for domestic and international communications and other space activities.



The US Army is developing a laser "black box" that will permit ground troops to guide homing missiles, bombs, and even artillery shells to their targets.

Called a Ground Laser Locator Designator (GLLD; pronounced "glid"), the system consists of a laser, range finder, telescopic sight, and tracking unit. Lightweight and tripod-mounted, GLLD can be transported easily on a battlefield by two men, the Army said.

The device is being developed for the Army's Missile Command by Hughes Aircraft Co. under a \$11.1 million, thirty-month design-to-cost contract.

Once an operator locates a target through the system's telescopic sight, he then determines distance and bearing using GLLD's laser range finder. A narrow-beam, high-intensity laser is then focused precisely on the target.

Alerted to the approximate location of the target, a remote aircraft or artillery unit would fire a weapon capable of homing in on the laser.

Wavelength and pulsation of the laser lets the weapon differentiate between its target and others being marked by other GLLD units, Hughes said.



Army also gave a go-ahead for the advanced development of Hellfire—the next generation helicopter-launched missile.

The modular missile system is being designed for use against hardpoint targets like tanks and ground emplacements and will accommodate four types of seeker heads: laser semiactive; radar frequency-infrared dual mode; optical contrast (TV); and imaging infrared.

The "fire-and-forget" missile, controlled in flight by vanes, is to work in conjunction with a ground or airborne laser locator-designator sensor package now under development. Army's current antitank weapon is the wire-guided TOW missile, which recently was adopted for use aboard the AH-1Q Huey-Cobra helicopter.

Both Hughes Aircraft and Rockwell International—under similar contracts—were given one year to produce a prototype missile, launcher, and other equipment. After evaluation, a single contractor will be selected for full engineering development.

Hellfire may have applications as an infantry weapon, for launch from RPVs, and for close-support missions.



According to the *Detroit Free Press*, Ralph K. Patton, president of the US Air Forces Escape and Evasion Society, has a problem.

Mr. Patton expects the October 7 arrival of fifty-seven Belgians of the "Comet" organization that saved 443 American aircrewmen from capture or death during World War II.

A former B-17 copilot and now coal company executive, Mr. Patton would like to welcome the Belgians in style. But he's in touch with only a handful of the 443. His address: 1424 Dorchester St., Birmingham, Mich. 48008.



SAC Headquarters, Offutt AFB, Neb., is now equipped to handle any commercial power failure that might have posed a threat to the Command's computer operations, an essential defense function.

Self-contained diesel generators will continue to back up the commercial power, but, had they been



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needed, a brief delay would have resulted. "Such a delay could be disastrous in an age when nuclear battles can be fought in minutes," an official said.

The new equipment obviates this danger by storing current for immediate use.



NEWS NOTES—Charles C. Bock, Jr., will be chief test pilot for US-AF's upcoming B-1, being built by

Rockwell International. A combat veteran of both Korea and SEA, he became an Air Force pilot in 1951 and went on to fly some sixty aircraft types as a test pilot.

J. Lloyd Jones has been named **Deputy Associate Administrator for Aeronautics Technology** in the Office of Aeronautics and Space Technology, NASA. And, under the OAST reorganization, **Robert E. Smylie** has been appointed **Deputy Associate Administrator for Space Technology**. OAST is responsible for the nation's future aeronautics and space technology.

William C. Schneider has been appointed **Deputy Associate Administrator for Manned Space Flight**, NASA Headquarters. Prior to this

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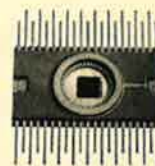
An integral part of our new capability is our D200 family of MOS/LSI processors. Autonetics was the first to develop this highly advanced solid-state microelectronics approach. And our D200 family was the first to use it.

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Aerospace World

appointment, Schneider had served as both Acting Associate Administrator and Acting Deputy Associate Administrator for Manned Space Flight. From 1968 until the end of the Skylab program in early 1974, he was Director of that program.

USAF has ordered an additional 6,000 Hughes Aircraft Co. electro-optically guided **Maverick** missiles under a \$44.8 million contract, raising the total built for the Air Force since 1968 to 17,000. An infrared-guided version for night operations currently is undergoing preliminary testing at Holloman AFB, N. M., and AFSC is developing a laser-guided version.

Rear Adm. Alan B. Shepard, Jr., the US's first man in space and one of twelve astronauts to explore the moon, retired from NASA and the US Navy on **August 1**.

Following the detonation of its first nuclear device in May, in July India's Prime Minister Indira Gandhi



Before his death at age seventy-seven in July, aircraft designer Alexander Kartveli posed with models of planes he helped bring into being during a lifetime career of aeronautical engineering. His left hand rests on the mighty P-47 "Jug" of World War II fame, whose initial design he first sketched in pencil on the back of an envelope.

announced that it would orbit a **space vehicle** in 1978. Technology and hardware were progressing well, she said, and flight qualifications for guidance systems have already begun.

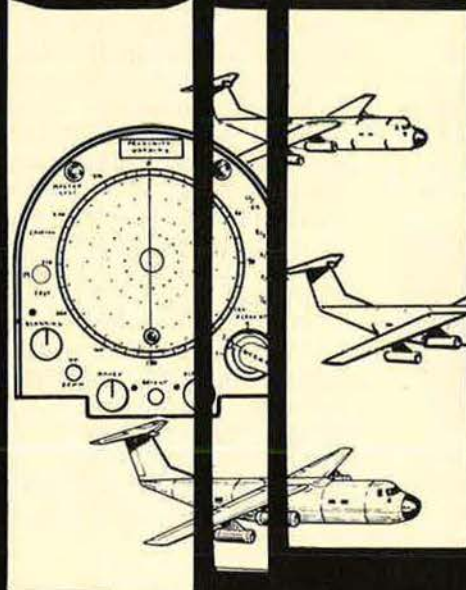
ADC's fourth annual **weapons loading competition** is scheduled for September 4-14 at Tyndall AFB, Fla.

Died: In Huntington, N. Y., on July 20, Russian-born **Alexander Kartveli**, chief engineer emeritus for **Fairchild Republic**. Once an artil-

lery officer in the Imperial Army, Mr. Kartveli came to the US in 1927 and settled into a lifetime career of designing successful aircraft, including the P-47 Thunderbolt, the F-84 Thunderjet, and the F-105 Thunderchief. A long-time AFA member, he was seventy-seven.

Died: Dr. Vannevar Bush, organizational and engineering genius who guided the US scientific effort during WW II and helped usher in the atomic age, in Massachusetts in late June. He was eighty-four. ■

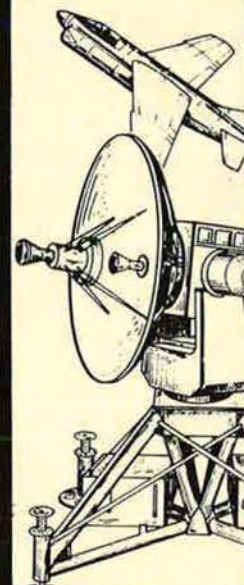
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The AN/APN-169A Stationkeeping Set (SKE) provides the Tactical Air Force's C-130 airlift aircraft with a capability of maintaining flight formation regardless of visibility. As part of a contract to prototype this equipment in the Military Airlift Command C-141 aircraft, Sierra is developing a compatible Drop Zone Marker for IFR air delivery operations.

Sierra's latest contribution is the AN/TPB-1A Air Support Radar. This highly mobile system, as part of the 507th Tactical Control Group's Air Support Radar Team (ASRT), was recently employed in a series of joint exercises and contributed to the Tactical Air Force's capability to **FLY** and **FIGHT**.



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Like the actuation system, the YF-16's Garrett environmental control system is low-cost. It's basically off-the-shelf equipment—and it's reliable. Garrett has built more ECS units than anybody in the world—including the first pressurization system ever used on a production aircraft, the B-29.

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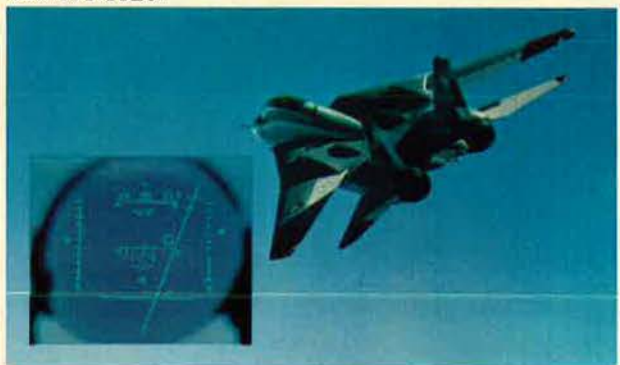
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The Secretary of the Air Force reflects on the Air Force Association's role in promoting public understanding of . . .

THE NEED TO MAINTAIN STRONG DEFENSE FORCES

BY THE HON. JOHN L. McLUCAS
SECRETARY OF THE AIR FORCE

Last year, in your Anniversary issue, I congratulated the Air Force Association for its valuable role in fostering the discussion of national security issues and playing a key role in promoting public understanding of the need for an effective Air Force, and I do so again with pleasure. In addition to discussing defense issues, needs, and systems, your **AIR FORCE Magazine** continues to enhance public appreciation for the highly professional contribution of the men and women of the Air Force.

In reflecting on what has occurred during the past year, I believe that one significant basis for optimism is increased public appreciation of the need to maintain strong defense forces. For example, we have seen surveys taken around the country which substantiate the judgment that the public holds the military in higher regard. The public increasingly feels that we can get the job done when called upon. I believe that a very convincing demonstration was our strategic airlift, which helped maintain a balance in the Middle East last fall without US conflict involvement.

This more positive public attitude toward the military has also been reflected by the fact that we have been able to meet our all-volunteer goals. Over the last twelve months,

without any draft, about 75,000 people entered the Air Force.

Besides meeting our quantity goals, we find that quality is improving, as reflected by test scores and the fact that about ninety-three percent of our new enlistees are high school graduates. Moreover, I think that our stress upon equal-opportunity programs, that is, moving further toward real racial and ethnic equal opportunity, is being more widely appreciated.

Also in the area of equal opportunity, the Department of Defense and the Air Force are leaders in providing challenging and important jobs for women. Moreover, we have doubled the number of women in the Air Force in the last three years and plan to double it again by 1978.

We have made progress in the development of new systems. In the tactical area, the F-15 air-superiority fighter (now in production), the Lightweight Fighter, and the A-10 close-air-support aircraft are significant programs that are moving ahead very satisfactorily.

These tactical systems are important, but perhaps our more crucial system is a strategic one—the B-1 bomber. I believe that the development of this aircraft is now proceeding soundly and that it could provide us with a capability to penetrate and survive the new Soviet defense that we expect in the 1980s and beyond. And, as you know, we have requested funds for further improvement in the Minuteman III.

As these improvements are under way, we sincerely hope that still further agreements will come out of the SALT negotiations and that détente will reach full maturity. I know that all of us see the need for mutual restraints as a part of guaranteeing essential equivalence for the future.

Thus, as we review signs of progress during the past year, I know that members of the Air Force Association share with us the knowledge that progress is difficult and that arms negotiations must be treated with great care. It should be stressed that accompanying our intensive efforts to achieve a durable strategic balance through a comprehensive arms agreement, there must be the maintenance of forces at such levels that an adversary would not perceive any advantage—real or imagined—of their forces over ours. And at the same time we must protect our R&D and higher technology lead or else quality alone will not be sufficient in the years ahead. Our defenses must remain adequate under any circumstances.

Continued public understanding and appreciation of this need for strong defense forces in today's environment are enhanced by the important efforts of the Air Force Association. For nearly thirty years the Air Force Association has done this job well, and you can rightfully take pride in it. ■



The Air Force's new Chief of Staff, in his first greeting to the Air Force community, comments on . . .

AFA'S DEDICATED SERVICE TO NATIONAL SECURITY

BY GEN. DAVID C. JONES

CHIEF OF STAFF, UNITED STATES AIR FORCE

Modern society runs on information, and there is plenty of it around. I read recently that there has been more knowledge and information derived in the past twenty-five years than in the entire previous history of mankind. Whether or not this is literally true, everyone would admit that current technology, sociology, medicine, and other fields produce a staggering amount of new knowledge almost daily. With the parallel advances in mass communications, today's citizen in search of the facts often feels like the man trying to get a drink from the fire hose. He is inundated with opinion, commentary, facts, and fancy, and is often hard-pressed to absorb all the information available. Most of us have learned to rely on organizations and publications of proven integrity and perception to help digest and interpret selected fields of interest. Such an organization is the Air Force Association and such a publication is *AIR FORCE Magazine*.

Throughout my long relationship with the Air Force Association and its worldwide membership, I have been continually impressed with its extraordinary ability to articulate not only to blue suiters, but to the nation at large, the vital role which airpower plays in national security. Likewise, *AIR FORCE Magazine* has earned an enviable reputation, managing to be not merely a "house organ," but an informal, highly authoritative, and accurate source of information to Americans in and out of uniform.

Because of this record, I am delighted to have the opportunity, through the medium of *AIR FORCE Magazine*, to present my first message of greeting to the Air Force community. I have been in office less than two months. It has been a busy time of study, travel, and learning, during which I have confirmed and reinforced what I have known all along: that the United States Air Force is the best there is. I am proud to serve as the head of an organization which is without peer in terms of the quality and the dedication of its people, the capability of its officer and NCO leadership, and a professionalism which permeates every level of our worldwide mission.

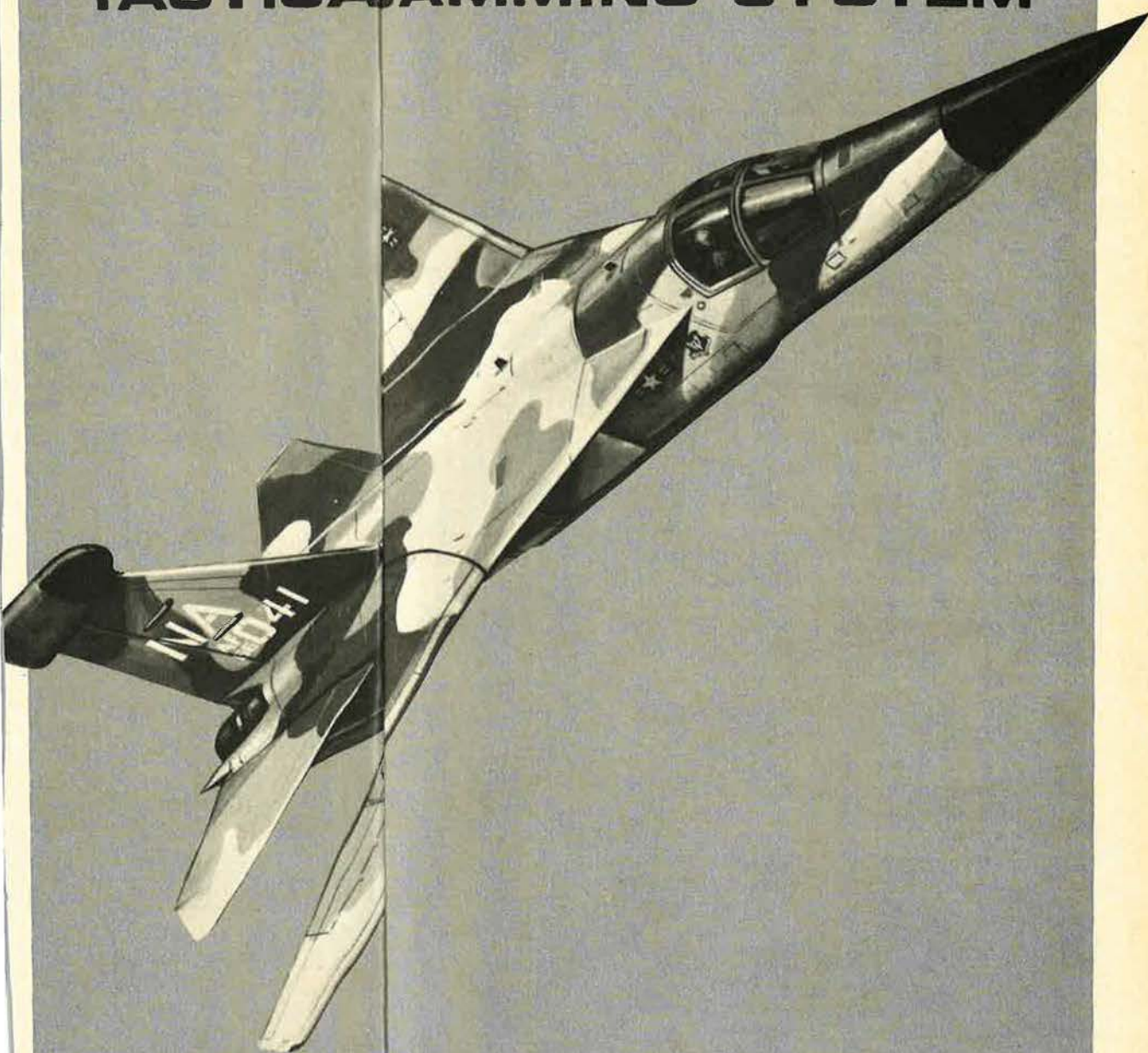
As Chief of Staff, I consider it one of my highest priorities to sustain this momentum of excellence built up by Gen. George Brown and previous Chiefs. The Air Force is gradually and prudently moderniz-

ing many of its older systems. As we move ahead in developing and deploying these more sophisticated and costly weapon systems, the future will impose still greater challenges for a well disciplined, smoothly functioning team of Air Force pros to operate and manage them. Much of our nation's future security rests on our meeting these challenges and I have every confidence that the Air Force will continue to meet and exceed our country's expectations.

I congratulate the officers, directors and members of the Air Force Association for their dedicated service to national security and the key role therein played by airpower. I also commend the editors and staff of *AIR FORCE Magazine* for their great track record of accurate and timely journalism. The combination has been one of the key elements in the successes of the United States Air Force and will remain an effective ingredient in assuring that we continue as the Number One Air Force in the world. ■

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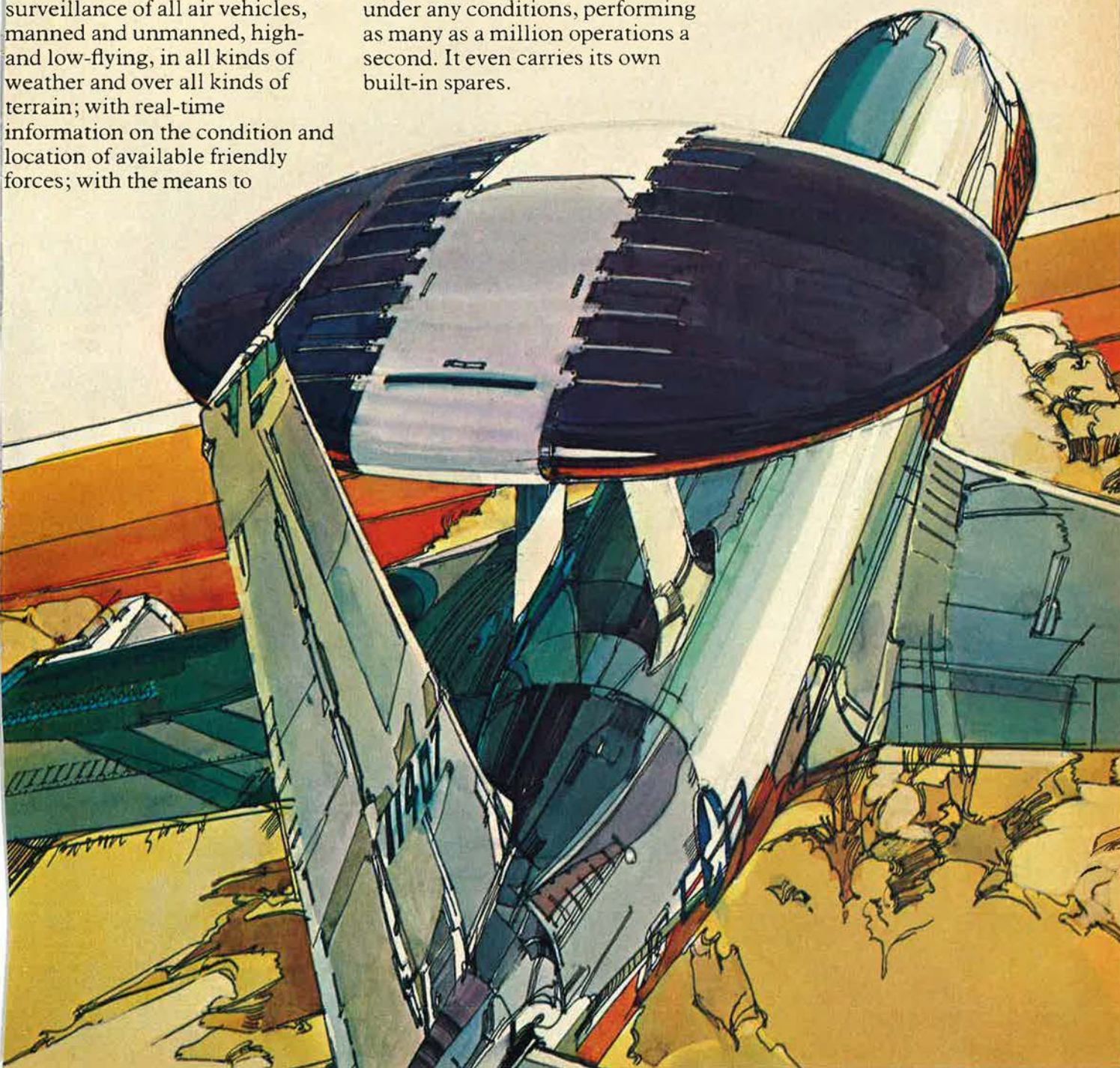
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GENERAL DYNAMICS

Pierre Laclède Center, St. Louis, Missouri 63105



Gen. Carl A. Spaatz, USAF

June 28, 1891

July 14, 1974

Gen. Carl A. "Tooe" Spaatz, USAF's first Chief of Staff and longtime pioneer of military aviation, died on July 14 at the age of eighty-three. On the following pages, AIR FORCE Magazine salutes the memory of this wise and gallant leader. The following tribute was written by General Spaatz's close friend and colleague, Lt. Gen. Ira C. Eaker, USAF (Ret.).

Carl Andrew Spaatz, destined to be the last Commanding General of the US Army Air Forces and the first Chief of Staff of the US Air Force, came from Pennsylvania. His grandfather had emigrated from Germany shortly after the Civil War. His father published a weekly newspaper in Boyerstown, and Carl was the only assistant, typesetter, and apprentice printer.

The father was popular and influential in the Pennsylvania Dutch community. In 1910, he announced for Congress as a Democrat against the Republican incumbent. But he withdrew after receiving a promise that his opponent would appoint Carl to West Point.

Carl Spaatz entered the US Military Academy in 1910 and was promptly nicknamed "Tooe" (a redhead in each class was called "Tooe" in those days). On the day of his graduation with the class of 1914, he was walking off demerits, of which he had the maximum allowable, and had but twenty minutes to dress for graduation parade. Thereafter, he was always a fast dresser. I later marvelled how he could sleep until a

quarter to eight and appear at Eisenhower's conferences in Algiers promptly at 8:00 a.m., freshly shaved, well-turned-out, bright, and alert.

Upon graduation, Tooe chose the Infantry over the Cavalry or Field Artillery, because he disliked horses. His first station was with the 25th Infantry at Schofield Barracks in Hawaii. There, he had the good fortune to meet Ruth Harrison, the seventeen-year-old daughter of a Cavalry colonel.

One day in 1915, Colonel Harrison said to his wife, "Mother, I see Ruth keeps company with that Lieutenant Spaatz. I want that to stop immediately! Today he put in for aviation training, and there is obviously no future in that."

Ruth was more prescient. She became Mrs. Spaatz two years later. Her father retired as a colonel while her husband, with her strong help, went on to become a four-star general.

Spaatz was accepted for aviation training, received his wings in 1916, and saw his first combat service with

After fifteen months as an Infantry officer, Lieutenant Spaatz was accepted for pilot training at the Aviation School, San Diego, where he posed with this Martin trainer. In the early '30s, then a major, he commanded the 7th Bombardment Group and the 1st Bombardment Wing at Rockwell and March Fields in California. The lower picture shows him directing his bombers by radio from an airborne Douglas LB-7.



the 1st Aero Squadron, chasing Pancho Villa with Pershing's Punitive Expedition in Mexico. In 1917, he went to France in command of the 31st Aero Squadron and was soon placed in command of Issoudon, the largest US pursuit training base. In the last weeks of the war, Spaatz escaped to a frontline squadron commanded by one of his former students. He shot down three German planes and won the Distinguished Service Cross.

His first postwar station was Rockwell Field, San Diego, Calif., as Operations Officer for the Commander, Col. H. H. Arnold. This is where I, then Assistant Adjutant, first met him. Early in 1919, he flew an SE-5 British-built fighter in a transcontinental air race, making the best time across the continent in a single seater.

When Arnold became Air Officer of the Western Department, he took Spaatz with him. It was obvious even then that Spaatz was Arnold's favorite assistant, a relationship that was to continue for thirty eventful and significant years.

In the years between World Wars I and II, Spaatz always commanded fighter groups or air bases, or held senior positions on the Air Staff.

He was always on the boards that tested and selected each new series of fighters. About 1930, he was president of the Pursuit Evaluation Board, with Capt. Frank "Monk" Hunter, Capt. Hugh M. Elmendorf (for whom the air base in Alaska was later named), and me. There were three planes in the competition. I remember the week we spent in competitive test flights at Wright Field, principally because of the report we rendered.

I served as recorder. Knowing Major Spaatz's reputation for brevity, I prepared a one-page report. He thought it much too long and redundant. The document he finally approved and signed read, "The Boeing P-12 won the fighter competition. It is a better plane; it more nearly meets the specifications. We recommend its early procurement."

Brevity became Tooeey Spaatz's trademark. He was a miser with words. If he had gone up the mountain with Moses, there would have been only one Commandment: "Always do the right thing." He was fond of saying, "I never learned anything while I was talking."

He seems to have transmitted that taciturnity to his elder daughter. In 1929, during the *Question Mark* aerial refueling experiment in California, Mrs. Spaatz and the children were visiting her parents in Santa Monica. She looked up from the garden one day, pointed skyward to where the *Question Mark* was refueling, and said to their ten-year-old daughter, "Look! Your father is in that plane. He has been in the air a whole week, a world's record. What do you think of that?" The youngster promptly replied, "I think it's silly."

An incident on that flight illustrates another Spaatz characteristic. When we were refueling on the first day, the air was quite bumpy. The hose was torn from Major Spaatz's hands and thoroughly soaked him with seventy-two-octane gasoline. I left the cockpit and went back to determine the trouble. We tore off all his clothes and covered his body with lubricating oil. He then said to me, "If this doesn't work and I need emergency

medical aid, I will get out in a parachute. You take command. Under no condition abandon this flight. That is an order! Do you understand?" I returned to the cockpit, flew out over the ocean where the air was smoother, and we completed the refueling. Our first aid proved effective. Major Spaatz suffered no serious discomfort, although he was rather greasy for the rest of the flight.

When the Germans crossed the French border in the spring of 1940, Arnold sent Colonel Spaatz and Lt. Col. "Monk" Hunter as US observers with the French Air Force. After Dunkirk, they became observers with the RAF. During these critical days, US Ambassador Joseph P. Kennedy, Sr., was reporting pessimistically to Washington. Britain was doomed he said, and Germany would launch an early and successful invasion. When he learned of these reports, Spaatz urgently cabled Arnold his own estimates. He believed the RAF would stop the Luftwaffe bombers. He concluded, "Air superiority over the Channel is essential to any invasion of Britain. The Germans, in my judgment, will never gain that requisite air superiority."

That Spaatz prophecy, accurate by a very narrow but conclusive margin, impressed President Roosevelt and endeared Spaatz to British leaders. He became the logical and certain choice to head our own air effort in Europe.

In June 1942, he returned to England with the headquarters and Fighter Command of the US Eighth Air Force. I had preceded him in February with the headquarters of the Eighth Bomber Command. When Eisenhower arrived in July, to command all US forces in Britain, there was a reunion of old friends. Cadet Eisenhower, West Point Class of 1915, had marched as a file closer behind Cadet Spaatz, Class of 1914.

In October 1942, when General Eisenhower went to North Africa to launch that invasion, Spaatz went along to head the air effort.

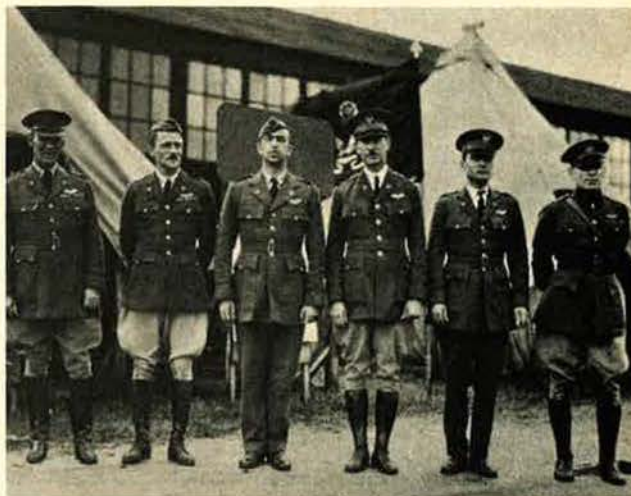
Early in the campaign, Eisenhower called Spaatz to a fateful conference. He said, "Tooey, my morning report shows you have 400 planes, while the British have 300 and the French show 100. Rommel has only 500 planes by today's intelligence estimate, yet every day he clobbers us. How come?"

Spaatz said, "Ike, your figures are about right. When they hit me, they outnumber me five to four; when they hit the British, they have the advantage five to three. The Germans have overwhelming superiority over the French, five to one. Our tactics have been all wrong. The airplane is a poor defensive weapon. Airpower must always be used on the offensive. The first mission of the tactical air force is to win air superiority over the battlefield. Only then can it be diverted to secondary roles like observation, directing artillery fire, shooting up tanks, or defending headquarters."

Eisenhower said, "Tooey, I get the point. Hereafter, as long as I am in command, you have operational control of all the airplanes made available to me by our government or any Allied nation."

The Luftwaffe never won another air battle in the North African campaign. The 800 Allied planes, all under Spaatz's control, took the offensive, destroyed the 500 German planes, and thereafter denied the resupply of the Afrika Korps by sea or air. Without gas,

The staff of the First Provisional Air Brigade during maneuvers at Langley Field, Va., in October 1925. From left, Brig. Gen. James E. Fechet, Major Spaatz, Major Jouett, Capt. R. H. Wooten, Capt. Ira Eaker, and Lt. B. R. Dallas.



CURTIS

In the fall of 1917, I was a fledgling pilot at the American advanced flying school at Issoudon in France. The mud was thick on the ground, there was an acute shortage of airplanes, and although we were supposed to be getting our final training before going into battle, much of our time was spent in picking up rocks on the runways and other mundane pursuits. Not

unnaturally, our estimate of our commanding officer, the then Maj. Carl Spaatz, was somewhat less than enthusiastic. It would have been incredible to imagine at that time that in the years to come he would become the outstanding air commander of World War II and one of my closest friends.

I had the privilege of serving as his chief of staff for three years from 1942 to 1945 in Europe and North Africa. Better than anyone I have ever been associated with, Tooey had an amazing ability to delegate authority and responsibility while at the same time keeping firm personal control of the things that really mattered. The skill with which he exercised that control is a matter of history.

—MAJ. GEN. EDWARD P. CURTIS, USAFR (RET.)

During the late 1930s, although twice assigned to the Office of the Chief of Air Corps, and to the Command and General Staff School at Ft. Leavenworth, Spaatz, now a lieutenant colonel, remained active as a fighter and bomber pilot.



HARRIS

My association with Tooey Spaatz goes back nearly forty years, and my memories of that association are all happy and were all fruitful.

His immensely detailed knowledge of the art and practice of air warfare, and his ever ready helpfulness in sharing that knowledge with those Allied officers who were lucky enough to find themselves working alongside him during the years of war in Europe, were of inestimable value to the Royal Air Force in general and the Bomber Command of the Royal Air Force in particular. We, who served in the Allied service in Europe, owe a great debt to "Tooey" as, indeed, did the whole Allied cause.

—SIR ARTHUR T. HARRIS
Marshal of the Royal Air Force
Commander in Chief, Bomber Command, RAF, 1942–45



It was my privilege to become a close friend of Tooey Spaatz, and I know of no leader in any Service of any nation for whom I came to have a greater respect, or indeed affection. He became the father of the USAF, as our Lord Trenchard was the father of the RAF—and they had many characteristics in common. A man of action rather than of words, he had an uncommon flair for the really important factor in any issue and, of course, an almost passionate belief in the mission of airpower. . . . Tooey was one of the relatively few Commanders on either side in World War II to whom can honestly be applied that much over-worked word "Great."



SLESSOR

—SIR JOHN SLESSOR
Marshal of the Royal Air Force
Chief, British Air Staff, 1950–52

(A longer version of Sir John Slessor's tribute to General Spaatz appeared in *The Times* of London on July 18, 1974.—THE EDITORS)

As a war correspondent with ground forces in North Africa, Italy, and France, I was conscious of the gradual conquest of the air by the Allies and grateful for it. In North Africa, we watched the sky, wondering whether approaching planes were theirs or ours. In France we could safely take it for granted that they were ours.



CRAWFORD

I knew in a vague way that we had Gen. Carl Spaatz and his command to thank for this.

But it was not until after the war, when he joined *Newsweek* as a commentator on military affairs, that I had the privilege of knowing the General as a journalistic colleague and as a friend. We worked together for thirteen years, and I came to understand why he had been a great commander. It was because he was a great man—wise, patient, and inspiring to everyone around him.

He would have been great in any calling.

—KENNETH G. CRAWFORD



After setting an endurance record in January 1929, the Question Mark, commanded by Major Spaatz, returned to Washington. From left, Capt. Ross Hoyt, refueling plane pilot; Captain Eaker; Major General Fechet, Air Corps Chief; Spaatz; Lt. E. R. Quesada; and MSgt. R. W. Hooe.

Rommel's tanks were halted. The Afrika Korps was finished.

Thereafter, Spaatz was always Eisenhower's principal air adviser. When Eisenhower returned to England, Spaatz accompanied him and assumed command of all US Strategic Air Forces in Europe. He held that job until final victory in Europe. He then transferred to the Pacific Theater, where he was given the same role—coordinator of all the US Army Air Forces strategic units used against Japan. That strategic campaign concluded abruptly when the two atomic bombs destroyed Hiroshima and Nagasaki.

When President Truman decided to drop the atomic bombs, he handed me a letter directing General Spaatz to carry out that mission. Spaatz asked that he be authorized to inform General MacArthur, and he flew to Manila and briefed the Supreme Commander in the Pacific.

Spaatz was the only Air Commander present at both surrender ceremonies in Europe. He was part of the Allied delegation when the original surrender document was signed in the schoolhouse in Rheims, France, on May 7, 1945. The next day, he and Gen. Walter "Beetle" Smith represented Eisenhower at the ratification of the Nazi surrender at Soviet Marshal Zhukov's headquarters in Berlin. General Spaatz was also aboard the *Missouri* for the Japanese surrender.

When General Arnold, tired, worn, and ill, elected to retire in 1946, General Spaatz inevitably became his successor. His immediate and disagreeable tasks were to dismantle the world's most powerful air force and reduce it from 2,300,000 men to 400,000 and from 90,000 planes to fewer than 10,000.

He had also to plan the organization, composition, and status of the postwar Army Air Forces. Here he faced a fundamental decision: Should the AAF be content to remain in the Army or should we campaign for a separate service, coequal with the Army and Navy?

Navy aviators, faced with a similar problem, decided to stay in the Navy and eventually run it. They suggested that Army aviators follow the same course.

General Spaatz had been an advocate of coequal status for the Air Force since the days of Billy Mitchell. He decided to "go for broke," reasoning that we would never have a better opportunity—with our war record,



KUTER

Gen. Carl A. "Tooe" Spaatz's professional military legacy is not only the United States Air Force as a whole, but every one of its major components.

Due to his World War II command of the US Strategic Air Forces and his terminal assignment, he is widely recognized as the organizer of the USAF and the father of SAC. Not so well known are the circumstances that make

him the father or the patron of TAC and MAC.

While he was Chief of Staff, the Navy's air transport units were integrated into one of his Air Force commands, and the function of air transportation was assigned to the USAF, where it remains.

When he was USAAF Commander in Tunisia, our tactical air units, in accordance with Army doctrine, were dispersed and subordinated to ground units. After they were gathered into a compact Allied Tactical Air Force, in accordance with RAF doctrine, they contributed largely to victory in Tunisia. General Spaatz's stature with General Eisenhower led to the establishment of the air doctrine and the TAC that we know today.

Additionally, his personal skill in World War I and his long-standing affinity for fast interceptor fighters were material elements in the background of our ADC.

America's strength in the air is, in large measure, the legacy of our beloved Tooe Spaatz.

—GEN. LAURENCE S. KUTER, USAF (RET.)

with the probable support of Generals Marshall and Eisenhower, and with powerful friends in Congress.

When General Spaatz presented the original plan to President Truman, the Commander in Chief said, "Tooe, I don't want two services, or three services, I want only one."

Eventually, the planners compromised with a single defense department and three coequal services—Army, Navy, and Air Force. President Truman approved, influenced by the decisive recommendation of the Assistant Secretary of War for Air, Mr. Stuart Symington. The plan was submitted to Congress and resulted in the National Defense Act of 1947.

The last year of my active duty, I served as Deputy Commanding General of Army Air Forces and Chief of Air Staff, occupying an office between Secretary Symington and General Spaatz. This gave me a unique

opportunity to observe two strong-willed and able men—the one a successful industrialist with a developing interest in politics, the other an experienced military leader—work out their joint roles and responsibilities for Army aviation leadership.

The relationship was eased immensely by General Spaatz's belief, firmly held, in civilian control of the military as a cardinal national policy. They tacitly agreed that the Secretary would handle all liaison and communications with the President, Congress, and the public, while the General would run the Air Force. Each admired the ability of the other and a warm personal friendship developed. As a result, a winning team was formed.

With the passage of the National Defense Act in 1947, Symington became the first Secretary of the Air Force and Spaatz the first Chief of Air Staff of the US Air Force. The successful cooperative effort continued to the great profit of the Air Force during this difficult and important reorganization period.

General Spaatz's success as a military leader and

manager was due primarily to two indispensable qualities that he possessed to an extraordinary degree. One was absolute integrity. He never vacillated, trimmed, or hedged where principle was involved. Many times, when it seemed certain to jeopardize his career, he took a course unpopular with his military superiors, because he believed it was right. He would not compromise.

The other quality that accounted for his phenomenal success was wisdom. He was always wise beyond his years. He was one of the most perceptive, quick-witted men I ever knew. Common sense dictated all his decisions and motivated his conduct.

Some months ago, I told General Spaatz I had been asked to tell an Air University class of my memories of Westover, Arnold, and Spaatz. He asked, "How much time have they given you?" When I told him forty-five minutes, he said, "That's fortunate. You can't do too much damage in forty-five minutes."

He continued, "Tell them I have never been prouder of the Air Force than in Vietnam, especially those lately returned POWs." He went on, "I think the Air Force is getting out of the flying business too fast and not getting into the space business fast enough. Of course, if we are so foolish as to let the Russians gain overwhelming strategic superiority, nothing else matters."

There you have the judgment of the wisest defense leader I ever knew—one General who never made a major mistake.

—BY LT. GEN. IRA C. EAKER, USAF (RET.)

Tooey Spaatz was Hap's very best friend. They had the highest respect for each other. Hap had the utmost faith in Tooey, in his ability, his judgment, his loyalty.

There was a close family attachment as well. We loved him and we will miss him.

—MRS. H. H. ARNOLD



In looking back over the years of achievement by General Spaatz, we certainly look upon him as one of the most outstanding military commanders this country has ever produced. But it goes much further than that. General Spaatz was one of the founding fathers of the United States Air Force—and Aviation itself.

General Spaatz presented to the world the importance of airpower.

—JIMMY STEWART



ARNOLD

My early memories of Tooey Spaatz still seem bright and new despite the fact that some of them extend back a half century. As two Pennsylvania Dutch descendants, my father and Tooey had much in common, but they definitely came from different molds. Tooey, quiet and taciturn, possessed a rather sophisticated, ironic sense of humor. In conversations he

seldom threw out an incomplete idea for others to remark on. He waited until his opinions or observations were complete. Dad, on the other hand, was more outgoing. His look and manner always seemed to reflect his mood. His sense of humor was more basic and boisterous and included a flair for practical jokes. A situation, hilarious to my father, usually produced an amused smile or a clever remark from Tooey.

Dad's regard for Tooey Spaatz was deep and sincere. It included a certain reverence, which, among all his friends, was unique only to Tooey. This deference made him a rather awesome person in the eyes of little children. Consequently, when something outrageously funny occurred that caused Tooey to join our family in real levity, we couldn't help but feel that somehow God was laughing.

—COL. WILLIAM B. ARNOLD, USAF (RET.)



Left, at war's end, General Spaatz, accompanied by Assistant Secretary of War for Air Robert A. Lovett and Capt. J. F. Delaney, examines the results of bombing in Germany. Below, Spaatz and Gen. Hap Arnold at one of the first airstrips built in France after the Normandy invasion.



COCHRAN

Everything I can say about General "Tooey" Spaatz is in the superlative. I knew him as a great warrior in the field, as a leader in defense, and as a close personal friend.

During his retirement days, I saw a great deal of Tooey and his fine wife, Ruth.

When I was running for Congress in California in 1956, Tooey came out and made a speech for me before the Seventh Day Adventists.

Tooey and Ruth used to spend at least a couple of weeks a year at our ranch in the California desert.

Tooey loved to play competitive games and gamble for small stakes. After dinner, when others had gone to bed, Ruth would read a book; and we would play backgammon or gin rummy usually until the early hours of the morning. When I was in Washington, Tooey and Ruth would call on me at the hotel but with a backgammon board tucked under his arm.

Most people do not realize the softer side of this warrior. One of his great hobbies was bird-watching, and he would sit by the hour on our lawn with binoculars and camera in hand, listing the various species of birds.

—JACQUELINE COCHRAN

Left, Gen. Dwight D. Eisenhower awards General Spaatz a second DSM at ceremonies in England in 1944. Right, Spaatz, who had assumed command of US Strategic Air Forces in the Pacific in July 1945, confers with Gen. George C. Kenney in Yokohama after the Japanese surrender.



The passing of Gen. Carl Spaatz marks the end of an era. He is the last of those bold and imaginative air commanders who flew before World War I, in World War I, in World War II, and who actively participated in the conception, development, and implementation of air doctrine—airpower.

He was a man of great courage, integrity, and wisdom. His military decisions were always sound.

I am indeed proud to have been one of his "boys."

—LT. GEN. JAMES H. DOOLITTLE, USAF (RET.)



DOOLITTLE

General Spaatz was a truly outstanding military leader. He was a man both strong and capable and one who understood his commanders and how best to use them. Those of us in the Air Force who had the privilege of serving under General Spaatz before and during his tenure as the Chief of the Air Force were most fortunate.

To know General Spaatz well was a great and happy experience for me. There were no dull moments during official meetings, as he kept things moving and was always in control. He was the kind of person one liked to be with, for he exemplified courage and confidence. He maintained a keen sense of feeling and understanding for his officers and airmen.

He will be deeply missed. A fine man, a superb commander, and a most wonderful friend—a man "to ride the river with."

—GEN. NATHAN F. TWINING, USAF (RET.)



TWINING



At left, Jimmy Stewart and Jimmy Doolittle, AFA's first President, discuss the organization of AFA with General Spaatz. Below, President Truman congratulates General and Mrs. Spaatz on the award of a third Oak Leaf Cluster to the DSM. Behind Spaatz is Air Force Secretary Stuart Symington, and, at right, Adm. Ernest King, Gen. Hoyt S. Vandenberg, and Gen. Omar Bradley.



LOVETT

My recollections of General Spaatz are happy ones and are filled with gratitude for his friendship and for his great contributions to our national security. Tooe Spaatz had an unequalled instinct for the use of airpower and an acute perception which made him a strong pillar in our nation's defense system and gained him respect and admiration around the world.

His quiet, wry humor and his wise, laconic contributions in discussions gave emphasis to his talents in his profession.

General Spaatz was an admirable man of most engaging qualities of mind and spirit and one of the great authentic leaders this country has produced.

—ROBERT A. LOVETT
Secretary of Defense, 1951–53



SYMINGTON

In the death of Gen. Carl Spaatz, first Chief of Staff of the United States Air Force, this nation has lost not only the airman who in World War II, along with Gen. H. H. Arnold, achieved complete control of the air over all of our enemies, but a truly great American.

His vision, his indomitable courage, and the basic purity of his character serve as high inspira-

tion to the millions of those who were under his command and who cherish his memory today, as do all members of the modern military.

The years it was my privilege to work with him but confirmed my conviction that his respect and affection for his own service was only exceeded by his abiding love for his country.

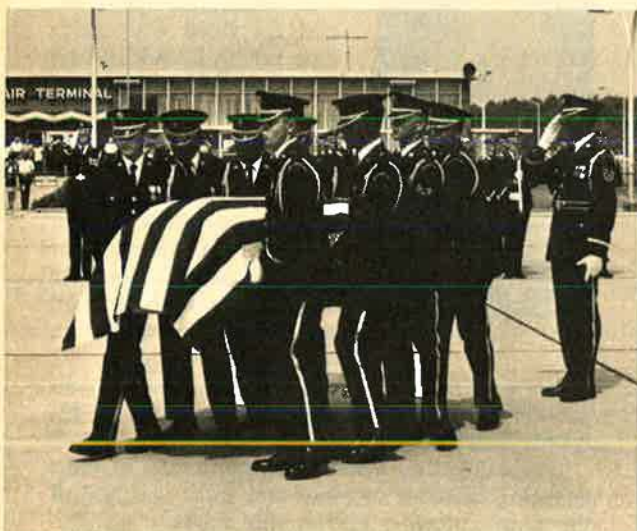
To his wife, Ruth, who herself is part of the Air Force, and his three gracious daughters, we all extend our deep sympathy.

—SENATOR STUART SYMINGTON



On the 35th anniversary of the Question Mark flight, General Spaatz talked flying with Maj. S. J. Kubesch, who had made a record B-58 flight from Anchorage, Alaska, to London.

July 16, 1974: Last flight of Gen. Carl A. Spaatz, from Andrews AFB, below, to his final resting place at the Air Force Academy, at right. A wise and courageous leader and a great airman, he served with distinction this country and the cause of freedom.



Gen. Carl Spaatz belonged to a select group—the early pioneers of the United States Air Force. To that group, and to him in particular, the US Air Force is deeply indebted. On this anniversary of the establishment of the US Air Force, we should recall the day in 1947 when it became a separate service, took its place beside the Army and Navy, and Tooeey Spaatz was named its first Chief. By that time he had behind him a list of accomplishments which demonstrated his personal capacity for tough tasks, as well as leadership qualities which were necessary for the strong foundation of a new Air Force. The strategic concepts developed by Carl Spaatz during World War II and his dynamic leadership during the early days of our fledgling Air Force were major contributions to airpower as we know it today. To him we are all grateful for the foundation he laid, which enabled the USAF to establish a brilliant record in Korea in the fifties, to deter nuclear conflict in the sixties, and to bring the North Vietnamese to the peace table in the seventies.



BROWN

—GEN. GEORGE S. BROWN, USAF
Chairman of the Joint Chiefs of Staff

Few people have left their mark so indelibly inscribed on the pages of airpower's history as did Gen. Carl A. Spaatz. Whether as a young combat pilot over the trenches along the Marne in World War I—as one of Gen. Billy Mitchell's chief supporters in gaining recognition for the dominance of airpower—or as the World War II Commanding General of the Army Air Forces in Africa, Europe, and the Pacific—General Spaatz's entire career was one of courage, dedication, and absolute professionalism. As the first Chief of Staff of the United States Air Force, his inspired leadership and brilliant organizational ability remain, today, as the guideposts which have led us to greatness.



JONES

But Carl "Tooeey" Spaatz was far more. He was a warm, sensitive human being who shunned the fame which he so richly deserved. He was a close and devoted family man who enjoyed the companionship of old and dear friends more than the limelight of the contemporary society. But most of all, he was a man of great integrity—a man of high ideals and principles—and a man dedicated to serving his country and his fellow man.

It is, indeed, an honor for me to represent the men and women of the United States Air Force in AIR FORCE Magazine's salute to Gen. Carl A. Spaatz. He was a great leader—a great airman—and a truly great American.

—GEN. DAVID C. JONES, USAF
Chief of Staff

A Sense of What Would Work



At about ten o'clock on Sunday morning, July 14, I received a call at home from Gen. Ira Eaker.

"General Spaatz died early this morning," he said.

There was no feeling of shock, or of surprise. We at AIR FORCE Magazine had been expecting it ever since the General had been admitted to Walter Reed Medical Center on June 12, following a fainting spell. A stroke was suspected, complicated by his age, eighty-three, and underlying heart disease. Since that time we had been keeping our own kind of journalistic death-watch, with frequent bulletins from General Eaker.

Carl Spaatz died as he had lived, deliberately, stubbornly, and with grace. He had improved slightly during the preceding few days. "I've got to get out of this damned hospital," he grumbled. And he did manage to get out of bed for a few minutes each day, up to the very end. His last request, when Eaker visited him only hours before the end came, was typical: "Ira," he said, "when you come tomorrow, bring some cards so we can play gin rummy."

I remember best a talk with General Spaatz at his home in Chevy Chase, Md., more than twenty years ago. I was not long with AIR FORCE Magazine and still looked at airpower with the jaundiced eye of a World War II infantryman, vintage 1943 North Africa, when most of the airplanes we saw behaved in a manner that matched their unfriendly markings. The General put me at my ease with a glass of whiskey, even though the time of day was closer to breakfast than to lunch. He explained patiently the theory and practice of air strategy and tactics and why, because these were so badly mangled in the penny-packet approach the Army insisted on in those early days, my time in Tunisia's Ousseltia Valley had been

so uncomfortable, not to say dangerous.

The conversation went on to the strategic bombardment of Germany and why General Spaatz had resisted the use of his bombers against targets in France to support the Normandy invasion. "I never thought you could win a war by bombing your friends," was the way he put it.

It made more sense, he said, to go after the key targets in Germany itself—oil, electrical producing and distributing systems, transport, ball-bearing factories—the stuff of modern war.

"But the damage we did to German targets," General Spaatz said, "was less than half the battle. The real purpose was to flush the Luftwaffe, to force it to battle. We knew we could beat them if we could get them up to fight. It worked. And we beat them."

It was this sense of what would work that made him a great air strategist, a great commander, and perhaps the very finest first Chief of Staff the Air Force could have had.

His military career is a litany of accomplishment, well set forth in General Eaker's warm and humorous memoir in this issue.

General Spaatz played an important role in the founding and growth of the Air Force Association. A close friend and associate of Gen. H. H. "Hap" Arnold, he shared Arnold's view that a postwar civilian organization was needed to help consolidate the gains airpower had made during World War II. As the Air Force's first Chief of Staff, he was a major speaker at AFA's first convention in Columbus, Ohio, in 1947. He made it possible for the title of the wartime journal of the Army Air Forces, AIR FORCE Magazine, to be used by the Association's publication.

After his retirement in June 1947, he served the Air Force Association as Chairman of the Board in 1950-51, working with then-President Bob Johnson.

He served continuously on AFA's Board of Directors until his death. At various times he also served as Chairman of AFA's Membership Committee and as a member of its Airpower Policy Committee. He rarely missed a National Convention and, until ill health began to interfere with his activities, he attended most major Association functions, including meetings of the Board. A vivid memory concerns the Fifteenth Anniversary Banquet of AFA, held in Washington's Mayflower Hotel in February 1961 during a howling blizzard. General Spaatz appeared on schedule at the black-tie affair, unruffled, with the legs of his evening trousers neatly tucked into his leather boots.

In retirement, the General also pursued a journalistic career, described as follows in an obituary in the Washington Post, written by Kenneth Crawford, who was head of Newsweek's Washington bureau and, in effect, General Spaatz's postwar boss.

"As a civilian he wrote articles for Life magazine and then joined News-

week as a columnist-commentator on military affairs. He seemed to enjoy his new status as a Washington journalist, though at first he had some trouble getting used to parking his own car and doing his own telephone dialing. He said he had come full cycle since his newspaper days in Boyertown [see p. 43].

"He joined the National Press Club and became an active participant in its management as chairman of its bar committee, a position in which he felt some obligation to help consume some of the more expensive beverages his committee had bought."

After retiring once more, this time from his writing chores, General Spaatz continued to lead an active life for as long as his physical condition permitted. He liked to hunt and fish, often with Air Force cronies. He became an enthusiastic bird-watcher, a pastime that somehow didn't seem to square with his personality, at least not to this writer. An inveterate card-player, he spent many afternoons over bridge at the Army-Navy Club. He was a doer and had been all his life. Time seldom hung heavy on his hands.

To quote once more from Kenneth Crawford: "Among the great leaders of American forces in World War II, General Spaatz was the least well known to the public at large. He was never publicized as some of his peers were. He wanted it that way. He valued privacy. He is not even listed in the current edition of *Who's Who in America*, obviously because he neglected or refused to supply biographical data."

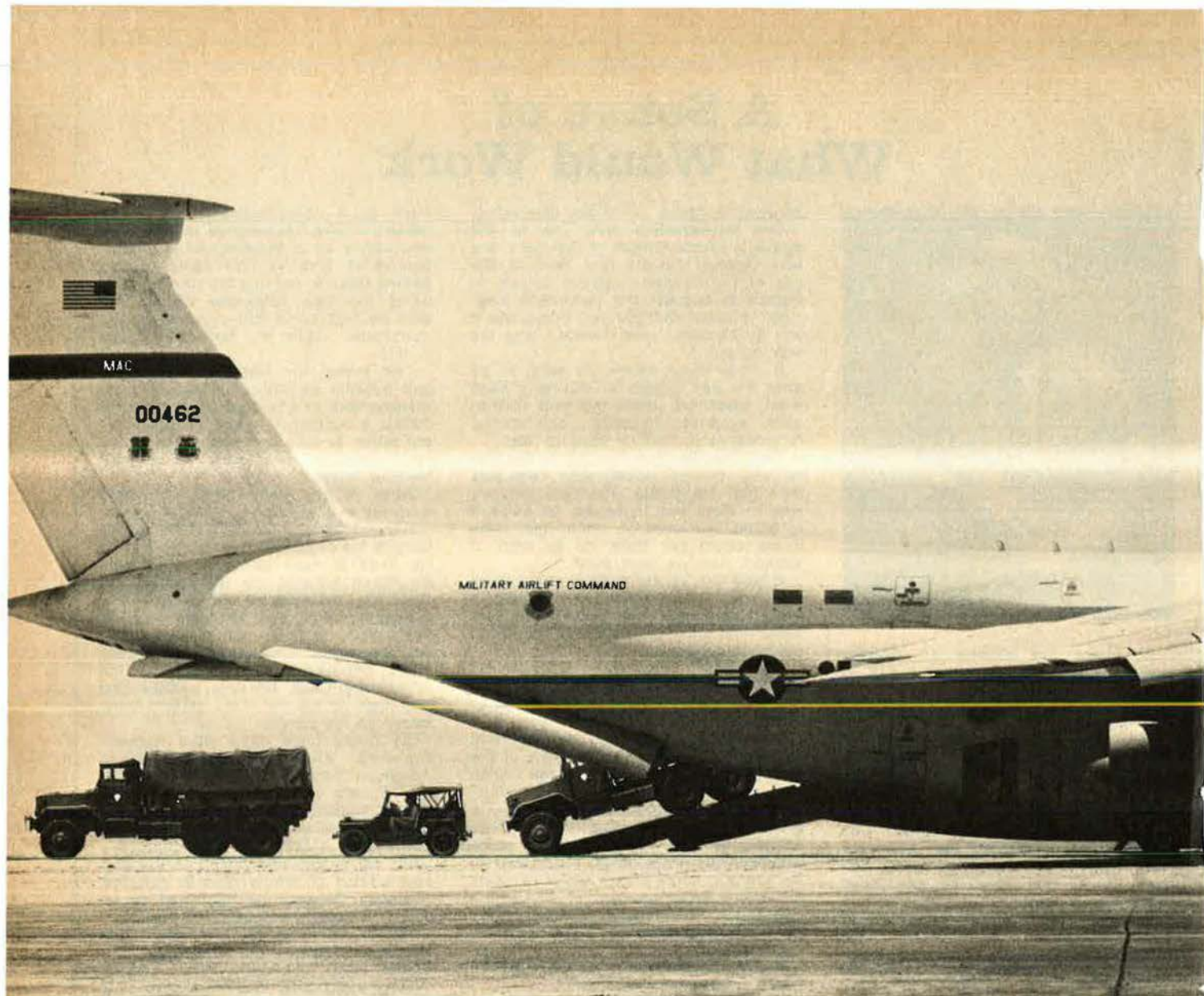
He is survived by his wife, Ruth Harrison Spaatz; three daughters, Mrs. Walter Bell, London; Mrs. Francis Thomas and Mrs. Steven Nagel, both of Washington; his sister, Mrs. Carol Leaver of Ardmore, Pa.; a nephew, Air Force Maj. Carl Spaatz Leaver; and eleven grandchildren.

Mrs. Spaatz has requested that those who wish to memorialize General Spaatz contribute to the General Spaatz Memorial Fund, c/o Academy Fund, Association of Graduates, US Air Force Academy, Colorado 80840.

Funeral services for the great leader were held on July 16 at Andrews AFB, Md. The chapel was jammed with old friends, former colleagues, and current Air Force leaders, to the point where the crowd spilled onto the lawn to hear the former Chief of Air Force Chaplains, Maj. Gen. Charles I. Carpenter, read briefly from the Scriptures. There was no eulogy. From Andrews, the body was flown immediately to the Air Force Academy, where interment took place in the Academy cemetery, in the shadow of the institution he valued so highly and worked so hard to make a reality.

An era had passed.

—John F. Loosbrock



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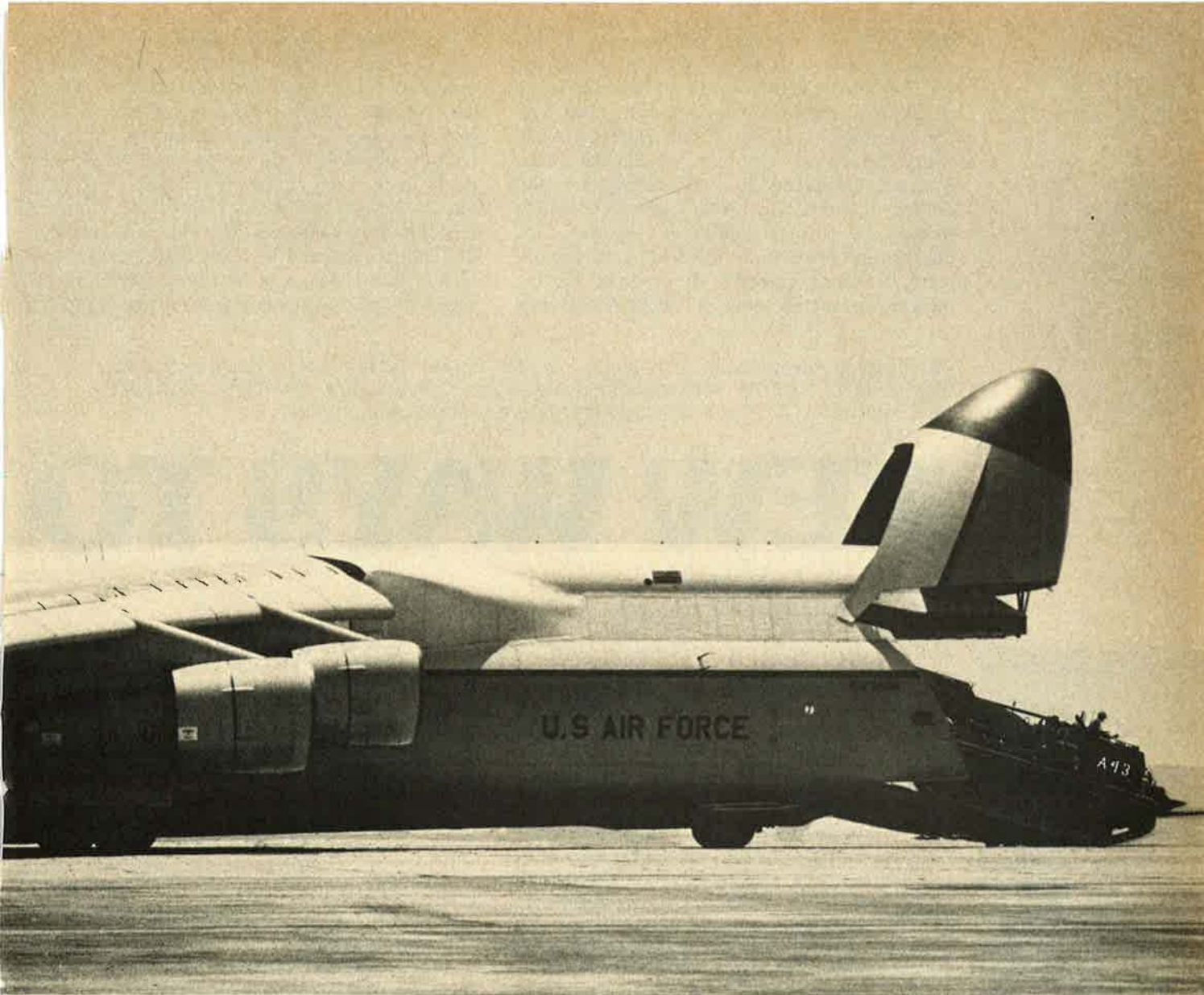
It's the only plane that can be loaded and

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If you want more information about the C-5A, "The Saga of Fat Albert" is available upon request.



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In fact, no other plane can match the C-5A in capability. After all, it was built to be the world's greatest airlifter.

Lockheed Lockheed Aircraft Corporation

THE Air Force's principal business, as the slogan has it, is to fly and fight. The tools for that job are being conceived, designed, evaluated, and acquired by the Aeronautical Systems Division (ASD) at Wright-Patterson AFB, Ohio, the largest component of the Air Force Systems Command in both manpower and dollars. Paradoxically, ASD's prospects at this writing are at once bullish and bearish. The number and price tag of the R&D and procurement programs currently in progress are the highest in several years, involving more than

and then start up again, the General commented.

While the current emphasis on prototyping produced important, salutary results, some harmful side effects have cropped up. A key caveat stressed by General Stewart is "that in building a couple of prototypes, such as we are doing in the case of the YF-16 and YF-17, or did on the A-9 and A-10, we and the contractors skip a lot of details. The idea is to jury-rig the unimportant and to concentrate on the key factors that make or break the concept." Jury-rigging, while "economical from strictly a proto-

Technology never stands still. Neither do the scientists, managers, designers, and engineers of AFSC's Aeronautical Systems Division, who are opening up new vistas for tomorrow's Air Force through startling aeronautical advances...

NEW WAYS TO

BY EDGAR ULSAMER
SENIOR EDITOR, AIR FORCE MAGAZINE



Lt. Gen. James T. Stewart, Commander of AFSC's Aeronautical Systems Division, stresses the importance of uninterrupted transitions from a program's R&D phase into the production cycle.

130 individual efforts. But, in spite of inflation, the Division's proposed FY '75 budget of about \$3.65 billion is down by almost one billion dollars from last year, and Congress has further pared the already lean funding.

The central problem, arising from the resultant start-and-stop funding that plagues the Division is what ASD Commander Lt. Gen. James T. Stewart terms the inordinately high price and poorly understood consequences of production gaps between the end of the prototype or preproduction phase of a program and the start of the production run. A recent study by senior ASD experts produced some startling findings about the effects of program stretch-outs on costs.

The stretch-out of the B-1 program, for example, was caused by a number of circumstances and actions of government agencies, including the Air Force, DoD, and the Congress. It has led to cost hikes high enough to pay for between fifteen and twenty aircraft, General Stewart told AIR FORCE Magazine.

Another typical example is provided by the A-10 program, according to the ASD Commander. Congress' decision of last year to whittle USAF's request for preproduction aircraft from ten to six opened a production gap that "could have sent between \$75 million to \$100 million down the drain. That would have been a net increase by that amount, not merely a short-haul factor," General Stewart emphasized. (The four aircraft, however, were included in FY '75 production money, and, as a result, the cost increase is significantly less.) ASD's analyses "prove that it can actually be cheaper to build a certain number of additional aircraft—and never fly them—than not to build any aircraft at all for a period of a year or so,"

typing viewpoint, may prove costly in terms of the overall program if the decision is made to proceed with production for the inventory. It can entail all sorts of uneconomical approaches, including hand-machining of exotic, high-priced materials" that can be replaced by cost-effective methods if there is an orderly, uninterrupted transition from prototype to production. Conversely, making corrections of this type, if the program goes directly from prototype to a full-scale production phase, may skyrocket costs and disrupt schedules, according to the ASD Commander.

The answer, in General Stewart's view, is not to start building production aircraft at an unreasonably high rate, but to maintain either a steady level or to go up in steps. The F-15 program can serve as a model, he pointed out: "We started out with one aircraft coming off the line almost every three months, accelerated to one every two months, have now reached a level of one F-15 a month, and will soon increase that rate. The key point, of course, is continuity. You can't afford to stop—unless you want to stop for good—once you have started building the first aircraft, providing that unanticipated problems don't dictate a prudent change in the program."

Preventing a B-1 Production Gap

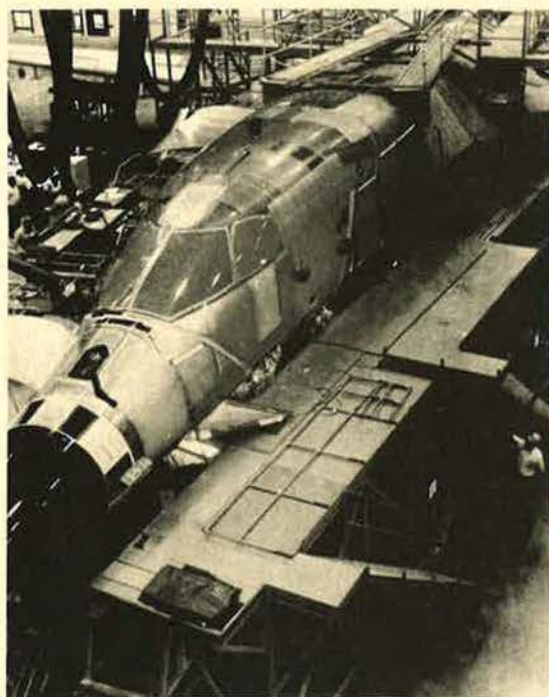
Following an extensive review last year of the B-1 program, generally considered the Air Force's single most important development effort, the conclusion was reached that starting production on the strength of only three test vehicles would be unduly risky and not cost-effective. The Air Force and the Department of Defense asked Congress, therefore, to fund a

fourth aircraft in the current budget, and reserved the option to build a fifth airplane with FY '76 money. Congress, so far, has denied this request and—in the aggregate—reduced the funding of the B-1 program this year by \$44 million.

Building the “fourth airplane now—and a fifth aircraft next year—is extremely important to the B-1 program,” General Stewart told *AIR FORCE Magazine*. Failure to do so, he emphasized, would represent a severe setback to the Air Force’s “learning process because it would

vides for a production decision by November 1976, and initial operational capability (IOC) in 1981. First flight of a prototype aircraft is expected late this year, according to General Martin. Total cost of the program, involving five test vehicles and 244 production aircraft, General Martin said, is expected to be about \$15 billion in “then-year dollars.” This total breaks down into \$3.5 billion for R&D and \$11.5 billion for production. Expressed in then-year dollars, the B-1’s unit cost, the complete cost of the aircraft excluding R&D, will be

FLY AND FIGHT



The first flight-test B-1 supersonic bomber is nearing completion at Rockwell International's final assembly facility at Palmdale, Calif. First flight of the test aircraft will be late this year.

stop the R&D cycle” and jeopardize the entire program.

Maj. Gen. A. B. Martin, ASD's B-1 System Program Director, told this reporter that forestalling the program's R&D phase and dissipating the knowledge acquired by the Air Force/industry B-1 team would cause cost increases in the production phase many times greater than the short-term “savings” involved.

The B-1 program schedule at present pro-

vides for a production decision by November 1976, and initial operational capability (IOC) in 1981. First flight of a prototype aircraft is expected late this year, according to General Martin. Total cost of the program, involving five test vehicles and 244 production aircraft, General Martin said, is expected to be about \$15 billion in “then-year dollars.” This total breaks down into \$3.5 billion for R&D and \$11.5 billion for production. Expressed in then-year dollars, the B-1’s unit cost, the complete cost of the aircraft excluding R&D, will be

about \$48 million (procurement unit cost); this figure goes up to about \$61 million per aircraft (program unit cost), if the R&D cost is allocated on a prorated basis, General Martin explained.

The Air Force is “quite concerned with keeping cost growth of the B-1 program down or preventing it altogether,” General Martin said. The record of the past four years “is not one that we are overly proud of, but there have been no inordinate increases. Program costs have increased by 12.1 percent, or by an average of about three percent per year, in terms of 1970 dollars,” he explained. If the effects of inflation are added, the program's cost increases over the past four years rise to 33.9 percent. Technical progress has been “quite good in general.” Weight increases turned out to be unavoidable, but will not “significantly” affect performance, General Martin told *AIR FORCE Magazine*. Takeoff roll is now expected to be about 7,500 feet, compared to 6,500 feet originally specified. This change should not impinge on performance “appreciably, and we still should be able to take off from the about 150 fields we have counted on from the outset,” according to General Martin.

Commenting on the fate of the B-1 program in the current fiscal year, General Stewart said it is unlikely that the Congress would formally restore the \$44 million needed to build a fourth test aircraft. “But Congress will permit us to come back after a successful first flight later this year to ask for reprogramming for a fourth aircraft. If that happens, there would be no major program setback because we had not planned on starting on the fourth aircraft before December of this year under any circumstances.” He added that if the Congress were to decide

against putting the B-1 bomber into production, the question of the fourth and fifth test aircraft would, of course, be moot.

The Air Combat Fighter

This spring, the Air Force undertook a series of studies of a "high/low mix" of air-superiority fighters at the request of the then USAF Chief of Staff and now Chairman of the Joint Chiefs of Staff, Gen. George S. Brown. Comprised of



The competition between the General Dynamics YF-16 (top) and Northrop's YF-17 (bottom) is to climax in the selection of one of these lightweight fighters as the Air Combat Fighter by the Air Force in the near future. At least 2,000 of these high-performance fighters are expected to enter USAF and allied inventories.

senior members of the Air Staff as well as top fighter pilots, these study groups concluded that, at least from the point of view of budgetary realities and general operating costs, a mix of F-15 aircraft and lower-cost Lightweight Fighters of the YF-16 and YF-17 type would meet the Air Force's future needs better than a smaller number of F-15s. As a result of these findings, the Department of Defense informed the Congress that the current prototype program involving the General Dynamics YF-16 and the Northrop YF-17 would be transformed into a full-scale development effort to provide an option for the "modernization of our own tactical fighter forces [and] those of our allies."

General Stewart disclosed that the Air Force plans to complete the competitive evaluation of the YF-16 and YF-17 and award a contract by

January 1, 1975. First flight of the first engineering development aircraft is to take place about twenty-two months later. The first operational aircraft should come off the line either late in 1978 or early in 1979 if the Air Force's present schedule is met, he added. Senior Department of Defense and Air Force leaders recently informed foreign Air Force representatives of this schedule and also told them that the aircraft, now designated the Air Combat Fighter, would be used by USAF in Europe and elsewhere, once it achieves full operational status.

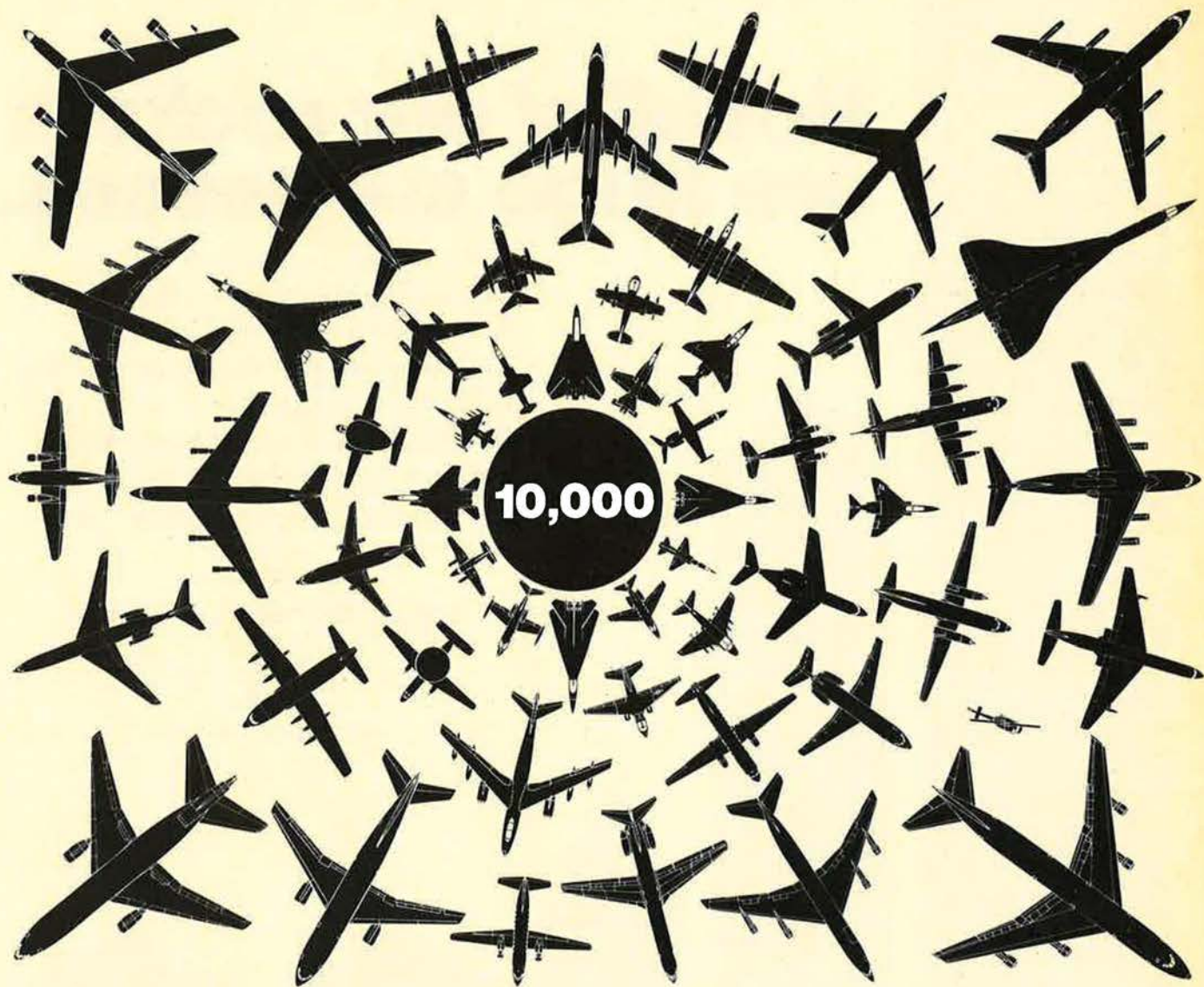
The Air Force plans to build about fifteen test aircraft, of which about half will be used for flight test and the remainder for operational test and evaluation as well as crew training. These test aircraft are to be built at a "slow but steady rate" to avoid a production gap, General Stewart explained. The performance characteristics of the Air Combat Fighter (ACF) are to reflect the intrinsic requirements of USAF, but must also meet the needs of potential foreign buyers. With a worldwide market of possibly 2,000 or more aircraft of this type, it is reasonable to assume that more ACFs will be sold abroad than USAF will purchase.

General Stewart stressed that in selecting the winning contractor, the Air Force will "be meticulously careful" in disregarding the fact that flight testing of the General Dynamics aircraft started about five months ahead of that of the Northrop YF-17—in January 1974 and June 1974 respectively. "We contracted with both companies for a one-year flight-test program, which could start at their option. This represented the maximally useful period for exploring the potential of these vehicles, especially in light of follow-on technology. We already have more than ninety percent of the information needed on the YF-16 and unless we run into a protracted grounding of the YF-17 because of unexpected difficulty, we will be able to pick a contractor by the end of the year," the ASD Commander pointed out.

Regardless of which competitor is selected, the ACF will be a different airplane from the Lightweight Fighter prototypes now flying. "There is no way we can live with the barebone avionics of the prototype vehicles. We are requesting proposals for the design and prototype development of two competing radars which we plan to enter into a one-year flyoff starting this fall," General Stewart disclosed.

The Air Force expects the ACF's radar performance to be at least equal to that of the F-4 but would "prefer" capabilities approaching those of the F-15. The new aircraft's radar and basic avionics capability, according to General Stewart, "should be comparable in many respects to that of the F-15 except that the Air Combat Fighter's radar won't have the same range as the larger aircraft." (Radar range is largely a function of antenna size. This automatically handicaps small, lightweight aircraft that obviously can't accommodate large an-

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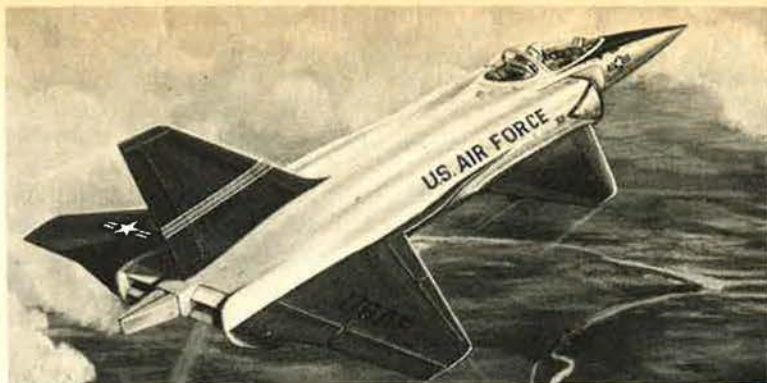
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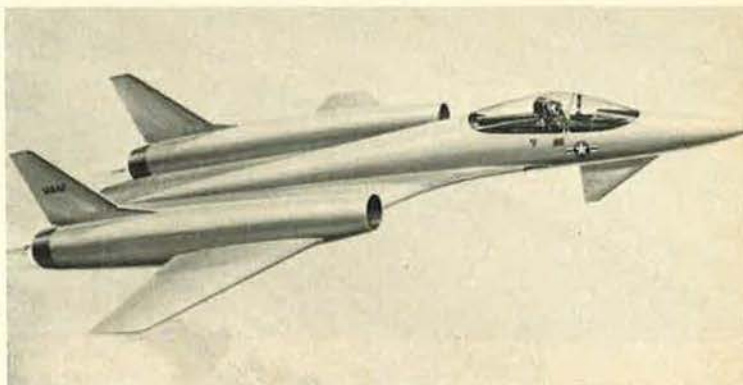
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Three different approaches to AFTI I, the Advanced Fighter Technology Integration demonstrator aircraft, are depicted in artists' designs: Fairchild Industries' entry is shown above, Rockwell International's is at upper right, and McDonnell Douglas' appears on the right.



tennas. While means exist for moderately boosting the performance of small antennas, the cost of doing so—especially of the sophisticated cooling techniques needed—is prohibitively high.)

No decision has been reached at this writing on whether the Air Combat Fighter will be equipped from the outset with the all-weather, radar-homing, air-to-air AIM-7 Sparrow missile. This would require a second, "illuminating" antenna. It is, however, certain that a growth capability to accommodate the Sparrow will be provided. In a structural sense, both the YF-16 and the YF-17 can carry the Sparrow. The ACF will incorporate "some tail warning radar capability," according to General Stewart.

The inherently good air-to-ground capability of the Lightweight Fighter—the result of low wing-loading, high thrust-to-weight ratio, and great structural strength—is to be emphasized in its transformation to the Air Combat Fighter. "We want to squeeze as much air-to-ground capability into the aircraft as possible without unduly compromising its primary air-superiority mission," General Stewart said.

The ACF is to incorporate extensive "fly-by-wire" (FBW) technology—substituting redundant electronic linkages between the cockpit and the aircraft's control surfaces for the conventional mechanical and hydraulic system. The YF-16 uses full-scale FBW, and Northrop similarly added fly-by-wire controlled ailerons to the YF-17. The Aeronautical Systems Division, General Stewart said, is an enthusiastic advocate of this new technology that, with the help of computers, "can think faster and act faster than man" in routine flight control. "I personally believe that we will see no future high-performance fighters, or even bombers, that will not make all-out use of fly-by-wire," he added.

Other likely changes include, in the case of the YF-16, strengthening the canopy, and in the YF-17, beefing up the landing gear and adding wet (fuel-carrying) wings.

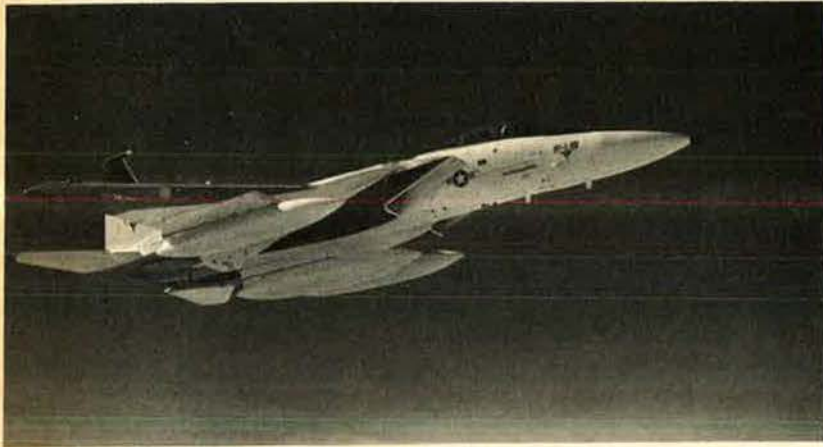
The Air Combat Fighter's average flyaway cost, according to Air Force and industry estimates, should be "somewhere between \$4 and \$5 million," expressed in 1975 dollars, according to the ASD Commander. The ACF's price is premised on a production buy of 300 aircraft. If this cost goal is met, the Air Combat Fighter will be from half to two-thirds the price of the F-15 and would fully meet the Air Force's high-low mix economic criteria.

Return of the Research Aircraft?

Last March, the Air Force Flight Dynamics Laboratory announced the award of contracts to McDonnell Douglas, Rockwell International, and Fairchild Industries for configuration studies of the first Advanced Fighter Technology Integration demonstrator aircraft termed AFTI I. The program could lead to the development by 1977 of two experimental aircraft, incorporating advanced technologies and pointing the way to new generations of high-performance combat aircraft.

Describing AFTI as a program to develop the technology for a potential follow-on to the Air Combat Fighter in the mid-1980s, General Stewart said the program might mark the return to a policy of pure research-aircraft development, dormant since the X-15 program ended in the 1960s. The AFTI program, he said, is meant to exploit new technologies in such key areas as high thrust-to-weight engines, high-energy fuels, computer-controlled flight controls, including air slewing (missile-like maneuvering), and new structural materials such as advanced compos-

ites. Initially, the ASD Commander said, "we might confine ourselves to a scaled-down design, perhaps half the size of a useful combat aircraft, to test out new concepts. This we might do four or five years from now, but the operational products will be keyed toward the middle of the next decade."



The F-15, according to initial USAF assessments, will be more efficient in the ground-support role than the F-4, but might require some modification of its highly specialized radar.

AFTI I, the first demonstrator under the AFTI concept, is aimed at enhancing tactical combat effectiveness, both in the air-to-air and air-to-ground modes. It is specifically meant to improve the maneuver, convergence, tracking, and target kill capability of future tactical aircraft.

The technologies to do this appear to pivot on three broad but mutually interactive categories: direct force generation, advanced control system concepts, and advanced crew station developments. These will provide such unique capabilities as pointing the fuselage (and gun) in a direction different from the flight path and "translating," or shifting, the airplane laterally or vertically without first rotating it in that direction.

A major concern in the future, General Stewart said, will be high thrust-to-weight engine technology because of its pervasive and synergistic effect on basic aircraft performance. The most advanced, currently operational, US fighter aircraft engine is the F100, the powerplant of the F-15. It weighs about 3,000 pounds and produces approximately 25,000 pounds of thrust, contrasted with the F-4's J79 engine, which weighs 3,855 pounds and produces 17,900 pounds of thrust. The thrust-to-weight ratio of the F-4 engine is 4.65, compared with about 8.0 for the F-15's engine. Similar dramatic increases appear possible in the years ahead as engines move toward the so-called stoichiometric level, meaning that in a practical sense the total

energy content of the fuel is being extracted rather than just a percentage as at present. A major advantage of a stoichiometric engine is that it eliminates the need for an afterburner, which reduces size and weight and increases efficiency.

Key to this form of fuel efficiency is turbine inlet temperature, which has climbed from about 1,800 degrees F in the F-4's engine to about 2,550 degrees F in the case of the F-15's F100 engine and to above 3,000 degrees F in experimental Air Forces engines. Other methods of significantly boosting engine efficiency pivot on using advanced fuels which, General Stewart predicted, "might enable us to get double the energy from a quantity of fuel than we can obtain now."

Research work on "variable-geometry engines" offers another way to increase performance and efficiency. By varying the bypass ratio of turbofan engines, it is possible to optimize the engine's operation for either low specific fuel consumption or for high thrust output. This is achieved by setting the fan and compressor either to operate at high pressure ratios and low airflow or the other way around, much as the automatic transmission of a car adjusts for various load and speed conditions.

In terms of aerodynamics, according to General Stewart, AFTI will capitalize on subtle refinements, such as body lift and strakes, that have already provided significant improvements for the YF-16 and YF-17, and new technologies such as variable incidence wings, jet flaps, and thrust vectoring/super circulation.

Fine Tuning the F-15's Air-to-Ground Capabilities

The Air Force has recently accented in congressional and other public statements the inherent air-to-ground capabilities of its new F-15 air-superiority fighter. According to General Stewart, "that capability was there all along." The aircraft's avionics have more than adequate computational capability to handle air-to-ground munitions, and the aircraft incorporates the hard-points and wiring for external fuel tanks, bombs, and missiles.

Initial Air Force assessments indicate that the F-15 will be more efficient in the ground-support role than the F-4. The F-15 is, however, handicapped in this role because its sophisticated look-down, shoot-down radar is optimized to reject ground clutter. This quality makes the system ideal for locating targets in the air, but less capable in the air-to-ground role than such systems as the F-111's attack radar. The F-15's radar could, however, be modified to fully exploit that aircraft's basic air-to-ground capabilities. In addition, the F-15 is not equipped to carry nuclear weapons, but General Stewart said that modifying for nuclear weapons carriage would be relatively easy and economical.

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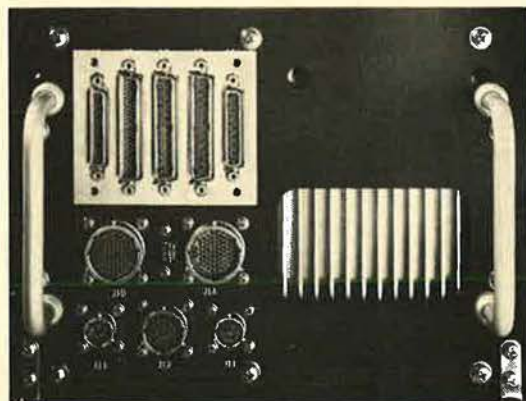
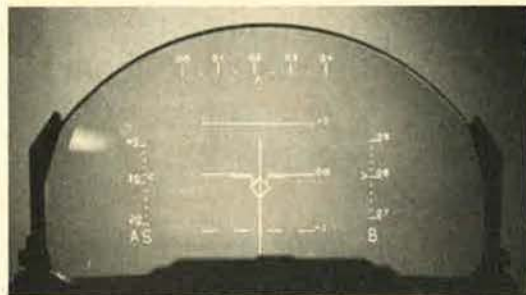
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Bolstering Future Strategic Airlift Capabilities

The US strategic airlift capability, which proved decisive by resupplying Israeli forces during the Middle East war in October 1973, consists of seventy-nine C-5s, 275 C-141s, and 246 long-range commercial aircraft of the Civil Reserve Air Fleet (CRAF). The Department of Defense has termed "major increases" of this force "one of the most urgent improvements" needed at this time. A number of means are currently under way or under consideration to improve the airlift situation. One involves modifying the 110 Boeing 747 passenger aircraft in the inventory of the US airlines, at a cost of between \$5.6 and \$6.6 million each. The modification consists in the main of installing a nose cargo door and strengthening the upper cargo deck. According to Defense Secretary James R. Schlesinger, these modifications could also be considered for the fifty-five 747s operated by the airlines of NATO allies. Such an arrangement, he said, combined with modification of the C-141 and greater wartime utilization of the C-5s, could reduce the average deployment time of US ground forces to Europe from nineteen to seven days per division.

In addition, the Defense Department and USAF "in the next few years" will buy a large convertible tanker/transport aircraft, according to General Stewart. (The exact number has not yet been determined.) Selection of the aircraft, he said, is tentatively planned for the end of 1975, but presupposes congressional funding authorization. The current budget provides \$8 million for basic studies. Candidates are the 747, DC-10, L-1011, and C-5. Price and operating cost will be the principal selection criteria since all are considered capable of performing the required tasks.

The aircraft could be operated as a conventional military transport, accommodating both troops and cargo. Such an arrangement, General Stewart pointed out, would reserve the C-5s for outsized cargo and enable the nation to airlift far greater quantities of time-urgent cargo than is now possible.

When used as a tanker, the new aircraft is to provide three aerial refueling stations—a center boom and one boom on each wing. The latter will be remotely controlled. Basic flight tests of the 747, DC-10, and C-5 in the tanker role, with the SR-71, F-4, E-4, and others, were conducted by ASD in the past two years and showed, according to General Stewart, roughly equal suitability of all these three aircraft for the tanker role.

While the aerospace industry has suggested major modifications of some of the competing aircraft that would bring them into the "million-pound class and involve engines with about 75,000 pounds of thrust," the Air Force sees no need "to build something akin to a



A key element in increasing US strategic aircraft capabilities is "stretching" the C-141 StarLifter through the addition of a 23.5-foot-long fuselage extension depicted in this artist's conception. The C-141 is air-refuelable.

new aircraft" with attendant cost increases, according to General Stewart.

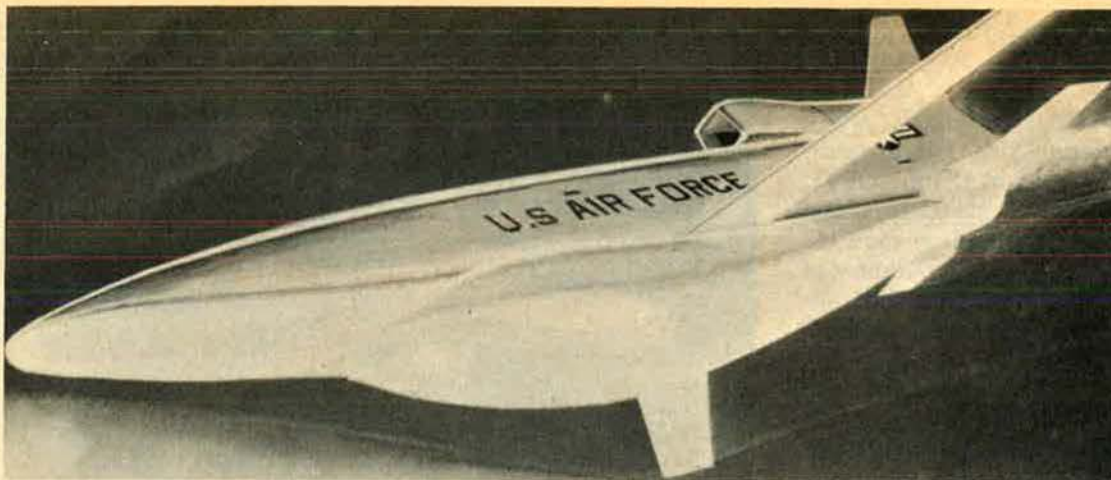
In addition to serving as a tanker, the new aircraft will also be a bulk carrier of fuel, using removable tanks.

New Strategic Missiles

After studies and research covering almost a decade, the Air Force believes that the time is ripe for a marriage of solid rockets and liquid-fuel ramjet technology. This combination is known as the integral rocket-ramjet, an advanced propulsion system ideally suited for future air-launched strategic missiles. Such a propulsion system accelerates a missile to high supersonic speed, using a solid rocket booster packaged in the ramjet/combustor. Following booster burnout, it shifts to the more economical ramjet mode, so-called because it "rams" outside air—the oxidizer—into the combustor, where a liquid fuel is burned to generate thrust.

The program is officially called the Advanced Strategic Air-Launched Missile, or ASALM, but is also known as the multipurpose missile. McDonnell Douglas and Martin Marietta are working concurrently on concept formulation studies and advanced technology development. The Marquardt Co., a division of CCI Inc., and United Technology Center are designing and ground-testing ASALM propulsion systems. The primary purpose of the missile, which might be ready for operational use within a decade, would be to replace the currently used SRAM missile.

"We expect the missile to have a somewhat higher speed than SRAM and about half the range of the Air-Launched Cruise Missile [ALCM—a subsonic cruise missile with a range of more than 1,200 miles currently in development but thought of mainly as a gap-



One of the most promising additions to the inventory of weapon systems carried by USAF's strategic bombers may be an air-breathing cruise missile with a range of almost 1,500 nautical miles. ALCM might reach operational status by 1979.

filler until ASALM comes into the inventory]. A ramjet is more efficient when operating at speeds above Mach 2 and performs best at altitudes up to 100,000 feet. ASALM will be about the size of SRAM, since it must fit into the bomb bays and rotary launchers of the B-52 and the B-1. Like SRAM, ASALM will be capable of high, low, or mixed high/low penetration," General Stewart told *AIR FORCE Magazine*.

Although the initial studies of the multipurpose missile explored its potential in bomber defense, General Stewart believes that a specialized, small missile is better suited for that task. Such a missile is currently under study by ASD, with its principal traits being the ability to accelerate very rapidly, to maneuver efficiently through "slewing," and to be sized "comparable to Maverick so that we don't eat up all the bomber's payload with weapons used for its own defense."

The Air-Launched Cruise Missile

One of the potentially most significant new programs in the current Air Force and Navy budgets is a medium-range, air-breathing, cruise missile to be launched by both aircraft and naval vessels, known in the USAF version as the Air-Launched Cruise Missile (ALCM). (See "Urgent US R&D Requirements," April '74 issue.) Prototype models of ALCM, General Stewart told *AIR FORCE Magazine*, are scheduled to enter flight testing in mid-1976. The new missile is to achieve full operational status by 1979. Its development is based on "a very carefully paced program."

ALCM borrows some airframe and propulsion technology from the Air Force's now-defunct Subsonic Cruise Armed Decoy (SCAD) program, but relies on basically new guidance and control technologies to provide the high accuracies and jam-resistance required for a strategic system. The ALCM uses an inertial autopilot combined with TERCOM, which stands for Terrain Contour Matching and provides fixes along the flight path. The matching

is based on digital information about waypoints the missile must pass en route to the target and which are checked by various sensors.

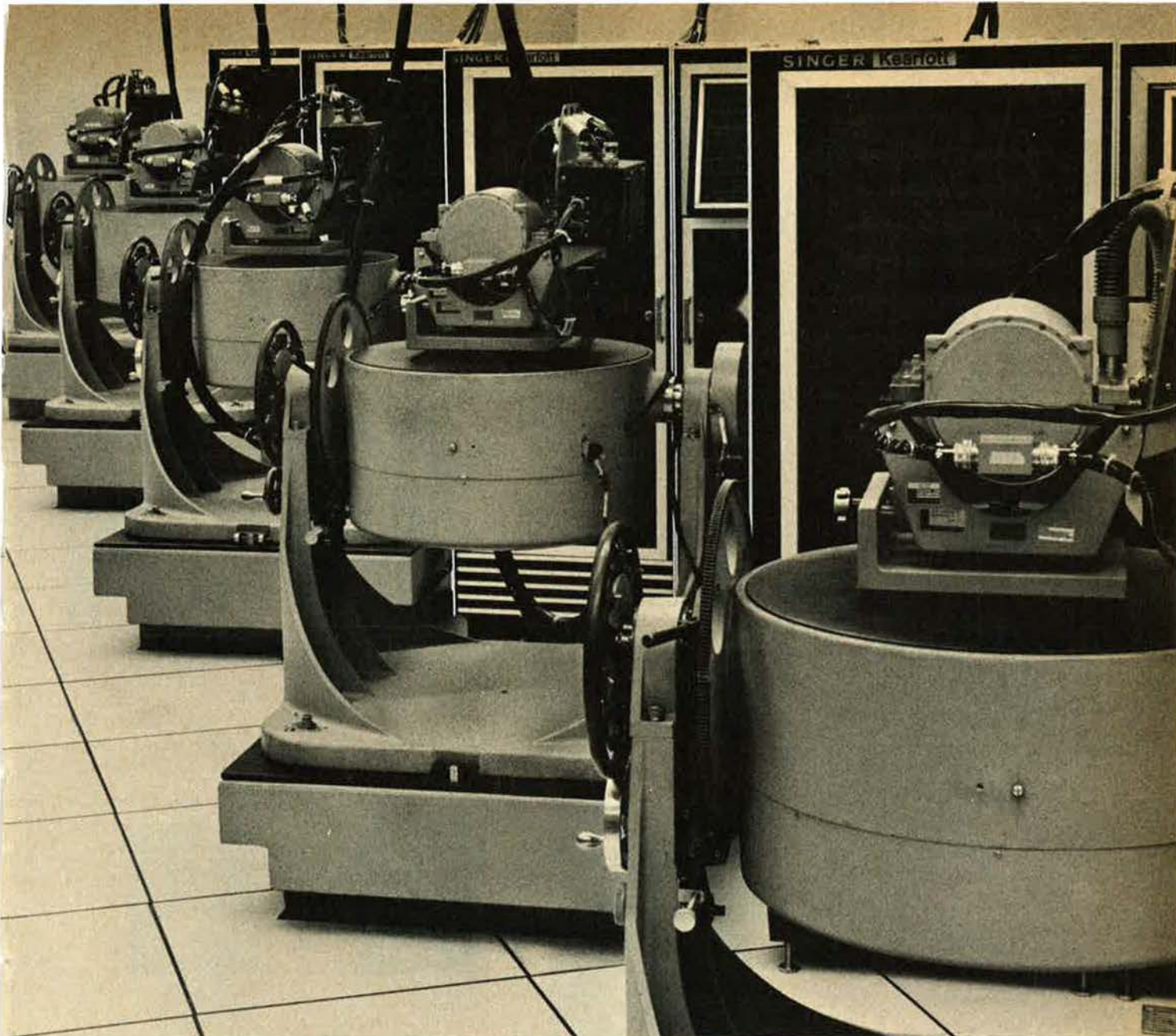
Achieving a highly reliable and successful TERCOM system, General Stewart believes, is the key to a successful ALCM program. He stressed that the Navy's development of this system "is now moving toward something we call a super-TERCOM, a refined, even more capable system than the one now in being." Eventually, ALCM, as well as ASALM, will benefit from the Air Force's NAVSTAR Global Positioning System, a sophisticated network of navigational satellites that will provide worldwide pinpoint accuracy.

The EF-111 Program

To fully exploit the capabilities of the F-111s and F-15s under certain combat conditions, an electronic countermeasures aircraft with comparable speed and range is needed. The aircraft to perform this tactical support jamming mission is the EF-111A. The program, for which USAF has requested \$36.7 million in the current fiscal year, involves modifying several dozen older F-111As currently in the Air Force inventory by installing ALQ-99 electronic countermeasures subsystems in the weapons bay. Late this year, the Air Force plans to select either Grumman Aerospace Corp. or General Dynamics to qualify and test two prototype EF-111As over a twenty-eight-month period. Full-scale production or modification decision on other F-111As will occur at the completion of the two-aircraft RDT&E program.

The ASD Commander described the EF-111A as a multiple jammer, more capable and versatile than the Navy's EA-6Bs and able to "go in with the force, without need of escort aircraft to protect it." ■

(This report on ASD programs will be concluded in next month's issue with reports on the A-10 program, AMST, remotely piloted vehicles, and ECM developments.)



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An AIR FORCE Magazine Photochart
(As of August 15, 1974)



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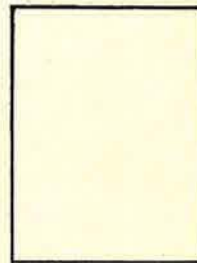
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Maj. Gen. Howard E. McCormick
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NORAD/CONAD, and Deputy Chief of Staff/
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Intelligence, AFCENT and Sr. US Representative,
AFCENT, Brunssum, The Netherlands

Maj. Gen. Edward Ratkovich
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Maj. Gen. Eugene B. Sterling
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Maj. Gen. Walter R. Tkach
White House Surgeon, The White House,
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Maj. Gen. William B. Yancey, Jr.
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Vaihingen, Germany

Maj. Gen. Kendall S. Young
Air Deputy, Allied Forces Northern Europe,
Oslo, Norway

In addition to the above, some fifty brigadier
generals and many field-grade and squadron-
level officers are serving in assignments
outside the Air Force.

**The author believes that the
Schlesinger strategy will not
produce both . . .**

NUCLEAR FLEXIBILITY AND PARITY

BY MARK B. SCHNEIDER

THE strategic force objectives of the United States have been the subject of a major debate in recent months. The debate was stimulated by Secretary of Defense James R. Schlesinger's announcement of a new strategic targeting concept (or strategy, if you will), and by his declassification of much information concerning the post-SALT I Soviet strategic threat.

The alarming nature of this threat did much to prompt the new strategy. SALT I gave the Soviets a four-to-one advantage over the US in missile payload, or throw weight. Before the Soviets developed MIRV, they translated this payload advantage into much higher yield weapons. With the development of MIRV, the Soviets have the option of translating their superiority in throw weight into both numbers of warheads *and* megatonnage.

In addition, the Soviets developed a series of boosters—the SS-16 through -19—that have much larger throw weights than the missiles they will replace. Particularly alarming is the SS-19 which, according to Secretary Schlesinger, carries six MIRVs of one-megaton yield each. It will probably replace the 990 SS-11s, most of which carry a single warhead in the one- to two-megaton yield range. The SS-18 will carry up to eight weapons of one- to two-megaton yield. It will probably replace the 300 SS-9s in the next five or six years. Just what the total load of the Soviet ICBM force will be

in 1980 is uncertain, because the Soviets have also tested large single reentry vehicles on the SS-17 and SS-18. They may retain some warheads with yields in the tens of megatons in addition to thousands of one- or two-megaton yield MIRVs.

Another thing that must be borne in mind is that the SS-19 is obviously not the last of the Soviet ICBMs. If the Soviets continue the same pattern they followed between the SS-9 to -13 series and the SS-16 to -19 series, we can expect at least one, and possibly two, generations of even larger Russian missiles before this decade is out.

The four new Russian ICBMs were developed during an era in which the US had initiated no successor program to its Minuteman III ICBM, had canceled all programs for new guidance and warhead improvement, and was funding its B-1 bomber and Trident missile submarine programs at minimal levels. The Soviets developed their rough counterparts to these programs—the Backfire bomber and the submarine-launched SS-N-8 missile—five years before our systems can become operational. They achieved this not because of any technical superiority, but simply because they were willing to invest enormous sums in these systems and we were not. *Even today, the cost of a single test of any one of the new Soviet ICBMs exceeds the projected FY '75 funding for all advanced ICBM concepts in the US.*

MAD, Sufficiency, and Flexibility

Beyond the growing Soviet threat to the pre-launch and post-launch survivability of our strategic forces, Secretary Schlesinger faced the basic problem of what should be the objective of our strategic forces. During the late 1960s, former Secretary of Defense Robert S. McNamara did much to enshrine the doctrine of Mutual Assured Destruction (MAD). Under the MAD concept, the role of strategic forces was almost entirely confined to the deterrence of their own use, which was presumed to be achieved when those forces had a credible capability to absorb a surprise attack and retaliate decisively against the enemy's urban-industrial complex.

Criticism of MAD developed on technical grounds (that McNamara manipulated threat estimates or ignored Soviet civil defense), on theoretical grounds (that it was unwise to base our national security strategy on the premise that strategic nuclear war could not occur), and on strategic grounds (that it ignored the problems of deterring nuclear attacks on our allies, or limited nuclear attacks on the United States).

The initial "Sufficiency" strategy of the Nixon Administration was basically a refinement of the MAD concept. It was not until late 1973 that the Administration began to move visibly away from limitations of what had now become the MAD creed.

Schlesinger introduced the concept of nuclear flexibility. US strategic forces under the MAD doctrine were procured almost entirely on the basis of their capability to inflict urban-industrial damage to the Soviet Union. As Secretary Schlesinger indicated, other SIOP (Single Integrated Operational Plan) targeting options existed—strategic counterforce and other military targets—but all of these options involved attacks with several thousand warheads. Moreover, because of political restrictions on the yield and accuracy of US strategic forces, their capabilities to implement attacks on hard targets were very limited, especially in relation to the new Soviet strategic force structure.

The need for a credible capability to deter limited strategic attack on the United States is the core of the new Schlesinger strategy. To achieve it, we must have the capability to ride out a Soviet surprise attack, retain a residual Assured Destruction capability for a protracted period, and simultaneously retain the capability to attack significant numbers of hard, semi-hard, and soft military and economic targets.

A limited capability along these lines can be obtained by simply reconfiguring the current SIOP, but broadening the base of our options will require changes in our strategic forces. Some of this can be done relatively cheaply by

modifying the force loads of projected B-1 bombers and Trident missiles. Very significant increases in our counterforce capability can be obtained by the deployment of the Mark 12A nuclear warhead on the Minuteman III, and the new AIRS (Advanced Inertial Reference System) guidance on this missile. Development of a new US ICBM would be more costly, but one can make a very good case for doing so, even under the MAD concept.

The Critics Respond

Critics of the Schlesinger strategy argue that MAD capabilities will deter limited strategic attacks. This is most certainly true if one postulates a cautious Soviet leadership in a non-crisis atmosphere. But it is reasonable to suggest that the objective of US strategic forces must be to deter an extremely aggressive Soviet leadership in a crisis period.

In an environment of visible Soviet strategic superiority (even if that superiority were not great enough to completely deny the US an Assured Destruction capability), would the US fire several thousand warheads at the Soviet Union in response to a Soviet attack utilizing a few warheads against this country? Even if the US had some capabilities to respond in a limited manner, would we do so if the Soviets threatened that any strategic response would trigger an all-out Soviet counterforce attack on the US?

Some would argue that there is no military objective worth a small attack on the US. This is simply not true. With a few warheads, half our Polaris-Poseidon capability could be destroyed in port. It is also conceivable that the Soviets might attack military installations in the United States supporting combat operations against Soviet forces in a limited war. One must, of course, admit that a cautious Soviet leadership will do neither of these things; but we cannot plan our strategic forces on the premise that the Soviets will always be cautious. Political changes of major proportions can occur overnight, while it takes five or ten years to build up new military capabilities.

Advocates of extreme Assured Destruction (or Minimum Deterrence) strategies that involve placing all US strategic weapons at sea would give the Soviets even lower risk limited strategic options—a campaign against Polaris-Poseidon submarines at sea under the cover of a limited war. Many of these same individuals advocate a ninety-day conventional war strategy for NATO, which should allow the Soviets adequate time (assuming such a NATO defense is feasible, which is very dubious) to wage a moderately effective campaign against Polaris-Poseidon. At what point within such a campaign would we implement an Assured

The author, Mark B. Schneider, a former faculty member of the University of Southern California and analyst for Stanford Research Institute, wrote his doctoral dissertation on "Nuclear Weapons and American Strategy, 1945-1953." During the past five years, his articles on nuclear strategy have appeared in several of the leading military journals, and he has coauthored or contributed to a number of published studies on strategy.

Destruction strike against the Soviet Union? Would we flush available submarines (hence creating more targets for Soviet ASW forces) or return more to port (creating more lucrative targets for a very limited Soviet strategic strike on the US)?

One point that has been ignored in the current debate is the fact that only the Minuteman force is highly invulnerable to a limited Soviet strategic strike, and this will not change, irrespective of the vulnerability of the force to a massive Soviet counterforce strike.

Restoring Nuclear Parity

The Schlesinger program will give the US capabilities adequate to respond to a wide variety of feasible limited, or even mid-range, Soviet strategic attacks on the United States. What cannot be achieved under the current concept is an adequate capability to deal with a massive Soviet counterforce strike if our objective is to deter the conflict from escalating into a general counter-city war, and to avoid at least some type of major capitulation to the Soviet Union.

While it is conceivable to postulate a number of potential outcomes from a Soviet all-out counterforce attack on the US in the late 1970s—depending on what accuracy one assumes for Soviet strategic forces—it is rather likely that the US, with 2,000–3,000 relatively small MIRVs on its ICBM force, will run out of strategic options before the Soviets with their projected 7,000–8,000 MIRVs in the megaton range. The US would then have to initiate an ultradestructive counter-city campaign (possibly against evacuated Russian cities, while the American population was still vulnerable) or capitulate to the Soviets on the issue over which the war is being conducted.

Unless we are to assume that the Soviets will relinquish in SALT II all the strategic advantages they won in SALT I, we will ultimately come to a crisis in our defense planning. Currently our strategic objective is to avoid any apparent first-strike capability against the Soviets, and at the same time avoid the development of a strategic imbalance between the US and Soviet strategic offensive capabilities. When this is further complicated by the SALT I ban on effective hard-site defenses for ICBM fields, and area defense for bomber bases, it will be impossible to achieve both strategic parity and no counterforce threat to land-based Soviet strategic forces. Any advanced, high-payload missile system that might be built today will have a counterforce potential.

This does not mean that the current Schlesinger programs will threaten the Soviet deterrent capability. They obviously will not. But neither will the programs reestablish strategic

parity. If strategic parity is to be regained, it will require a major US ICBM program aimed at developing a much higher throw weight missile.

Two concepts for an advanced ICBM are under consideration. One involves a relatively small payload mobile missile (either air or land mobile), and the other a large payload, silo-based missile. The deployment of either form of mobile missile would significantly increase the survivability of our strategic forces, but two or three hundred such weapons obviously would not regain strategic parity. (In the first place, they probably would be deployed five years after the Soviets deploy their SS-16 as a mobile. Secondly, they would only slightly increase our missile throw weight.)

A large payload missile would very significantly reduce the margin of Soviet lead in throw weight, but do nothing for our strategic force survivability.

The mobile concept is probably more compatible with currently accepted concepts of arms control and US strategic objectives in the fields of deterrence and limited war-fighting capabilities. This author would suggest that currently accepted arms control concepts led to SALT I and will either lead to a similar SALT II agreement or no agreement at all. If one takes an alternative view of the value of threatening one's opponent with a less favorable strategic balance as a consequence of a SALT stalemate, then the deployment of both high payload and mobile ICBM systems becomes quite important.

Much of the current thinking concerning arms control is based on the simplistic "action-reaction" model. Despite a great deal of evidence that other factors—institutional biases, bureaucratic politics, technical limitations and opportunities, and political objectives—are the prime determinants of weapon systems procurement on both sides, the action-reaction concept has dominated thinking in recent years. It weakened our SALT I position by guaranteeing the Soviets their strategic force survivability and penetration capability before they even came to the bargaining table. We were reduced to a position where we were forced to bargain away programs vital to the preservation of our deterrent in order to curtail Soviet programs that threatened it. The net result was a SALT I agreement that did little to enhance our security requirements and granted the Soviets visible superiority in many critical areas of strategic weaponry.

The Schlesinger program—if implemented—will improve our bargaining position in SALT II. Whether or not US programs, funded at tens of millions of dollars as a counter to Soviet multibillion dollar efforts, will impress the Soviets enough to substantially moderate their position in the near future is yet to be seen. ■

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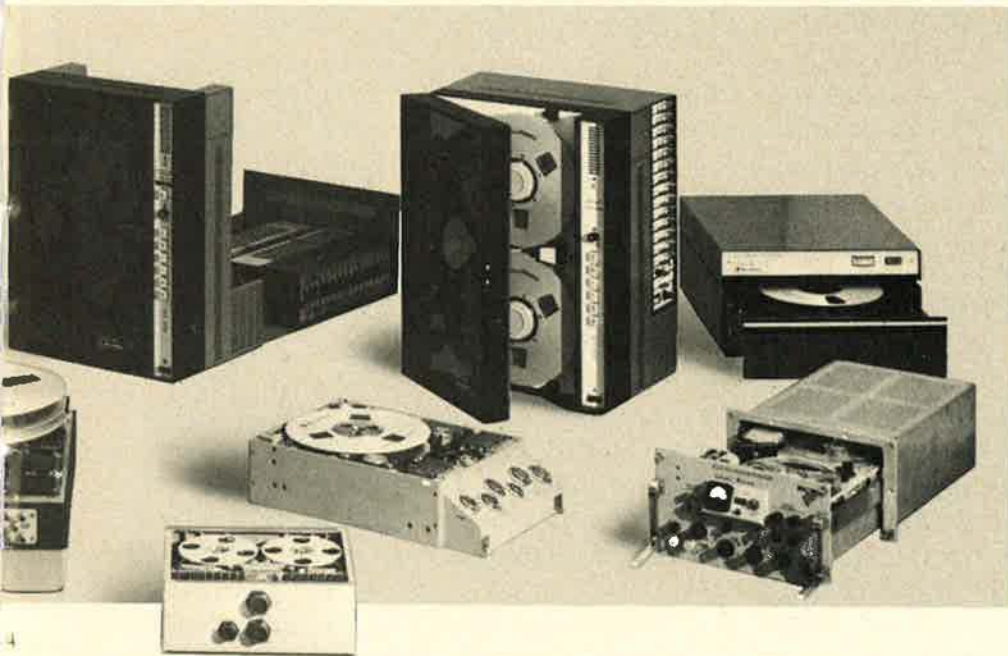
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In this important article, the authors discuss frequently ignored physical and operational factors that affect an opponent's attack planning, and explain . . .

Why ICBMs Can Survive

BY LT. COL. JOSEPH J. McGLINCHEY, USAF,
AND DR. JAKOB W. SEELIG

INTRODUCTION

Analysts who question the survivability of US land-based missiles have based their evaluations on the assumptions that several enemy warheads could, and would, be detonated over each US missile silo either simultaneously or within a very short period. If that assumption were correct, the Soviets—with more and larger land-based missiles than the US—could seriously threaten the survivability of the US land-based missile force, particularly if Soviet missiles are equipped with accurate multiple warheads.

The authors of the following article point out that the analysts invariably ignore physical phenomena and operational factors that substantially limit an attacker's ability to launch a disarming first strike against his opponent's missile fields. Among these factors is the virtual impossibility of programming all warheads to arrive and explode over their targets at precisely the same instant. If detonation is not simultaneous, the first warheads to explode will create nuclear radiation, fireballs, shock waves, nuclear winds, and clouds of debris, dust, and ice crystals that either will destroy other warheads arriving over the same or nearby targets (fratricide), or grossly reduce their accuracy. For similar reasons, the success of an attack in waves, with a second salvo closely following the first in order to increase the probability of destroying missiles in their silos and of preventing a counterattack, also is questionable. If the second wave is withheld until the adverse conditions dissipate, surviving missiles could be launched against the attacker.

The reader may conclude that under these conditions and until the Soviets attain extreme system accuracy, a substantial part of the US land-based missile force would survive an attack and be able to retaliate. Land-based missiles remain effective as a deterrent and as a principal means of carrying out a variety of response options.

A COMMON assumption in classic analyses of ICBM survivability has been that an attack on an ICBM force, deployed in a dense complex or complexes of hardened silos, can include many reentry vehicles scheduled to detonate at each target in a short time span. This is erroneous. Effective attack is possible only where targets are far from one another, or when the time span of the attack is not criti-

cal. In fact, evaluation of nuclear environment effects created by earlier detonations on later attempted detonations raises considerable doubt that an attacker can effectively utilize multiple rounds against each target.

The classic analysis assumes that each reentry vehicle of the many assigned to a given complex of hard targets is affected by the same environmental conditions as the first re-

Nuclear Attack

entry vehicle to reach that complex. That is not the case. However, before discussing how flight into and through a developing, dynamic nuclear environment can degrade a reentry vehicle, we must describe the flight of a reentry vehicle through an atmosphere that has *not* been affected by nuclear detonations.

A reentry vehicle separates from its booster shortly after termination of the booster's powered flight. The reentry vehicle then follows a ballistic trajectory until it starts to reenter the atmosphere at a velocity, for ICBM ranges, of approximately 23,000 feet per second. As the vehicle penetrates the atmosphere, it begins to experience aerodynamic heating because of its high velocity and the rapidly increasing atmospheric density. The heating rises rapidly to a maximum and then decreases gradually.

Aerodynamic drag slows the reentry vehicle. In the process, the vehicle's kinetic energy is converted to heat, which is absorbed partly by the vehicle and partly by the air. Reentry vehicle designers strive for as much heat absorption by the air as possible, in order to protect the vehicle substructure. In the past, blunt-nose bodies have been used to generate strong shock fronts, which will absorb part of the heat. Current techniques using slender-nose bodies protect the vehicle substructure with an ablating material, which gives off gases as it burns and thus transfers heat to the atmosphere. This heat transfer process generally occurs at altitudes from approximately 200,000 feet down to 50,000 feet. Eventually, reentry vehicle velocity is decreased by aerodynamic drag to such an extent that heating subsides.

The reentry trajectory is a function of the ballistic coefficient of a reentry vehicle, the type of ablative heat shield, the reentry angle, the atmospheric winds. These parameters are included in a drag model that is used to predict impact points. As long as the values of the parameters are reasonably predictable, impact points can be estimated with a high degree of accuracy.

Parametric Changes in a Nuclear Environment

The atmosphere in a nuclear battle space will be considerably disturbed by detonations of

nuclear weapons. Nuclear radiation, the fireball, shock waves, nuclear winds, and the nuclear cloud all have a potential impact on reentry vehicle performance. If reentry occurs while the atmosphere is still in this highly disturbed state, the changes in values of atmospheric parameters from nominal values used for impact-point predictions can result in excessive failure rates or impact errors.

Of the several categories of radiation produced by a nuclear detonation, neutrons have the major potential impact on reentry vehicle performance. The neutron flux (the number of neutrons in a given area) generated by a nuclear detonation will be roughly proportional to the yield of the warhead. Neutron flux will decrease rapidly (inverse square law) with increasing distance from the explosion source. In addition, the flux will be reduced because some neutrons will be absorbed by the atmosphere as they travel from the explosion source. The neutron flux will reach an incoming reentry vehicle almost instantaneously after the nuclear detonation. When a reentry vehicle is subjected to a neutron flux of sufficiently high magnitude, the nuclear material in the warhead can be so affected that either the material will fail to initiate the nuclear reaction, or the reaction will occur with a reduced yield.

The detonation of a nuclear weapon in the atmosphere will result in absorption of high-energy radiation by the surrounding air. The air temperature will be raised on the order of a million degrees Kelvin (nearly two million degrees Fahrenheit). Resulting pressures will be on the order of a million pounds per square inch. The high-pressure fireball gases expand rapidly, generating a shock wave in the surrounding medium, and also start to rise in the surrounding cooler air. The radius of the fireball of a megaton-size weapon will grow to the order of thousands of feet and will emit visible radiation for at least one minute.

At times greater than about ten seconds after detonation, a reentry vehicle entering the fireball should be able to survive to its impact point if its warhead is to be detonated at the surface by a contact mechanism. However, if the warhead is to be detonated at or near the surface by a radar or inertial fuze, problems may arise. The signal return from the fireball

could cause the radar fuze to malfunction. An inertial fuze will not be affected by the signal return. Its accuracy, however, may not be sufficient to assure the attacker that the burst will not occur at either too high an altitude so that the lethal effects will not reach the ground, or at too low an altitude so that the deleterious effects of a surface burst on following reentry vehicles will be generated.

The shock wave generated by the high-pressure fireball gases is characterized by a sharp increase in air pressure at the shock front. The pressure behind this front decreases rapidly and eventually drops below the ambient pressure. The shock wave from a megaton-size weapon will travel tens of thousands of feet in tens of seconds before dissipating.

A reentry vehicle arriving in the vicinity of a detonation may encounter the shock wave generated by that detonation. The proximity in time of arrival of the second reentry vehicle to that of the first reentry vehicle determines the magnitude of the shock wave the second reentry vehicle must traverse. If the second reentry vehicle is following very closely behind the first, it will pass through a shock front having a magnitude great enough to impose deceleration loads that will exceed the reentry vehicle's structural strength, thus causing catastrophic failure.

If the second reentry vehicle is further behind the first, it will pass through a nondestructive shock front and through the flow field behind the shock front. The reentry vehicle's trajectory will be deflected by the shock front, but, more importantly, it will traverse regions behind the front where air density and winds are very different from those predicted for normal reentry. That environment will change the second reentry vehicle's impact point from the one predicted for the normal environment. The magnitude of the change will be affected by the ballistic coefficient of the reentry vehicle; blunt-nose vehicles with low ballistic coefficients will experience greater deflection than will streamlined vehicles with slender noses and high ballistic coefficients. The deflection may also be greater if the reentry vehicle is early in its reentry trajectory when it encounters a shock front than if the reentry vehicle encounters a shock front of the same magnitude just before impact.

The detonation of a nuclear weapon at or near the surface will also cause the formation of the typical mushroom-shaped nuclear cloud. The cloud will form as the hot fireball begins to rise in the cooler, denser surrounding air.

The rising fireball will sweep up surface dust and ingest water vapor. In addition, when the detonation occurs at a height of burst of less than about ten scaled feet (*i.e.*, ten times the cube root of the yield in kilotons), particles caused by crater formation will be swept up in the stem and then into the cloud. Great quantities of particles will be carried aloft in the rapidly moving air. The heaviest of these will fall back rather quickly, while lighter dust and water vapor will remain aloft for tens of minutes. The cratering process will also propel large particles of debris to as far as several miles from the original crater. Reentry vehicles can be disabled if they pass through the high-density stem (which can last for several minutes) or if they are struck by debris (which may be airborne for about a minute).

A reentry vehicle changes shape and loses weight as its heat shield ablates during reentry. Also, heat shields can become eroded when the vehicles pass through clouds, even those composed of the fine particles of dust and water vapor still aloft tens of minutes after a detonation. The coupled effects of ablation and erosion change the time-dependent ballistic coefficient from values predicted for a normal reentry in a benign atmosphere. These unpredictable changes in ballistic coefficient can result in either deflection from the original aim point or failure of the reentry vehicle before detonation. Since erosion rate varies at least with the square of reentry vehicle velocity, this phenomenon has more effect on reentry vehicles with high ballistic coefficients than on reentry vehicles with low ballistic coefficients.

For heights of burst above about ten scaled feet, the cratering phenomenon should disappear, and with it the stem and ejected particles. However, the fireball will still sweep up surface dust in amounts that will vary inversely with the height of burst; it will still ingest water vapor in quantities at least as great as those for a surface burst. Therefore, a reentry vehicle that traverses the cloud resulting from a near-surface burst will suffer only slightly less erosion than that which would occur if the reentry vehicle traversed the cloud resulting from a surface burst.

Constraints on the Attacker

The attacker must consider the constraints imposed on him by the detonation of his own weapons in an attack on a dense complex of ICBMs. The constraints can have an important effect on the results expected from the attack if at least the following conditions apply:

- The attack weapons have yields in the low megaton range.
- The silos housing the ICBMs are sufficiently hardened that the attacking force needs precision accuracy.
- Silos are spaced at most a few miles apart.

- The ICBMs being attacked will not necessarily remain in the silos for extended periods of time after the attack begins.

In targeting the first round of weapons against the ICBM complex, the attacker must consider the possibility that crater debris will be carried to nearby silos. Furthermore, shock waves will travel between silos in ten to thirty seconds, and nuclear clouds will, within about a minute, grow to heights that will effectively mask downrange silos. The attacker, therefore, must plan the first round of the attack so that either all reentry vehicles impact in a time span of a few seconds or the impact pattern of the reentry vehicles sweeps through the complex from the farthest silos to the nearest ones in at most a few minutes. Raising the height of burst can eliminate the debris hazard, but the shock waves and the nuclear cloud will still require that the attack proceed as described.

The precise structure of such an effects-free attack requires careful planning to coordinate weapon detonations. Further, methods of reprogramming for failures within the short time spans available must be developed if all targets are to be attacked. Such methods may involve sophisticated command and control systems, the withholding of missiles with short times of flight, and the use of lofted or depressed trajectories. Even if these techniques are achievable, they are costly from a dollar standpoint and can reduce system accuracy.

When a low probability of damaging the target with the first round confronts the attacker, or when he is unable to reprogram for failures, he might assign additional rounds of weapons. The utility of that decision can be questioned in light of the hazards posed by the nuclear environment. The severity of the environment created by a surface burst probably precludes even low-confidence predictions that the second round will successfully detonate at the target. This suggests that, when weapons in the first round are intended to detonate at the surface, no additional rounds of weapons can be effectively targeted unless the rounds are spaced tens of minutes apart. Of course, if successive rounds are a few seconds apart and a first-round weapon fails to arrive or detonate at the target, a second-round weapon will function. This tactic, however, is extremely costly in resources because of the many second-round reentry vehicles that will be destroyed by first-round reentry vehicles.

Another conceivable tactic is to employ air-burst weapons on the first round. In this case, the initial nuclear environment will be less severe than in the surface-burst case and a second round may be feasible. The most optimistic scenario from the attacker's standpoint involves the near-simultaneous detonation of the first round of air-burst weapons at all targets in the complex. As noted earlier, a following round or rounds cannot be air burst

by using a radar fuze until the fireballs dissipate; by that time, nuclear clouds of dust and moisture will have risen sufficiently to mask most of the missile complex. The only apparent means of successfully placing the second round on the target is, therefore, to use a contact fuze for each reentry vehicle that will have to fly through a fireball. Surface-burst detonations of the second round, of course, will prevent the programming of any additional rounds.

Summary

In summary, analytic methods used in the past to determine the survivability of ICBM systems deployed in dense complexes of hardened silos rely primarily on mathematics and statistics and neglect operational considerations. An attack planner must take into account the constraints caused by a dynamic nuclear environment. Weapons cannot be indiscriminately assigned to attack hardened ICBM silos that are closely spaced. The interactions of the reentry vehicles with the environment caused by previous detonations can lead to mission degradation or even complete failure if timing constraints are not observed.

Analysts can continue to use the classic methods if they understand that long time spans between rounds are required to successfully detonate many reentry vehicles at a given ICBM target. If, however, the attack planner cannot reasonably expect that missiles will remain in the silos for long periods of time, the classic tools must be modified to account for the nuclear environmental constraints. ■

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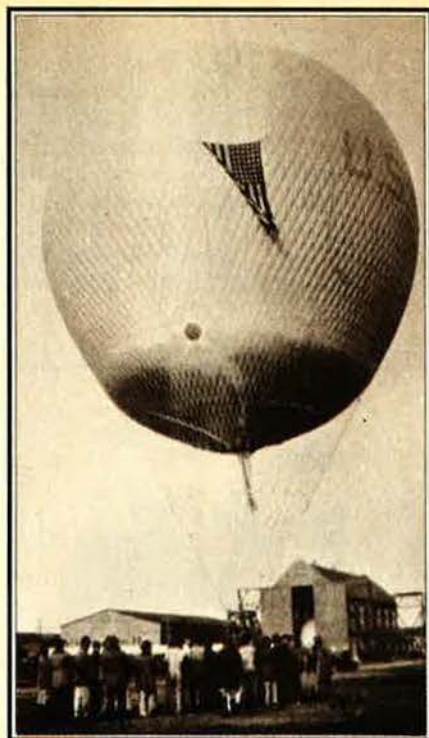
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FREE SPIRIT IN A FREE BALLOON

BY JOE CHRISTY

WHEN the old 1st Balloon Squadron was stationed at Fort Sill's Henry Post Field in Oklahoma during the 1930s, one of its members was a character named "Red" Carter. Red was a big, good-natured fellow, with little formal schooling and a large affinity for craps and moonshine whiskey. He wasn't fanatical about personal neatness, and he appeared to believe that the Army couldn't really be serious about all those regulations.

Now, Red wasn't insubordinate, you understand. Indeed, he was always pleasant to his superiors and even properly repentant when his frequent transgressions were called to his attention. It was just that Red's priorities failed to parallel those of the military.

Still, like many free spirits, Red possessed at least one redeeming quality: He was fiercely loyal to his unit. A personal slight he could take, but an insult to the 1st Balloon Squadron—a not uncommon pastime among the heavier-than-air

types at Post Field—was a clarion call to battle as far as Red was concerned.

This, of course, could cause problems—not only an enthusiastic intra-service brawl occasionally, but once, after a balloon man was cheated and beaten by employees of a roadhouse called the "Blue Moon," the squadron winch truck flattened the place by roaring through one wall and out the other. True, neither truck nor its driver was ever identified by civil or military investigators, but retired ballooners, still living in nearby Lawton, will not only provide this information (with more relish than shame), but will also tell you exactly how Red managed to get the truck off Post and back that night without detection, all of which should clearly establish that Red was less than a joy to his first sergeant and his commanding officer.

Nevertheless, Red got by, perhaps in part because it was so difficult to stay angry at him, and maybe partly because he wouldn't lie. Not that

The author, Joe Christy, has been a pilot since 1937 and was a racing driver, teacher, and airport operator before turning to aerospace writing in 1963. His article, "That First Round-the-World Flight," appeared in our March 1974 issue. His new book, due out next winter, will be about the P-38 Lightning.



ABOVE: Note "rip panel" on balloon's upper surface for quick release of explosively flammable hydrogen at the end of a flight.

LEFT: Observation balloon winch truck used at Henry Post Field, Okla., in '30s had puncture-proof tires.

he would "rat" on anyone; he wouldn't. He reconciled these two principles by telling the truth when he could, and refusing to answer the rest of the time. Somehow, that usually worked out all right for the big redhead.

Runaway Balloon

Take, for example, the day the training balloon ran away with Red aboard. The Army used free balloons to train the crews for the tethered observation balloons. The training craft were not the hot-air type popular with today's sport "balloonatics," but the old hydrogen-filled gas bags, controlled by releasing lifting gas or sand ballast to descend, ascend, and maintain altitude. Non-flammable helium was available—the US had the only known helium deposits in the world then—but it was more costly than the explosive, unpredictable hydrogen, and Air Corps budgets in the mid-'30s permitted no such luxury.

Army free balloon pilots "weighed-off" as the last step before liftoff by carefully balancing lift with ballast.

Then, with the release of some sand, the crew chief called, "All hands off!" The ground handlers released their hold on the basket, and the pilot reached above his head to pull the slipknot that bound the appendix or inflation tube that hung from the bottom of the 35,000-cubic-foot bag. It was, of course, necessary that the appendix at the bottom be open as the balloon ascended into the steadily decreasing air pressure above because the hydrogen inside the bag expanded proportionately to the decrease in outside air pressure.

Now, on this particular flight, when the pilot reached up and tugged the cord binding the appendix, it failed to pull free as it was supposed to. Added muscle merely tightened the perverse knot. The situation was a bit fluid for a time (to borrow an old Army term meaning, "Things are going to hell fast"), as the pilot continued to haul away, ineffectually, on that insignificant if critical bit of cord, meanwhile paying less attention than he should have to an ever-increasing rate of ascent.

Red, in the meantime, watched

the proceedings with interest, then volunteered to climb atop the loading just above their heads and attack the problem more directly. By the time Red had attained that precarious perch, however, it was too late: The bag had expanded too rapidly and too well—and, as four pairs of eyes stared incredulously, it neatly swallowed its own appendix.

That development eliminated further consideration of their plight, because the rope that valved gas in controlled amounts from the top of the bag came out through the vanished appendix. So, the crew had no choice except to bail out. The balloon's uncontrolled ascent would continue until the bag burst.

On the ground, SSgt. Joseph A. Murray, the squadron's most experienced free-balloon pilot, smiled his satisfaction as he counted the first three parachute canopies blossoming beneath the doomed craft. Then Murray had some anxious moments. The fourth chute didn't appear until long seconds later, and the figure in its harness seemed oddly hunched, injured perhaps. The Sergeant mounted



Disaster, as an Army balloon comes to a flaming end near Ft. Sill, Okla., in the summer of 1935. Static electricity, the product of nearby rain showers, was believed to have ignited the highly flammable hydrogen lifting agent.

a motorcycle and raced across the prairie. He became more concerned when he noted that the man in the fourth chute made no attempt to guide with his risers, and evidently struck the ground with arms tightly held across his chest. By then, Murray was fairly certain the man was Red.

But when Murray reached him, Red was sitting on his carefully folded chute calmly smoking one of his roll-your-own cigarettes.

"You all right, Red?"

"Sure, Sarge."

"Then what in hell were you doing huddled up in that harness all the way down?"

Precious Cargo

Red poked his toe in the buffalo grass and lowered his eyes. "Well, ah, y'see, Sergeant, I, ah, sort of took a jug along today in case we didn't get back to Post tonight. I just *couldn't* jump out and leave it up there."

Sure enough, partly concealed in the grass nearby was a gallon jug of white lightning.

Murray knew that the chewing-out he gave Red was probably wasted. He also knew that Red was accepting more than his share of the blame—a gallon of local "squeezin's" obviously represented an investment by the whole crew—and it was a matter the Sergeant couldn't allow to reach the ears of Maj. Ira R. Koenig, the CO, because Major Koenig viewed liquor aboard a balloon as only a slightly less heinous crime than treason. Murray would have to impose punishments in his own way or see the four drawn and quartered.

Murray decided the most effective punishment for Red was to keep him on the ground for awhile. Red loved ballooning, and was forever seeking angles to get his name posted for a flight. He was always on hand, eager to help, whenever the inflation crews backed up to the steel bottles of hydrogen, stacked like cordwood beside the tall balloon hangar.

A week or so later, Red was on the scene, trying to make himself useful, as another four-man free balloon was made ready for flight.

It was a fine summer morning, and although Red knew that his penance had not been completely served, he apparently believed that it didn't do any harm to make himself handy and willing just in case one of the passengers or pilot-aids didn't show.

Red's chances were slim, because this flight was special. An airplane pilot from the 16th Observation Squadron, which shared Post Field with the 1st Balloon, was to be a guest passenger. Capt. F. D. Lynch had never ridden a free balloon, and rumor had it that he didn't particularly care to, but was making the gesture in the interest of improved intraservice relations.

Also scheduled to make the flight, in addition to the pilot, Sgt. Joe Murray, were SSgt. D. M. Tucker, listed as a passenger, and MSgt. R. J. Rumpel, aid and recorder.

Disaster in the Making

This was a lot of ballooning experience to put in one basket, and probably reflected Major Koenig's determination to ensure Captain Lynch a pleasant experience. However, even the best conceived and most competently manned missions are sometimes subject to a buildup of small problems that lead to disaster—especially in a hydrogen-filled balloon.

But if disaster lay in wait that day—July 10, 1936—its violence nevertheless was fated to serve the spirit of the mission, because the heroism that emerged was about equally divided between ballooners and their airplane pilot guest. It's hard to maintain old and ill-defined animosities in the face of a newly discovered mutual respect.

Army ballooners' primary mission was artillery fire correction, and their basic vehicle from 1917 until 1937 was the C-3 "sausage" balloon, anchored to a winch truck by steel cable. Communication was by telephone.

The order "All hands off" came at 0940 hours. Sergeant Murray released sand, and the balloon rose silently toward scattered cumulus far above, those soft cloud-sheep that graze atop tall thermal currents over the plains. Red watched wistfully as the craft dwindled in size, drifting northward with the gentle south wind. Then he climbed behind the wheel of the retriever truck and prepared to follow. At the end of the flight, Murray would jerk a cord to open the "rip panel," a lightly sealed elongated section near the bag's top, allowing quick deflation. Red, and his companions in the truck, would then load the balloon on their vehicle and return it along with its crew to Post Field.

Meanwhile, in the balloon, Captain Lynch was having a great time whistling at dogs, shouting at people, and, sometimes, just standing quietly in the deep basket, marveling at the silence, the lack of wind. Serene and strangely detached feelings are characteristics of that kind of flight.

For the next three hours, everything went well, except for a couple of minor warnings recorded, almost automatically, in the back of Murray's mind. He noticed that the innocent cumulus were beginning to take on vertical development, indicating the possibility of thunderstorm activity later in the day. Of more immediate interest, it meant, as Murray had learned during his eleven years of balloon piloting, that static electricity would be generated fairly early in the process.

However, the cloud buildup was still a safe distance away, and, besides, Murray surely felt some pressure (either real or imagined) to leave the best possible impression on Captain Lynch. Every balloonist sensed the contempt held for his aerial vehicles by the airplane peo-

ple, and Murray himself had heard some of the remarks from 16th personnel about the injustice of flight pay for those "gold brickers floating around on nice days, hanging onto a cloud in a bag."

Whether or not any of this influenced Murray's decisions that day is impossible to report. But he did give Captain Lynch the full treatment, including three practice landings and a demonstration of precise altitude control at various heights, accompanied by an explanation of how winds aloft could often give the free balloon pilot a degree of directional control by selection of the proper altitude.

After the second practice landing, at about 1230 hours, Murray took note of another small warning. He was using ballast pretty fast with all that maneuvering; and the surface wind had increased a bit. He continued northeastward for a short distance, made a final demonstration landing when an excellent spot presented itself, and confirmed that the wind had increased to about twenty-five mph. Then he ascended once more for the final leg of the flight. Another fifteen miles would take them beyond Anadarko, Okla., for a total distance of about fifty miles. A very satisfactory example of bal-

looning for Captain Lynch to remember.

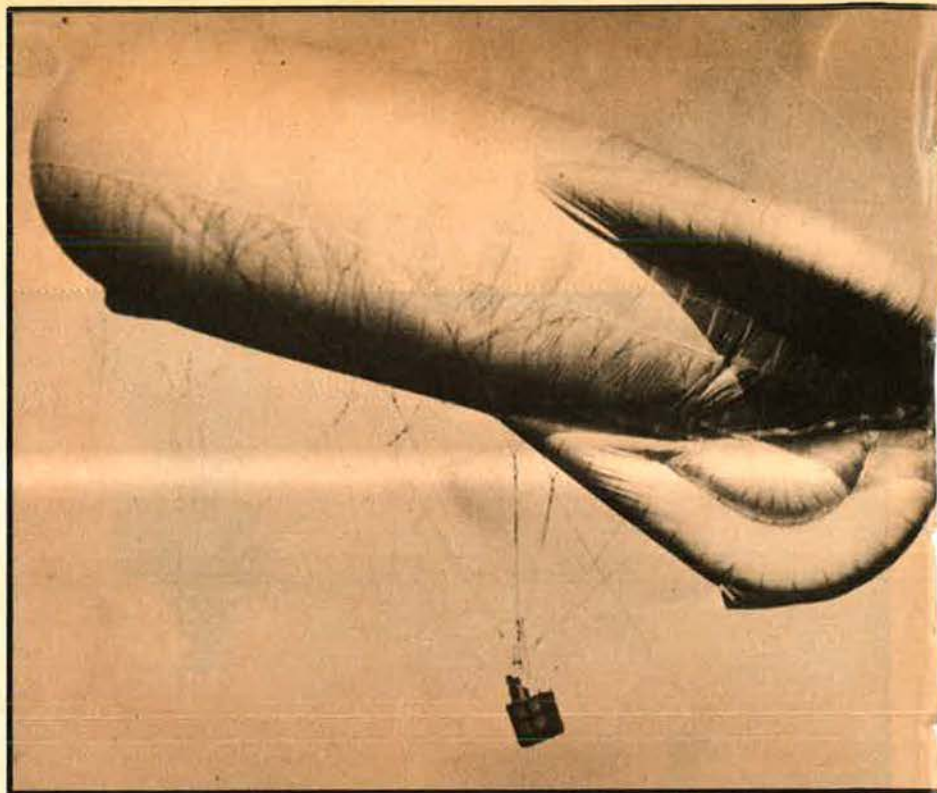
Captain Lynch *was* to remember it—but with horror.

Far Enough

Twenty minutes later, Murray decided that they had gone far enough. They were approaching the South Canadian River, which had few bridges for the retriever truck to use, so Murray quickly chose a clear space on the river's near side and began his descent, signaling his intent to the truck bouncing along below in a cocoon of dust.

Descending rapidly, the balloon dropped below the crest of a hill in its path, and Murray released as much ballast as he felt he could afford. The hill was covered with scrub timber, and that may have affected the brisk windflow across it. At any rate, the basket seemed to dip, strike the ground very hard, and rebound into the air, oscillating wildly. Murray jettisoned more ballast, gaining enough lift to clear the ridge. By that time, he had barely enough ballast left to make the landing.

As they sailed down the lee side of the hill toward the clearing, the basket continued to oscillate. Sur-





Shortly before World War II, the Army balloon program had progressed to this C-7 nonrigid, helium-filled vehicle equipped with a four-place, twin-engine gondola. When war came, these were transferred to the Navy for patrol duties.

face wind was about thirty-five mph. Murray warned the others that they were in for a tumble, stressing that they should stay in the basket for maximum protection. All were calm. The three ballooners had been through rough landings before and regarded a few bruises now and then as part of the job. Captain Lynch watched Murray closely, anxious to help.

Fireball

The only help Murray needed was more ballast for better control, because the inexorable laws of physics were putting them down on the hillside, yards short of the clearing. Then, as the basket snagged in the underbrush, Murray heaved at the rip panel—and at that instant came the explosion. Thirty-five thousand cubic feet of hydrogen were transformed into a huge fireball, and the basket tumbled crazily inside the inferno.

Red and the three men with him saw the explosion from a quarter mile away, and the truck was on the scene in less than a minute. Red smashed through a barbed-wire fence, roared into the ring of burning brush, and leaped from the truck in a dead run. He could see Captain Lynch, who had been thrown clear of the basket, attempt-

ing to free Murray, whose chute was entangled in the rigging. Sergeant Tucker was on the ground a few feet away, his clothing and parachute aflame. Red did not see Sergeant Rumpel, but raced through the flames to help Tucker. He was joined almost at once by Murray and Lynch. Murray was obviously injured and in shock; Lynch had some burns, though was clearly in command of himself. He produced a pocket knife to cut away Tucker's clothing.

"Throw dirt on him, Captain!" Red shouted. Then, shielding his face with an arm, Red picked his way through the fire, looking for the man yet unaccounted for.

The hydrogen had been consumed in a single mighty flash, but everything beneath it that was combustible had been set alight and continued to burn. Red found Sergeant Rumpel in the smoldering basket. The veteran balloonist was dead. Red carried Rumpel's body beyond the blackened circle to a clear space, then ran back to the others.

Lynch was in control. Murray, with multiple burns and a broken back (discovered later), had lost consciousness. Tucker, badly burned, was also—mercifully—unconscious. Lynch had already dispatched one of the truck's crew to the road to stop a car, and had the other two

beating out fires with their jackets. He then helped Red move Tucker, and stood by until Murray and Tucker were on their way to the hospital at Anadarko. Finally, with the fires under control and Rumpel's body gone, the Captain heeded Red's "order" to have his own burns looked after.

As it turned out, Captain Lynch's burns were not serious. Sergeant Tucker, however, died in the hospital a few hours after the accident. Sergeant Murray completely recovered, and returned to flying status in January 1937.

By that time, important changes had taken place at Post Field, undoubtedly spurred by the tragedy. The hydrogen bottles were gone, replaced with drums of nonflammable helium; and the 1st Balloon Squadron had received the first of the Army's new motorized blimps, Model C-6.

The two-man C-6s were similar to the old C-3 type observation or "sausage" balloons in use since World War I, except that the new craft could exchange its tether-cable and observer's basket for a motorized gondola, allowing it to fly where it pleased at airspeeds up to fifty-four mph.

As one would expect, Red was enchanted with the motorized balloons, and, after a period of reasonably circumspect behavior, was well on his way to earning his aircrewman's wings when Sergeant Murray caught him and a companion hovering above the farm home of a local moonshiner, hoisting a jug at the end of a rope.

Like we said, Red wasn't exactly the perfect airman. But he had a few things going for him like honesty and loyalty, and, yes, courage. Those count for a lot when the chips are down. ■

Air Service test pilots of the early '20s
were short on engineering degrees,
long on ingenuity and courage.
One of that exclusive fraternity
tells about the days of . . .

Wood, Wire, and Canvas— **TESTING THE EARLY PLANES**

BY MAJ. GEN. LEIGH WADE, USAF (RET.)

THE romance of test piloting has been sped forward from open cockpits and biwings to hypersonic speeds and swept wings by the same engineering advances that have replaced the Wright brothers' crude starchbox wind tunnel with today's hurricane-force tunnels. Goggled test pilots of the gone era flew as much by "feel" as anything. But, even then, they realized that future flyers of the "test" fraternity would have to be as much engineer as they were pilot.

As a young man, I wasn't too interested in flying, much less the adventures of test piloting. I was set on a career in medicine. The threat of war, however, changed all that, just as it did for so many others then and since. First came a short stint in the North Dakota National Guard in 1916. I marched around in trousers too long and too round, and with a shirt that showed my elbow every time I bent my arm.

I mustered out of the Guard in February 1917, entered the US Army four months later, and was sent to officers training school. While there, I was accepted for flight training. My first close look at an airfield was at Toronto, Canada. I had been detailed there under secret orders to receive pilot training from the Royal Canadian Air Force. At the time, the US was still sorely lacking instructors, airplanes, and aviation facilities. The Army Signal Corps entered into an agreement with the RCAF to provide flight training.

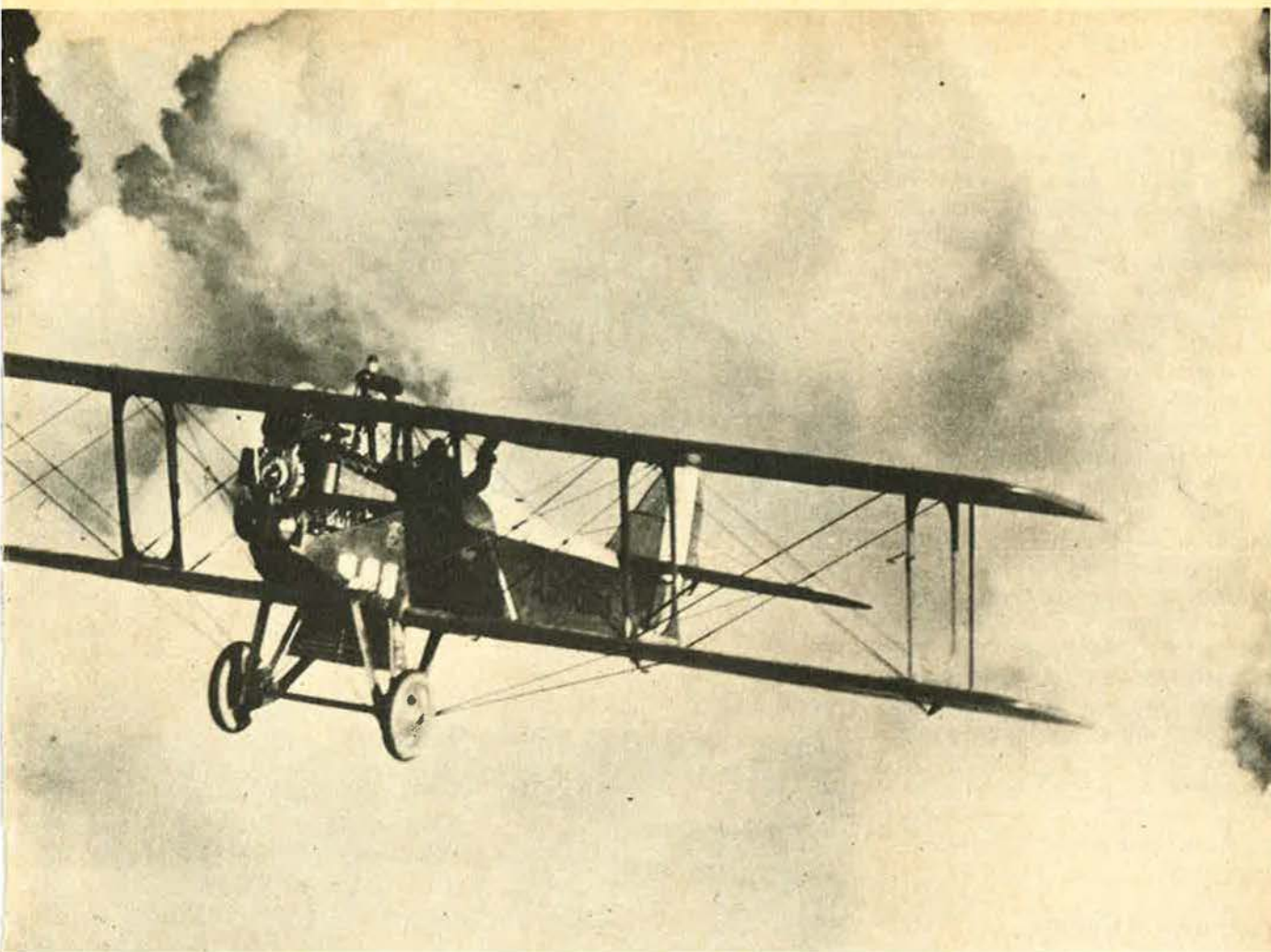
When the US declared war on Germany in April 1917, the Army's air arm had only sixty-five officers, 1,000 men, and 200 airplanes. All of the aircraft were training planes, none suitable for service at the front. By contrast, as early as 1915 France had some 1,500 aircraft in its air force, and Germany had about 1,000. Moreover, the emphasis of American design was on training planes,

while in Europe it was on combat types.

The RCAF provided dual instruction in the Curtiss Jenny, or as it was known there, the Canuck. Its landing speed was forty mph. Because of its low power, we were under strict orders that if anything went amiss on takeoff we were to ". . . go straight ahead; don't try to come back."

Nevertheless, while I was on a solo flight near the end of my training, a cylinder quit right after takeoff. I thought, "What now?" I tested the controls, and the ship responded well. I decided to bring her around for a landing. As I made my approach, a workman pushing a wheelbarrow was scurrying across the strip. I raised the plane's nose and started around again. Another cylinder let go. I thought I was in deep trouble then, but the plane still "felt" right. It held out until I landed. A grim-faced instructor





Le Pere biplane with Liberty engine and Moss supercharger in which Maj. R. W. Schroeder and Lt. John A. Macready set altitude records in 1920 and 1921.

rushed up and shouted, "You were told to go straight. Why did you disobey orders!" I answered, almost in a whisper, "I still had power, and it kept altitude." He broke into a grin and said, "Beautiful job."

I believe that incident as much as anything else showed me that flying by the book may be the safest, but that it isn't always the best way of doing things. In later years, the experience would repeat itself over and over again.

Testing World War I Fighters

My test piloting days began after I finished training at the Third Aviation Instruction Center at Issoudun, France. The school provided ad-

vanced and pursuit training. As students we got a thorough grounding in aerobatics, formation, and combat flying. In all, 766 men were graduated as pursuit pilots, and 627 of them reached the front before hostilities ceased. After my training, I stayed on as an instructor and check pilot. The flight testing consisted of checking the flight stability of the new French and British aircraft arriving at the school.

It was while at Issoudun that I experimented with night landings. Lt. Ennis Whitehead, who one war later commanded the Fifth Air Force in the Pacific, and I tied a kerosene lantern below the wing of an old Caudron. The man in the front cockpit did the piloting while the man in the rear acted as lookout. The trick, we found, was to come in smoothly enough so the lantern wouldn't bounce loose or blow out.

One incident in which I surely must have been carrying a rabbit's

foot occurred while I was piloting a fifteen-meter Nieuport. I was in a mock combat training flight, and the "enemy" was on my tail; he was hot. I thought by doing a roll at the top of a loop, the Nieuport would react the same as kicking it into a horizontal roll from normal flight. Hoping to shake him, I kicked the plane over and went into a spin.

But as I spun earthward, everything revolved on the outside instead of the inside. I had put it into an inverted spin. Fortunately, I got the Nieuport out of the spin and landed okay. I became so intrigued by the maneuver that I even tried it again the next time I was up. A few months later I learned what a damn fool I had been. The airplane wasn't built to take all the strain of an inverted spin.

I moved on to Paris for my next assignment, arriving on a day when the Germans were shelling the city. I was assigned to Air Service Head-

quarters, under Gen. Mason M. Patrick, and joined two other test pilots on the staff. We did the acceptance flight testing of planes the US was buying from the French. We all wanted to get to the front and drew straws for the order in which we would go. I drew number three. The Armistice came before I could get into combat.

In contrast to the meager sprinkling of American pilots and planes when the US entered the war, by Armistice Day there were some 767 pilots, 481 observers, 740 planes, and forty-five American squadrons actually assigned to field armies. Twelve of the squadrons flew American-built planes with Liberty engines.

World War I, as all modern wars do, brought on an accelerated technical development of machines, including the airplanes. The US emerged from the war with its aviation development still moving forward and with a surplus of aircraft. But we didn't continue technical development on a very grand scale. By the mid-1920s, military and civil aviation development was in the doldrums.

Test Flying in the '20s

However, in the years immediately following the war, considerable testing continued at McCook Field, Ohio, part of the Air Service's Engineering Division. I arrived there in August 1919, and before leaving in late 1923 had the opportunity to test just about all the new trainers, fighters, bombers, and reconnaissance aircraft being built. My wartime duty at Air Service Headquarters in Paris, where I worked very closely with the French, and the subsequent work I did testing German aircraft turned over to the US under the terms of the Armistice were responsible, to a great degree, for my assignment to McCook.

Seven pilots handled the flight-test duties. We determined the performance of the new planes, particularly their service ceiling, speed, and maneuverability. The pattern was for the Air Service to obtain newly designed aircraft in pairs. One was put through engineering testing



A Martin MB-2 bomber at McCook Field. In this type airplane, the author set a multiengine altitude record of 27,120 feet in December 1921. A frozen fuel line prevented him from reaching a higher altitude.



A workhorse of the Air Service in the early 1920s was the DH-4, three of them shown here at McCook Field along with a World War I Spad.

and the other into flight test to be wrung out.

I recall one experience in particular. We were dealing with a high-winged fabric and wood biplane. It was equipped with a very large experimental Wright air-cooled engine. Because it took a lot of stick forces to operate the lateral controls while airborne, we began experimenting with changing the area of counterbalance on the ailerons. We used a simple fish scale to measure the stick forces.

On one of these flights, the counterbalance was exceptionally large. I was in a dive, exceeding the rated speed of the airplane. As I turned to the right, the ailerons locked, keeping me in the earth-bound spiral. While I rocked the

controls trying to snap the ailerons free, the macabre thought flashed through my mind that my larger plane would make a bigger grease spot on the field than Sergeant Madan did (a fellow test pilot who had crashed a few months earlier). I finally pulled out of the dive with less than a foot between the wheels and the ground.

Several months later, one of the field's top engineers asked me, "How did you feel after the narrow escape?" I said, "Normal, as far as I can remember. My main interest was to get the wing open and see if any of the glue joints had loosened. Why?"

"You may not remember," he said, "but the entire engineering division was out watching. And when

you walked up, nobody dared speak because you looked like a walking corpse."

I don't remember seeing anyone, so I surely must have been shook up. But if I was, my action in averting what looked like a sure crash and my concern with the wing structure make it a clear case of the subconscious mind taking command of a situation.

It seemed as if risk always rode our wing. I recall Lt. Harold Harris testing the Vought E-8 with a 300-horsepower Hispano-Suiza engine. He found the airplane directionally unstable at any speed below flying speed. He told me, "In order to prevent a ground loop on landing I have to land with power and slow down while taxiing." Once he came in with the elevator control stick badly bent because of the effort he exerted trying to keep the plane from nosing over. His disenchantment with the plane showed in his final evaluation. He wrote, "... at present the airplane is nearly as

heavy to handle laterally as a DH-4 and ... is considered quite unsuitable as a pursuit airplane."

Occasionally we lost a pilot. Lt. Fred Neidermyer was one of those. When the Fokker pursuit monoplane first came in for testing, McCook engineers were quite concerned over the possibility of vibrations setting up and destroying the veneer-covered wings. Their concern wasn't misplaced. Neidermyer was testing one of the monoplanes when the wings vibrated to pieces. Unable to parachute out, he was killed.

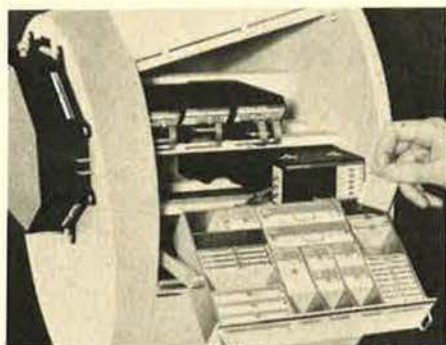
Later, in a test I was making with a similar monoplane, the vibrations set up again. Remembering Fred, I didn't hesitate in preparing to bail out. But as I reduced throttle, the vibrations subsided. I elected to glide the plane in. When I passed over the spot where he had crashed, I began to have second thoughts and decided, "If I'm going to jump, I better do it now." But by then I was below 500 feet, the bailing-out cutoff altitude. I kicked myself men-

tally for not jumping when I had the chance. Once again, however, everything worked out, and I landed without mishap. An inspection showed that a stud, one of the four that anchored the engine to the fuselage, had broken and set up the vibrations.

New Armament and Instruments

One of the more gratifying aspects of being a test pilot at McCook was that you got the chance to see some of your thinking incorporated into new aircraft designs.

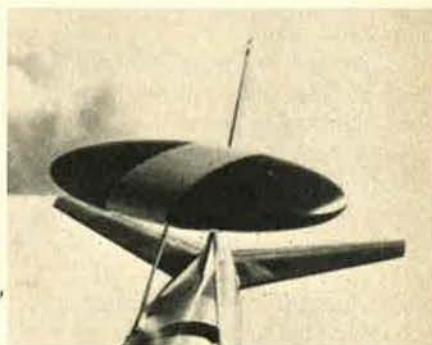
Late in 1923, news of an all-new metal monoplane designed by the Air Service Engineering Division and manufactured by the Gallaudet Aircraft Corp. spread through the Corps. Its official designation was CO-1. The wings and fuselage were covered with corrugated duralumin, and the structure was heat-treated steel. Powered by a Liberty 12 engine, it weighed 3,000 pounds empty and 4,750 loaded.



EAR



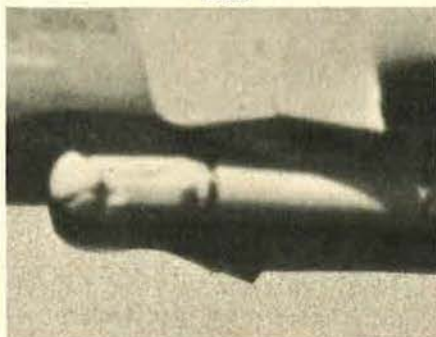
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See the next 6 right-hand pages



The author with a Thomas Morse fighter that had been converted into a racing plane for the air races at Mitchel Field, N. Y., in 1921. In addition to testing new planes and equipment, Air Service test pilots set many records.



While some of the most spectacular testing was done on early fighters, test flights ran the gamut from trainers to bombers. This converted DH-4 was the first aerial ambulance developed by the Air Service.

Some of its features identified it as the observation plane it was designed to be. For instance, the wing rested on the fuselage and its width was reduced adjacent to the cockpit to give the pilot an unobstructed view of the ground. Glass windshields protected the front cockpit, so the pilot didn't have to wear goggles. The front cockpit was roomier than most, while the rear cockpit was arranged to partially shield the observer from the wind and weather when handling his guns.

Not all of our flight testing involved aircraft performance. At times it was the aircraft systems that kept us busy. While at McCook, I tested instrumentation systems such as the turn-and-bank indicator and the earth induction compass. We thought we had a real pilot aid in that compass. In all of our tests it proved to be highly satisfactory. What we didn't consider was that we were testing it only in moderate and low temperature ranges. We found out on our 1924 Round-the-World Flight that it failed completely in tropical climates.

The oxygen mask was another system with which we experimented. Even the urgency of World War I hadn't produced a real good one, and when I left McCook Field the mask still hadn't been perfected. Consequently, we pilots often rigged up our own system. We used to carry an oxygen bottle and a hand regulator on our flights. In one case, I

The author, Maj. Gen. Leigh Wade, USAF (Ret.), is the only surviving pilot of the historic 1924 Round-the-World Flight. In 1926, he left the Air Corps to become chief test pilot for Consolidated Aircraft. Recalled to active duty in 1941, he retired in 1955 and now lives in Washington, D. C.

was flying an open cockpit monoplane that went much higher than we had anticipated it would. I had the oxygen tube stuck in my mouth and was so intent on watching the instruments that I got a good face frostbite, especially on the part of my lips that held the oxygen tube.

We also worked extensively with aircraft armament, such as bomb racks, bombsights, and bomb loads. In those days the bombs were much smaller and were carried externally. The bomb racks used in the Martin bomber that Gen. Billy Mitchell flew when he sank the German super-dreadnaught *Ostfriesland* were developed at McCook Field.

Least the reader get the impression that the early Air Service assignments were all "nose to the grindstone" type work, let me hasten to add that all McCook officers were regularly scheduled for a roll call at the Officers' Club every Tuesday and Thursday afternoon, precisely at 3:30 p.m. At that time, we took part

in the equivalent of today's physical-fitness program. Only then it was in the form of soccer football that delivered all the blackened eyes, the sprained ankles, and the split lips that one might expect.

Air Shows and Records

More to our style of relaxation was participating in air shows like the one at Dayton on May 28, 1923. Officially it was Aviation Day. Unofficially, it was to honor the return of Lts. Oakley G. Kelly and John A. Macready from their successful non-stop transcontinental flight, the first ever. The show opened with a five-ship formation of de Havilland DH-4s climbing to altitude, followed immediately by three Vought planes engaging in a five-lap speed race around the field. The winner clocked a speed of 120.2 mph.

Later, Lt. Jimmy Doolittle piloted a Fokker monoplane in a mock battle with a Martin bomber. He maneuvered about it, under and on top of it, looping and diving. The show presented a keen contrast in size, speed, and dexterity between the small Fokker and the doughty Martin. Meanwhile, I was at a lower altitude in a new Curtiss pursuit plane demonstrating the slow and, for its day, terrifically high speeds of the plane, as well as its capability to handle stunts of all types.

Air show performances were a welcomed break in our routine, and

the public exposure did no harm to the Air Service's reputation. Also, record-setting flights always caught the public eye, and at McCook there were many such flights. For instance, one of the areas that concerned designers, engineers, and pilots alike was how to boost aircraft to higher altitudes. World War I had impressed upon us that a superior climbing plane was almost invincible. The answer was the supercharger. Of course, its value had to be determined in actual altitude tests.

Maj. R. W. Schroeder was one of the first to take on the test task. He flew a Le Pere biplane with a Liberty engine supercharged by a Moss supercharger to a one-man record of 33,113 feet on February 27, 1920. At the time it was called "... the most sensational flight in the history of aviation," owing to the aircraft's uncontrolled wild fall from more than 33,000 feet to 2,000 feet.

The flight was routine through 25,000 feet, at which point the regulating valve on the primary oxygen

supply container froze. Schroeder switched to the emergency ration and continued on. He had hoped to be able to accurately gauge the exhaustion point of the oxygen supply. He misjudged and blacked out. Its pilot unconscious, the aircraft plummeted. At about 2,000 feet, Schroeder was jarred back into consciousness by what he described as a "terrible explosion in the head." In the almost seven-mile drop, he went from a temperature of 68 degrees below zero to 20 degrees above. His eyes were frozen, lungs poisoned with carbon monoxide from the exhaust, and his body chilled to the bone. Miraculously, he landed the plane safely.

Schroeder had paved the way for altitude records. Lieutenant Macready bettered the feat on September 28, 1921, when he flew to 34,508 feet in the same type aircraft used by Major Schroeder.

On December 8, 1921, I flew a supercharged Martin bomber to a multiengine record of 27,120 feet.

Had the angel who looks after test pilots been more kind, I am confident that the aircraft would have gone even higher. It was climbing strongly when a gasoline feed line froze, shutting down one of the two engines and aborting the flight.

Record-setting attempts and successes continued throughout the early 1920s. Some spectacular flights were made by pilots of the Air Service and many, such as Lester Maitland, Harold Harris, Lowell Smith, John Richter, O. G. Kelly, and John Macready, put the US in the enviable position of owning thirty-three of forty-two world records by the end of 1923. These men were all pilots of the highest caliber. But I am sure that even they would stand in awe of the engineering expertise possessed by the test pilots of today.

It leaves me with a good feeling to know that we, the pilots who tested the old planes, helped create the atmosphere in which engineer-trained test pilots could thrive. ■



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Like their predecessors of the 1920s, today's USAF test pilots are a special and courageous breed. The author, one of that superbly trained group of pilot-engineers, describes a "first" flight in the age of . . .

Simulators, Sensors, and Computers— **TESTING THE X-24B**

BY MAJ. STUART R. BOYD, USAF

IT COULD be a typical Monday morning in any squadron, as the pilots gather around the scheduling board with cups of coffee. There are the usual comments concerning who has been "hogging" the most flying time and what types of missions are being flown this week. A close look at the scheduling board, however, reveals that things are not as typical as they first appeared. Missions involving F-15s, A-10s, F-5Es, the X-24B lifting body, and even a C-47 are listed. This is the first day of another week of Flight Operations for the 6512th Test Squadron at Edwards AFB, Calif.

All of the 6512th's pilots are graduates of a test-pilot training program. The pilots and assigned aircraft participate in developmental and operational testing of all Air Force fighters, helicopters, transports, and bombers. This squadron, formerly known as Air Force Flight Test Center Test Operations, is where all new aircraft enter the USAF inventory.

There is a special level of excitement around the operations counter this morning. Today will be the first flight of the X-24B by an Air Force pilot, Maj. Mike Love. There have been a lot of first flights at Edwards within the past several years: the F-15, F-5E, A-9, A-10, and, most recently, the YF-16 and YF-17. Each one, however, generates its own special excitement. As a member of the Fighter Branch of the



6512th, Major Love is assigned as the Air Force project pilot on this joint NASA/USAF program.

A lifting body is an aerodynamic vehicle designed for efficient flight at hypersonic speeds—Mach 5 and greater. Although the X-24B itself will fly no faster than Mach 1.5, data gathered from its test program will provide some insight into the design of future hypersonic aircraft. The NASA pilot, John Manke, has com-

pleted four test flights in the X-24B, and now it is the Air Force's turn.

The sun is first spilling onto the Mojave Desert as Mike Love levels his T-38 at 25,000 feet. Flying on each wing is a blue-and-white NASA F-104. Mike has previously flown almost 200 specially designed T-38 approaches, practicing for his X-24B flight. This morning's approaches are to get a final check on weather and turbulence for the X-24B launch scheduled later in the morning. John Manke, who is to be ground controller for today's X-24B flight, and Bill Dana, veteran X-15 and lifting body pilot, are along in the F-104s to ensure that all flight procedures are letter-perfect.

The X-24B doesn't really fly—it glides. It is equipped with rocket engines to accelerate it to high test speeds, but the landing is made from a power-off pattern that starts about five miles above the touchdown point. Touchdown is on a special dry lake runway, four miles long. The pilot makes a single 180-degree turn, losing 20,000 feet of altitude, before landing. The chase aircraft are used to provide information to the X-24B pilot and to take in-flight photographs for future analysis.

The three aircraft are now specks in the early morning sunlight as they roll out high above the dry lake to start their steep descent for landing. Lowering landing gear and speedbrakes, Mike adjusts power in his T-38 and smoothly pushes over to

an eighteen-degree dive to simulate the glide profile of the X-24B.

The Team Warms Up

Capt. Chuck Walls glances briefly toward the three aircraft rolling out on final approach as he accelerates his F-4C to near the speed of sound. When you're flying more than 700 mph at fifty feet, you can't afford much time for distractions. Chuck will be flying a T-38 photo chase for the X-24B later in the morning. His early mission objective is airspeed and altimeter calibration for the F-4C. As the aircraft passes over a point abeam a tower, an observer determines the aircraft's precise altitude above the ground. By comparing actual altitude with readings of the aircraft instruments, the accuracy of the new altimeter system installed in his aircraft can be determined.

Chuck is one of the many 6512th pilots who have been involved in the DoD AIMS test program. AIMS is

an acronym of acronyms that describes the Department of Defense project to ensure that the airspeed and altimeter systems in all military aircraft will meet new, more stringent standards set by the Federal Aviation Administration. AIMS testing has entailed more than 1,000 test sorties and more than 1,600 flying hours in sixty-five different types of Air Force aircraft.

Another pair of early risers are Lt. Col. "Brick" Russell, Chief of the 6512th Rotary Wing Branch and Maj. Jon Hannan. Later in the morning, they too will be concerned with the X-24B flight, but right now they are concentrating on a different test mission. Many of the low-altitude flight tests are flown in the early morning to take advantage of the smooth air for precise data acquisition. Their mission in the H-1 Huey helicopter is one of these. As a pace automobile accelerates to thirty miles an hour, they smoothly begin a transition in the Huey to

keep up with him—flying backwards. To gather tail rotor effectiveness data, the helicopter must be placed on a precise heading and flown backwards at exactly fifteen feet above the ground. Maintaining an exact position with respect to the automobile requires fine control, made more difficult by being able to see only where you've been, not where you're going.

As this strange-looking formation moves out across the dry lake, Mike and the two NASA F-104s roll into the break for landing. In the short space of thirty-five minutes, the flight has made three simulated X-24B approaches from 45,000 feet, the planned launch altitude—and are now ready for the big event. Winds are light, turbulence almost nonexistent, and it is a "go" for an 0900 launch.

Other members of the launch team have also been busy. The X-24B ground crew has been at work since 0500, completing the instrumentation

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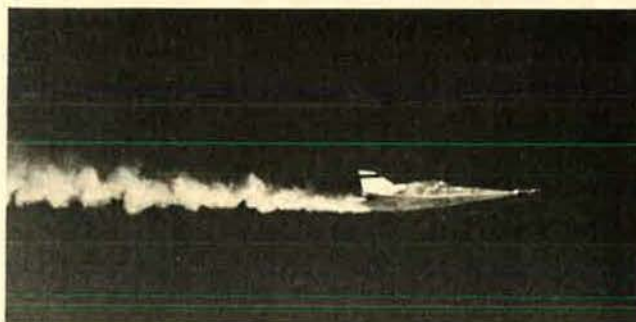
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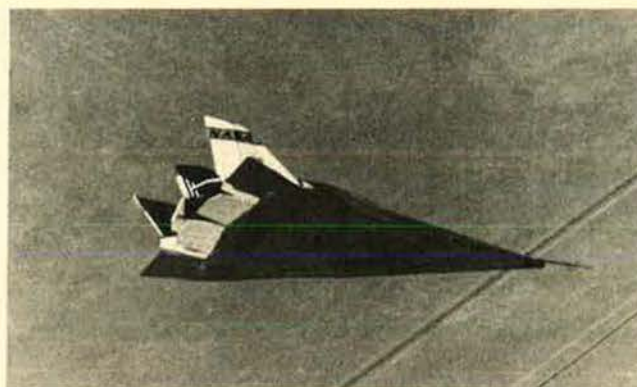
These photos record the sequence as the X-24B makes its first flight under Air Force test pilot control: launch from B-52 mothership followed by testing of the controls . . .



check of auxiliary hydrogen peroxide rockets for emergency thrust . . .



climaxing with turn to glide path preliminary to landing.



and systems ground checks with the X-24B mated to a pylon on the right wing of the B-52 "mothership." Johnny Armstrong, the Air Force flight planner, began putting the finishing touches on his radar planning charts at 0500. He has programmed the current winds at altitude into the computer for the X-24B ground simulator and flown several simulated profiles. Based on these profiles, Armstrong has concluded that the light winds will require no adjustment to the planned launch point.

While the morning missions are debriefing and data is being down-

loaded for processing, Mike and John Manke are busy having their biomedical pickups attached in preparation for X-24B pilot entry at 0800. Manke will act as "NASA One," the mission ground controller, and the heart-rate histories of both Manke and Love during this flight will be added to the NASA data bank that goes back to the early days of the X-15 program.

Swinging into Action

By 0800, the "dawn patrol" has begun to gather around the 6512th duty officer's desk to monitor the

progress of the X-24B preflight checks. Mike, dressed in a silver-colored, full-pressure suit, has already climbed up a ladder into the cockpit of the X-24B, which is hung on a special pylon between the B-52 fuselage and the right inboard engines. From a distance, the B-52 seems to dwarf its important cargo. The chatter on the duty desk radio reveals that Maj. George Luck, Chief of the Bomber Test Branch, and his combined Air Force/NASA crew are approaching the "start-engines" point in the B-52 checklist.

Mike starts the long challenge-and-response X-24B checklist with "NASA One" (also John Manke's call sign). This is the signal for Brick Russell to head for the UH-1 rescue helicopter, and for Chuck Walls, now in a T-38, to start his preflight. Flying the back seat of the T-38 will be Dale Rice, an Air Force aerial photographer.

At 0843, two minutes ahead of schedule, the mothership starts to taxi out to the runway. It will pass many of the USAF aircraft that are at Edwards either for flight test or for test support. Each of these aircraft is unusual in some way. Most are highly modified for gathering flight test data; many are preproduction test aircraft bearing only an external resemblance to the final operational models now in field use.

The mothership, NB-52B number 52-008, is an excellent example of the unusual nature of the squadron's aircraft. It has been flown for nearly fifteen years as a launching platform for the X-15, M2-F2, M2-F3, HL-10, X-24A, and now the X-24B. It contains internal tanks to provide liquid oxygen and compressed air to the research aircraft it carries.

The B-52 turns onto runway 04 for takeoff. Mike, in the X-24B, is busy with final before-takeoff checks. Ahead are three miles of concrete and an additional two miles of rock-hard dry lake bed. If anything goes wrong, George has plenty of room to set the B-52 and its tiny passenger back down. Then there's the whine of eight J57 engines accelerating and a surge of power as the crew eases the throttles forward up in the B-52 cockpit.

The entire X-24B team has now

The author, Maj. Stuart R. Boyd, graduated from USAF's Test Pilot School in 1970, after posts with ATC, PACAF, and TAC. He has flown as project test pilot on numerous F-111 test programs. Major Boyd is presently assigned as operations officer of the Fighter Test Branch and is project pilot on the NASA F-111 Supercritical Wing test program.

swung into action. Brick and Jon have chased the mothership down the runway in their UH-1; Chuck is just breaking ground in his T-38; the two NASA F-104s are rolling; and both the Air Force and the NASA radar tracking facilities are locked on the X-24B and the mothership.

The first-flight excitement has begun to build. Outside the glassed-in NASA control room is a crowd of

onlookers, many of whom have been associated with other lifting body programs and the X-15 program. Through the window they can see a television picture of Mike's cockpit attitude display, and all of the flight radio transmissions can be heard through the loudspeakers.

Above the flight control console, the "Time to Launch" readout decreases to ten minutes as the B-52 prepares to start a turn onto final launch heading. High above the Mojave Desert the merging contrails from the mothership and its three chase aircraft cut a white slash across the blue sky.

Five minutes to launch. The mothership slowly decelerates to 190 knots as it eases through 44,500 feet. Mike switches from B-52 electrical power to the X-24B batteries. This is a tense moment. Once X-24B electrical power is selected, the aircraft must either be launched or aborted and a captive landing made under the wing of the B-52. The limited

battery power in the X-24B will not permit another orbit and return to the launch point.

Mike is now deep in concentration. Timing is extremely critical. The remaining control checks must be done without error, and they must be done on time. NASA One reads through the Checklist and Mike responds:

"One minute to launch."

"Roger."

"Helium source pressure."

"4,200 pounds."

"Heading."

"Zero zero three."

"Angle of attack."

"Three degrees."

"Sideslip."

"One degree left."

"Gyro erect switch."

"Cutoff."

NASA One calls, "Thirty seconds," and relays to the experts at ground control that all systems are looking good. Mike turns the camera and recorder on, and reaching back

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*Conclusion of
Major Love's test
flight of the X-24B
lifting body:
approaching
desert landing
facility . . .*



*leveling off with
loss in altitude . . .*



*landing gear
down near
touchdown . . .*



*only an instant
before touchdown
with NASA F-104
chase plane in
background.*



on the left console, pushes the launch-control circuit breaker.

"Ten seconds." He raises the red safety cover from the launch switch.

Mike is concentrating on keeping his right hand off the control stick. Experience has shown that a "hand-off" launch is a smooth launch.

"Five, four," . . . Mike moves his hand to the launch switch . . . "one." Whang!

From the T-38 chase aircraft, Chuck watches the X-24B fall smoothly away from the B-52 wing pylon. His T-38 is already set up with gear and speed brakes down, and Chuck pulls the power to idle to stay with the X-24B, which is easing downward toward the dry lake bed eight miles below.

The two NASA F-104s move into position as they take over the primary chase duties. Both the NASA and Air Force cameramen are zeroed in on the X-24B with their cameras rolling. And here, after it was all over, is how Mike described the mission.

Five Months for Four Minutes

"It was a smooth launch with almost no rolloff, but it was a whopping surprise for me in the X-24B cockpit. The pitch-down motion of the aircraft as it left the pylon caused about one-half negative-G at the pilot's seat. This caused me to rise up in my straps with my helmet making a gentle bang against the canopy. That was my first lesson of the flight: strap in tighter next time.

"Ten seconds into the flight I corrected a fifteen-degree rolloff to the left and trimmed to ten degrees angle of attack. At twenty seconds, I was passing 42,000 feet at 190 knots indicated airspeed. NASA One called for twelve degrees angle of attack, and I trimmed it up. Thirty seconds, passing 40,000 feet. A sharp input on the right rudder followed by one on the left rudder. The nose oscillated back and forth a little with some bank oscillations. Then, full right aileron followed by full left aileron. Some more small nose oscillations and bank oscillations were apparent. From these pulse maneuvers, the engineers can determine the aerodynamic characteristics of the aircraft and compare them with wind-tunnel predictions.

"Thirty-eight thousand feet, forty seconds: time for the roll evaluation. I banked thirty degrees right using the ailerons, then rolled back to thirty degrees left. I looked out; there was lake bed runway 18. Visi-

bility was good, especially forward, and that roll was very smooth. It felt as nice as a T-38. Now a rudder roll back to thirty degrees right bank. Beautiful! It was very controllable with rudder, like an F-100. It was unusually quiet. I tried to hear the hydraulic pumps, but couldn't. All I could hear was the airflow scratching over the canopy. It sounded very much like a sailplane.

"Passing 30,000 at a minute and twenty seconds. NASA One called to close the upper and lower flaps to landing configuration. I did a pullup and a pushover from fifteen degrees to five degrees angle of attack, and finally back to ten degrees. This beauty really felt nice. Twenty-five thousand. NASA One called three miles to the turning point and asked for a landing rocket check. I felt a slight boost as I moved the throttle forward, and the two 500-pound-thrust hydrogen peroxide rockets ignited. Those rockets could provide twenty-seven seconds of thrust to

help decrease the airspeed loss between flare and touchdown, if necessary.

"As the flight crossed Highway 58, Dana, in a NASA F-104, moved in close to my right wing. Two minutes forty seconds after launch; 21,500 feet. I rolled into a forty degree left bank and looked back to the touchdown point on runway 18. The bird felt solid. It was a pleasure to fly. At the ninety-degree point, Dana called 260 knots and 17,500 feet. I checked my cockpit readings; they were the same. I felt a little high on the glide path, and opened the flaps to provide more drag. The nose dropped gently as I rolled out on final at 300 knots and 9,000 feet.

"Passing 6,000 feet, the glide path looked right on the money, so I moved the flaps closed. Dana called 1,200 feet above the ground, and the entire formation began to flare. All the practice was paying off. It was a beautiful, comfortable airplane. Three minutes fifty seconds; Dana

called 100 feet. The airspeed was bleeding off through 240 knots. I pulled the gear handle, and Dana called 'three good ones.' Thirty-five, twenty, ten, five, three, one—touchdown, at four minutes even.

"As the two F-104s went screaming by, I rolled to a stop on the dry lake. The Huey slowed to a hover nearby to ensure that everything was A-OK and I gave him a thumbs up. He probably couldn't see the grin on my face through the faceplate of my pressure suit, but I felt as if it spread from ear to ear. Five months of flight practice, hours and hours of simulator training, and many weeks of anticipation and study paid off."

Mike's log book, which already lists many hundreds of hours in everything from F-4s and F-100s to Tiger Moths and sailplanes, will now reflect a big four minutes of X-24B flight time. In the remarks section will be placed a brief but significant note:

"Air Force first flight." ■

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Fifty years ago this month, as recounted in our March issue, the first Round-the-World Flight was completed by two of the starting four Douglas World Cruisers. One went down in the Atlantic. The crew of another miraculously survived, when, as told here by one of them . . .

SEATTLE HAS CRASHED IN ALASKA

BY COL. ALVA HARVEY, USAF (RET.)

A HEAVY snowstorm delayed our departure from Seward on April 14.

But the morning of April 15 dawned bright and clear. Up at 5:30 a.m., we were soon ready for takeoff. All planes cleared Resurrection Bay by 9:45 on our way down the Alaskan peninsula to Chignik, our next scheduled stop.

Major Martin and I in the *Seattle*

were the fourth and last plane to clear the waters of Resurrection Bay. Though we didn't know it then, it was the last time we were to see our flight comrades for many months.

At about 2:30 in the afternoon, we were just off Cape Igvak when I noticed an unusual amount of oil spilling over the left side of the fuselage. The oil pressure gauge read zero. The Major throttled back and

started a gliding descent toward the sheltered waters of Portage Bay, where we made a successful emergency landing. An examination of the engine revealed a hole in the bottom of the crankcase about three inches in diameter. We dropped anchor and spent a cold night huddled in the cockpit.

Early the next morning, Major Martin noticed a wisp of smoke on



The four Army Air Service World Cruisers left Santa Monica, Calif., on March 17, 1924. After a three-week delay in Seattle, they fought through bad weather to Resurrection Bay near Seward, Alaska. On April 15, the *Seattle* was forced down en route from Seward to Chignik on the Alaskan peninsula and towed by a US destroyer to Kanatak, where it is shown awaiting a new engine.

the horizon to the southeast, in the direction of Kodiak Island. As the smoke column drew nearer, we recognized through our field glasses that it came from the funnels of a US destroyer. Signals from our Very pistol brought the destroyer, the USS *Hull*, within about a mile of us around 5:30 a.m. The *Hull* was searching for our aircraft, as requested by Lowell Smith, who, after arrival at Chignik, notified all ships in that vicinity of our disappearance.

After we breakfasted aboard the *Hull*, the *Seattle* was towed to Kanatak, a small village on the shore of Portage Bay. Here we floated the plane at high tide into a small cove where it could be anchored and better protected from the williwaws, those violent Alaskan winds.

We were told that the calm wind condition on the night of April 15 while we were anchored on Portage Bay was the first and only calm period in that area over the past eight months. Had the usual strong winds prevailed, our light anchor could not have held *Seattle*. Our air-

craft would have drifted out to sea, where the high waves would certainly have destroyed it.

The people of Kanatak were most hospitable, providing us with what shelter and assistance were available. Our living quarters consisted of two bunks and a potbellied stove in a small lean-to built on the side of a trading post operated by Carl Madsen, the village leader. At a greasy-spoon restaurant we could get meager rations: two eggs and sourdough biscuits for two dollars; a piece of apple pie for a dollar; coffee black and thick, two-bits.

During early planning for the Round-the-World Flight, certain stations had been stocked as major supply bases. Dutch Harbor in the Aleutian Islands was one; and from there a new engine was shipped to us aboard the Coast Guard cutter *Algonquin*.

Miraculous Escape

High winds and extremely low temperatures delayed installation,

but on the afternoon of April 24 weather conditions moderated to a point where the job could be started. We experienced considerable difficulty in getting the engine started because of the low temperature. However, we managed by priming with ether and oxygen acetylene gas—a desperate measure, but it worked. By early morning of April 25, we had the *Seattle* back in good running order, ready to continue on to Chignik.

Meager weather reports indicated the possibility of continuing on to Chignik. We took off about 11:00 a.m., and although reasonably heavy snowfall and low visibility were encountered, we reached Chignik around 5:30 p.m. High winds and heavy snowstorms were the order of the day on April 26, 27, and 28, with some improvement on the twenty-ninth. Radio messages on the morning of April 30 reported good weather at Dutch Harbor, where we hoped to rejoin the other crews. Reports from ships along the route were less favorable but good enough

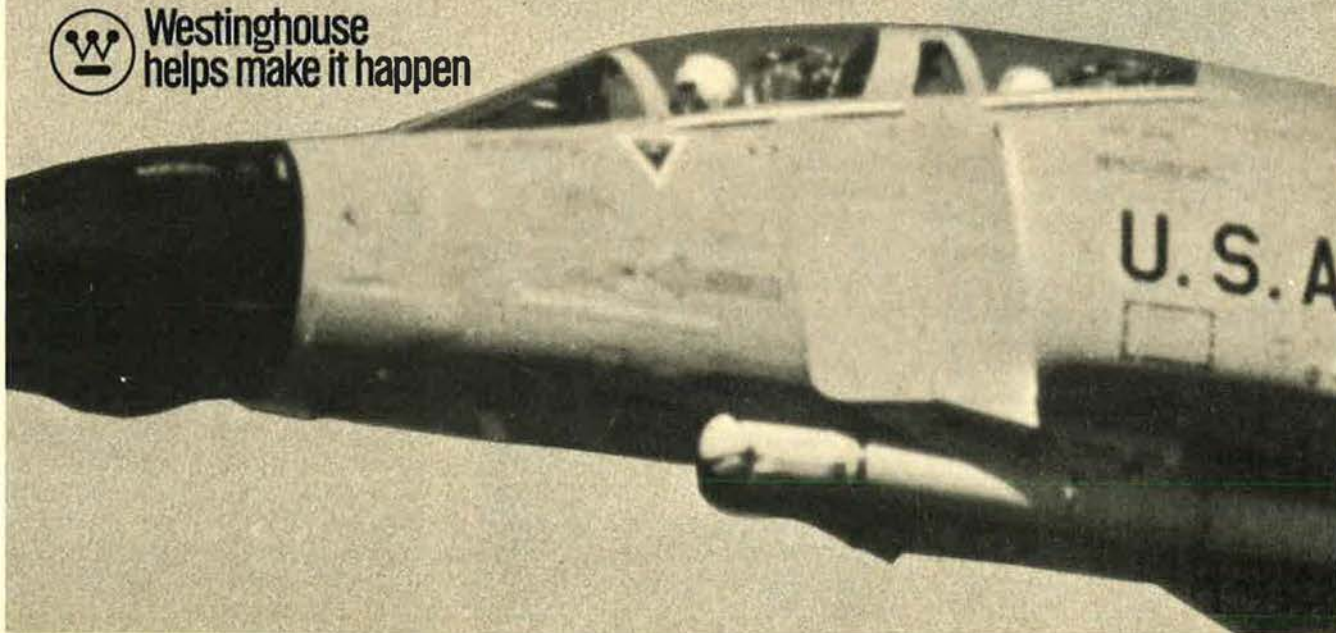
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to warrant our departure. The *Seattle* cleared the waters of Chignik lagoon about 10:00 a.m.

Our flight plan was to cross the portage west of Chignik, pick up the coastline, and proceed along the south coast of the islands. After being airborne a short time, we saw a formation that resembled a clear body of water to the west. Major Martin turned in that direction, expecting to pick up the coastline, but to our surprise this formation turned out to be a heavy fog bank. We continued on the westward course and soon were enveloped in dense fog with visibility zero.

Major Martin started a climb to get above the fog, but the heavily loaded plane rose slowly. The westerly course we were following, we

unhurt. After a few minutes, we climbed out to gather our faculties. Walking back to inspect the point of initial impact, we found that the plane had hit on the slope of a rather steep hillside, the pontoons and right wing striking first. The plane continued in a skid up the slope for about two hundred yards, tearing to pieces as it went.

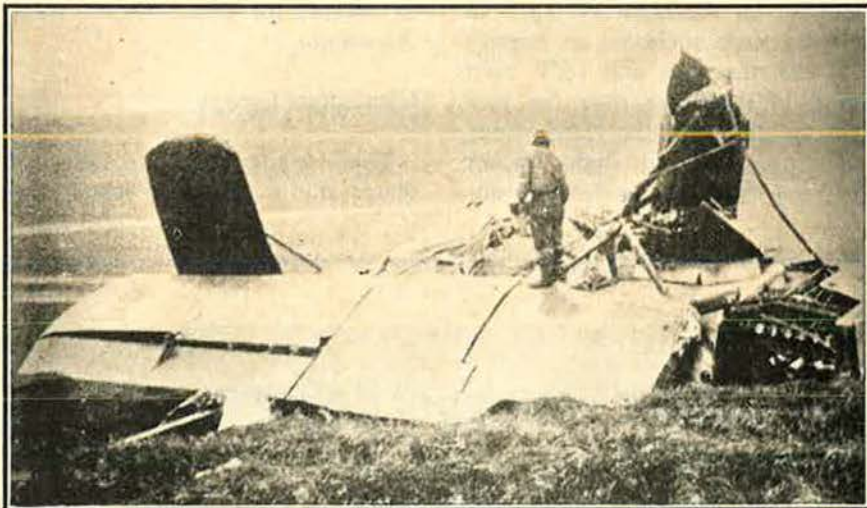
Next item on the agenda was an estimate of our situation. Prior to our leaving Chignik, Mrs. Osborne, the wife of a cannery manager there, had prepared two sandwiches for each of us along with a quart thermos of coffee, which was destroyed in the crash. The sandwiches were the last solid food we were to get for several days.

The maps provided for this part of

more confidence than was warranted. The fog was so dense that one man had to lead with the pocket compass, the other following a few paces behind to warn against circling. After walking about five hours, and with darkness approaching, we realized our effort was in vain. We were simply climbing a steep mountain, so we retraced our footsteps to the plane. That night we used up a considerable amount of broken wooden parts from the plane to keep a fire going.

Ten-Day Trek

On May 1, the dense fog still persisted. Having been forewarned that the spring fogs often lasted for days, we realized our situation was some-



At left, Major Martin and then Sergeant Harvey after their ten-day hike out of the Alaskan wilderness. Above, the wreckage of the *Seattle*, which crashed in fog on a mountain in the Alaskan peninsula.

later learned, took us north of the highest of the mountain range to a hilly area on the Bering Sea side of the peninsula. We never reached the top of the fog bank. The crash came at 11:30 a.m., ending the glorious adventure of around-the-world flight for Major Martin and me but fortunately sparing our lives, and offering a new, unexpected challenge.

Flying into a mountainside is not recommended, but, with some divine guidance, we received only minor injuries. Major Martin suffered a banged-up nose and a pretty good shiner, but, aside from shock, I was

the flight were coastal geodetic charts, well descriptive of the coastlines, harbors, and bays, but providing very limited details inland. Our map showed a number of villages and canneries along the Pacific Coast, nothing on the Bering Sea side, so it was to our advantage to reach the Pacific side of the peninsula.

Leaving our heavy flying suits behind, dressing as carefully as possible for the trek out, and taking a few items of gear such as pistols, pocket compass, map, razor, toothbrush, and a change of socks, we pushed off at 1:30 p.m. with far

what perilous. To expect outside rescue was pure folly. Survival was entirely up to us, so we made an agreement and shook hands on it. We would start for the coast, never to return to the plane.

The fog stayed with us for five days. Our progress was slow and tiring. We either waded in knee-deep snow or slipped on frozen ground in the higher regions. Our only food supply was a quart of concentrated beef that we consumed a teaspoonful in a cup of water at each meal.

The hours of darkness were short, lasting about four hours. We were in an area totally uninhabited, barren of trees, but with a few alder thickets from which we could pick enough dead limbs to build a small fire. The hours of darkness were spent huddled in the alder bushes

Col. Alva Harvey entered the Air Service in 1919 and was commissioned in 1926. In 1941, he piloted a B-24 around the world, opening air routes across the Pacific. During World War II, he was Deputy Commander of a B-29 wing in China and the Pacific. Retired since 1956, he holds the DSM, Silver Star, DFC, and Air Medal.

over our small smoky fire that melted its way deep in the snow. Fatigue, lack of food and sleep, and snow blindness pushed us almost to the point of exhaustion.

On May 6, we spotted a small lake off to our right in the marshland, but an inspection of its shores revealed no outlet to the sea. On May 7, we came upon a small stream formed by melting snow. We thought it was sure to lead somewhere to our advantage, so we proceeded, walking in the icy water that proved to be easier going than wading in snow.

Around 11:00 a.m., the stream led us to a body of water. At last the coast! After following the coastline a few miles, we found a small uninhabited cabin whose owner had apparently departed for the season.

It was a most welcome sight, the Hilton at its finest.

The remainder of May 7 and the next day, we rested in the cabin, adjusting to the need of sleep and food. The food we could consume, at first, only in very small quantities because of our shrunken stomachs. The departed trapper had, fortunately for us, left his .30-caliber rifle. We managed to bag some ducks and rabbits, which provided a feast long dreamed of.

A study of our map and the coastline led us to the conclusion that we had reached Moller Bay, a body of water on the Bering Sea side of the peninsula. The departed trapper had left mail in the cabin bearing a Port Moller address, so we could expect to find a trading post or salmon cannery not too far away. We spent May 9 in further reconnaissance, verifying our location. On May 10, we were on our way, following the coastline in search of the expected cannery or trading post.

By walking on the beach, we made reasonably fast progress, covering

twenty-five miles in about six hours. In midafternoon we spotted the cannery. We also were observed walking along the beach by one of the natives who picked us up in his launch and carried us to the cannery. Here, all the comforts of home were provided. Radio messages went out to the War Department in Washington and to our families, advising them of our safety.

Our participation in the Round-the-World Flight ended on a mountainside of the Alaskan peninsula on April 30. We were unhappy, of course, at not being able to complete the flight. But after counting our blessings, we found that life could continue despite that cruel disappointment.

Alaska, and all Arctic regions, even with their majestic beauty, their enormous wealth of minerals and other resources, will always confront the traveler with weather problems as unforgiving as the sea—unforgiving of man's errors, his omissions, and his lack of preparedness to cope. ■

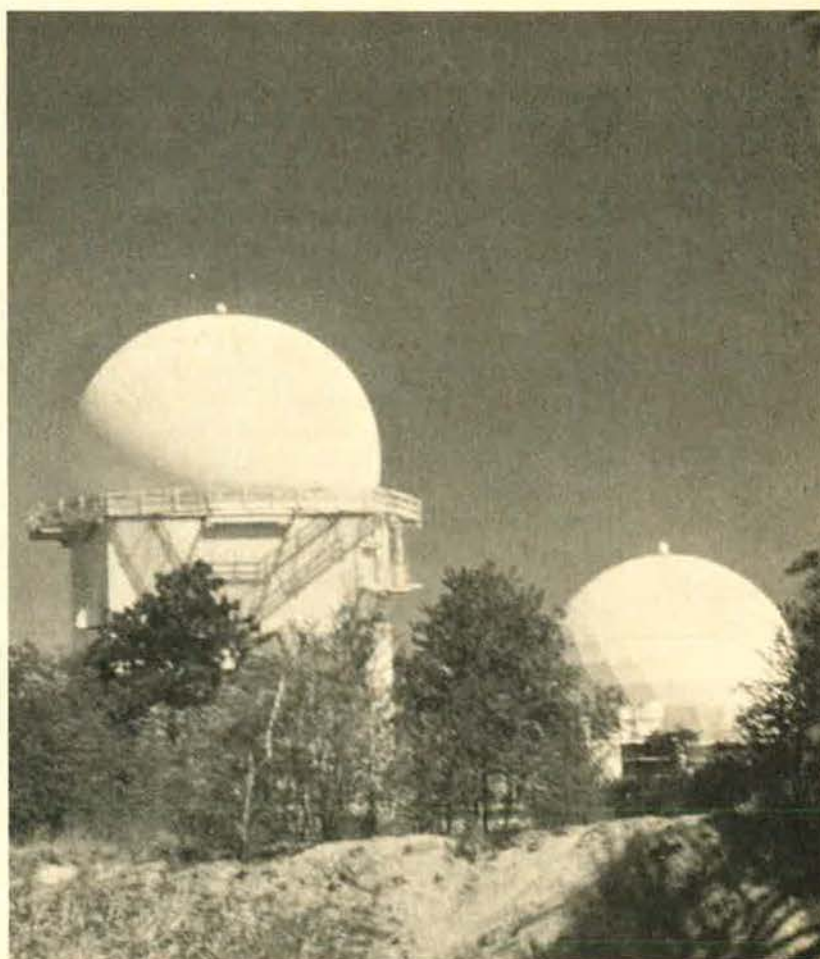
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In February 1971, the Air Force launched an imaginative plan—sparked by the Utah Project of AFA's affiliated Aerospace Education Foundation—to weld the Air Force and civilian training and education of USAF people into an accredited, transferable academic program. That plan has evolved into the Air Training Command's...

Community College of the Air Force

By Gen. William V. McBride, USAF

COMMANDER, AIR FORCE LOGISTICS COMMAND
FORMERLY COMMANDER, AIR TRAINING COMMAND

ON APRIL 1, 1972, the Community College of the Air Force (CCAF) officially opened its doors at Randolph AFB, Tex. The ceremony marked the culmination of more than a year of intensive planning and was a big step toward bringing the huge civilian and military technical education systems closer together.

The purpose of this specialized, nontraditional institution is to enrich the job training of the airman by guiding him through a program of college instruction to the two-year level by the time he reaches senior supervisory status. CCAF is designed to develop an airman into a master of his or her trade—so recognized through the awarding of appropriate certificates and credit for the training he has received.

To attain these ends, each airman is given opportunities and incentives to become a skilled craftsman while broadening his general education through off-duty study in colleges and universities. In short, through the many educational avenues open in the Air Force, CCAF hopes to stimulate every airman to constantly improve his work by fostering, guiding, and documenting educational growth.

Stated formally, CCAF was established—and exists—to:

- Integrate on-duty training and off-duty voluntary education of the airman into a con-

sistent, meaningful pattern of career growth toward attainable objectives;

- Have Air Force instruction recognized for its full value by those organizations that set standards for individual qualifications and institutional excellence; and

- Improve the educational and career-related incentives for recruitment and retention of high-quality personnel in the Air Force.

History

Long before the founding of CCAF, it had become apparent that there were more similarities than differences in the training given young Air Force people and their civilian counterparts. Knowledgeable occupational educators postulated that increasingly sophisticated technology was forcing the Air Force and civilian industry to pursue ever more convergent training paths. Whatever the rationale, studies disclosed that graduates of about ninety percent of our Air Force specialties could use their acquired skills when they returned to the civilian work force through separation or retirement.

In 1967, a unique experiment was launched in Utah under the aegis of the Aerospace Education Foundation (an Air Force Association affiliate), in conjunction with the US Office of Education. Its avowed purpose was to test, for the first time, the efficacy of the Air Force training experience in a civilian environment.

Three ATC courses—electronics, medical technician, and aircraft maintenance (with attendant course materials)—were inserted into the curricula of six Utah schools concentrating on occupational-vocational pursuits. In these schools, ranging from high school to college level, teaching the Air Force courses was conducted under stringent controls.

When student achievement and student and faculty acceptance were measured subsequently, the findings were impressive. They proved beyond doubt that the education programs developed and taught by the Air Force could be adapted to civilian models with highly favorable results.

This raised an obvious question in the minds of Air Force leaders: If their courses could be taught in colleges for credits, why couldn't arrangements be made for credit to be given to Air Force students who successfully complete the courses while on active duty?

At a February 1971 meeting, representatives of the Air Force Academy, Air University, and Air Training Command formed a tricommand working panel to explore the subject.

The group convened two months later at Sheppard AFB, Tex., at the tricommand's Accent on Youth conference. The participants discussed for the first time the feasibility of establishing an Air Force school through which educational credits for all pertinent on- and

off-duty education received during an entire Air Force career would be recorded on a single transcript.

This last item was of particular significance to these men, personally aware as they were of how frequent transfers from one base (and educational institution) to another could often cause military personnel to lose hard-earned college credits. They were convinced that a separate, accredited special-purpose college could go far toward resolving the problem. In addition, they felt pragmatically that it would constitute an attractive selling point for Air Force recruiting and retention counselors.

In the months that followed, the working group continued to refine the CCAF idea. All concerned were convinced that the idea was not only desirable, but feasible and practical as well. While CCAF could make major changes in the relationship of education and training to Air Force careers, it would not call for construction of a new campus, inordinate expense, or the disruption of current cooperative educational programs. It could be built on the foundation of existing technical programs while taking into account the service member's after-hour studies. The "main campus" would be the Air Force's technical training schools, with all remaining functions of a conventional institution of higher education centrally focused in a new organization dedicated to bridging the gap between civilian and military technical education.

Thus, the Community College Development Division was formed within the Training Re-

search and Development Directorate at Headquarters ATC. It was directed to formulate a plan for the organizational structure, to project cost estimates, and to program personnel phases for the unit—all normal elements in a concerted college development plan. The unit's six officers were the nucleus around which CCAF grew.

The dream was realized when the Air Force Chief of Staff ordered the activation of CCAF as a separate unit under the direction of ATC in April 1972.

Organization and Governance

The Commander and staff of ATC provide the resources for CCAF, just as state agencies and departments support the operations of their university systems. As a nontraditional, transregional, multicampus institution, CCAF encompasses seven affiliated schools. Five of them—the Schools of Applied Aerospace Sciences at Sheppard AFB, Tex., Lackland AFB, Tex., and Keesler AFB, Miss., plus the USAF School of Health Care Sciences at Sheppard and the USAF School of Applied Cryptologic Sciences at Goodfellow AFB, Tex.—are located in the area served by the Southern Association of Colleges and Schools (SACS).

Two more—the Schools of Applied Aerospace Sciences at Chanute AFB, Ill., and Lowry AFB, Colo.—fall within the purview of



the North Central Association of Colleges and Secondary Schools (NCACS). An additional twenty-one schools, particularly NCO academies, have requested affiliation with the institution, and are presently being considered for accreditation by regional associations.

The college's administrative unit is centrally located at Randolph AFB, Tex. It provides a permanent institutional context for governance of career-education patterns and issues the computerized transcripts, while updating around 3,500 each week. After publication of a comprehensive catalog in August 1973, CCAF began awarding Career Education Certificates to those who qualified. The certificate follows the model of the two-year "technical associate" degree.

Through its Careers Division, CCAF maintains communications with significant professional and industrial standard-setting organizations. Certificate programs and major academic policies are controlled through an interlocking governance system consisting of the internal Academic Council, authentication of policy by the CCAF President, and policy review by the Commander, Air Training Command. In addition, an external advisory committee of prominent educators and military and industrial leaders provides advice and comment on the progress and policies of the CCAF. The members of this committee report their findings and recommendations to the Secretary of the Air Force. The committee conducted its first review of the CCAF concept and school policy on August 20, 1973.

Accreditation

Following the accepted pattern of accreditation, ATC requested evaluation of its schools as individual institutions—first the Southern group, then the Northern—by the Southern Association of Colleges and Schools and the North Central Association of Colleges and Secondary Schools. The request was granted and the process was set in motion.

After each school had completed a prescribed program of self-study and improvement, it was officially visited by an evaluation team from the appropriate regional organization.

SACS (through its Commission on Occupational Education Institutions [SACS/COEI]) granted accreditation to the five Southern schools in December 1972. Three months later, the two Northern schools were accredited by NCACS. These actions meant that, henceforth, when an airman's transcript was submitted to civilian colleges or universities, the credits recorded on his transcript could be evaluated on the same basis as those transferred from civilian technical education institutions.

Accreditation of the individual schools was a major breakthrough. To complete the pattern, they were joined as "charter affiliates" of CCAF. Then, in December 1973, CCAF itself was accredited by SACS/COEI as a multicampus, post-secondary institution.

Programs

The ultimate goal of the student is to earn CCAF's credential, a Career Education Certificate. This is awarded only after he has successfully completed specified courses in an individual skill area—his or her "major"—and has accumulated a prescribed minimum of sixty-four semester hour credits, varying slightly with the "major."

CCAF offers eighty-four tailored career patterns (major programs) leading to the certificate. Designed on a two-year model, these are grouped into eight general career classifications: Administration and Management, Aircraft Maintenance, Communications, Crafts and Trades, Distribution Services, Electromechanical, Health Care Sciences, and Public Services. Where possible, appropriate licensing, certificating, registry, or other requirements for credentials negotiable in the civilian marketplace have been met during the combination of military and civilian instruction that earned the certificate.

Each program contains three elements: technical, related general education, and management studies. For the most part, the technical requirements can be met in the accredited Air Force technical schools (in some instances additional outside courses may be necessary).

Successful completion of the required technical school courses gives the airman from two to thirty-six credits toward a CEC—an average of about thirteen, again depending on the skill area. The management and military science course credits, a minimum of six hours, may be gained at an accredited Air Force Noncommissioned Officer Academy, or by completing courses at one of the more than 600 civilian educational institutions that conduct classes on or near Air Force bases. For the courses in related general education, he or she must voluntarily attend civilian colleges or universities on off-duty time, taking courses in communicative skills, science and mathematics, and/or social sciences.

This requirement lays to rest fears expressed by a few civilian educators in the early days of CCAF that the CEC program would result in a shrinkage of enrollments in civilian colleges. They now realize that the opposite is true, that it virtually assures an increase. CCAF is an *exporter* of students, and an *importer*, from cooperating schools, of instruction.

Through its Education Services Program,



The author, Gen. William V. McBride, now Commander of the Air Force Logistics Command, headed Air Training Command when this article was written. A triple-rated officer and World War II combat veteran, General McBride has held several posts in the Military Airlift Command, ranging from wing commander to Chief of Staff. A former Military Assistant to the Secretary of the Air Force, he has been an Air Staff planner and Vice Commander in Chief, US Air Forces in Europe.

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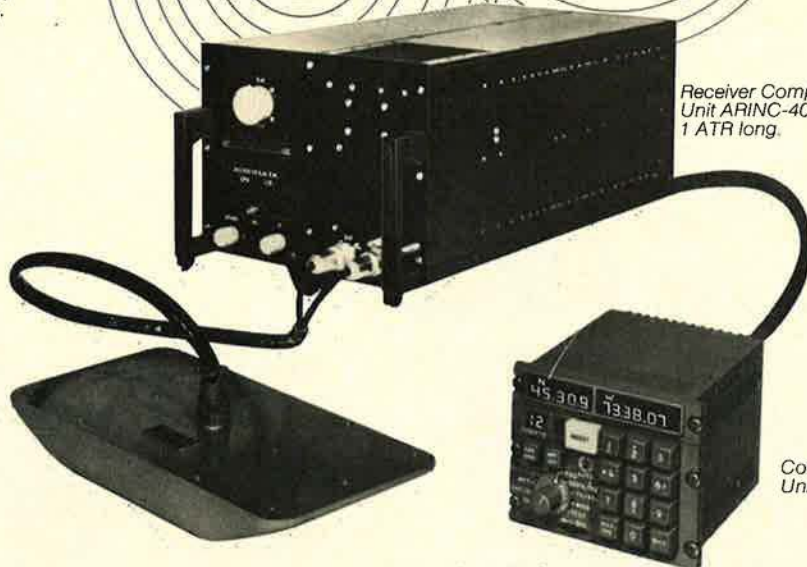
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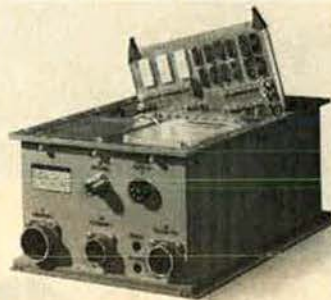


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the Air Force pays up to seventy-five percent of civilian tuition fees, and Veterans' Administration in-service programs in many cases also assist with tuition support.

When new enlistees complete their basic training, they receive credit for four semester hours in physical training, the smallest required unit in all CCAF programs. The majority then proceeds to one of ATC's Technical Training Centers. When the airman successfully completes training there, the credits earned are added automatically to the transcript.

Thus, CCAF credits entitle every Air Force enlisted man and woman to apply through the local Base Education Office for registration in a CEC program.

Airmen who believed they were already eligible for a Career Education Certificate have been permitted to submit supporting documents since May 1973. Upon receipt of the application, CCAF begins a meticulous validation process to ascertain whether all requirements have been met. On August 23, 1973, the first certificate was awarded by Lt. Gen. (now Gen.) Robert Dixon, then USAF Deputy Chief of Staff/Personnel, to SMSgt. William Rushing, USAF Recruiting Service.

Sergeant Rushing, who has spent more than twenty-two years in the Air Force, was credited with sixteen CCAF semester hours in the Work Center Management Program. Hoping to get a B.A. in Business Administration, he submitted his transcript to Southwest Texas State University (SWTSU), in nearby San Marcos, Tex.

His Air Force credits, accepted by SWTSU, plus semester hour credits he had earned at Texas Lutheran College, San Antonio College, and the University of Maryland, permitted him to enter as a senior the following month. He was graduated last May and returned to full-time military duties following his year on campus.

CCAF credits are not always transferred at face value by civilian colleges, of course, any more than they are from one civilian school to another. That is the prerogative of the gaining institution issuing the graduating credential.

For instance, an airman currently attending the University of South Carolina, working toward a degree in computer science, had fifteen of his Community College of the Air Force credits accepted. The remainder were disallowed because they duplicated courses for which he had already been credited by the University during a year he had attended before entering the Air Force.

A management analyst in Buffalo, N. Y., who separated from the Air Force in 1972 as a staff sergeant, had completed three years of work toward a B.A. degree in mathematics at New York's State University College at Brockport, N. Y., before enlisting. Deciding to re-

enroll for the necessary final year, he submitted his CCAF transcript.

The college transferred Air Force-earned computer science credits at face value, but disallowed some of the physics credits, also because of duplication with courses taken previously.

However, the transferred credits permitted him to graduate earlier than would otherwise have been the case.

Accelerating Operations

It was eminently fitting that the late Lt. Gen. George B. Simler, then ATC Commander, should have presided over CCAF's opening-day ceremonies. For it was he, along with Lt. Gen. Alvin C. Gillem II, former Commander of Air University, and Lt. Gen. Albert P. Clark, then Superintendent of the Air Force Academy, who provided the initial driving force that carried the concept from early planning to reality.

As CCAF has continued to grow, its operations have accelerated accordingly. As of April 26, 1974, approximately 11,000 officially embossed transcripts have been mailed to more than 1,000 schools and colleges throughout the nation, as requested by airmen, with another 28,000-plus issued to students and educational counselors. Also, some 7,100 airmen have enrolled in CEC programs.

The USAF Recruiting Service, also headquartered at Randolph AFB, reports that, besides being a potent recruiting inducement, the obvious opportunities for advancement and self-improvement inherent in the CCAF program are expected to contribute measurably to the retention of skilled airmen.

Trained Air Force craftsmen returning to the civilian work force find that they are helped immeasurably in "getting a foot into doors" of their specialties by the fact that growing numbers of civilian licensing, professional, and standard-setting organizations have endorsed specialized CEC programs for examination, certification, or licensing.

These include such organizations as the Texas Commission on Fire Protection Personnel Standards and Education, the Texas Commission on Law Enforcement Officer Standards and Education, the Texas State Department of Health, the Federal Aviation Agency, the American Optometric Association, the National Association of Church Business Administrators, and the California and Colorado-Wyoming State Restaurant Associations.

CCAF has already taken long strides toward its announced goals. It seems safe to predict that in the future it will exert an ever-widening influence on the educational and personal growth of enlisted men and women in the Air Force. ■

The Bulletin Board

By John O. Gray

MILITARY AFFAIRS EDITOR, AIR FORCE MAGAZINE

Status Report on AFA Resolutions

At its National Convention last September, the Air Force Association adopted fifty-seven policy and general resolutions. Some were new; others, of long standing, were readopted. AFA strongly supports these resolutions and constantly works for their approval with legislators, government agencies, and other service-oriented groups. A status report as of early August follows:

Policy Resolutions

1. **Flight Pay:** PL 93-294, June 1, 1974, overhauled officer flight pay scales, restored pay to flyers cut off last year, and made other reforms.

2. **B-1 Advanced Bomber:** In the FY '75 military procurement authorization bill, Congress approved \$455 million in B-1 Research Development, Testing and Evaluation outlays. DoD had requested \$499 million. Actual funding for this and other hardware projects (items 3 through 9 below) will follow soon in the FY '75 Defense appropriations bill.

3. **F-15 Advanced Fighter:** Congress voted \$756.9 million in the FY '75 program for procurement of seventy-two F-15s and \$220.5 million for twelve F-111s.

4. **A-10 Aircraft:** Congress authorized procurement of thirty A-10s plus initial spares.

5. **Minuteman III:** Both houses of Congress authorized \$739 million for FY '75 procurement, RDT&E, and force modernization of the Minuteman program, \$19 million below Defense's request.

6. **Air Defense:** For Airborne Warning and Control System in FY '75, Congress authorized \$370.7 million for procurement of six AWACS, half the number sought by the Pentagon. For AWACS research, they approved \$220 million. (Early in 1974, AWACS was assigned to the General Purpose Forces.) The Defense Department sought no funds for an improved manned interceptor.

7. **Advanced Airborne Command Post:** The lawmakers authorized \$67.7 million in RDT&E outlays.

8. **AWACS:** See item six above.

9. **Defense R&D Program:** The Department asked for \$9.3 billion (including \$3.5 billion for USAF) in the FY '75 budget. Congress approved \$8.9 billion and \$3.4 billion, respectively.

10. **Strategic Parity in ICBMs:** See item five above.

11. **Recomputation of Retired Pay:** House-Senate conferees again rejected a Senate-approved amendment to the military procurement bill, to recompute retired pay on January 1, 1972, pay scales. Rep. F. Edward Hébert (D-La.), chairman of the House Armed Services Committee and archfoe of recomputation, called the amendment "non-germane" to the bill.

12. **Amnesty:** House hearings were held in March, but no legislation is expected. Defense, AFA, and other organizations oppose "blanket amnesty."

13. **Status of MIAs and POWs in Southeast Asia:** AFA has pressed vigorously for as full an accounting as possible of all American MIAs and POWs in Southeast Asia.

Continuing General Resolutions

A. **Moving Expenses Incident to Change of Permanent Station:** Now PL 93-213. Relates to overseas movements only.

B. **Dependent Dental Care Program:** Air Force now says it "supports" a program "provided the care is furnished by civilian dentists and the patient contributes to the cost." Still, the large price tag remains a major deterrent to any serious action.

C. **Airmen Retention Program:** PL 93-277, May 10, 1974, is the long-awaited new enlistment and reenlistment bonus law. USAF, doing well recruiting new members, currently is not using the enlistment bonus to attract recruits, but will use it if the need arises.

D. **Reserve Retirement on a Reduced Annuity Basis:** Veteran Reservists not yet sixty years old want this one badly. Defense's proposal went to the Office of Management

and Budget July 10, but no legislative action is seen this year.

E. **Reserve Medical Officer Promotion Program:** This would give Reserve physicians in organized units and M-Day slots accelerated promotion chances (which active-duty medics have long enjoyed). Defense has taken no action, though participating Reserve physicians are authorized the new bonus established for active-duty doctors.

F. **Elimination of Non-Residency Status for Military Personnel:** Action by the states, which AFA strongly urges, would allow transient military members to enjoy the lower "resident" tuition rates at state universities and colleges. Only 100 such institutions in twenty-six states reportedly now waive residency requirements for military service people.

G. **Support of Civil Air Patrol:** AFA now has an adviser to the AFA President for CAP affairs. Many of the Association's chapters are providing effective support to CAP.

H. **Amendments to the Dual Compensation Act:** Bills to erase inequities heaped on retired Regular officers if they take Civil Service jobs



USAF's newly appointed Assistant Secretary for Manpower and Reserves is David P. Taylor, formerly an MIT professor and more recently with the President's Office of Management and Budget. Mr. Taylor, forty, is an Army veteran and holds a Ph.D. from the University of Chicago.



New Deputy Associate Director of the Office of Management and Budget is Hugh E. Witt, a veteran of top civil posts, Hq. USAF. Mr. Witt served on AFA's Civilian Personnel Council for five years. He's earned three USAF Exceptional Civilian Service awards.

have been introduced. Defense supports them and has a corrective proposal at OMB. Still, no relief is in sight.

I. Trailer Moves and Dislocation Allowances for Military Personnel: Defense's plan to provide total reimbursement of trailer move costs at PCS time (current limit is 74¢ a mile) went to OMB in April. AFA also supports dislocation allowances for members who move trailers on transfer.

J. Enlisted Representation on Air Force Aid Society Board: This resolution calls for assigning the Chief Master Sergeant of the Air Force to membership on the Board of Trustees of the AFAS. AFA still pursuing this objective.

K. National Guard Technician Retirement: Legislation to end the fifty-five percent restriction and give full credit for service performed before the 1968 National Guard Technician Act is still pending in the House. The Senate has approved.

L. Air Force Academy Pre-Med Students: The resolution would permit more Academy graduates to attend medical school, but Congress insists on barring all such enrollments beyond the class of 1977.

M. Support of the Community College of the Air Force: AFA continues to support the CCAF and is pleased to note that the College was recently granted full institutional membership by the American Association of Community and Junior Colleges.

N. Tuition Assistance for Chil-

dren of POW/MIAs: This calls on all states to provide tuition-free schooling for such children in state-supported colleges and trade schools.

O. Employer Support of the National Guard and Reserve: AFA's national officers and local chapters continue to urge employers to fashion personnel policies that encourage employees to participate in the Reserve and National Guard. AFA's involvement in the National Committee for Employer Support of the Guard and Reserve continues.

P. Incentives for Members of the National Guard and Reserve Forces: Servicemen's Group Life Insurance (\$20,000) and broadened BX shopping privileges were recently granted these groups. But the Pentagon has backed away from its Reserve enlistment-reenlistment plan, and an Air Reserve plan to give Reservists tuition aid has bogged down.

Q. Earlier Retirement for Civilian Employees: Bills allowing retirement with a combination of years service and age have been introduced, but large price tags have a deterring effect. A straight thirty-year retirement package (no age or penalty proviso) has received serious consideration, and USAF reportedly may go along.

R. Correction of Constructive Service Inequity: Aim is to delay the early mandatory retirement of Reserve physicians and dentists, so they can provide health care longer. Defense says it now allows waivers enabling them to serve until age sixty, and believes this is adequate.

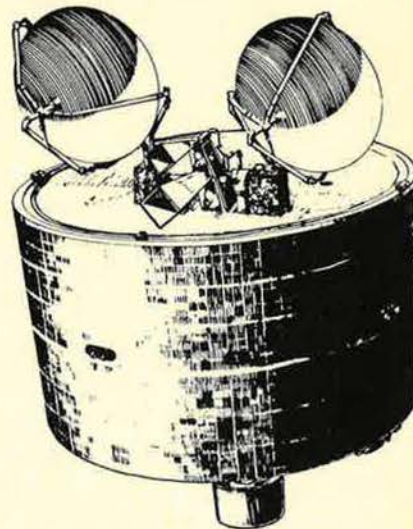
S. Flying Training for AFJROTC Cadets: Many AFA local units and leaders encourage maximum use of local civilian flying facilities for these cadets.

T. Attendance of AFJROTC Cadets at CAP Summer Encampments: Air Force encourages joint membership by AFJROTC cadets. However, Hq. USAF says that, because of insurance problems, participation in CAP encampments without membership in CAP is not permitted.

U. Reenlistment Leave Option: Reenlistees, under this plan, could choose reimbursement of some or all of their leave and carry the balance forward. But no action is being taken. Defense, meanwhile, is calling for more regular leave taking, less leave accumulation.

V. Increased Unaccompanied Baggage for E-4s Under Four: Full travel and transportation entitlements will be provided all lower graders pending funding in the FY '75 Defense Appropriations Act.

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The Pros and Cons of 'Three-Way Pay'

"It's unfair for many people, particularly those who live in government quarters and eat in government messes. It widens the pay gap between bachelors and married members, and slows down retirement pay increases," say opponents of the Department of Defense proposal to split military pay raises three ways—into basic pay, quarters allowance (BAQ), and subsistence allowance (BAS).

"It's fair, easier for the troops to understand. And it will save the government money," says the Department of Defense.

Target date for launching the change, which won approval of the House of Representatives in early July, is this month. For on October 1, federal civilian employees are slated to receive a pay raise of 6.2 percent. Under present law, that automatically translates into an 8.1 percent increase in basic military pay.

The three-way plan, besides applying the lower 6.2 figure to BAS and BAQ as well as to basic pay, will save Uncle Sam considerable money. The official estimate for the last three quarters of FY '75 is \$158 million in savings.

The projected five-year total savings is \$1.1 billion, money that otherwise would show up in various military compensation outlays. This "loss" largely explains why service members generally oppose the new system which is expected to win Senate approval handily.

Defense has not let the opposition stifle its determination to get the measure through Congress and into operation. Meanwhile, the Department has gone directly to its membership with a bid to change their minds about the three-way pay plan.

This internal selling effort surfaced via the July 1-4 issue of "Commander's Digest," a pamphlet circulated Defense-wide. The entire issue explains and applauds the proposal, though whether it has changed many opinions seems doubtful.

The Pentagon holds that while recent basic pay raises have been adjusted properly to reflect BAQ and BAS as part of total military compensation, both allowances have been boosted sharply in separate actions.

Through a legal loophole, the enlisted subsistence rate rose seventy-five percent early this year. Quarters allowances climbed thirty-five percent in late 1971 via separate pay legislation. And while basic pay has jumped eighty percent since 1967, Civil Service salaries have climbed just fifty-six percent.

This constitutes "double payment" for the military, according to the House Armed Services Committee. Defense adds that incorporating BAQ and BAS into the general raise formula should "eliminate the necessity of adjusting them separately."

The Committee, putting it another way, says "present law overstates basic pay and understates quarters and subsistence allowances, resulting in allowances appearing to military personnel to be lower than they should be."

Spreading the raises into allowances should make "the compensation system more understandable to military personnel in the future," the Committee's report on the measure also declares.

Occupants of government quarters, not surprisingly, are growling; since Uncle Sam collects the entire BAQ, they won't realize any extra quarters money. For example, consider a married, six-year service captain living off base. Under the three-way plan, he will collect an extra \$12 a month in BAQ starting in October. His on-base counterpart will merely surrender more—\$207.60 vs. the \$195.60 he currently gives up.

Here's the full monthly picture for the same captain:

	Current Status	Present Law*	Three-Way Plan**
Basic Pay	\$1,100.40	\$1,189.50	\$1,168.50
BAQ	195.60	195.60	207.60
BAS	47.88	47.88	50.85
Totals	\$1,343.88	\$1,432.98	\$1,426.95

*With 8.1 percent raise in basic pay only, effective Oct. 1, 1974.

**With 6.2 percent raise in basic, BAQ, and BAS effective same date.

For off-base residents, the BAQ raise maintains "a level of reasonable relationship with increased costs in the economy," Defense says. And for the growling on-base residents?

"They have no real gripe. Considering that Uncle Sam pays all utility and maintenance costs, most families in government quarters pay less [in surrendered BAQ] than they would for comparable facilities outside the gate," one prominent Defense official said.

Families shelling out their full BAQ for small, run-down on-base Wherry quarters hardly share that viewpoint, however. With such a wide variance in the size, condition, and desirability of government quarters throughout the services, many occupants will continue to enjoy A-plus living for comparatively little money. For others, the reverse situation doubtless will continue.

If nothing else, the move to increase the value of the BAQ again underscores the pressing need to modernize the housing allowance system, possibly by ditching it entirely and going to a fair rental-type arrangement.

Because quarters and subsistence monies are not taxable, persons living off base can stretch their future pay raises further than would be possible should the entire raise remain packed into taxable basic pay.

Bachelors residing off base, because their BAQ is smaller than the rates for married members, will receive smaller raises. Actually, most military bachelors are tied to barracks and government messes. Thus, with smaller basic pay boosts and no extra in-hand cash for BAQ and BAS, they stand to fall further behind many married members in total pay under the three-way plan, protesting enlisted groups point out.

The captain example above also provides a clue about the impact of the proposed system on future retired pay. In other words, basic pay will rise much more slowly than under the present system. This in turn will hold down the fast-rising projections in retired pay and save the government money.

Many other compensation items also are tied to basic pay. Included are reenlistment bonuses, readjustment pay, cadet pay, Reserve drill pay, physician-dentist continuation pay, and the government's considerable contribution to Social Security.

Under the three-way pay plan, all of them will increase more slowly than under the current system.

A final factor that has received little attention is the new plan's impact on the fourth element of total military compensation—"tax advantage." A succession of future increases in BAQ and BAS will have the effect of increasing members' tax advantage considerably. Or might such an occurrence invite attempts from influential budget cutters to remove the allowances' nontaxable status altogether?

Three-way pay represents a major innovation. The objections raised against the plan are understandable. Still, with personnel budgets soaring as they are, governmental efforts to trim projected outlays should come as no surprise. They are the order of the day and probably will be intensified.

The Bulletin Board

New General Resolutions

1. Defense Officer Personnel Management Act: Initial House subcommittee hearings were held in July, and a relief bill to continue Air Force officer promotions past September 31, 1974, emerged. Passage of the full DOPMA package is not expected to occur this year, and maybe not in 1975.

2. Provide Special Pay for Judge Advocates: Bills exist that would give military lawyers special monthly pay and continuation bonuses. But without Administration support—OMB killed a proposal last year—their chances remain poor.

3. Military Dependency Criteria: Many inequities that servicewomen married to civilians or other service members have suffered, dealing with quarters allowances and other benefits and privileges have been corrected.

4. Proposed New Military Non-Disability Retirement Plan: To date, Congress has ignored this controversial package. If the lawmakers ever consider it, AFA urges them to carefully weigh the measure's impact on morale before taking action. Defense's Military Manpower Commission is reviewing.

5. Low-Cost Housing / Mobile Homes for Airmen Under E-4: For the first time in history, the FY '75 military construction program calls for 3,000 new family housing units (800 for USAF) for married lower graders. USAF, which prefers this route, regards trailers as substandard housing.

After years of work, SMSgt. Tom Fowler was recently awarded a doctorate in sociology from the University of Arizona. The twenty-one-year veteran, currently senior airman adviser of the 4600th AB Wing, Peterson Field, Colo., attended fourteen colleges to make this possible, during which he took a BA in economics and an MA in science. During his career, he's received sixty-two letters of commendation.



6. BAQ Scale to Cost of Living Index in Different Geographical Locations: A stateside Variable Housing Allowance, this plan is dormant because of its large price tag.

7. Support for Air Force Enlisted Widows' Home Foundation: AFA continues to support strongly this worthy project.

8. CHAMPUS Authorization for Retirees over Age Sixty-five: CHAMPUS and other military health care programs for dependents and retirees are undergoing high-level scrutiny. Results of the probes may trigger more reductions—not improvements—in health care for military retirees.

9. Improvement of the Military Survivors' Benefit Program: Legislation to improve the Civil Service SBP, on which the military's is modeled, has passed the House and Senate in different forms. When a compromise emerges and acceptance of the military SBP can be more accurately determined, firm plans for improving it can be pursued.

10. Viability of the Air National Guard and Air Force Reserve: The components have improved their recruiting in recent months. AFA Headquarters continues to urge its State and Chapter organizations to help the ANG and AF Reserve sign up high-quality members.

11. Maintaining Adequate Medical Capability: The recently approved medical officers bonus legislation, PL 93-274, should help.

12. Performance Rating System: The Civil Service Commission is considering replacement of the Performance Rating Act with a simplified program for more effective evaluation of employee performance.

13. Civilian Employee Mobility: This plan, which the Defense De-

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partment is considering, would provide a government-paid move on retirement.

14. Disability Retirement: This Defense-backed proposal would grant lump-sum payments for employees on retirement for disability, thus permitting immediate replacement of key personnel leaving for disability. While legislation on this matter has been introduced in the House, congressional action is expected this year.

15. Payment of Travel Expenses for Civilian Presidential Appointees to First Duty Station and Return to Their Home of Record: Though support exists, formal legislation has not been introduced.

16. AFJROTC Support: This resolution urges high-priority USAF support for training aids, equipment, base encampments, etc., for the AFJROTC program. Air Force feels it is complying.

17. Point-to-Point Travel for AFJROTC: While USAF would like to provide AFJROTC cadets more flights on military aircraft, it notes fuel and energy restrictions, opposition to space-available flights, etc.

18. Franking Privilege for AFJROTC Units: Approved and being implemented. This should help enrollment and membership drives.

19. Award of E-3 Rank to AFJROTC Graduates Entering USAF: The Air Force has determined that, because of the current favorable recruiting climate, this action would be "inappropriate."

20. Increasing Air Force Junior ROTC Units: The Air Force favors expansion from 1,200 to 1,400 units. Defense is coordinating a proposal.

21. CAP Search Missions: Legislation to provide funds to expand CAP's air-search mission has been introduced. AFA supports it strongly.

22. Man in Space Historic Site: Legislation establishing the Historic Site at Cape Canaveral, Fla., has been introduced. But it obviously lacks high legislative priority status.

USAF Shaping RIF Plans

The Air Force officer reduction-in-force outlook, as of early August, appeared ever so slightly improved. Hq. USAF authorities held out the possibility that the earlier forecast of 2,200 RIFs during FY '75 might be reduced. It depends.

The first RIF of the fiscal year occurred in July when 496 company-grade non-Regulars were let go, leaving about 1,700 to be released late in the fiscal year.

Officials recently announced new voluntary early-out programs. The major new factor is that the exit chances for pilots wanting to leave are more liberal than heretofore. A large response from rateds and non-rateds requesting voluntary departure could reduce the force-out.

Headquarters expects to have a handle on the early-out requests by early fall. Also by then, congressional action on the FY '75 Defense Appropriations bill should be concluded, and Air Force should know exactly what, if any, personnel cuts the measure requires.

One highly favorable congressional action came when Congress, in the annual procurement authorization bill, okayed an end-FY '75 Air Force of 627,500 members. It rejected an earlier Senate-approved measure of 615,000 members, a force that would have meant a bigger RIF. The action represented a minor victory for USAF personnel and manpower officials who have urged Congress to halt the force cuts.

Whatever the size of the remaining RIF in FY '75, it is not slated to occur until June 1975.

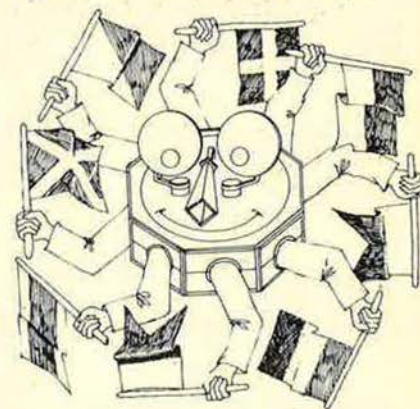
Short Bursts

Air Force, while planning a sizable RIF this fiscal year, will take on 3,966 AFROTC graduates, approximately half of whom are ROTC scholarship students. . . . Secretary John L. McLucas doesn't spare himself in giving the Air Force story important exposure: in one thirteen-



Col. Ben H. Settles, USAF (Ret.), executive vice president of Air Force Village, presents huge key to Mrs. Josephine V. Grier, as the 200th resident of the San Antonio retirement complex, now eighty-five percent occupied. Mrs. Grier is the widow of USAF Lt. Col. Robert L. Grier.

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The Bulletin Board

day period during July he delivered speeches in Georgia, California, and Missouri; and he's testified before congressional committees ten times in the past year. . . . McLucas says "Congress has treated us [Air Force and its people] very well."

Ninety-one percent of the Air Force active-duty officers are college graduates, and 1,200 of them hold doctorates (not counting equivalent medical or other professional degrees). . . . Last year the per-graduate cost of the three main sources of new Air Force officers had risen to the following: Officer Training School, \$6,500; AFROTC,

\$13,200 (scholarship students) and \$8,500 (non-scholarship); and Air Force Academy, \$80,000. . . . Mean-time, fewer airmen will be receiving commissions via OTS as Headquarters has reduced Airman Education and Commissioning program slots this fiscal year from 700 to 425.

Congress has held off further immediate cuts in generals' aides, but maybe not for long; while permitting 675 aides (all-services) at the moment, the lawmakers have directed the Pentagon to "study the need" for the aides and report the findings to Congress within three months, following which hearings will be held. . . . To help members beat the "pay inversion" problem (by retiring September 1 they will draw more retirement pay than if they departed October 1 or later), Hq. USAF said it would publish September 1 departure orders as late as August 31. ■



Angelo State University, Tex., AFROTC Cadets Richard J. Benton (left) and Deanna Miles are congratulated by Robert G. Carr on being named the first recipients of Carr scholarships at ASU. Mr. Carr has donated \$101,000 for AFROTC scholarships at the school. At right is Maj. Buford D. Graham, since 1971 ASU's Professor of Aerospace Studies.

\$101,000 in AFROTC Scholarships at Angelo State

A San Angelo, Tex., supporter of AFROTC, Robert G. Carr, has given Angelo State University a total of \$101,000 to create annual scholarships for cadets enrolled in the school's AFROTC detachment.

Mr. Carr, an Air Service instructor in World War I and a lieutenant colonel in World War II, also played a key role in getting the Angelo State unit established three years ago.

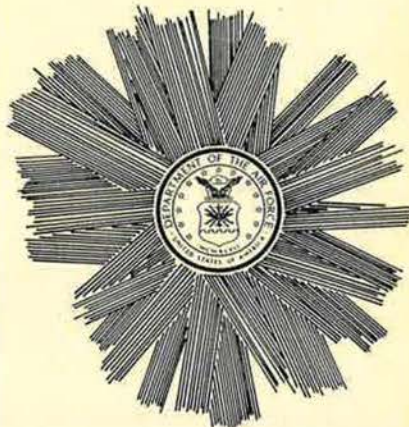
AFROTC Commandant Brig. Gen. Robert M. White, in accepting \$51,000 of Mr. Carr's gift on behalf of the ROTC unit recently, said it was the only private donation of its kind to an AFROTC outfit. Since then, Mr. Carr has given an addi-

tional \$50,000 for the scholarship fund. The total amount is expected to provide about thirty-four scholarships each year, worth \$200 to \$300 apiece. They would be awarded in addition to any other AFROTC scholarship recipients might otherwise receive.

First winner of one of the Carr scholarships is Cadet Richard J. Benton (see photo), an ASU student recently named commander of the cadet corps for the semester starting this fall.

Air Force officials hope other dedicated, security-minded citizens will follow Mr. Carr's example in helping produce high-quality military leadership for the future.

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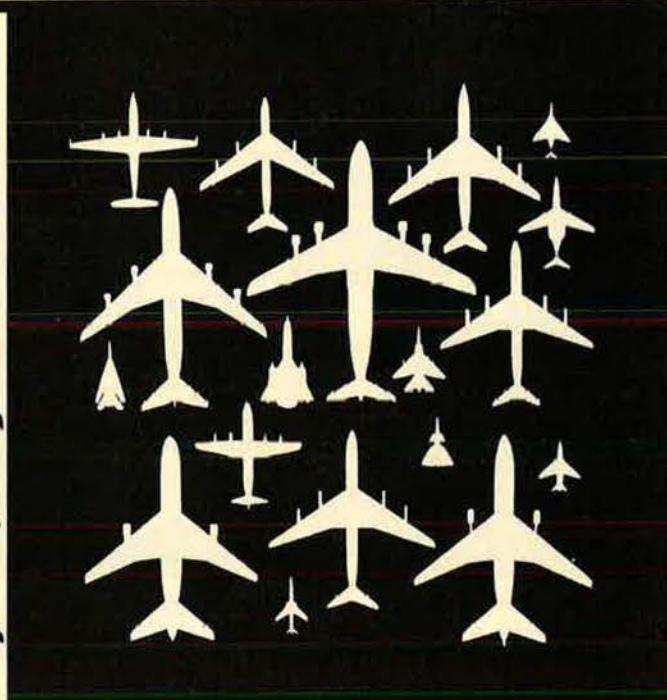
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Senior Staff Changes

PROMOTIONS: To be Lieutenant General: Marion L. Boswell; John J. Burns; Robert E. Hails; James E. Hill; Donald G. Nunn; Brent Scowcroft; Richard F. Shaefer.

RETIREMENTS: L/G Gerald W. Johnson; L/G Glenn A. Kent; B/G Jonas Lebell; M/G Douglas T. Nelson; L/G James E. Sherrill; and B/G Thomas B. Wood.

CHANGES: Col. (B/G selectee) James H. Ahmann, from Cmdr., 20th TFW, USAF, RAF Upper Heyford, England, to Cmdr., AF Eastern Test Range, AFSC, Patrick AFB, Fla. . . . M/G (L/G selectee) Marion L. Boswell, from Dir., Legislative Liaison, OSAF, to Asst. V/Chief of Staff, Hq. USAF, with add'l duty as Sr. USAF Member, Military Staff Committee, U. N. . . . M/G (L/G selectee) John J. Burns, from Cmdr., AF Test & Evaluation Ctr., Kirtland AFB, N. M., to Cmdr., US Support Activities Group, and Cmdr., 7th AF, PACAF, Nakhon Phanom, Thailand, replacing retiring Gen. Timothy F. O'Keefe.

M/G Richard G. Cross, Jr., from Dir., Operational Requirements & Dev. Plans, DCS/R&D, Hq. USAF, to Cmdr., AF Test & Evaluation Ctr., Kirtland AFB, N. M., replacing M/G (L/G selectee) John J. Burns . . . M/G Abraham J. Dreiszun, from Cmdr., Defense Personnel Support Center, DSA, Philadelphia, Pa., to Cmdr., AF Contract Mgmt. Div., AFSC, Kirtland AFB, N. M., replacing M/G Donald G. Nunn . . . Col. (B/G selectee) Frank M. Drew, from Asst. for General Officer Matters, DCS/P, Hq. USAF, to Cmdt., Air Command and Staff College, AU, Maxwell AFB, Ala., replacing M/G John P. Flynn . . . M/G Howard M. Fish, from Dir. of Budget, Air Force Comptroller, to Acting Dep. Asst. Sec. (Security Assistance) OASD (ISA) . . . M/G John P. Flynn, from Cmdt., ACSC, AU, Maxwell AFB, Ala., to Cmdr., AF Mil. Tng. Ctr., ATC, Lackland AFB, Tex., replacing M/G Robert W. Maloy . . . Col. (B/G selectee) David L. Gray, from Sp. Asst. to Asst. Vice C/S, to Exec. to C/S, Hq. USAF . . . M/G (L/G selectee) Robert E. Hails, from Cmdr., Warner Robins ALC, AFSC, Robins AFB, Ga., to V/C, Hq. TAC, Langley AFB, Va. . . . M/G (L/G selectee) James E. Hill, from Asst. DCS/P&O, Hq. USAF, to CinC, Alaskan Cmd., Elmendorf AFB, Alaska, replacing L/G James E. Sherrill, who is retiring.

M/G John R. Hinton, Jr., from IG, Hq. SAC, Offutt AFB, Neb., to V/C, 15th AF, SAC, March AFB, Calif., replacing M/G Charles F. Minter, Sr. . . . M/G Ralph T. Holland, from Asst. to Cmdr., to Cmdr., Warner Robins ALC, Robins AFB, Ga., replacing M/G (L/G selectee) Robert E. Hails . . . Col. (B/G selectee) Charles B. Knudson, from Dep. Dir. of



In this space last month, we reported, in error, that Lt. Gen. James D. Hughes was retiring. General Hughes, who took command of TAC's 9th AF, Shaw AFB, S.C., last December 1, was promoted to three-star rank on May 31, 1974, and is still very much on active duty. AIR FORCE Magazine regrets the error.

Transportation, DCS/Systems and Logistics, Hq. USAF, to Asst. Dir. for Installations and Logistics, NSA, Ft. George Meade, Md. . . . B/G Louis G. Leiser, from Cmdr. 23d Air Div., ADC, with add'l duty as Dep. Cmdr., 23d NORAD/CONAD Region, Duluth Int'l Airport, Minn., to Cmdr., 24th NORAD/CONAD Region, with add'l duty as Cmdr., 24th Air Div., Malmstrom AFB, Mont. . . . L/G George H. McKee, from Cmdr., 8th AF, SAC, Andersen AFB, Guam, to Cmdr., Hq. ATC, Randolph AFB, Tex., replacing L/G William V. McBride . . . M/G Robert W. Maloy, from Cmdr., AF Mil. Tng. Ctr., ATC, Lackland AFB, Tex., to V/C, Hq. ATC, Randolph AFB, Tex., replacing M/G Alton D. Slay . . . M/G (L/G selectee) Winton W. Marshall, from DCS/P&O, PACAF, to Vice CinC, Hq. PACAF, Hickam AFB, Hawaii.

M/G Charles F. Minter, Sr., from V/C, 15th AF, SAC, March AFB, Calif., to Cmdr., 8th AF, SAC, Andersen AFB, Guam, replacing L/G George H. McKee . . . M/G (L/G selectee) Donald G. Nunn, from Cmdr., AF Contract Mgmt. Div., AFSC, Kirtland AFB, N. M., to IG, Hq. USAF, replacing L/G Gerald W. Johnson . . . B/G Don D. Pittman, from Cmdr., 14th Air Div., 15th AF, SAC, Beale AFB, Calif., to IG, Hq. SAC, Offutt AFB, Neb., replacing M/G John R. Hinton, Jr. . . . M/G (L/G selectee) Richard F. Shaefer, from ACS/Ops, SHAPE, to Dep. Chairman, NATO Military Committee, Casteau, Belgium . . . M/G Alton D. Slay, from V/C, Hq. ATC, Randolph AFB, Tex., to Dir., Operational Requirements & Dev. Plans, DCS/R&D, Hq. USAF, replacing M/G Richard G. Cross . . . B/G Grant R. Smith, from Dep. Cmdr., 22d NORAD/CONAD Region, North Bay, Ontario, Canada, to Exec. Dir., Production, Contract Administrative Services, DSA, Cameron Station, Va.

B/G David W. Winn, from V/C, Sheppard TTC, ATC, Sheppard AFB, Tex., to Dep. Cmdr., 22d NORAD/CONAD Region, North Bay, Ontario, Canada, replacing B/G Grant R. Smith . . . B/G (M/G selectee) William B. Yancey, Jr., from Chief, Objectives Plans & Military Assistance Div., J-5, Jt. Staff, OJCS, to Dir., J-5, US European Command, Vaihingen, Germany.

—Compiled by Kathryn Foxhall

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MIA/POW Action Report

By William P. Schlitz

ASSISTANT MANAGING EDITOR, AIR FORCE MAGAZINE

League Convention

Despite the frustrating lack of progress in the MIA accounting situation, morale was surprisingly good at the recent League of Families national convention.

The MIA/POW organization's fifth annual meeting drew about 600 family members to the convention site in Omaha, Neb. Among those attending were a number of returned POWs.

During business sessions, members offered a series of recommendations on such important topics as new programs, financing, the League's future, and publicity projects.

League members also voted overwhelmingly for a demand to bring a complete halt to all presumptive findings of death in cases of those Americans still missing in Southeast Asia until all accounting procedures and possibilities have been exhausted. Heretofore, family members of SEA MIAs could request the respective service to review the evidence in the case of their missing man. This has led to a growing number of changes in status from missing to killed in action. The issue of status changes has proved both a legal and psychological tangle.

As the official list of MIAs has

dwindled, alarm among many family members has grown. The fear is that the more than 1,000 Americans will simply be written off as the US participation in the Southeast Asian war fades into memory. At the convention in Omaha, resolute League members rededicated themselves to keeping this key issue alive.

"We are aware that time is against us," said E. C. "Bus" Mills, an MIA father who was elected new Executive Director of the League. He replaces Col. Scott Albright, USAF (Ret.), who concluded his year as the top League official. (In a parting statement, Scott Albright cautioned against the divisiveness brought to League matters by presumably well-meaning but non-family "concerned citizens" who had taken to meddling in MIA/POW affairs. He called for a united front of League members, who themselves voted at the convention to keep the vote confined to family members only.)

"What is needed is a renewed effort by our government—particularly our congressional and executive branches," said Mr. Mills. "If the President and Secretary of State can travel all over the world to solve other countries' problems and make sure their POWs are accounted for, there is no question

that the issue of the US MIAs should have top priority, the promise of which has been made time and time again.

"It is beyond our understanding," said Mr. Mills in reference to lack of congressional support on the MIA issue, "how only twelve Senators could cosponsor an amendment that would deny favored-nation treatment and other benefits to countries until they put pressure on North Vietnam to abide by the Paris accords. And at one point, it looked as if Senator Fulbright would head a committee to go to Hanoi, but nothing has come of that yet.

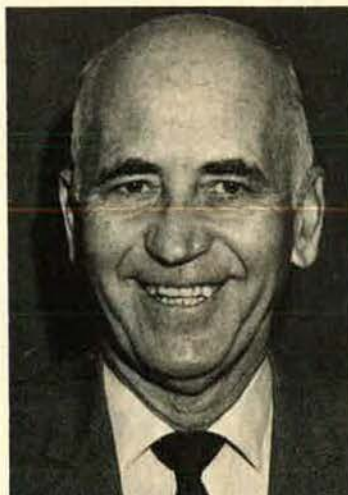
"For its part," Mr. Mills said, "the League intends to continue its worldwide campaign by asking other governments to bring pressure to bear on the North Vietnamese to accede to the accords. In this respect, our government could wield economic 'carrots' and 'sticks' to help bring this about.

"Regarding League finances," Mr. Mills went on, "it is no secret that we will have to have support if we are to remain active. Members have been asked to contribute \$5 per month if possible. Also, families have been urged to seek help from community civic organizations and local service clubs. One idea would be for American Legion and VFW posts and others to adopt a missing serviceman and contribute regularly to the League in his name [AFA Chapters, please note]. This would also provide an incentive for such groups to remain involved in the League's 'awareness' campaign, helping with letter-writing support and the like."

During the convention, nearly fifty League members indicated an interest in a trip to Laos or other areas in Southeast Asia. So, beginning in mid-September, groups of ten will travel to SEA at three-week intervals.

Hopefully, US and other media around the world will focus attention on them and other League efforts to conclude the stalemated MIA tragedy. ■

Born in Oklahoma but a long-time resident of California, E. C. "Bus" Mills was elected Executive Director of the League of Families at the recent national convention. His son, Navy Lt. Cmdr. James B. Mills, far right, went missing over North Vietnam on September 21, 1966.



Airman's Bookshelf

Strategic Analysis

Strategic Survey 1973. The International Institute for Strategic Studies, 18 Adam St., London WC2N 6AL, England, May 1974. 104 pages. \$2.50 post-paid.

This eighth annual survey of international developments throughout the world is one of the best yet published by the prestigious International Institute for Strategic Studies. By way of narrative, analysis, tables, maps, and chronologies, the *Strategic Survey* provides indispensable background for both military and civilian students and observers of international affairs.

Nearly half the current *Survey* is devoted to the causes, course, and consequences of the Middle East War, including a close look at military lessons of that war, its impact on the superpowers, and on relations between the United States and Western Europe.

So far as Soviet relations with the other two largest powers are concerned, the *Survey's* authors observe that, despite détente, US-USSR tensions grew rather than declined in 1973, and that the USSR probably will tolerate the growth of China's nuclear power rather than attempt to destroy it.

Other sections of the *Survey* deal with Southeast Asia—particularly the continued struggle in Vietnam; insurgencies in South Africa; and the situation in Chile following overthrow of the Allende government.

Seven detailed chronologies list important events of 1973 by geographic areas. The tables contain a great deal of hard-to-find information on military forces, oil production and shipping, arms agreements, and Mideast War order of battle.

—JLF

Quoth the Raven

The Laotian Fragments, by John Clark Pratt. Viking Press, New York, N. Y., 1974. 245 pages. \$7.95.

Lt. Col. John Pratt, an English professor at the US Air Force Academy, depicts the 1970 air war in

Laos with great authority. He was himself assigned there with Project CHECO (Contemporary Historical Examination of Combat Operations), one of a small group of hand-picked officers selected to document what went on as faithfully as possible. But this is not a history book—it is a novel.

The time frame is late 1969 to the spring of 1970, though the exact year is never mentioned. Maj. Bill Blake is transferred from South Vietnam to Laos to complete his combat tour as chief of the Raven forward air controllers, small-plane experts with the tremendous responsibility of directing air strikes in a war rife with political implications and operational strictures.

Pratt advances his narrative through a collection of intelligence reports, airborne intercom and radio transcripts, personal letters, memos, Senate hearings, and other documents. Blake sends these fragments to York Harding, his former teacher and a political science professor, who edits them after Blake is MIA. This framework reveals Harding as the kind of American abstract intellectual who understands very little of the SEA war, or of the men fighting it.

Blake doggedly pursues his job despite difficulties with Horowitz, the local CIA chief, Col. Jake Barnes, the air attaché, and others. The war is directed by Seventh Air Force, headquartered a nation away, but it often seems, as in Heller's *Catch-22*, that no one is really in control; hence the ideas and acts of the individual assume paramount importance. After a series of ground-action reversals, Blake flies a final armed combat mission and is shot down.

The book has no axe to grind—it's fiction, not propaganda. In his *Newsweek* review of May 27, 1974, Peter S. Prescott writes: "Blake has no opinion about the war—I'm fighting a war in the best way I know how"—nor does the author evince one. Pratt seems to feel that the better part of honor is not to question, but to proceed efficiently with whatever war there is." Prescott couldn't be more wrong, for Pratt raises a good many questions, not the least of which concerns not only this war, but war in general.

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Airman's Bookshelf

A prefatory quotation from Tolstoi suggests what the novel is really about: "There are two aspects to the life of every man: the personal life . . . and the elemental life of the swarm, in which a man must inevitably follow the laws laid down for him." You can take Pratt's use of these words straight, or ironically. Must we inevitably follow such laws? Are the laws real, or conditioned? The *Fragments* are the cosmic flotsam and jetsam that daily bombarded our consciousness and we, like York Harding, attempt to arrange them, to give them meaning: But what is meaning? What is truth? These things are, what Pratt really dares us to ask ourselves.

The novel is witty, at times depressing, perceptive—jammed with all the chaos and repelling attraction of life itself. The combat scenes are masterfully done, the characters vivid, the dialogue crisp and compelling.

The violence and pressures of men in combat blend believably with integrity, dedication, and a real love for the people and terrain for which they are fighting.

Anyone who has flown combat in SEA will readily identify with this work, and it is a pleasure to find a novel by an academician that is not bookishly self-conscious. Like all good fiction, it can be read quickly for pleasure, or lingered over; it wears well. The documentary narrative frame takes some getting used to and would pall if the novel were longer, but Pratt wraps it all up at just the right point.

Samuel Johnson says of Milton's *Paradise Lost* that, despite its excellence, no one ever wished it longer than it is. Because of its narrative frame the same can be said of John Clark Pratt's novel—but that puts it in pretty good company.

—Reviewed by Lt. Col. Joseph F. Tuso, Department of English, US Air Force Academy.

New Books in Brief

Aircraft Stability and Control for Pilots and Engineers, by Sqdn. Ldr. B. Dickinson. This is one of Pit-

man's Aeronautical Engineering Series, intended primarily as textbooks for students of aeronautical engineering. The author has been an exchange professor at the Air Force Institute of Technology. The contents, however, may be instructive to anyone interested in aeronautical problems. A knowledge of mathematics and physics is assumed, but an intelligent reader should have no difficulty following the main parts of the book. Pitman Publishing Corp., New York, N. Y., 1968. 660 pages with index. \$24.00.

Air Facts and Feats, by John W. R. Taylor, Michael J. H. Taylor, and David Mondey. This book is a listing of many of the "firsts," the "mosts," and the "only" facts and the people of aviation history up through rocketry and spaceflight. The volume is well illustrated with black-and-white and color photos, as well as drawings. It includes four appendices, a bibliography, and index. The Two Continents Publishing Group, New York, N. Y., 1974. 288 pages. \$8.95.

Air Power and the Fight for Khe Sanh, by Bernard C. Nalty. This is the story of the 1968 struggle by the American and South Vietnamese forces to hold the Khe Sanh base in northern South Vietnam. The author concentrates on the accomplishments of the Air Force during the seventy-day siege by North Vietnamese troops. Includes black-and-white photos, maps, and diagrams. Office of Air Force History, Washington, D. C., 1973. 134 pages.

The Atomic Energy Commission, by Corbin Allardice and Edward R. Trapnell. Both authors have served as advisers to the Atomic Energy Commission. They cover the reasons for the establishment of the Commission and its history. The book, one of a series on US government departments and agencies, also explains the present-day organization, its relationship with Congress, continuing research, and questions of national security. Praeger Publishers, Washington, D. C., 1974. 237 pages with index. \$10.00.

Comparative Defense Policy, edited by Frank B. Horton III, Anthony Rogerson, and Edward L. Warner III. Comprised of forty-five articles written by specialists in their fields, the book is a comparative study of the defense policies of the major military powers. Conceived by Political Science faculty

members at the Air Force Academy as a companion to their text, *American Defense Policy*, the volume contains articles by such contributors as Morris Janowitz and Richard Neustadt. The book is organized in six parts: The Military Profession, Structure and Process, Military Doctrine, Force Posture, Weapons Acquisition, and the Use of Force. The Johns Hopkins University Press, Baltimore, Md., 1974. 604 pages. \$17.50.

Fight for the Sky, by Douglas Bader. The story of the RAF's two best known fighters—the Spitfire and the Hurricane—and their battles against the Luftwaffe, told by a World War II ace. The history of the planes, from their birth, is interlaced with the experiences of Bader and his fellow pilots. Black-and-white and color photos. Doubleday, Garden City, N. Y., 1973. 192 pages. \$10.00.

Focke-Wulf, An Aircraft Album, by J. Richard Smith. This is a history of the development of the Focke-Wulf line of aircraft, from the first planes built by Wilhelm and Heinrich Focke, and Georg Wulf. It contains statistics and photos of the planes into this decade. Arco Publishing Co., New York, N. Y., 1973. 112 pages. \$4.95.

Free as a Bird, by Philip Wills. The author, who is president of the British Gliding Association, has combined the history of gliding over the forty years he has known it, and the history of the British Gliding Association, with discussions of the art of gliding. The book includes black-and-white photos and appendices. Barnes and Noble Books, New York, N. Y., 1974. 246 pages. \$13.50.

Justice Under Fire: A Study of Military Law, by Joseph W. Bishop, Jr. The author, a specialist in military law and a Professor of Law at Yale University, gives a cogent and balanced description of the history and present state of military law in the US. The main emphasis of the book is on military justice proper, the court-martial system. He also examines the war powers of the President and Congress and discusses the constitutional limits that the courts can place on such powers. Charterhouse, New York, N. Y., 1974. 317 pages with index. \$8.95.

The Last Offensive, by Charles B. MacDonald. The focus of this volume is on the role of the American

armies—the First, Third, Seventh, Ninth, and to a lesser extent the Fifteenth—the largest and most professional ground force ever put into the field by the United States. The part played by Allied armies—First Canadian, First French, and Second British—as well as that of the tactical air forces appears in sufficient detail to give perspective to this account of the final campaigns of the war. General Eisenhower's still controversial decision to halt at the Elbe is fully discussed and documented as are the intricacies of other command decisions. Center of Military History, US Army, Washington, D. C. 20315, 1974. 532 pages with foldout maps and index. \$15.20.

Listen, the War, edited by Lt. Col. Fred Kily and Lt. Col. Tony Dater. A collection of poems about the war in Vietnam, this book was sponsored by the Association of Graduates of the USAF Academy. Many of the poems were never meant for publication, but are well-expressed emotions by people connected with the war in one or many ways. The themes run through rejection of the war, grief, the longing for a loved one, patriotism, and the cynicism of the foot soldier. The \$2.00 price includes shipping, and all proceeds go to charity. Association of Graduates, USAF Academy, Colo. 80840. 160 pages.

The Origins and International Economics of Space Exploration, by Sir Bernard Lovell. An expansion of a lecture given at the University of Edinburgh, this book traces the history of rocketry from the concepts of Isaac Newton and the military rockets of the eighteenth and nineteenth centuries. Pointing out the major impetus military needs gave to space exploration, the author discusses the political and economic history of the US-USSR space race and explores the area of satellite communications, and the benefits of space exploration to science. Halsted Press, New York, N. Y., 1973. 104 pages. \$4.50.

The Peninsula Campaign, by Joseph P. Cullen. The Civil War capitals of the Union and the Confederacy were only about 100 miles apart. Thus, it was natural for the Union forces to attempt to take Richmond and end the war quickly. Lincoln appointed Gen. George B. McClellan to do this task. Cullen's book is the story of the failure of McClellan, which the author says was due to the General's incompe-

tence rather than the interference of Lincoln, and the story of the rise of Gen. Robert E. Lee. Stackpole Books, Harrisburg, Pa., 1973. 192 pages with index. \$8.95.

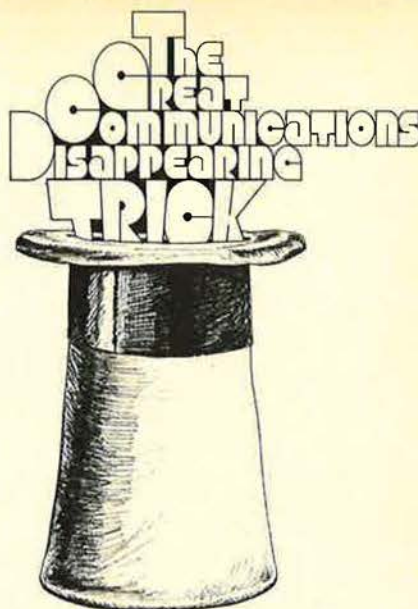
Research and Development and the Prospects for International Security, by Frederick Seitz and Rodney W. Nichols. This defense of tomorrow's military research and development starts with a discussion of possible future world situations and US policies. The authors present plans for development programs and for strengthening the case for R&D in the public mind. A valuable and useful appendix on the cost of defense research and development is included. Crane, Russak & Co., New York, N. Y., 1973. 75 pages. \$4.95.

Water Flying, by Franklin T. Kurt. This book is an introduction to water flying for land pilots who have never flown seaplanes, as well as a guide for water pilots who want to advance their skill. About two-thirds of the book is on the techniques of water flying, while the last third surveys the history, current design, and future of seaplanes. Macmillan, New York, N. Y., 1974. 272 pages with index. \$8.95.

Why Nations Go to War, by John G. Stoessinger. This recognized expert on international relations says of his early studies of the causes of war: "The conventional wisdom left me totally dissatisfied, both intellectually and emotionally. It somehow always missed the human essence of the problem." His book is an attempt to describe some of the problems of human personality that helped to bring about six wars in the twentieth century: World Wars I and II, Korea, Vietnam, the conflicts in India and Pakistan, and those in the Middle East. St. Martin's Press, New York, N. Y., 1974. 230 pages. \$8.95.

Three new books on famous military aircraft from Squadron/Signal Publications are: *F-106 Delta Dart in Action*, by Capt. Don Carson and Lou Drendel; and *The New Luftwaffe in Action*, by Peter Doll and Hermann Dörner. Each fifty pages, \$3.95. *Aces of the Eighth*, by Gene B. Stafford and William N. Hess, has sixty-four pages and is \$5.95. All are paperback, and have a history of the aircraft with a large number of photos and color plates. The Squadron Shop, 23500 John Rd., Hazel Park, Mich. 48030.

—By Kathryn Foxhall



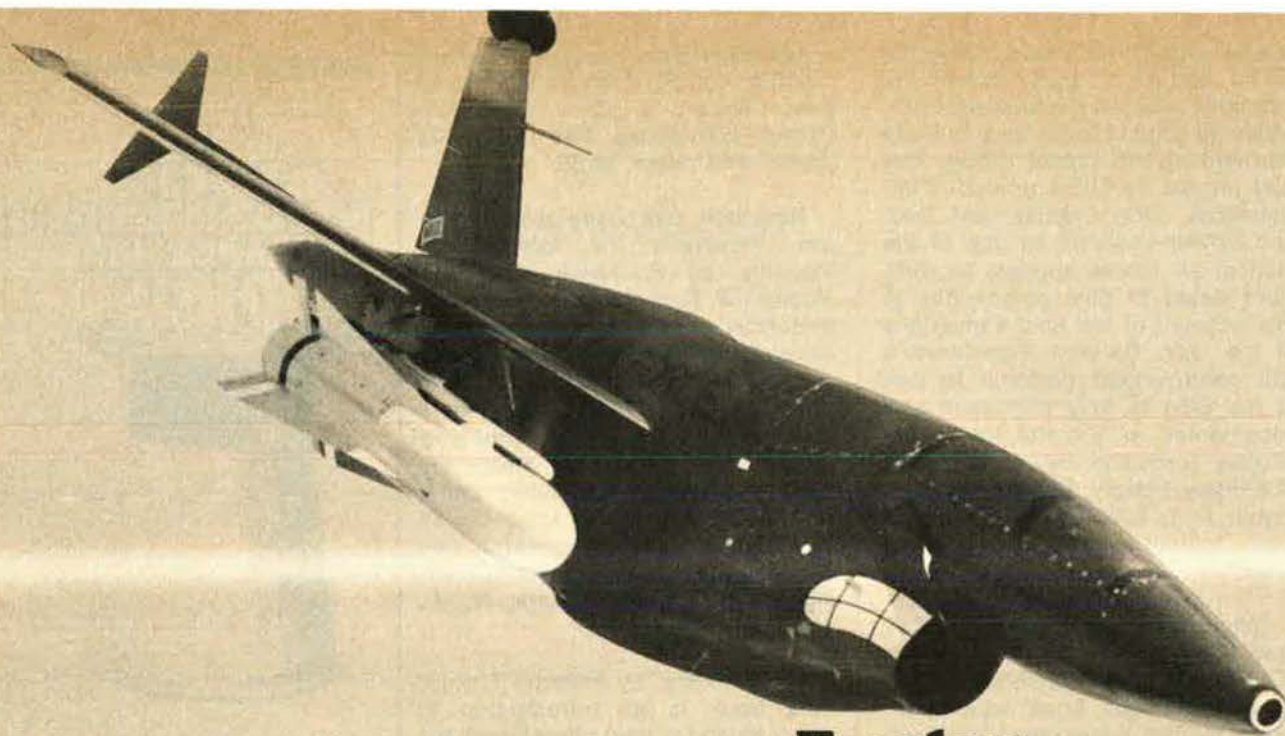
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A highly decorated Super Jolly Green pilot tells about "one of the toughest search and rescue missions" of the Vietnam War . . .

THE RESCUE OF BENGAL 505 ALPHA

**BY CAPT. DALE STOVALL,
USAF**

Seventh Air Force turned down our request for forty-eight fighters to clear out the guns. It was April 10, 1972. Every available fighter was targeted against North Vietnamese Army (NVA) troops and tanks surrounding An Loc. NVA reinforcements were still pouring across the DMZ. We were given two F-105 Iron Hand aircraft for anti-SAM coverage and a few F-4s.

The weather was bad, too. A forward air controller (FAC) in an OV-10 got into the area the first night and established voice contact with the survivor, but low ceilings prevented fighter strikes for the first day and a half. On the afternoon of the second day, the strikes couldn't quiet enough of the guns for us to risk the easy-target helicopters.

The weather improved on the third day. We made a try for the survivor, but new guns opened up and the helicopters never got past their holding point. Our hearts sank as we turned homeward and heard Capt. Dan Gibson, FAC in Nail 27, ordering area denial ordnance around the survivor to keep enemy troops away.

The next day, we were weathered out again.

We could imagine how the sur-

WHEN you're on rescue alert at Nakhon Phanom (NKP) RTAFB, Thailand, midnight phone calls mean trouble.

"Briefing at 0300 local," was all the dispatcher said.

The best I could hope for was that my helicopter and crew would be the one to make a "save." As it turned out, we didn't; but we had a box seat at one of the toughest search and rescue (SAR) missions of the war. And there was plenty of action to go around.

"This is going to be a real shoot-

out," one of the A-1 Sandy pilots told me after that first early morning briefing.

The objective was Bengal 505 Alpha, a Navy A-6A crewman who'd gone down on a night mission between Tchepone, Laos, and the demilitarized zone (DMZ). At least twenty antiaircraft artillery (AAA) sites and two surface-to-air missile (SAM) installations surrounded the survivor. An AC-130 had been downed by a SAM near Tchepone two weeks earlier. SAM sites were active all along the DMZ.



The author, Capt. Dale Stovall, is a 1967 graduate of the Air Force Academy. As an HH-53 Jolly Green pilot in SEA, he flew some of the deepest penetration rescue missions of the war, including the rescue of Capt. Roger Locher, who was shot down north of Hanoi in May 1972. Captain Stovall has been awarded the Air Force Cross, Silver Star with cluster, the DFC, and several Air Medals. He is now assigned to Hq. Aerospace Rescue and Recovery Service, Scott AFB, Ill.

vivor, Marine Corps Maj. Clyde D. Smith, must feel. He knew we were trying our damndest, but time was running out. The NVA troops were searching for him, and they had a good idea of his location. Things weren't going his way.

After four days of frustration and delay, we started the engines of our HH-53C Super Jolly Green Giant for another attempt. On a SAR scramble, we would probably have launched from the taxiway and done all of our planning in flight. But this wasn't that kind of mission.

Volunteer Mission

We taxied to the runway for a rolling takeoff, the SAR plan firmly etched in our minds from days and nights of conferences with other Jolly Green, Sandy (A-1H), and Nail (OV-10) crews. Intelligence and the Rescue Coordination Center had given us custom-tailored maps and all the data at hand. A lot of behind-the-scenes people have a hand in a SAR of this magnitude.

At liftoff we were near the Super Jolly Green's maximum gross weight of 42,000 pounds—12,000 pounds of it in fuel, enough for six hours of flight. Two converted F-105 center-line tanks each contained 650 gallons. This external supply could be jettisoned for maximum performance.

Ahead of us, Jolly Green 32, piloted by Capt. Ben Orrell, had the coveted "low-bird" position and would be the primary rescue helicopter. As "high" or back-up, our Jolly Green 62 would attempt immediate recovery of any rescue forces shot down.

When a mission broke, each crew tried to jockey into "low-bird" position and earn the satisfaction of saving a fellow American from capture or death. By mutual agreement—after heated but friendly discussion—today was Ben's turn.

We were all volunteers for the mission. The 40th Aerospace Rescue and Recovery Squadron commander had declared the mission "volunteer" because of the limited SAR resources and the very hostile environment. No one on the two alert crews backed out.

Neither did anyone in the other two HH-53s that would launch, along with six more A-1s, an hour and a half behind us. They would be the backup force if we had to pull out for fuel—or less desirable reasons—in mid-SAR.

The Super Jolly Green is not a high-performance aircraft, but it can outclimb the OV-10 and A-1 when all are near maximum gross weight at the start of a SAR. Cruising 120 to 130 knots fully loaded—less at higher altitudes—we sometimes passed the OV-10 when it was heavy.

En route to the initial holding point, the A-1s flew "lazy eights" around the two Jollys, watching for ground fire. Maj. Jim Harding in Sandy 01 would be on-scene commander.

The SAR Force Moves In

King 21, HC-130P, was already on station. It would be airborne mission commander for the SAR force and tanker for the helicopters. Everyone knew the plan by heart.

The A-1Hs and an OV-10 would go into the SAR area while the heli-

copters held safe west of the Ho Chi Minh Trail. The run-in would be in two stages: a twenty-six-mile-high altitude run across the western part of the NVA route structure to the "high bird's" holding point over a mountaintop; then a twenty-four-mile, low-level run across the eastern route structure for Jolly 32.

Keeping busy to ease the tension, the crew checked personal equipment—Air Force survival vest, pistol, AR-15 rifle, gas mask, and parachute. Each crewman wore an armored helmet and would don forty-five pounds of titanium body armor before the run-in. These preparations became very personal as the radios told us of strike activity in the SAR area.

A Jolly Green pilot must learn to separate four radio conversations—UHF, HF, VHF, and FM. The survivor and Sandy low (01) are on UHF, the helicopters and other A-1s on FM, and King works HF and VHF.

When we reached the holding point we could hear Dan Gibson, in his OV-10, talking to a flight of Navy A-7s. More than seventy Navy A-7s and F-4s had left "weathered-in" targets in the DMZ to help out. We had to attempt a run-in today while we had the extra support.

Just prior to crossing the trail, we refueled. The HC-130 came up from below and behind the helicopters and slowed to 110 knots, and both helicopters moved into holding position above and behind his wingtip. Ben was first to refuel from the eighty-one-foot hose. Then it was our turn.

We dropped behind and slightly above the gently swinging forty-two-inch drogue basket with our nine-foot refueling probe extended to eighteen feet. The tip of the probe was four feet in front of and seven feet below the six big rotor blades turning at 185 rpm. The air was choppy, but the Jolly Green is very stable, and we connected on first attempt. Hooked to the drogue, we climbed slightly above and behind the wingtip where we could draft off the King and use twenty percent less power to stay in formation.

Blade stall is a problem when refueling at altitude. If disconnect occurs with the helicopter almost full, the combination of altitude and weight makes it very difficult to attain 15 knots overtake speed. The

HH-53 begins to shudder and shake, threatening any loose tooth fillings, but there is ample warning before the helicopter goes out of control.

Refueling complete, both crews ran our combat checklists: landing gear lowered and isolated from the rest of the hydraulics to prevent leakage from small-arms hits; aircraft commander monitoring UHF only; the three Miniguns test-fired at both 2,000- and 4,000-round-per-minute settings.

We also had two M-60 machine guns aboard in case we were forced down and the electrically powered Miniguns became useless.

The clamshell doors on the front of each engine were closed against the debris which would be generated by the eighty-knot rotor downwash of the helicopter in a fifty-foot hover. The flight mechanic readied the hydraulic hoist with the heavy forest penetrator at the end of its 240-foot steel cable.

The crew donned body armor, and the pilots pulled the armored wings of their seats forward. Instinctively, we sat a little deeper in

the seats. The floor of the cockpit and the major control systems and transmissions are protected by 1,300 pounds of titanium armor plate—effective against small-arms fire. The Minigun on the back ramp sits in a titanium tub to shield the gunner.

The Guns Come Up

Both helicopters drew 57-mm fire as we crossed the trail, and we finally reached our holding point by dodging from cloud to cloud. From 14,000 feet, we could see a tracer-filled sky and smoke from the bombs as the Sandys and Air Force and Navy F-4s and A-7s started their bomb runs only seconds apart.

Dan Gibson was a busy FAC.

"Start your run-in, Jolly," ordered Harding as he sent Sandy 02 to lead the helicopter in.

Ben made a twisting autorotation to treetop level. Banking and using power to prevent rotor overspeed, he dropped at more than 6,000 feet per minute. In case of loss of power,

a helicopter pilot can autorotate to a safe landing by gaining lift from the inertia built up in the rotor system. In full autorotation, the Super Jolly drops at 4,500 feet per minute. We wore parachutes because a hit in the transmission case could cause loss of cooling oil and resultant transmission failure in less than sixty seconds.

Jolly 32 was above its red line of 170 knots as Ben skimmed the trees, "jinking" to keep the enemy gunners guessing. Eighteen miles out two 57-mm guns opened up. The A-1s hit one, and the other called it quits.

Eight Navy A-7s laid 500-pound bombs on both sides of the helicopter to form a corridor. Air Force F-4s sprinkled antipersonnel, delayed-action cluster bombs ahead of the Jolly to force the enemy into cover.

"Jolly, hold your position!" Harding spotted a trap as three 23-mm guns and automatic weapons fired into the helicopter's path just three miles from the survivor.

The big helicopter swung into a

The end of a successful rescue mission. Former Secretary of the Air Force Harold Brown called the work of ARRS crews "one of the most outstanding human dramas in the history of the Air Force." ARRS crews made 2,624 combat saves in SEA.





Big, tough, and heavily armed, the Sikorsky Jolly Greens often had to fight their way into and out of rescue areas to make seemingly impossible saves. The Aerospace Rescue and Recovery Service crews who manned them were among the most decorated airmen of the Vietnam War.

tight seventy-degree bank over a small hill, and a polka-dot light pattern criss-crossed the cabin floor as small-arms fire from a bunker fifty feet below opened holes in the Jolly's skin. Sgt. Bill Brinson was hit in the knee before he silenced the ground fire with the rear Minigun.

Twenty-one miles away, at our operating ceiling at 16,000 feet, our hearts stopped at the "hold" order. The heater wasn't working and it was below freezing in the cabin—but we were sweating. Someone else would be hit if we didn't get the SAR over soon.

SAM sites on both sides of us had turned on their radars. Hypoxic from the altitude, we missed the significance of two calls of "Shrikes away" as the Iron Hand F-105s knocked out both radar vans. We worried until we were out of range.

"Pop Your Smoke"

"Let's go, Jolly."

Far ahead, Sandys 02, 03, and 04

had wiped out the NVA trap and laid down a smoke corridor with white phosphorous bombs. The big "low bird" roared toward the survivor as Ben called, "Pop your smoke, Bengal. Pop your smoke!"

A1C Bill Liles, flight mechanic and hoist operator, directed the pilot into a hover over a spot on the side of the ridge where red smoke was coming up through sixty-foot trees. He lowered the forest penetrator to the ground.

On the ground and further down the ridge, Major Smith watched helplessly as his smoke drifted under the jungle canopy before rising into the trees about fifty yards uphill.

As the helicopter hovered above the only smoke the crew could see, Smith scrambled and clawed his way through the dense jungle in an adrenalin-charged drive toward the life-saving penetrator.

"Ground fire! Ground fire! Nine o'clock. Top of the ridge!"

A1C Kenneth Cakebread in the

left window saw NVA firing down on the helicopter, but couldn't return fire because the Miniguns can't be elevated to shoot through the rotor path.

Careful of the suspended hoist, Captain Orrell turned the helicopter to bring the tailgun to bear, simultaneously calling for fighters. The injured Sergeant Morrow returned fire just as a Sandy dove on the ridge, 20-mm cannon blazing.

Frustrated, Orrell ordered Liles to retract the hoist for another try at locating the survivor. Then came Liles' surprised voice as the penetrator cleared the trees with a man dangling from the cable.

Jubilantly, Liles pulled Smith aboard and stowed the penetrator—its three seats and straps still neatly folded.

Smith had reached the cable just as the penetrator cleared the ground. Ignoring the limbs and debris swirling around him in the rotor wash, he snapped a mountain climber's link from his survival vest to the penetrator as it was pulled skyward at 200 feet per minute.

"Survivor's on board. We're coming out!"

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and cost challenges.

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Rough Return

Orrell started a maximum power climb up the ridge and pushed the aircraft to 170 knots for five miles of treetop flying before popping up to follow Nail 27 across the trail.

At 1,500 feet, 23-mm tracers streamed across the cockpit. The copilot, 2d Lt. Jim Casey (left seat in the HH-53), called the gun's position and A1C Cakebread's Minigun poured its thin stream of red into the site.

More and bigger guns opened up, and the SAR force was under fire until the HH-53, OV-10, and A-1s broke into the sunlight at 12,000 feet. King 21 made his roll call and told home bases that all SAR force and fighter planes were accounted for.

Five miles behind the main force, we were experiencing a "high" of joy and hypoxia.

"Ground fire! Five o'clock!"

I quickly broke left.

"Ground fire! Seven o'clock!"

"Break right! Break right!" yelled Capt. Jim Bruner, my copilot.

Three 57-mm guns were firing at us. Despite the efforts of our pararescuemen, SSgt. Chuck Morrow and SSgt. Gary Osborne, the Miniguns were ineffective at 15,000 feet.

I yelled for the Sandys as four red balls of flame rose in formation and exploded on both sides of the helicopter. SSgt. Harry Cash, the

Editor's Note: Capt. Ben Orrell received the Air Force Cross for the rescue of Bengal 505 Alpha. The rest of his crew were awarded Silver Stars. Sergeant Brinson also received the Purple Heart. Each member of the Jolly Green 62 crew, including Captain Stovall, was awarded the Distinguished Flying Cross.

flight engineer (seriously wounded on a later mission) told me to keep my altitude since most of the shells were exploding below us.

It seemed like a lifetime before two beautiful A-1Hs came into view. The guns went quiet as the Sandys fired smoke rockets into the pits. At seventy-two knots indicated airspeed, time passed slowly until we reached a nonhostile area.

Even then, our luck didn't improve a lot. Encountering thunderstorms, we were forced to fly along the Mekong River through the driving rain at eighty knots, fifty feet above the water. Jim watched the bank, and I watched the radar altimeter. The HH-53's altitude controls can be coupled to the radar altimeter so we wouldn't fly into the water if we lost our references.

We broke out ten miles from the base. The Sandys, having flown over the storm, were waiting for us to join them for the traditional low-

level-formation pass over the flightline where hundreds had gathered as word of the successful mission spread.

Pop Your Corks

We landed first so Ben's bird could be checked for damage on the taxiway. I signaled to the crew chief that his machine was okay, applied the rotor brake to stop the blades in a few seconds, and rushed across the flightline.

A typically tough pararescueman, Sergeant Brinson was brushing aside offers of assistance as he climbed out.

Smiling and weary, Major Smith was already in the ambulance.

The crew was being doused in a shower of champagne.

The maintenance men were fingering the bullet holes and shaking their heads at an aircraft that could take such punishment and come home with all vital systems intact.

The Super Jolly Green Giant is a fantastic machine. Ask the man who's flown one on a combat rescue. Better yet, ask the man who's ridden one home after an otherwise bad day.

We had a party that night in honor of Maj. Clyde Smith. We had a party after every rescue. And we drank a toast to those who hadn't been so lucky. We always did that, too. ■

WHERE ANGELS FEAR TO TREAD

During Big Brawl #2, those of us who were tied to a desk at Eastern Flying Training Command, Maxwell Field, found it difficult to get in our flying time. We grasped every opportunity to get airborne.

One afternoon a fellow staff member, Lt. Col. Jerry Hall, phoned and told me he had a "ship" for a short hop. Down on the flight line, I found Jerry by a brand-new B-29. "Great," I thought as we climbed to the cockpit, followed by a staff sergeant who was a veteran flight engineer.

Jerry motioned for me to take the left seat. I protested, but he insisted so I gave in and started a study of the dials, gadgets, and checklist.

With considerable help from our flight engineer, we started the engines, contacted the tower, taxied to the end of the runway, and made our runup. Jerry insisted, again under protest, that I make the takeoff.

Using what technique I had as a short-time B-17 jockey, I coaxed the big beast up and, after cruising around for about an hour, managed "an arrival" back on the Maxwell runway.

Climbing out of the cockpit, Jerry asked me how much time I had in '29s. "None," I replied. "My God!" cried Jerry, "I thought you'd been checked out! I've never even been in a '29 cockpit before."

Lady Luck and a dedicated flight engineer had done a great job.

—Contributed by Col. Harry D. Copland, USAF (Ret.)

(AIR FORCE Magazine will pay \$10 for each anecdote accepted for publication.)

With more than 500 military, civic, industrial, and AFA leaders, family members, and girl friends in attendance, the Air Force Academy's 27th Cadet Squadron—the men who “put it all together best”—was saluted at AFA's . . .

15th Annual Outstanding Squadron



Standing by the Air Force Association's trophy for the Outstanding Squadron of the Air Force Academy are, from left, AFA Board Chairman Martin M. Ostrow; Cadet Lt. Col. Jeffrey W. Lee, Fall Term Commander of the 27th; Cadet Lt. Col. Douglas R. Pelton, the 27th's Spring Commander; the Winter Commander, Cadet Lt. Col. Mark R. Bell; and AFA National President Joe L. Shosid.



Program participants included, from left, Col. Robert D. Beckel, Class of 1959, the Academy's first cadet wing commander; Lt. Gen. Albert P. Clark, Air Force Academy Superintendent; and the master of ceremonies, the Hon. Howard T. Markey, Chief Judge of the US Court of Customs and Patent Appeals, and a former AFA National President.

FOR THE fifteenth year, aerospace and AFA leaders from throughout the country, leaders in the Colorado Springs community, fathers of the cadets, and, for the second consecutive year, mothers, sisters, and girl friends attended the annual dinner cosponsored by the Air Force Association and its Colorado Springs Chapter to honor the Air Force Academy's "Outstanding Squadron." This year, the 27th Cadet Squadron was saluted as the best of the Academy's forty squadrons.

Although scheduled to "quarterback" the event, Roger Staubach, of the Dallas Cowboys, was unable to attend because of surgery. Members of the Squadron and the audience were privileged to listen in on a most interesting and entertaining telephone call from AFA President Joe L. Shosid to Roger at his home in Dallas. Then, the Hon. Howard T. Markey, Chief Judge of the US Court of Customs and Patent Appeals, a major general in the Air Force Reserve and a former AFA National President and Board Chairman, filled in as master of ceremonies.

Brief remarks were made by Gen. Lucius D. Clay, Jr., Commander in Chief of Continental Air Defense Command and of North American Air Defense Command; Lt. Gen. Albert P. Clark, Superintendent of the Air Force Academy; Col. Robert D. Beckel, Aide to the Chairman of the Joint Chiefs of Staff, and the Academy's first cadet wing commander, Class of 1959; and Cadet Lt. Col. Douglas R. Pelton, the Spring Term Commander of the 27th Squadron.

—By Don Steele

Dinner



Among the many AFA leaders attending the dinner were, from left, Mrs. Haug; AFA's National Chaplain, Rev. Msgr. Rosario L. U. Montcalm, Col., USAF (Ret.); AFA National Director Edward T. Adder; and Roy A. Haug, Vice President for AFA's Rocky Mountain Region.



During the reception, AFA leaders, from left, AFA Executive Director James H. Straubel; Maj. Gen. M. J. Ingelido, USAF (Ret.), President of the Colorado Springs Chapter, cosponsors of the dinner; and AFA National President Joe Shosid visit with Gen. Lucius D. Clay, Jr., Commander in Chief of the Continental Air Defense Command and of North American Air Defense Command.

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AFA News

By Don Steele

AFA AFFAIRS EDITOR



Gen. Samuel C. Phillips, Commander, Air Force Systems Command, headquartered at Andrews AFB, Md., the guest speaker at the New York AFA's Convention Banquet, visits with New York AFA President and AFA National Director Gerald V. Hasler, who, for the second consecutive year, was named the State AFA's "Man of the Year" at the Awards Luncheon. Mrs. Hasler was named the State AFA's "Woman of the Year" at the luncheon, and, during the business session, Mr. Hasler was reelected for another term.



At the New York AFA's Convention Awards Luncheon, recently held in New York City's Biltmore Hotel, Mrs. Bernt Balchen, widow of the pioneer Polar aviator, presents the State AFA's first "Bernt Balchen Award" to Herbert O. Fisher, then President of the Iron Gate Chapter, "for his significant contributions to aviation and the advancement of flight over the past forty-five years." Also shown are AFA National President Joe L. Shosid, left, the luncheon speaker, and New York President Gerald V. Hasler, right.

Brig. Gen. Robinson Risner, Commander, 832d Air Division (TAC), Cannon AFB, N. M., the guest of honor and speaker at the Colorado AFA's 1974 Convention held recently in Colorado Springs, visits with several award recipients. Shown are, from left, CMSgt. Tommy E. Fowler, Colorado AFA's "Outstanding Airman of the Year"; General Risner; Capt. Paul E. Hughes, Headquarters, Tactical Air Command, Langley AFB, Va., recipient of AFA's "Maj. Gen. Paul W. Scheldecker Award" as the "Outstanding Accounting and Finance Officer" in the USAF; and TSgt. Ira E. Stanley, Colorado AFA's "Top Air Force Recruiter."



More than 175 members and guests attended the Washington State AFA Convention in Spokane May 10-11. Lt. Gen. William F. Pitts, Commander, Fifteenth Air Force (SAC), was the guest speaker; incumbent President Lee Gomes was reelected; and the State AFA's "Airman of the Year" award went to SSgt. Edward K. Nieratko, 3636th Combat Crew Training Wing (Survival) (ATC), Fairchild AFB. In the photo, a group of AFA Convention Delegates pose at the entrance to the US Pavilion on "Air Force Association Day" (May 11) at EXPO '74.



During the Virginia AFA's recent convention in Alexandria, AFA National President Joe L. Shosid, second from right, the guest speaker, congratulates incoming State AFA President Lester Rose. Looking on are, from left, AFA National Secretary Martin H. Harris; outgoing State AFA President Jack Wages; and, on the far right, A. A. "Bud" West, Vice President for AFA's Central East Region. The Northern Virginia Chapter hosted the Convention, and its President, Thomas Anthony, was the master of ceremonies.



CHAPTER AND STATE PHOTO GALLERY



Art O. Fisher, right, outgoing President of the Iron Gate Chapter, welcomes several table guests to the Chapter's June 25 luncheon meeting at New York City's famous Club. Head-table guests included, from left, AFA National Director J. Gilbert Eaton, Jr.; Brig. Gen. Guy E. Halston, Jr., Director, USAF Office of Information; William Bailey, incoming Chapter President; and the guest speaker, Gen. George S. Brown, then USAF Chief of Staff (General Brown became Chairman of the Joint Chiefs of Staff on July 3).



June 4, AFA President Joe L. Shosid presented an AFA charter to the newly established General Joe C. Moffitt Chapter. Participants in the program included, from left, Colorado AFA President James C. Hall; Maj. Gen. Joe C. Moffitt, the Adjutant General Colorado, for whom the Chapter is named; Chapter President Charles T. Lopez; A. Haug, Vice President for AFA's Rocky Mountain Region; and Mr. Shosid, guest speaker.



During the recent Nation's Capital Chapter Reception, Gen. Richard H. Ellis, left, Air Force Vice Chief of Staff, visits with, from left, Rep. William E. Minshall (R-Ohio), Rep. O. C. Fisher (D-Tex.), Rep. Leslie C. Arends (R-Ill.), Mrs. Troutman, and Chapter President George Troutman. The three congressmen and Rep. Charles S. Gubser (R-Calif.) were the guests of honor at the reception.



AFA President Joe L. Shosid, the guest speaker at the Virginia AFA Convention, poses with State AFA leaders who were honored during the convention awards dinner. They are, from left, Lester Rose, incoming State AFA President; Tom Fowler, Langley Chapter President; Jon Donnelly, Richmond Chapter President; Mr. Shosid; George McKay, State AFA Organization Director; Jack Wages, outgoing State AFA President; and Tom Anthony, Northern Virginia Chapter President, recipient of the Virginia AFA's "Man of the Year" award.

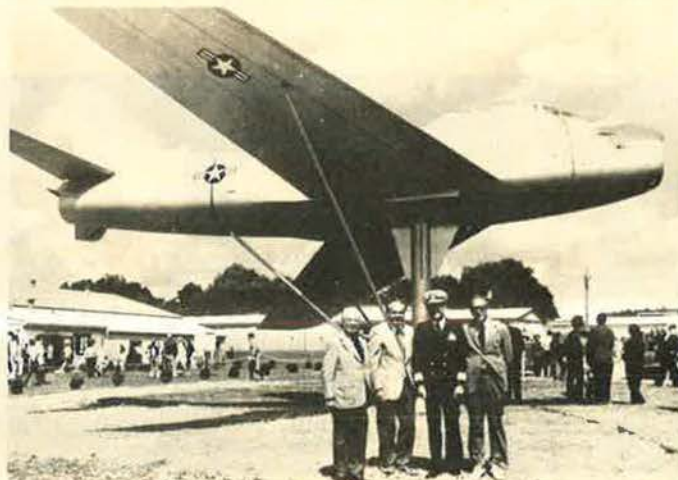


Enjoying the accolades being tossed to them during the short program at the Nation's Capital Chapter Reception held in their honor, are, from left, Rep. Charles S. Gubser (R-Calif.), Rep. O. C. Fisher (D-Tex.), Rep. Leslie C. Arends (R-Ill.), and Rep. William E. Minshall (R-Ohio). The four congressmen were honored on the occasion of their pending retirement from the Congress.

AFA News



Participants in the recent presentation of a plaque commemorating the installation of carpeting in Offutt AFB's largest dining hall, included, from left, Brig. Gen. Thomas M. Ryan, Jr., Ass't DCS/Logistics, Headquarters SAC; Col. John H. Vincent, Offutt AFB Commander; Nebraska AFA President Lyle Remde; and State and Ak-Sar-Ben Chapter Secretary Frank Kaultman. The carpeting was made possible by a donation of \$5,500 from the State AFA and the Chapter. Over the past several years, more than \$30,000 has been donated by the two AFA units to Offutt AFB for improvements not covered by appropriated funds.



More than 1,300 people attended the Beaver Valley Chapter's All County Memorial Day Service at Beaver County Airport, Pa., on May 27. During the program, a surplus F-86 was dedicated as a memorial to all the war dead of Beaver County. The F-86 was obtained from the Air Force by the Chapter, and the project of transporting and refinishing it was accomplished by Chapter members. Participants in the dedication ceremony included, from left, AFA National Director Carl J. Long; Chapter President Deane Sterrett; Rear Adm. J. R. Rohleder, USNR, the dedicatory speaker; and Tom Fry, a Past President of both the Chapter and the Pennsylvania AFA, who initiated the project.



Lt. Gen. James T. Stewart, left, Commander, Aeronautical Systems Division (AFSC), and Edward Nett, President, AFA's Wright Memorial Chapter, confer at the podium before announcing the winners in the Fourth Annual Stewart Open Golf Tournament held at Wright-Patterson AFB, Ohio, on May 22. Cosponsored by ASD and the Chapter, the tournament was attended by more than 400 Air Force, industry, and AFA golfers. With a contribution to the Air Force Museum of \$3,000 from the net proceeds, the tournament has raised more than \$12,500 for the Museum in four years.



The Merced County Chapter's Second Annual Honors Night was held in the Castle AFB, Calif., Officer's Open Mess, with more than 250 members and guests in attendance. Maj. Gen. Charles I. Bennett, Jr., extreme right, Director of Plans, DCS/Plans & Operations, USAF, was the guest speaker. Head-table guests included, from left, then California AFA President Ben Snell; Mrs. Brodalski; AFA Princess Summer Bartholemew; Brig. Gen. R. N. Cody, Commander, 93d Bomb Wing (SAC), Castle AFB; Mrs. Snell; Mrs. Cody; and Chapter President Ted Brodalski. During the program, AFA awards were presented to outstanding officers and airmen from Castle AFB. General Bennett, one of the founders of the Merced County Chapter when he was Commander of the 93d, retired from active duty in July and is now living in Florida.



Tennessee AFA President James Carter, left, entertains a group of distinguished people prior to a recent meeting of AFA's H. H. Arnold Memorial Chapter at the Arnold Engineering Development Center (AFSC), Tenn. In the group are, from left, Mr. Carter; Chapter President Leonard T. Glaser; Col. Joseph W. Kittinger, the speaker; Mrs. Kittinger; AFA National Director Maj. Gen. Daniel F. Callahan, USAF (Ret.); and Col. J. F. Regan, Vice Commander, AEDC. Colonel Kittinger, who has been attending the Air University since his release from a Hanoi POW camp last year, described his high-altitude parachute jumps in the early 1960s.

PHOTO GALLERY



More than 200 members and guests attended the Monterey Bay Area Chapter's Annual Awards Banquet, which was held in Salinas, Calif., in June. Head-table guests included, from left, Lt. Col. Alfred M. Worden, USAF, Apollo-15 astronaut and guest speaker; Col. Belne Lay, Jr., USAF (Ret.), author of the novel Twelve O'clock High; Rep. Burt L. Talcott (R-Calif.); Col. Jesse P. Jacobs, Jr., USAF (Ret.), the master of ceremonies; and Col. Gregory "Pappy" Boyington, USMC (Ret.), WW II Marine Corps Ace and Medal of Honor winner. Awards were presented to outstanding Air Force students at the Defense Language Institute, Presidio of Monterey, and to individuals who have supported the Air Force and aviation activities in the area.



The Fresno Chapter, Calif., recently sponsored a luncheon and a dinner at which briefings on Soviet officer indoctrination were presented by Capt. Ioannas M. Vellianitis and Lt. William C. Lindahl, Air Force Foreign Technology Division, Wright-Patterson AFB, Ohio. Shown with the briefers are, from left, S. Samuel Boghosian, the Chapter's Director of Public Affairs; Captain Vellianitis, dressed in the uniform of a Russian Air Force officer; Lieutenant Lindahl; and Chapter President John "Ted" Fessel.

CORRECTION

Through an inadvertence, Robert C. Vaughan, a nominee for elective Directorship on the AFA Board of Directors for the coming year, was not listed on p. 94 of the August issue. Mr. Vaughan, a sales engineer residing in San Carlos, Calif., has served AFA as both a State and Chapter President in California and Illinois, as an elected National Director, and as a member of the Aerospace Education Foundation's Board of Trustees. Floyd Damman, who was listed, is not a nominee for elective Directorship on the AFA Board of Directors for the coming year. We sincerely regret this error and apologize to Mr. Vaughan and Mr. Damman.



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25-29	60,000	12,500	10.00	6,000	2,000	2.50
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35-39	40,000	12,500	10.00	6,000	2,000	2.50
40-44	25,000	12,500	10.00	5,250	2,000	2.50
45-49	15,000	12,500	10.00	4,050	2,000	2.50
50-59	10,000	12,500	10.00	3,000	2,000	2.50
60-64	7,500	12,500	10.00	2,250	2,000	2.50
65-69	4,000	12,500	10.00	1,200	2,000	2.50
70-75	2,500	12,500	10.00	750	2,000	2.50

20-24	\$100,000	\$12,500	15.00	\$6,000	\$2,000	\$2.50
25-29	90,000	12,500	15.00	6,000	2,000	2.50
30-34	75,000	12,500	15.00	6,000	2,000	2.50
35-39	60,000	12,500	15.00	6,000	2,000	2.50
40-44	37,500	12,500	15.00	5,250	2,000	2.50
45-49	22,500	12,500	15.00	4,050	2,000	2.50
50-59	15,000	12,500	15.00	3,000	2,000	2.50
60-64	11,250	12,500	15.00	2,250	2,000	2.50
65-69	6,000	12,500	15.00	1,200	2,000	2.50
70-75	3,750	12,500	15.00	750	2,000	2.50

* In the event of an accidental death occurring within 13 weeks of the accident, the AFA plan pays a lump sum benefit of \$12,500 in addition to the benefit, except as noted under AVIATION DEATH BENEFIT, above.

** Each child is covered in this amount between the ages of six months and 21 years. Children under six months are provided with \$250 protection once they are 15 days old and discharged from the hospital.

AVIATION DEATH BENEFIT: A total sum of \$22,500 under the High-Option Plan or \$15,000 under the Standard Plan is paid for death which is caused by an aviation accident in which the insured is serving as pilot or crew member of the aircraft involved. Under this condition, the Aviation Death Benefit is paid in lieu of all other benefits of this coverage.

CHECK THE ADVANTAGES OF THESE AFA PROGRAMS

Wide eligibility! If you're on active duty with the U.S. Armed Forces [regardless of rank], a member of the Ready Reserve or National Guard [under age 60], a Service Academy or college or university ROTC Cadet, you're eligible to apply for this coverage [see exceptions].

Keep your coverage at the low, group rate to age 75, if you wish.

Full conversion privilege. At age 75 [or at any time, on termination of AFA membership] the amount of insurance shown for your age group at the time of conversion may be converted to a permanent plan of insurance, regardless of your health at that time.

Disability waiver of premium, if you become totally disabled for at least nine months, prior to age 60.

Convenient premium payment plans. Pay direct to AFA or by monthly government allotment.

Reduction of cost by dividends. Net cost of insurance to AFA insured persons has been reduced by payment of dividends in eight of the last eleven years. However, dividends cannot, of course, be guaranteed.

Administered by insurance professionals on your Association's staff, for excellent service and low operating cost.

Planned for You

Both plans have been specifically designed to fill your particular needs. This is full-time, worldwide protection. There are no war clauses—no hazardous-duty restrictions, or geographical limitations on AFA life insurance protection. At AFA, our policy is to provide the broadest possible protection to our members, including those in combat zones.

Low Group Rates

And, as a member of AFA, you are able to secure this outstanding protection at low group rates. What's more, there's no increase in premiums for flying personnel. In fact, in most cases, flying personnel are entitled to full death benefits. Only when death is caused by an aircraft accident in which the insured was serving as pilot or crew member does the special Aviation Death Benefit take effect.

Higher Benefits for Young Families

The higher benefits for younger members make both plans particularly outstanding buys for the young family. The young family breadwinner can make a substantial addition to his life insurance estate at a time when his family is growing up—when his financial obligation to his family is at its greatest!

CHOOSE EITHER OF THESE GREAT PLANS! MAIL THIS APPLICATION TO AFA TODAY!

EXCEPTIONS:

Group Life Insurance: Benefits for suicide or death from injuries intentionally self-inflicted while sane or insane shall not be effective until your coverage has been in force for 12 months.

The Accidental Death Benefit and Aviation Death Benefit shall not be effective if death results: [1] From injuries intentionally self-inflicted while sane or insane, or [2] From injuries sustained while committing a felony, or [3] Either directly or indirectly from bodily or mental infirmity, poisoning or asphyxiation from carbon monoxide, or [4] During any period a member's coverage is being continued under the waiver of premium provision, or [5] From an aviation accident, military or civilian, in which the insured was acting as pilot or crew member of the aircraft involved, except as provided under AVIATION DEATH BENEFIT.

The insurance will be provided under the group insurance policy issued by United of Omaha to the First National Bank of Minneapolis as trustee of the Air Force Association Group Insurance Trust. However, because of certain limitations on group insurance coverage in those states, nonactive-duty members who reside in Ohio, Texas, Florida, and New Jersey are not eligible for AFA group life insurance coverage.

EFFECTIVE DATE OF YOUR COVERAGE

All certificates are dated and take effect on the last day of the month in which your application for coverage is approved. Coverage runs concurrently with AFA membership. AFA Military Group Life Insurance is written in conformity with the Insurance Regulations of the State of Minnesota.

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Group Policy GLG-2625
United Benefit Life Insurance Company
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Full name of member _____
Rank _____ Last _____ First _____ Middle _____

Address _____
Number and Street _____ City _____ State _____ ZIP Code _____

Date of birth Mo. Day Yr.	Height	Weight	Social Security Number	Name and relationship of primary beneficiary
------------------------------	--------	--------	------------------------	--

Please indicate category of eligibility and branch of service.

<input type="checkbox"/> Extended Active Duty <input type="checkbox"/> Ready Reserve or National Guard <input type="checkbox"/> Air Force Academy <input type="checkbox"/> ROTC Cadet	<input type="checkbox"/> Air Force <input type="checkbox"/> Other _____ (Branch of service) <input type="checkbox"/> _____ Academy Name of college or university
--	--

Name and relationship of contingent beneficiary _____

This insurance is available only to AFA members

☐ I enclose \$10 for annual AFA membership dues (includes subscription (\$9) to AIR FORCE Magazine).

☐ I am an AFA member.

Please indicate below the Mode of Payment and the Plan you elect.

HIGH OPTION PLAN			STANDARD PLAN		
Members Only	Members and Dependents	Mode of Payment	Members Only	Members and Dependents	
<input type="checkbox"/> \$ 15.00	<input type="checkbox"/> \$ 17.50	Monthly government allotment. I enclose 2 months' premium to cover the period necessary for my allotment to be established.	<input type="checkbox"/> \$ 10.00	<input type="checkbox"/> \$ 12.50	
<input type="checkbox"/> \$ 45.00	<input type="checkbox"/> \$ 52.50	Quarterly. I enclose amount checked.	<input type="checkbox"/> \$ 30.00	<input type="checkbox"/> \$ 37.50	
<input type="checkbox"/> \$ 90.00	<input type="checkbox"/> \$105.00	Semiannually. I enclose amount checked.	<input type="checkbox"/> \$ 60.00	<input type="checkbox"/> \$ 75.00	
<input type="checkbox"/> \$180.00	<input type="checkbox"/> \$210.00	Annually. I enclose amount checked.	<input type="checkbox"/> \$120.00	<input type="checkbox"/> \$150.00	

Names of Dependents To Be Insured	Relationship to Member	Dates of Birth			Height	Weight
		Mo.	Day	Yr.		

Have you or any dependents for whom you are requesting insurance ever had or received advice or treatment for: kidney disease, cancer, diabetes, respiratory disease, epilepsy, arteriosclerosis, high blood pressure, heart disease or disorder, stroke, venereal disease or tuberculosis? Yes ☐ No ☐

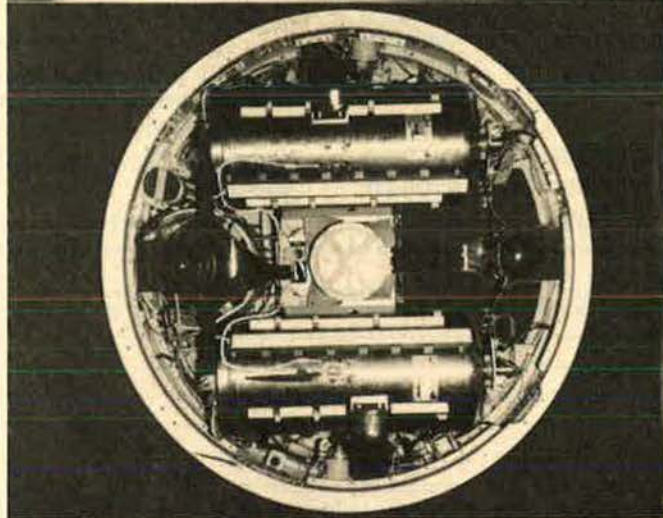
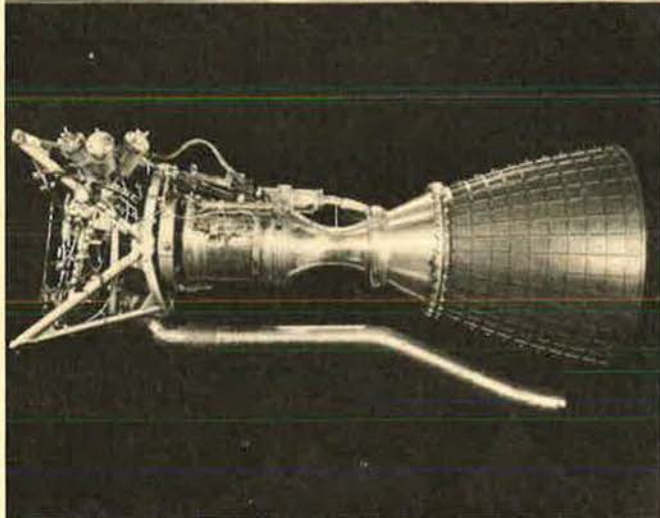
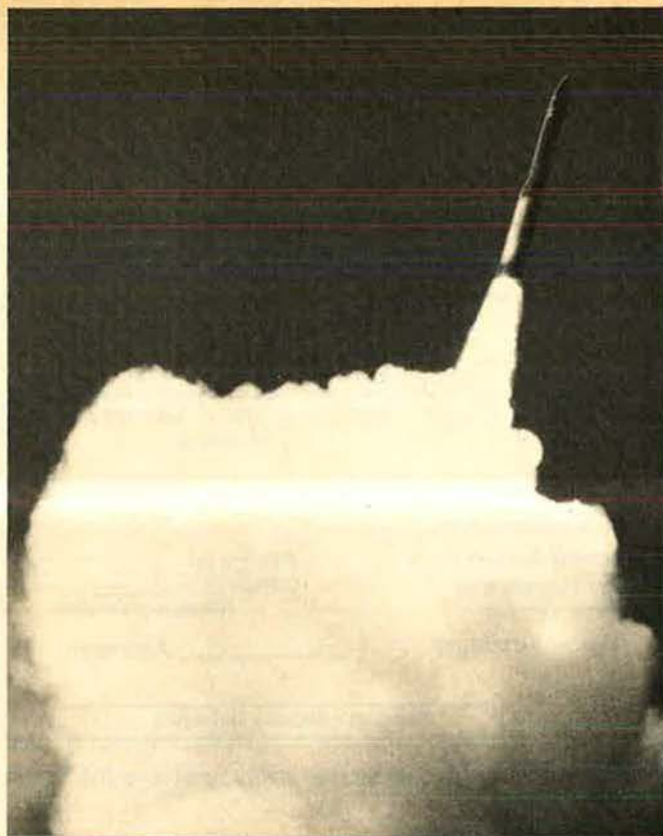
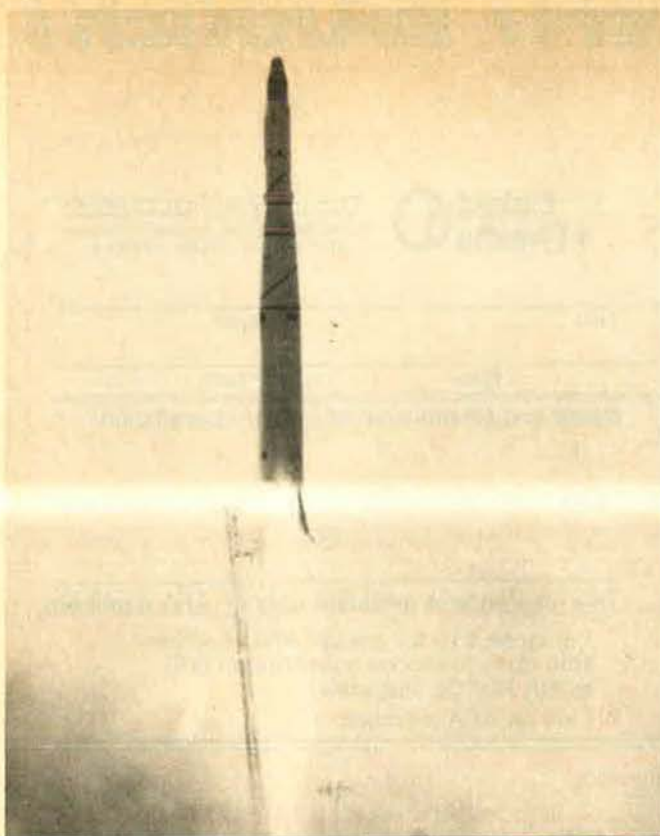
Have you or any dependents for whom you are requesting insurance been confined to any hospital, sanitarium, asylum or similar institution in the past 5 years? Yes ☐ No ☐

Have you or any dependents for whom you are requesting insurance received medical attention or surgical advice or treatment in the past 5 years or are now under treatment or using medications for any disease or disorder? Yes ☐ No ☐

IF YOU ANSWERED "YES" TO ANY OF THE ABOVE QUESTIONS, EXPLAIN FULLY including date, name, degree of recovery and name and address of doctor. (Use additional sheet of paper if necessary.)

I apply to United Benefit Life Insurance Company for insurance under the group plan issued to the First National Bank of Minneapolis as Trustee of the Air Force Association Group Insurance Trust. Information in this application, a copy of which shall be attached to and made a part of my certificate when issued, is given to obtain the plan requested and is true and complete to the best of my knowledge and belief. I agree that no insurance will be effective until a certificate has been issued and the initial premium paid. I understand United reserves the right to request additional evidence of insurability in the form of a medical statement by any attending physician or an examination by a physician selected by United.

Date _____, 19____
Member's Signature _____



Agena, The Workhorse

Fifteen years of highly reliable performance in hundreds of flights have earned the title "Workhorse of the Space Age" for the Agena rocket engine. A similar reputation is being built by the Minuteman III Propulsion System Rocket Engine (PSRE).

On the occasion of its 20th anniversary in July, the Space and Missile Systems Organization of the U. S. Air Force put it this way: "Seldom, if ever, in the history of military weapon systems has one been developed and used with such success as that enjoyed by the PSRE." This readiness and reliability means operational economy.

The PSRE and "The Workhorse" are products of Textron's Bell Aerospace Division: the company to be depended upon for reliable rocket engines and propulsion systems in the future.

textron Bell Aerospace
DIVISION

This Is AFA

The Air Force Association is an independent, nonprofit, airpower organization with no personal, political, or commercial axes to grind; established January 26, 1946; incorporated February 4, 1946.

OBJECTIVES

The Association provides an organization through which free men may unite to fulfill the responsibilities imposed by the impact of aerospace technology on modern society; to support

armed strength adequate to maintain the security and peace of the United States and the free world; to educate themselves and the public at large in the development of adequate aerospace

power for the betterment of all mankind; and to help develop friendly relations among free nations, based on respect for the principle of freedom and equal rights to all mankind.



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Kentucky



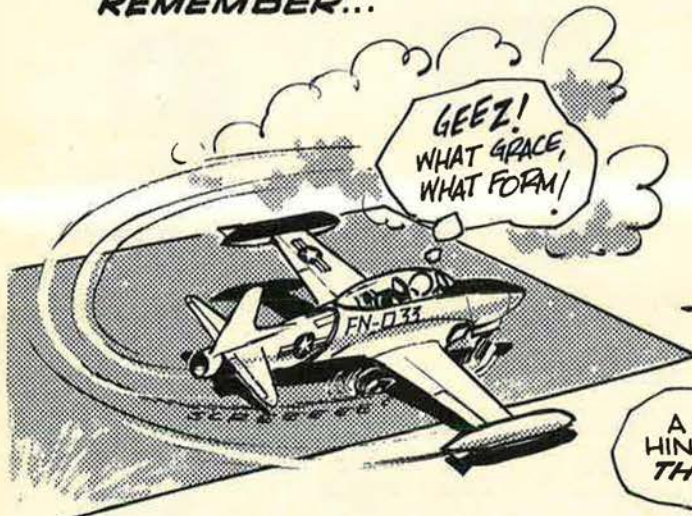
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Southeast Region
North Carolina,
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Georgia, Florida,
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Bob Stevens'

"There I Was..."

THE SAME YEAR THE USAF WAS BORN, THE FIRST TP-80C (RE-DESIGNATED THE T-33A) CAME OFF THE LINE. THE OL' "T-BIRD" HAS BEEN WITH US EVER SINCE and MANY A PILOT CUT HIS JET TEETH IN THIS VENERABLE MACHINE-

REMEMBER...



...A TAKEOFF ATTEMPT WITH THE NOSEWHEEL COCKED?

...SNOW IN THE COCKPIT- IN JULY? (IT WAS THE AIR CONDITIONER-PARTICULARLY ON HOT, HUMID DAYS)

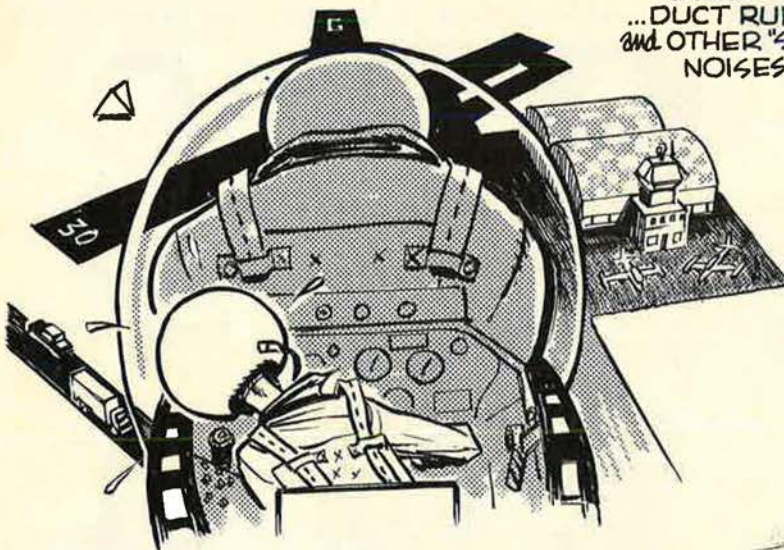
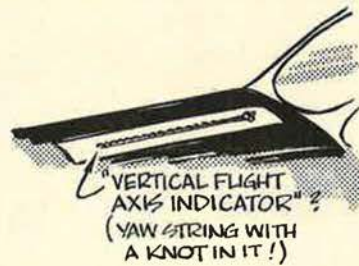


A TRAIN? BEHIND ME?... AT THIS ALTITUDE?



...DUCT RUMBLE and OTHER "SPOOK" NOISES?

NEW! "MORE THERE I WAS..." BOOK. FULL OF CARTOONS and MANY OF THOSE GREAT SONGS OF FLYERS! SEE AD ON PAGE 143.



...YOUR VIEW FROM THE REAR SEAT ON FINAL WITH A STUDENT PILOT UP FRONT?



...YOUR FIRST EXPOSURE TO AILERON BOOST? *Bob Stevens*

When you command joint forces from 40,000 feet,



E-Systems is there.

Strategic and tactical command and control systems, designed and developed by E-Systems, are true command posts in the sky.

Systems in use today by the National Command Authority and the U. S. Air Force's Strategic and Tactical Air Commands receive, process and display data and relay command decisions to joint air, ground and sea forces.

Our complete systems have included clear and secure communications systems, large-scale data

processing systems, software, data-link terminals, displays, and related antennas. E-Systems has proven competence in systems analysis, design and development, equipment fabrication and installation, systems integration and test, and systems field support.

Highly sophisticated command and control systems are only one example of E-Systems multi-faceted capabilities in:

- Intelligence and Reconnaissance
- Command and Control
- Electronic Warfare
- Communications
- Guidance and Navigation

- Aircraft Overhaul and Modification
- Commercial and Industrial systems

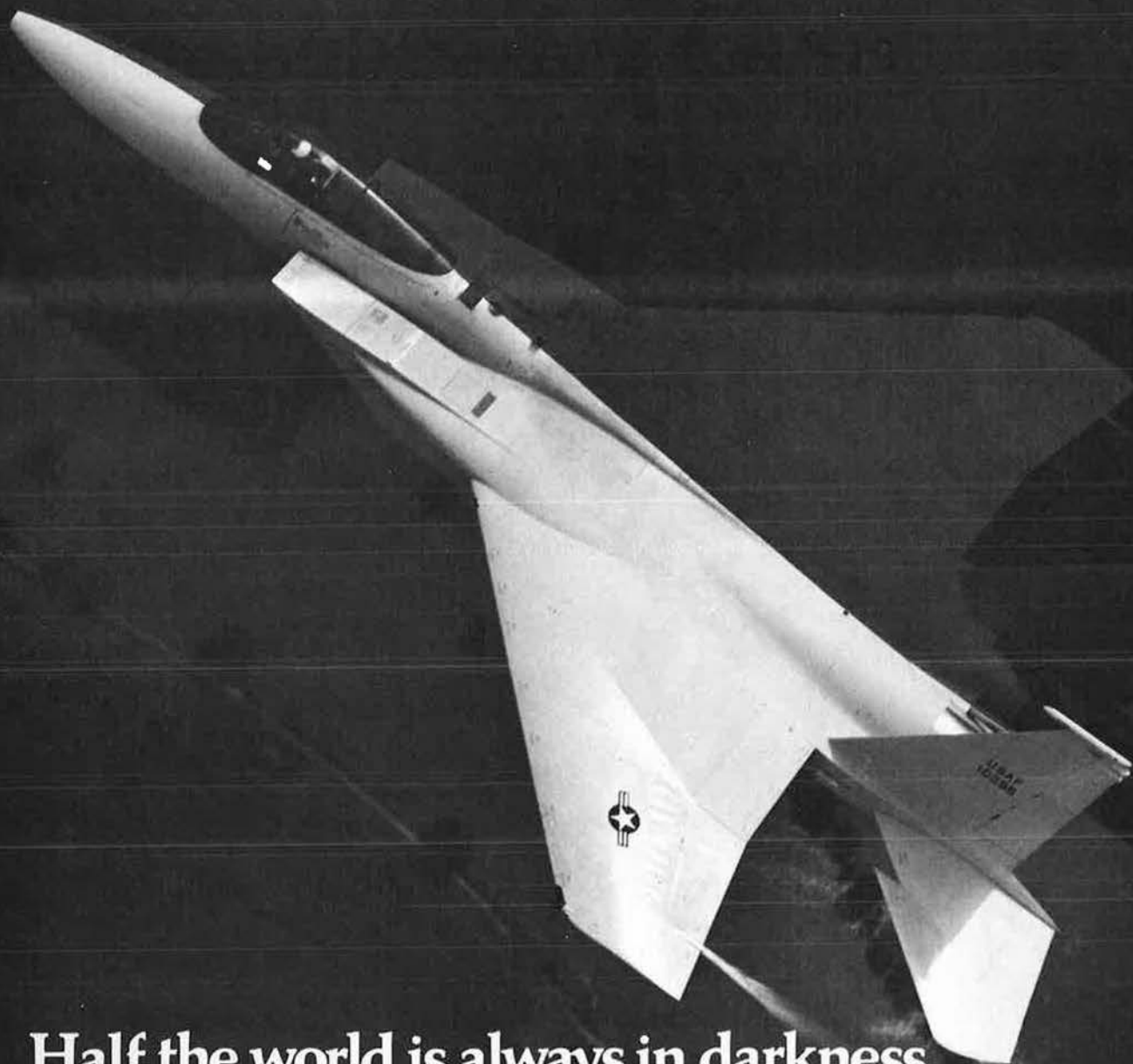
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We solve problems... systematically.

Two good reasons for the F-15 Eagle's night and day, all-weather capability:



Half the world is always in darkness. And clouds cover two-fifths of it.

To survive and win in the air combat arena, you have to be ready to take on all contenders. Usually on their terms. That's why the McDonnell Douglas F-15 Eagle was designed so that it doesn't have to pick its day to fight. It will go where it is needed, when it is needed. Day or night. Good weather or bad.

The F-15's attack radar system gives the pilot the long-range "eyes" to acquire, identify, track and take the initiative against a hostile aircraft—before it sees him. Visual displays, combined with the inertial navigation system and a digital computer, help him plan his

attack. All necessary target data, the status of weapons systems and firing cues for precision delivery are provided on both his wind-screen and cockpit displays.

The F-15 Eagle. Day or night, there's nothing like it on the horizon.

MCDONNELL DOUGLAS

The versatile Eagle. It's what you'd expect from the team that created the Phantom.

