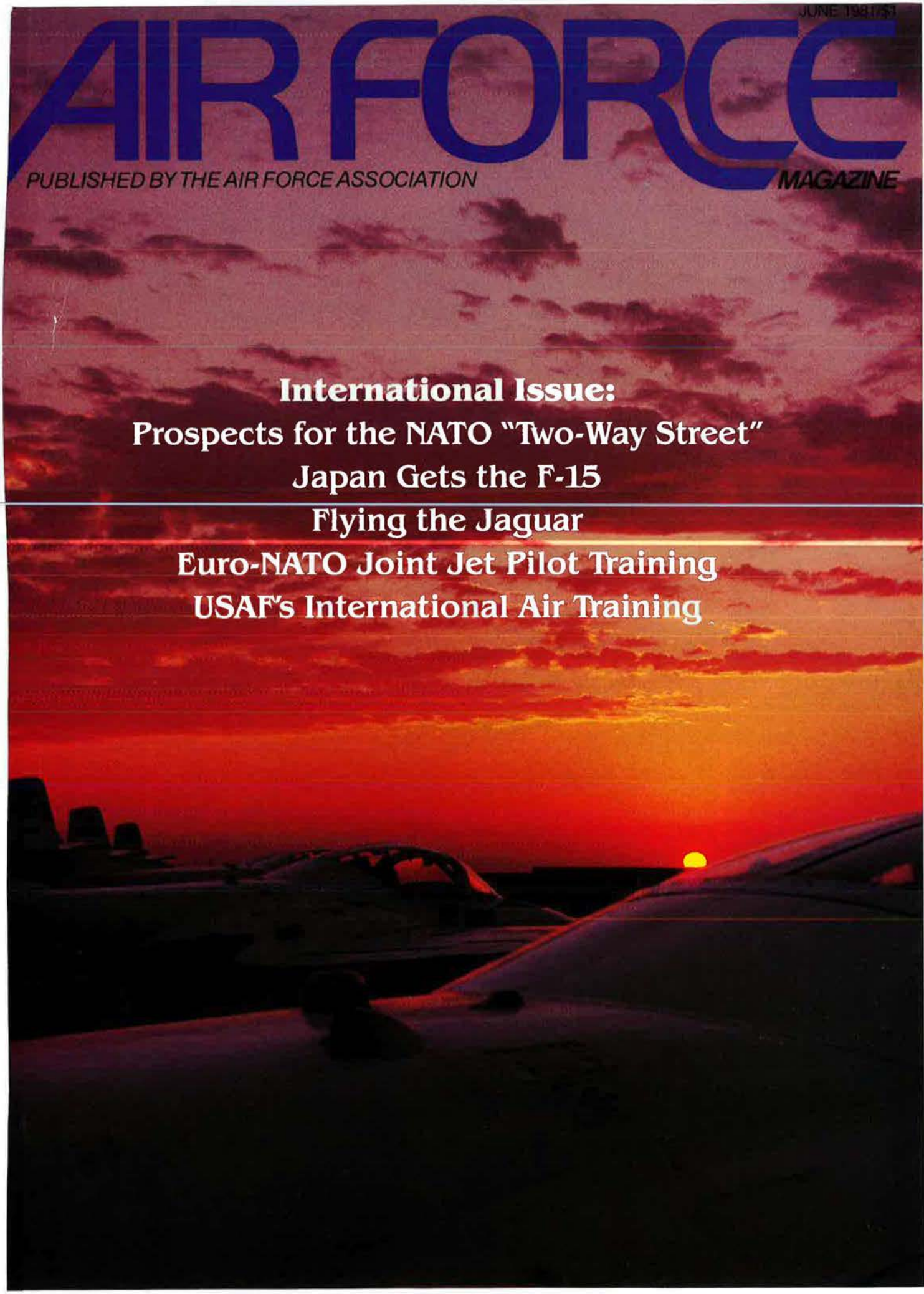
JUNE 1981/$1

AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION



International Issue:

Prospects for the NATO "Two-Way Street"

Japan Gets the F-15

Flying the Jaguar

Euro-NATO Joint Jet Pilot Training

USAF's International Air Training

Air Force Power

TF34-POWERED A-10 CLOSE AIR SUPPORT AIRCRAFT

CFM56-POWERED KC-135 TANKER AIRCRAFT

CF6-50-POWERED KC-10A ADVANCED TANKER/CARGO AIRCRAFT

GE engines: The superior performance and reliability needed, whatever the mission

General Electric high bypass turbofans are continuing to prove their performance capabilities in key USAF missions.

Twin TF34 engines help provide Fairchild's A-10 with the short-field performance, maneuverability and extended loiter time needed for its close air support mission.

For the McDonnell Douglas KC-10A Advanced Tanker/Cargo Aircraft, three CF6-50 engines help provide excellent mission range and payload capabilities. And for re-engined Boeing KC-135 Tankers, four CFM56 engines offer significantly higher aircraft productivity and lower fuel consumption for tomorrow's varied air-fueling missions.

GENERAL ELECTRIC

AIR FORCE
PUBLISHED BY THE AIR FORCE ASSOCIATION
MAGAZINE

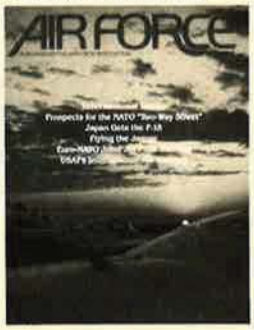
AIR FORCE Magazine (including SPACE DIGEST) (USPS 010-280) is published monthly by the Air Force Association, Suite 400, 1750 Pennsylvania Ave., N.W., Washington, D.C. 20006. **Phone:** (202) 637-3300. Second-class postage paid at Washington, D.C., and additional mailing offices. **Membership rate:** $13 per year (includes $9 for one-year subscription); $36 for three-year membership (includes $24 for subscription). **Life Membership:** $200. **Subscription rate:** $13 per year; $25 per year additional for postage to foreign addresses (except Canada and Mexico, which are $8 per year additional). Regular issues $1 each. Special issues (Soviet Aerospace Almanac, USAF Almanac issue, Anniversary issue, and "Military Balance" issue) $3 each. **Change of address** requires four weeks' notice. Please include mailing label. Publisher assumes no responsibility for unsolicited material.

BPA Circulation audited by Business Publication Audit

This Month

JUNE 1981 • VOLUME 64, NUMBER 6

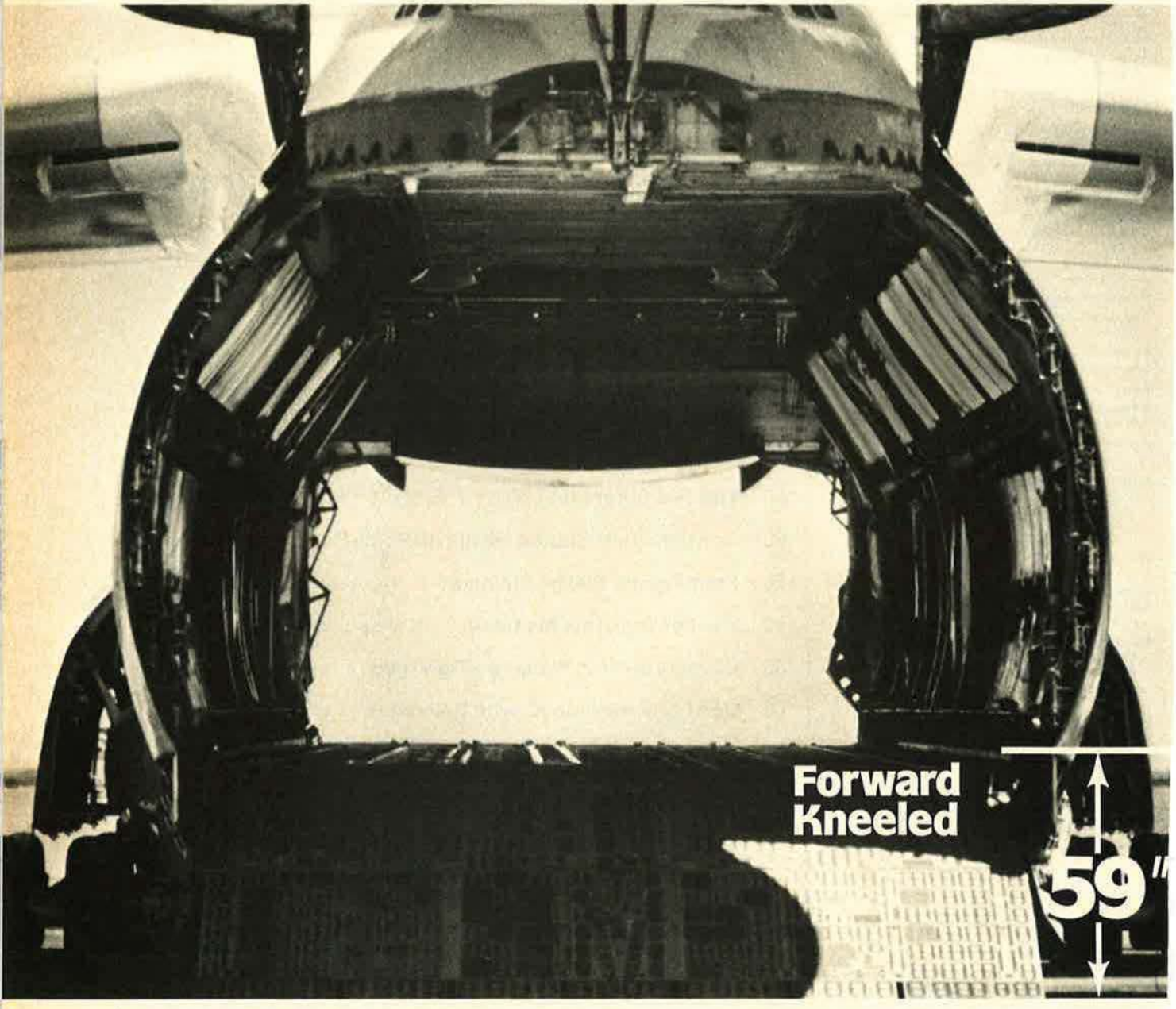
ABOUT THE COVER



The rising sun casts a reddish glow over T-37s parked on the flight line at Sheppard AFB, Tex., soon to be home of the Euro-NATO Joint Jet Pilot Training program. The ENJJPT program is covered beginning on p. 40 as part of this month's "International Issue." (Photo by Capt. Glenn L. Ferguson III, USAF)

Departments

The lowdown



You need to think low when the subject is new military airlifters. A low cargo deck. A low aft opening. A low forward opening. A low ramp angle, fore and aft.

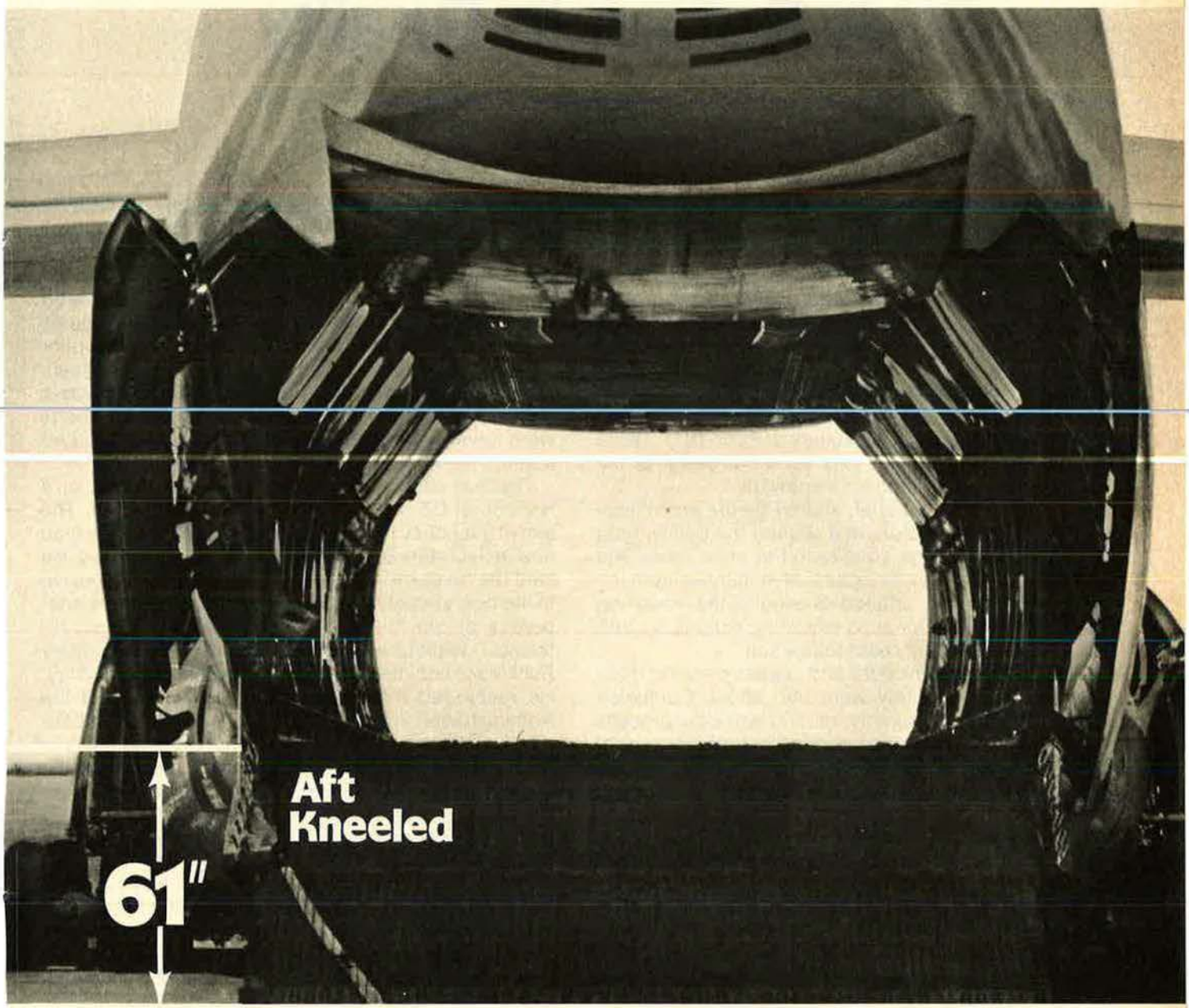
Those low features work together. The low cargo deck means you use a short ramp, fore and aft, that creates a low cresting angle. The two cargo openings give you straight-through loading and unloading.

Together, they add up to fast, easy loading and unloading—and actual operations in crisis situations

The need for low ramp angles has been proved in actual operations.

have shown that there are times when fast unloading, without sophisticated ground-handling equipment, is

on airlifters.



a priceless feature.

But there's more to the cargo compartment of a great strategic airlifter than low cargo openings and cresting angles. The compartment must be sized just right, neither too small nor too large. Lockheed tests demonstrated that the ideal cargo compartment for long-range aircraft has fore and aft openings and is 19 feet wide and 13.5 feet high with a low ramp angle. And it's 121 feet long. Actual operations have confirmed the validity of those tests.

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When it comes to airlifters, Lockheed knows how. The engineers and skilled workers at Lockheed-Georgia have more experience, by far, in airlifters than anyone else in the world.

Lockheed-Georgia

AN EDITORIAL

A Return to Reality

JUNE 1981 sees the thirty-fourth edition of the Paris Air Show, at present the world's largest aerospace fair. On this occasion, besides featuring a record number of exhibitors and aircraft, the exposition at Le Bourget Airport marks renewed cooperation between the US government and the aerospace industry. This comes after a four-year hiatus caused by the Carter Administration's failed arms-transfer policy. The policy was announced with fanfare less than two weeks before the thirty-second Paris Air Show. But when asked what the policy meant for US exhibitors at Paris 1977, White House officials admitted they were not aware of the Paris Air Show. So much for homework.

President Carter's belief, shared by the antimilitary and anti-industry zealots who drafted the policy, held that the United States contributed to arms races and conflict worldwide by its exports of military equipment. If the United States curtailed its exports, the reasoning went, then other major arms-exporting nations, including the Soviet Union, would follow suit.

The defective homework and biases became more apparent as the policy went into effect. Confusion reigned through the summer of 1977 while the process was sorted out. The biases were most apparent in what came to be called the "leprosy letters." These were instructions to American diplomatic posts prohibiting assistance to US commercial firms selling defense articles and services. In effect, embassy officers had to treat such firms as diseased and deserving of quarantine.

Industry, and some officers in embassies and in Washington, considered the "leprosy letters" rank discrimination by singling out one class of US firms for denial of embassy assistance routinely tendered to all others. The senior Carter official responsible for arms-transfer policy acknowledged the industry feeling.

Under Secretary of State Lucy W. Benson told Congress, "I understand these concerns." She was one of the few who tried to listen to industry, and enter into a dialogue with its members. She said, "I think the defense industries as a whole are satisfied that they can get a fair hearing from me . . . when they have a problem. I am less certain that we are always able to provide what they would consider acceptable solutions." Secretary Benson, to her credit, always tried to listen to all sides of an issue before making up her mind. In this she was the exception in Carter arms-transfer policy execution.

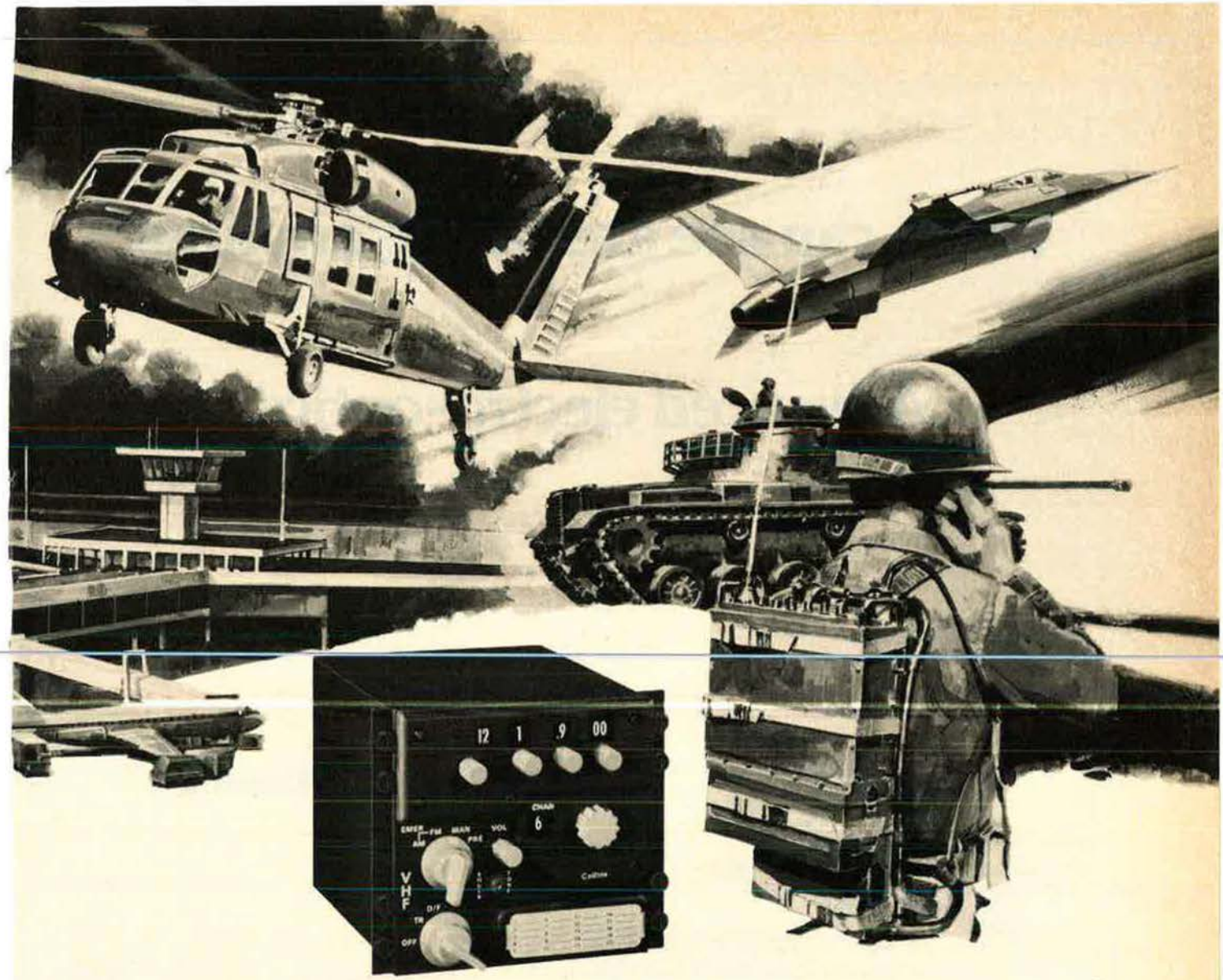
The short-term result of all this was confusion, as noted. The long-term effects were exactly opposite to those intended. The worldwide supply of military equipment did not drop. Neither allies nor adversaries exercised commensurate restraint. Instead, major exporters such as France and the UK simply accelerated their sales pitches. They rushed into market vacuums created by the US restrictions. Also, new supplier countries moved ahead more quickly than foreseen. Examples included the Republic of Korea, Brazil, Argentina, Taiwan, and others whose defense exports were given a leg up by US government-mandated abandonment of markets.

That has changed with the Reagan Administration's revision of US conventional arms-transfer policy. The aim of the policy review was stated recently by the man now in Secretary Benson's old post, James Buckley. He said the review will make US policy "more responsive to the new security challenges we face and more supportive of our military, political, and economic interests." Without waiting for the final draft, Secretary Buckley enunciated a general expression of the policy. He rescinded the "leprosy letters," noting that the Administration views US industry "as a valuable partner in promoting US security and that of our friends and allies." He said, "Accordingly, posts [US diplomatic missions] hereafter should treat representatives of US firms selling arms with the same courtesies as other US businessmen and may supply basic business information and services to them."

The results of the policy shift should be apparent at Paris. As details of the review go into effect as policy, the US armed services and industry can once again compete with foreign suppliers on the merits. Concurrently, they will come to realize that to reach many of the lost markets, they must consider more multinational arrangements than before. The sagacious ones realized that years ago.

At the same time, US military officers are also realizing that multinational cooperation will pay dividends if done right. Two examples that come immediately to mind are the Euro-NATO Joint Jet Pilot Training detailed in this issue (p. 40), and foreign air forces' participation in TAC's "Red Flag" exercises. AIR FORCE Magazine will continue to recognize this new reality by such things as pilot reports on foreign aircraft, and articles on the multinational arrangements as they occur. Just as "no man is an island," neither can an air force afford to go it alone in the present world.

—F. CLIFTON BERRY, JR.



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Small wonder the AN/ARC-186(V) has been selected as the new standard VHF for the U.S. Air Force and is being sold for U.S. Army and international applications. We're delivering 6,000 with options for 7,000 more.

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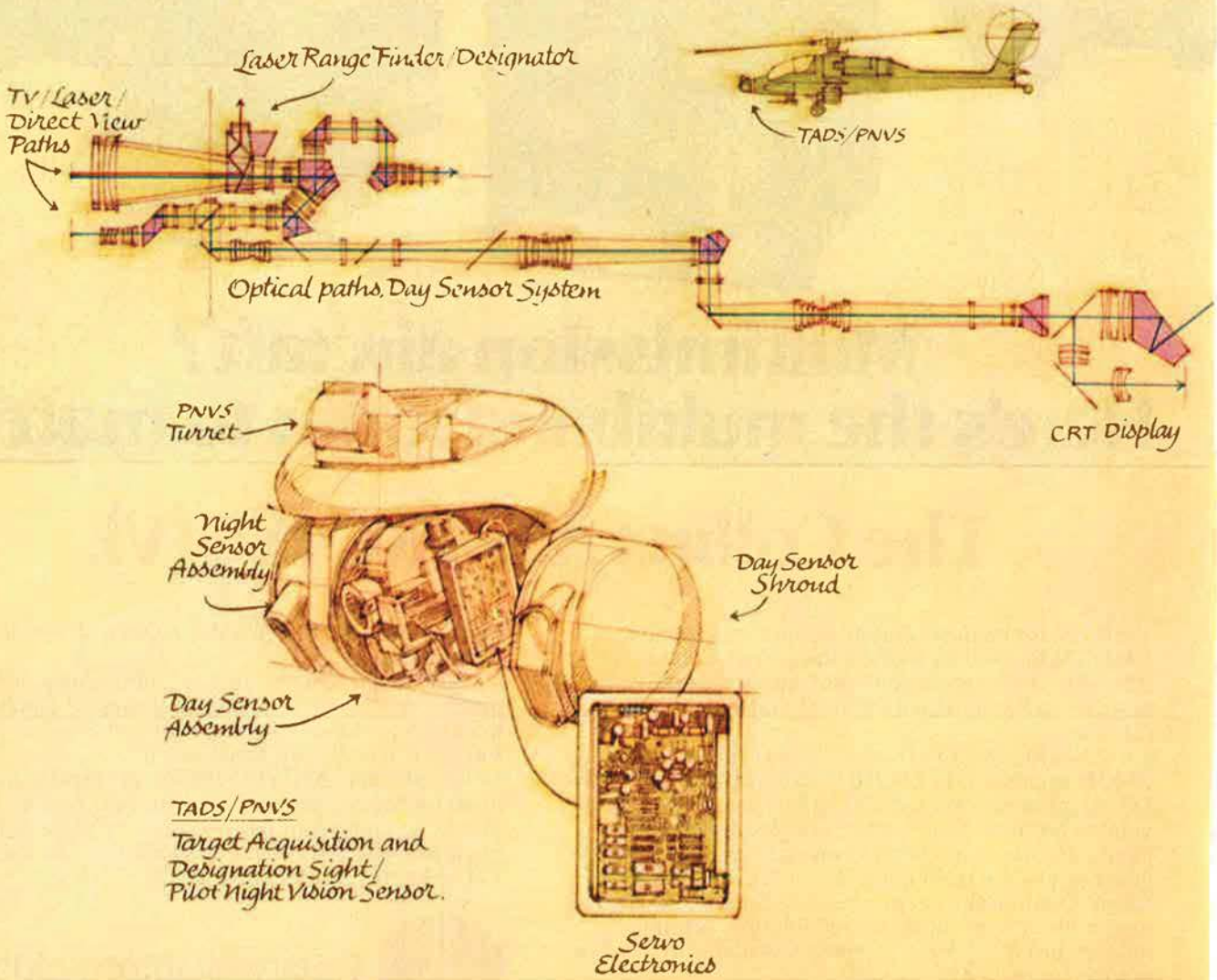

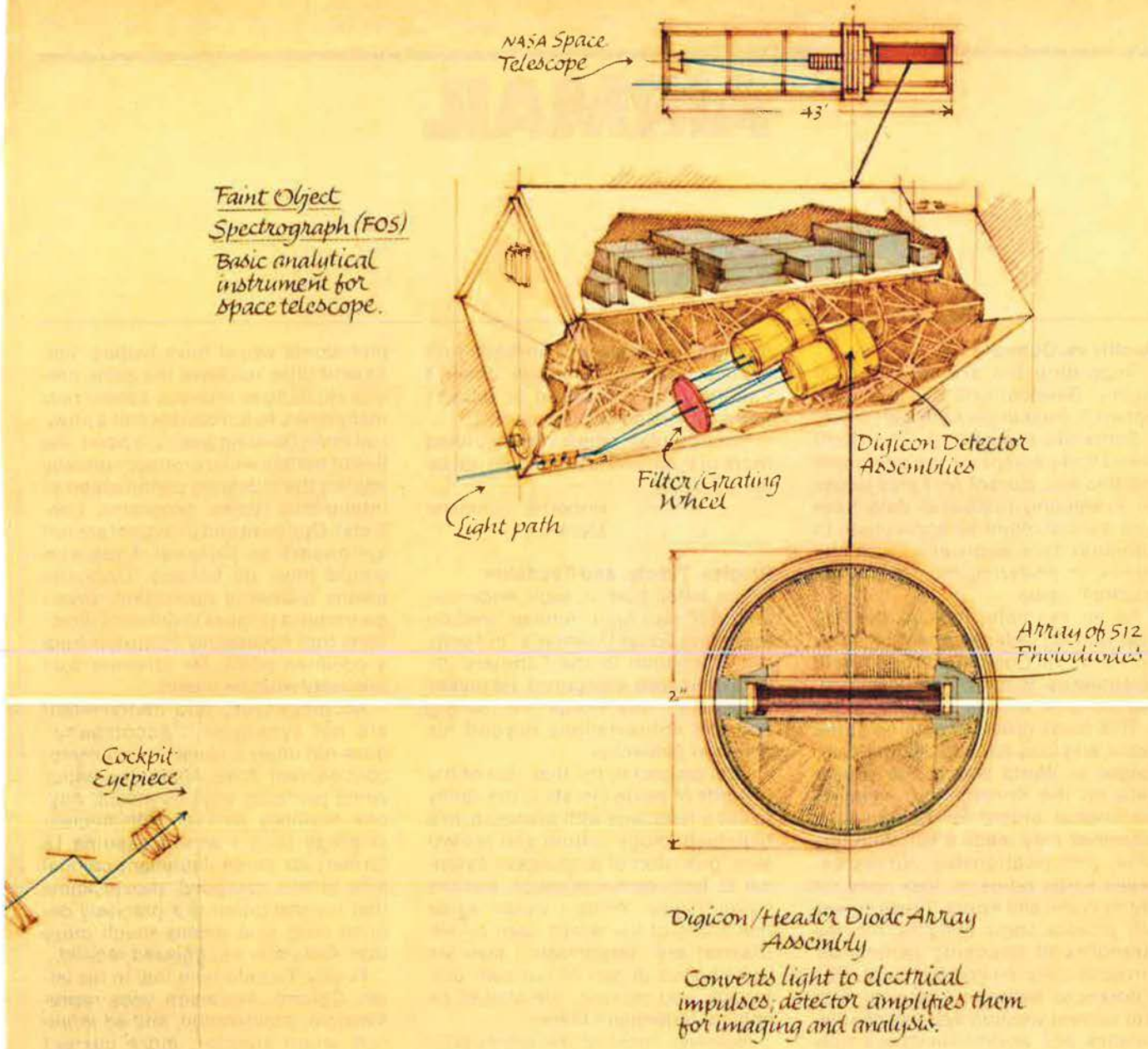

At Martin Marietta, years of experience in optics, electronics and microelectronics have created a firm technological base in the development of sophisticated fire control systems for air, land and sea forces.

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In the near future, all-weather millimeter wave and synthetic aperture radar systems will penetrate heavy cloud cover and dense forest overgrowth. And this same intensive development effort is pushing the state-of-the-art in new instrumentation for space exploration.

Eliminating the effects of adverse weather, low light, and terrain cover is a key element in many of tomorrow's space and defense missions. Martin Marietta can see it and is keeping advanced electro-optics developments clearly in its sights.

MARTIN MARIETTA

Martin Marietta Aerospace
6801 Rockledge Drive, Bethesda, Maryland 20034 U.S.A.

AIRMAIL

Quality vs. Quantity

Regarding the article "Tactical Fighter Development" by Maj. Gen. Robert D. Russ in the April 1981 issue:

Some time ago, Lt. Gen. Glenn Kent stated that perhaps we can gain some insights into current Air Force issues by examining historical data from past wars. It might be appropriate to consider this approach, with the others, in analyzing the "quality vs. quantity" issue.

As an example, look at the IDA [Institute for Defense Analysis] study on "Air-to-Air Combat in World War II: Quantitative History," by Joseph H. Reinburg, November 1966.

This study provides data on sortie ratios and loss rates for all the campaigns in World War II. For similar data on the Korean War, examine the special orders for Korean aces whenever they made a kill. With this data, plot relationship curves between sortie ratios vs. loss rates for World War II and Korea. These curves will provide some insights into the strengths of opposing tactical air forces in air-to-air engagements. The differences between historical data and current weapon systems characteristics and environments are fully recognized. However, certain assumptions can be taken into account to gain some insights, which is common practice in any analysis.

Another thought on this problem: When tactical air forces are compared between the US and USSR, the numbers for the Soviets are always very much larger. Obviously, many of these aircraft are not high quality. If they are not, then why do the Soviets keep them in their inventory? Do they know something we don't know about quality vs. quantity?

There were two sentences in General Russ's article that I believe didn't help his cause any: (1) "What we should do is put a moratorium on the debating and, instead, direct our attention to accelerating the development and procurement of quality aircraft . . . " (in other words, be quiet and trust me); and (2) "Those who argue against quality systems are prone to rely too heavily on economic analysis." (Translation: Anybody who argues against me either doesn't understand the problem or doesn't know how to do good analysis.)

In my opinion, I think we really need more of both. The issue should not be either/or.

Robert E. Schmaltz
Mendon, Vt.

Precise, Timely, and Readable

The letter from Joseph Anderson on p. 8 of your April "Airmail" section regarding Edgar Ulsamer's "In Focus . . . " column in the February '81 issue demands a response. He makes two points—the words are too big and the abbreviations beyond his ability to remember.

With respect to the first, one of the rewards of being literate is the ability to use a language with precision. In a high-technology culture and profession, precision of language is essential to both communication and the technologies. While I would agree that some of the words used by Mr. Ulsamer are "jargonisms," they are nonetheless jargon of our own profession and making. We should be able to understand them.

However, most of the words criticized by Colonel Anderson are precisely correct in their usage and clearly articulate the author's meaning. *Quintessence* means, among other things, "the most perfect embodiment of something"—in a single word, precisely what the SMS-2000 is to national policy. To use a string of less precise words would degrade the quality of the article. *Demands* is not (as suggested by Anderson) the same as *postulates,* and *accord* is neither simpler nor more precise than *consonance.* To suggest that the author substitute *logical* for *eclectic* is to misunderstand completely the point of the sentence. "Eclectic" means to draw from a wide variety of sources. It may be "logical" to use an eclectic approach, but logical approaches need not be eclectic.

If Colonel Anderson does not understand that *orthodoxy* means *conventional* or "generally accepted," I doubt using several simpler words would have helped him. *Extend* does not have the same precise meaning as *protract. Extend* normally refers to full outreach of a physical thing (landing gear, the hand, the line of battle), while *protract* normally implies the indefinite continuation of intangibles (times, programs, conflicts). *Opposite* and *divergent* are not synonyms as Colonel Anderson would have us believe. *Opposite* means diametric opposition. *Divergent* means to move in different directions (not necessarily opposite) from a common point. Mr. Ulsamer said precisely what he meant.

Accompanying and *concomitant* are not synonyms. "Accompany" does not imply a causal relationship; *concomitant* does. Again, the editor wrote precisely what he meant. Anyone remotely familiar with nuclear strategy (and I would assume [a former] Air Force lieutenant colonel falls in this category) should know that *reconstitution* is a precisely defined term that means much more than Anderson's suggested *rebuild.*

Finally, I would note that in his letter, Colonel Anderson uses *reprehensible, proliferation,* and *ad infinitum* when simpler, more correct words would have done nicely. He further suggests that the readers of AIR FORCE Magazine form a "captive audience." It is not true. We all read it on a purely voluntary basis, and Colonel Anderson is free to read other publications written at his level of literacy (I have some suggestions if he is interested).

With respect to the second point (abbreviations), it is proper journalistic procedure to use both abbreviations and acronyms, so long as unfamiliar ones are explained the first time they appear in the text. Please note that Mr. Ulsamer used SMS, ABRES, NSDM, PD, MAD, LNO, DARPA, C^3, BMD, and PGM in his text and wrote out the entire word set for each acronym at its first usage. What Colonel Anderson is really saying is that he cannot remember what he read from paragraph to paragraph—a lamentable personal problem.

Bottom line: We are educated pro-

fessionals, we of the "captive audience," and find Mr. Ulsamer's writing to be precise, timely, and readable. Keep up the good work.

Col. Art Evans, USAF
Langley AFB, Va.

The Me 262 That Didn't

Jeffrey Ethell's treatment of "Watson's Whizzers" [April '81 issue, p. 54] was both entertaining and useful in filling in a little-known part of the Me 262's history.

In the interest of accuracy, however, it should be noted that although the Hughes Aircraft Division of the Hughes Tool Company did have an Me 262 for flight evaluation purposes in the late 1940s, it was, in fact, never flown.

The dismantled aircraft was shipped by rail to the Hughes airfield in Culver City, Calif., in 1946. There, necessary repairs were made and it was reassembled and prepared for flight (the "high-gloss paint job" being only a touch-up of the original markings).

True, the purpose of the program was to determine why its performance was superior to that of the P-80A. But by the time it was ready to fly in 1948, the P-80C was being produced and it, in turn, was clearly superior to the Me 262. Accordingly, the whole program was canceled, very much to my personal regret. I was the Hughes pilot who was to have flown the evaluation.

As for Howard harboring fantasies of flying the Me 262 in the Bendix and/or Thompson Trophy races—a romantic notion to be sure, but hardly a realistic one. Mr. Hughes could be a bit eccentric at times, but he was not crazy. With his YF-11 and Hercules problems in those days an added confrontation with General Arnold was neither needed nor instigated.

R. M. DeHaven
Encino, Calif.

We Keep Trying . . .

Regarding your April '81 issue: One of your better efforts lately, with more general subject matter. Electronic Air Force, Russian Aerospace Almanac, etc., *are* rather parochial.

To General T. R. Milton's article ["Discipline Means Survival," p. 84]: Damn right! As far back as 1965 in Wiesbaden a lot of the communications staff types were doing an eight-to-five job and might just as well have been in gray flannel. When I got into missile operations (Minuteman II then Titan), lots of people thought I was too "brown shoe."

On Jeff Ethell's "Watson's Whizzers [April '81, p. 54]—where in Indiana was (or is) this Freeman Field?

In closing, I like Jeff Ethell's and Mark Berent's stuff.

D. C. Breidenbach
Evansville, Ind.

• *Freeman Field is still an active airstrip, located near Seymour, Ind., sixty miles south of Indianapolis.*
—THE EDITORS

Bravo to General Milton

"Bravo!" to Gen. T. R. Milton, USAF (Ret.), for his excellent article, "Discipline Means Survival," in your April issue.

I wholeheartedly support his views.

Mrs. Molly Fox
England AFB, La.

The Flying Crow

Shades of nostalgia! Mark Berent's pilot report "Flying the Luftwaffe Alpha Jet" [April '81 issue, p. 48] brought back some revered memories of flying "ZULU" out of Fursty with the 527th Fighter-Bomber Squadron back when we chased MiGs up and down the border in 1953.

Although Mark probably wasn't in the 527th in 1955–56, because it converted to the 496th (I'm told), he followed a long line of history makers when the 527th became the first squadron to pull "ZULU" in the F-86F at Fursty—shortly after a 526er was shot down in an F-84E near the border.

Of particular interest is the revelation that the 527th lives again, as the 527th Tactical Fighter Training Aggressor Squadron at RAF Alconbury ["USAF's Aggressor Squadrons," April '81 issue, p. 42]. Hallelujah! With alumni of the 527th such as George Simlar, George Lavin, Dale Sweat, Mo Detlie, Hank (Long-Giland) Rettinger, Pat Chennault, Clarence Edmonds, John Dolan, Sandy Sandlin, George Love, and literally hundreds of others over the years, the 527th should be retained as an active squadron if only because of its illustrious alumni. Long live the Flying Crow!

Charles E. Walker
President, AFA Ogden Chapter
Ogden, Utah

Beating OER Inflation

Your article in the April '81 issue on "How Best Curb OER Inflation?" [p. 95] was a good one.

I have been on many promotion boards in the far past and found the OERs almost impossible to deal with because of this inflation factor and unknown *rater* information.

I suggest that three questions be added to the OER to give boards greater information on what to do with these OERs. It would be very much better for both the rater and the rated.

(1) Is this officer ready for promotion now? Why? (2) Is this officer ready for reassignment now? Why and where? (3) Is this officer ready for advanced schooling now? Why and where?

If the answers to these three questions are available to boards of selection for movement, promotion, or schooling from several commanding officers, it would enhance the Air Force's development of all officers and make the Air Force a much better place to live.

Brig. Gen. John A. McDavid, USAF (Ret.)
Galion, Ohio

Bring Back the Hustler?

In all the controversy over a new manned bomber program, why has the Air Force played down the fact that in the decade 1959–69 it had two operational wings of the first supersonic bomber, the Convair B-58A Hustler?

Air Force leadership lacked the guts to stand up to [Secretary of Defense Robert] McNamara and his whiz kids at the Pentagon and, in 1970, SAC deactivated the 43d and 305th Bomb Wings. These great aircraft now sit out on the desert and SAC crews are flying an antique aircraft, the B-52, which is older than its crews.

I suggest the Air Force conduct a feasibility study to determine the cost to install new engines and electronic equipment on the B-58A and the time required to get a new improved Hustler bomber back in service.

This may be a better option than the proposed mini-B-1 and the stretched FB-111 now under study and, in addition, it would not disrupt the current FB-111 program.

Col. Harry P. Wilson, USAF (Ret.)
Hampton, Va.

Right Refuelers, Wrong Base

In the April edition of AIR FORCE Magazine, the story "FB-111A Mission Profile" [p. 64] was excellent. The photography was outstanding.

However, there is one small error in the caption on the photo on pages 66–67. The (Maine) Air National Guard's 101st Air Refueling Wing is located at the Bangor (Maine) International Airport, not at Loring AFB (Limestone), Me.

I was fortunate enough to have been a member of the Maine Air National Guard for about five years before transferring to the NHANG in October of 1980. Most of my time in

the MeANG was spent with the 101st AREFW in Bangor.

The magazine is excellent. Keep up the informative reporting.

Richard L. Bearor
Portland, Me.

Another Geography Lesson

Not true, not true! It's not upper New York State we see!

Those beautiful FB-111s outbound from Plattsburgh AFB ["FB-111A Mission Profile," April '81 issue, p. 64] have just "invaded" the homeland of Vermont's Green Mountain Boys *and* the site of the first fully successful year-and-a-half-long flight evaluation of Loran-C RNAV.

Vermont's heads-up Agency of Transportation, working with NASA and DOT's Transportation Systems Center, has just successfully completed some 300-plus nonprecision instrument approaches into the state's rural airports guided entirely by Loran-C. The Burlington International Airport, one of our "ORI" targets, is shown roughly centered in your photo on pgs. 64–65.

For the benefit of our old SAC bomb comp friends: CEP for the 300 approaches less than 150 feet; ninety-five percent value less than 600 feet!

Maj. William L. Polhemus, USAF (Ret.)
Cambridge, Vt.

A Future F-111 Driver

I recently received the April issue of AIR FORCE Magazine and was absolutely thrilled and delighted to see your article on the FB-111A at Plattsburgh AFB, N. Y.

I am a senior in high school, and I plan on going through AFROTC in college and, hopefully, become an Air Force pilot. The F-111 is the aircraft I want to fly and the one I am in love with. I am already a student pilot and member of the Civil Air Patrol, and I thoroughly enjoy and love military flying.

Besides writing to compliment you on your fine article, I wanted to ask readers if they have photos or posters of the F-111 I could have. Any negatives or prints would be greatly appreciated and warmly accepted.

Keep up the good work.

Shawn Lehnertz
131 Indiana
Rapid City, S. D. 57701

Nineteen, not Ninety

In your report on the AFA National Symposium, October 1980, Los Angeles ["Cracks in the Defense Industrial Base," February '81, p. 98], you quote Lt. Gen. Jerome O'Malley as stating: "In ninety days we erected the mini-base which would sustain up to 600 people for the ninety-day deployment. . . ."

That reference to the Proud Phantom deployment errs in one significant fact: It took nineteen—not ninety—days to erect the base, due to the magnificent efforts of and cooperation between Air Force professionals of the Red Horse, Combat Communications, Harvest Bare, and MAC units involved.

As the leader of the site survey of Cairo West conducted just prior to the deployment, I can attest to the fact that they truly had a "bare base" to work with. The results of their labors were impressive, and a reaffirmation to me that "Yankee ingenuity" is alive and well in USAF.

Col. Leigh H. Hunt, Jr., USAF
APO New York 09123

Counting Photographers

Reference your April '81 issue ["Photographers Don't Count!" p. 82]: I happen to believe that photographers *do* count: 1.9, 2.5, 3.8, 4.2, 5.6, 8, etc. It's just that they count differently.

Best wishes to "Rush" Russhon.

Truman Smith
Ponca City, Okla.

Cigarettes for the Poor Russians

Regarding Lt. Col. Curtis N. Farris's letter in the April 1981 issue about the T-6 pre-takeoff ritual C-I-G-F-T-P-R (controls-instruments-gas-flaps-trim-prop-run-up): We learned it as "*cig*arettes *f*or *t*he *p*oor *R*ussians."

Starting with AT-6s in Basic in 1944, I have used it as a pre-takeoff check up to the present day (in a Cessna 210). It even worked in Century Series fighters, albeit with the "P" meaning "pressurization" and "R" for "remove seat pin." It even works in our Thunder AX-7 hot-air balloon, except I have not figured out what the "P" stands for (I'll let you guess what the other letters stand for on a balloon checklist).

I have been enjoying AIR FORCE Magazine since the first issue; it is the only magazine in which I read the letters to the editor section.

John M. Fitzpatrick
McLean, Va.

Yesterday's Air Force and Museum

We operate a nonprofit educational military aviation museum at the St. Petersburg-Clearwater International Airport.

We are recreating an operational military airfield and are asking our fellow AFA members for the loan or donation of military aircraft, uniforms, and flying artifacts.

Our "airfield" averages 200 visitors each month. We have more than 300 members of our organization.

We differ from most other museums in that we allow people to get into some of the aircraft and get a close-up of their workings.

Very shortly we will be erecting two eighty-foot quonset huts we recently obtained from the VA. One of these will be a museum, and the other will be a recreated WW II Aircrew Briefing Room, in which we will hold our meetings.

We have even restored a 1943 GI flight line fire truck.

We presently have a B-17G on loan to us from the Air Force Museum, a C-47, P-47, PBY-5A, TBF, A-4, and an H-34. An F-4 will be added within a few months.

We would appreciate the assistance of all AFA members in obtaining flyable or nonflyable aircraft, uniforms such as flying suits, pinks and greens, etc., and artifacts.

Lt. Col. Henry L. Marois, Jr., USAF (Ret.)
President, Yesterday's Air Force and Museum
P. O. Box 2027
Pinellas Park, Fla. 33565

Fifth Air Force Vets

For the past two years I have been spearheading an effort to find the names of World War II veterans of the Southwest Pacific area in order to list them with their appropriate unit association.

In general, this includes former members of the following Fifth Air Force units: the 35th, 48th, 8th, 348th, 475th, and 58th Fighter Groups; the 3d, 19th, 43d, 38th, 22d, 90th, 380th, 345th, 312th, and 417th Bomb Groups; the 6th and 71st Recce and Photo Groups; and the 374th (TC), 317th (TC), 375th (TC), 433d (TC), and 2d (CC) Transport Groups.

At present I am in communication with almost all of the established veterans associations listed above. I am trying to help other veterans (where no association exists) to form their own association, if they wish to do so.

I am also seeking information on the "Night Fighters." I have not found anything on any veterans or veterans association for this group.

If you are not on the mailing list of

4,005 gallons per hour

1,970 gallons per hour

775 gallons per hour

100 gallons per hour

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For training and inter-base missions, the C12-D can offer major fuel savings compared to other utility aircraft. This savings will allow additional flight time for flight crews of all types of aircraft, at a far more affordable cost.

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In this time of both cost and fuel consciousness, the Beechcraft C12-D is the answer to several of your concerns at once: fuel availability and allocation, cost of flight time and personnel retention.

For more information, please write to Beech Aircraft Corporation, Aerospace Programs, Wichita, Kansas 67201.

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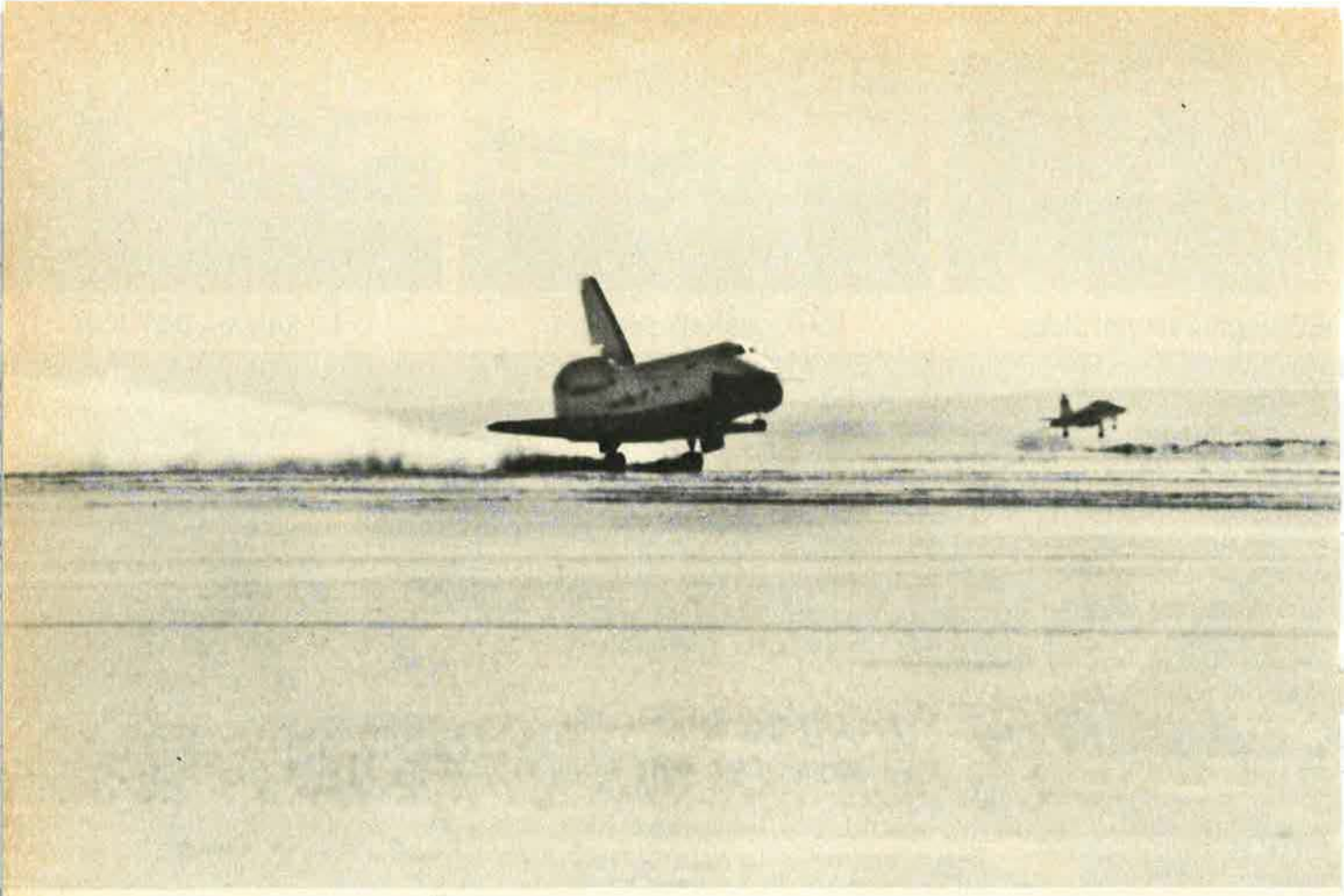

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The space shuttle is the most complex flying machine ever devised. Every aspect of its development has challenged its design and operations personnel. Because getting it right the *first* time is so vitally important, NASA and Rockwell International chose Eaton's AIL Division to design and develop the microwave landing system.

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We're proud of our role in the space shuttle program. AIL—The originator is still the innovator—and we're proving it over and over again.

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Comac Road, Deer Park, New York
11729

EATON
Advanced Electronics

your own Fifth Air Force unit associations listed above, please contact me.

Clarence A. Goetz
Route 22, Box 22
Springfield, Mo. 65803

Downing of Yamamoto

I am searching for information on the 339th Fighter Squadron P-38s flown on the April 18, 1943, mission in which Admiral Isoroku Yamamoto was shot down over Bougainville. Photos or information on the aircraft (either before or after the mission) flown by Capt. Thomas O. Lanphier, Lt. Rex Barber, Lt. Besby Holmes, and Lt. Raymond Hine will be greatly appreciated.

Also, assistance in obtaining the addresses of the surviving members of the mission, from the list below, would be greatly appreciated:

Maj. John W. Mitchell; Maj. Louis E. Kittel; Lt. Julius Jacobson; Lt. Douglas S. Canning; Lt. Delton C. Goerke; Lt. Roger Ames; Lt. Lawrence A. Graebner; Lt. Everett H. Arglin; Lt. William E. Smith; and Lt. Albert R. Long.

Assistance from anyone who was on Guadalcanal when this mission was flown would help in my project to produce an historically accurate painting of this important event in aviation history.

David L. McFarland
542 High Point North Rd.
Macon, Ga. 31210

Color Photos Needed

I have been approached recently by one of my publishers about doing a book that would be illustrated entirely by color photos taken between 1935 and 1955. The concept is an overview of military aviation of all nations during those years seen through vintage color photos and text drawn from the era itself.

Any of you who have color slides taken during that period, please drop me a line. I would be happy to pay for duplication or, if you are willing to loan the slides, I would take great care of them and I would return them promptly.

Jeffrey Ethell
2403 Sunnybrook Rd.
Richmond, Va. 23229

F-4 Phantom II Directory

I am compiling a USAF/McDonnell F-4 Phantom II directory listing every F-4 built for USAF by Air Force serial number and McDonnell c/n, to which I would like to add the individual aircraft service history covering date and place delivered to USAF; date and units served with, including any aircraft names and codes where possible; as well as information about modifications (LES, Wild Weasel, etc.); and fate of aircraft if lost or written off.

I would very much like to hear from pilots and/or WSOs with this information about their personal mount and from any crewmen who worked or are working on the F-4, as well as any other F-4 bug who is able and willing to contribute bits of information.

Please contact:

Walter A. Trimborn
10 Lea Ct.
Syosset, N. Y. 11791

AIRMAIL

Photos of F-84s Needed

I am assisting the author of "F-84 in Action" for Squadron/Signal publications, and am trying to locate ex-members of any F-84 group or wing based in USAFE, FEAF, or the States who might have photos or slides of their aircraft. If such photos or slides exist, I would like to borrow them for copying and duplicating, and then return them to the owner, paying the postage both ways.

I especially need coverage of the following groups/wings: 508th, 506th, 407th, 48th, 406th, 86th, 78th, 36th, 33d, 31st, and 27th.

Also, do color photos exist of the experimental camouflaged F-84Gs of the 48th Fighter-Bomber Wing, or of such commanders' aircraft as Wilson's FS-275 of the 508th, McKee's FS-647 of the 36th, or Blakelee's FS-027A of the 27th, or any other wing commander's aircraft?

MSgt. David W. Menard, USAF (Ret.)
5224 Longford Rd.
Dayton, Ohio 45424

WW II Special Ops History

I am doing research on US Army Forces Special Operations activities in the ETO and MTO during WW II. If enough material can be gathered on the men, aircraft, and missions involved in supporting the Resistance movements in occupied Europe, I hope to publish this untold story.

There were several units which flew the black B-24s, B-17s, A-26s, and C-47s and most are listed below. It would be of the greatest value to this project if former members of the units involved would contact me.

Principal units were: The Carpetbaggers; 36th, 406th, 788th, 850th, 856th, 857th, 858th, 859th, and 422d Bomb Squadrons; 492d and 801st Bomb Groups in the ETO; plus 885th and 859th Bomb Squadrons of the 15th/2641st Special Groups in the MTO.

All letters are welcome and will be promptly answered. If you think you have any information and/or photos (to lend) or were involved in these missions, please get in touch.

Capt. Bernard V. Moore, USAF
PSC Box 1336
APO New York 09057

2d Lt. John E. Joyce

Any information that readers may be able to furnish regarding the flight/mission of B-26 Martin Marauder aircraft of the 72d Bombardment Squadron, October 15, 1942, would be most appreciated. The squadron was presumably based at Attu, Aleutian Islands. It is believed that the mission might have been directed against Kiska in the Aleutian Islands.

My brother, 2d Lt. John E. Joyce (42-E), copilot of one of the aircraft, was reported missing in action and subsequently killed in action. No other information has been obtained.

Hopefully, among readers there may be one who recalls the incident and the participants.

Capt. Thomas E. Joyce, USNR (Ret.)
15 W. Santa Anita Terrace
Arcadia, Calif. 91006

Sixth Air Force

In 1944–45, we served with the 24th Fighter Squadron in the Sixth Air Force in the Republic of Panama. During the past thirty-five years we have seen very little history published on the forgotten Sixth Air Force. In fact, I doubt if the story of the Sixth has ever been really covered in depth by any publication.

As I recall, the 27th, 28th, and 32d Fighter Squadrons were around the same time down there as the 24th, but my memory is clouded by many years. We would like to hear from anyone who served in the Sixth and borrow any photos that we can copy and promptly return. The purpose will be to develop an informal history of the Sixth Air Force and, hopefully, clarify some of the strange activities that we had a small part in that little-publicized theater of war.

Robert L. Taylor
President, Antique Aircraft Ass'n
Route 2, Box 172
Ottumwa, Iowa 52501

36th Fighter Group

I'm doing research on the history of the 36th Fighter Group during their

assignment to Howard AFB, Panama Canal Zone, from 1946–48.

Of particular interest is their transition to USAF's first operational jet fighter, the P-80 Shooting Star, and subsequent deployment to West Germany.

I'm seeking information and photographs of aircraft, crew members, and significant events relative to this period of activity.

All information and photos will be carefully reproduced and promptly returned with my sincere appreciation.

Milton E. Buckley
6843 Red Maple Way
Citrus Heights, Calif. 95610

404th Bomb Squadron

I am helping Mr. Ted Spencer, President of the Alaskan Historical Aircraft Society, fill in gaps of early combat in the Aleutian area.

Any officers or enlisted men of the 404th Bomb Squadron who started at Barksdale in June 1942, please contact me.

Col. Robert C. Orth, USAF (Ret.)
8201 Coral Pl.
Tacoma, Wash. 98498

UK Service in the 1950s?

I am doing a book on Air Force life in the UK during the early 1950s and need photos of aircraft and crews (will be returned) of SAC units on TDY deployments with B-36s, B-47s, etc., at such bases as Upper Heyford, Fairford, Mildenhall, Lakenheath, etc. Also need home base assignment of units.

Any photos or story material used will be credited to source.

Col. Robert A. Haynos, USAFR
4711 Hunt Circle
Harrisburg, Pa. 17112

Narsarssuak AB

We are trying to contact as many former members of Narsarssuak AB, Greenland, as possible to let them know that after all these years, the first reunion is being planned for October 8–11, 1981, at the Gunter Hotel, San Antonio, Tex. The "Ice Worms" will nest again, sans million-year-old ice.

If readers who were former "Greenlanders" haven't heard about the reunion and want details, please contact:

Col. Art Turner, USAF (Ret.)
10218 Willowick Ln.
San Antonio, Tex. 78217

SPAR Symposium Change

In your April '81 issue, you reported in your "Unit Reunions" section that the 1981 Science, Philosophy, and Religion Symposium would be held April 29–May 1, 1981, in Albuquerque, N. M.

Due to scheduling problems, the SPAR Symposium has been postponed to January 20–22, 1982.

Capt. David E. Ellis, USAF
President, SPAR
Albuquerque, N. M.

Back Issues?

I am interested in obtaining back issues of AIR FORCE Magazine. I would like to build a collection that goes back at least ten years.

Anyone who has back issues that they would not mind parting with, or who knows where I can obtain back issues, please contact:

Tad Lonergan, M. D.
Santa Ana—Tustin Medical Pavilion
17400 W. Irvine Blvd., Suite L
Tustin, Calif. 92680

AFROTC Det. 550

AFROTC Detachment 550 is looking for alumni. All Rensselaer Polytechnic Institute graduates are invited to retain their ties with their alma mater by contacting the Detachment at the address below. An alumni

UNIT REUNIONS

ABNCP/AUXCP Communicators
Members of the Looking Glass, Achieve, Grayson, Stepmother, Blueeagle, Seabell, Silver Dollar, Nightwatch, Upkeep, Silk Purse, Wager, and AXEL aircraft; ROs, CTOs, RMs, and CCOs, will hold their reunion July 10–12, 1981. **Contact:** Looking Glass Reunion Committee, CMSgt. Chris McCormick, 13001 S. 33d Circle, Omaha, Neb. 68123. Phone: (402) 292-6526 (home), AUTOVON 271-2618. CMSgt. Wayne Buhr, S. 46th St., Omaha, Neb. 68157. Phone: (402) 734-5738 (home), AUTOVON 271-6233.

Air Force Survival Instructors
A third reunion for the Air Force Survival Instructors will be held July 23–26, 1981, in Reno, Nev. **Contact:** Don Wertz, 3827 Pine Leaf, Houston, Tex. 77068.

CBI Hump Pilots
China-Burma-India Hump Pilots Association's thirty-sixth annual reunion will be held September 10–12, 1981, Red Carpet Hotel, 4747 S. Howell Ave., Milwaukee, Wis. 53207. **Contact:** Mrs. Jan Thies, Executive Secretary, 808 Lester St., Poplar Bluff, Mo. 63901. Phone: (314) 785-2420.

Glider Pilots Ass'n
The National Association of World War II Glider Pilots will hold their reunion on September 24–26, 1981, Marriott Hotel, Tucson, Ariz. **Contact:** Dr. J. J. DiPietro, 3855 E. Calle Cortez, Tucson, Ariz. 85716.

Silver Wings Fraternity
The Silver Wings, the world's largest organization of men and women aviators who made their first solo flight at least twenty-five years ago, are holding a reunion/convention on September 17–19, 1981, in Charlotte, N. C. **Contact:** Haskell Deaton, Box 18222, Charlotte, N. C. 28218.

Stearman Fly-In
The tenth annual Stearman Fly-In will be held at Galesburg Municipal Airport, Ill., on September 9–13, 1981. **Contact:** Ted McCullough, 43 Indiana Ave., Galesburg, Ill. 61401. Phone: (309) 342-2298.

8th Air Force Historical Society
The 8th Air Force Historical Society (AFHS) is holding its seventh annual reunion in St. Paul, Minn., October 15–18, 1981. Those who have served in the 8th AF and are not members of the 8th AFHS and wish to receive information on the 8th AFHS should identify their WW II unit and England location. **Contact:** 8th AF Clearinghouse, c/o Elmer Fessler, 3911 N.W. 173d Terrace, Opa-Locka, Fla. 33055.

12th Bomb Group
The 12th Bomb Group will hold its fortieth annual reunion on July 30–August 1, 1981, at the La Jolla Village Inn, La Jolla, Calif. **Contact:** Evan Arnold, P. O. Box 65796, Los Angeles, Calif. 90065. Phone: (213) 256-2722.

19th Bomb Group and Wing
The 19th Bomb Group and Wing will hold a reunion at the Holiday Inn in Riverside, Calif., on September 24–27, 1981. **Contact:** Herbert A. Frank, 90-13 201st St., Hollis, N. Y. 11423. Phone: (212) 465-5740.

22d Depot Supply Sqdn., 15th AF
Reunion will be held at Albert Pick Motel, 320 Murfreesboro Rd., Nashville, Tenn. 37210, on September 15–17, 1981. **Contact:** Robert J. Jess, 3500 S. Stultz Ave., Oklahoma City, Okla. 73119. Phone: (1-405) 685-7673.

26th Photo Recon Sqdn.
The 26th Photo Recon Squadron will hold its reunion on September 4–6, 1981, in Chicago, Ill. **Contact:** Hartwell McCullough, P. O. Box 2141, Lafayette, La. 70502.

43d Bomb Group
Members of the 43d Bomb Group, along with the 63d, 64th, 65th, and 403d Bomb Squadrons (circa 1942–43) will hold their reunion on June 19–20, 1981. **Contact:** Col. R. H. Butler, Box 409, Fayetteville, N. C. 28302. Phone: (919) 483-5105.

Class 48-B
Former members of Class 48-B will meet in San Antonio, Tex., for their first reunion on

newsletter is being published to keep graduates in touch with their classmates and RPI. An alumni directory is planned for sometime next year.

We also schedule an annual Alumni Day and consider a valuable resource the graduates who can speak to cadets about their time in USAF.

If you wish to remain in contact, please include in your letter your address, base, and year of commissioning/graduation.

AFROTC Detachment 550
Rensselaer Polytechnic Institute
Troy, N. Y. 12181

460th Fighter Squadron

I am attempting to gather together all of my old squadron mates for a possible reunion. However, the address list I have is more than thirty-five years old.

Could anyone who knows the present address of any member of the "Black Rams," 460th Fighter Squadron, 348th Fighter Group, Fifth Air Force, please contact me at the following address?

Herbert F. Cass
1622 East Diana Ave.
Anaheim, Calif. 92805

Desk Models Wanted

I am interested in building a collection of the various desk display models of aircraft and missiles available, both now and past.

Anyone with any information that would help me build this display, please contact me. (I am willing to purchase them if necessary.)

Larry Williams
30105 Windsor Dr.
Gibraltar, Mich. 48173

AIRMAIL

Looking For . . .

We are trying to locate members of the following organizations:

The 369th Fighter Squadron Association, along with the 359th Fighter Group of WW II, AAF Station 133, 557 England, and their supporting units, the 448th Air Service Group, the 824th Air Engineering Squadron, the 648th Air Material Squadron, and the 3d Gunnery Tow-Target Flight.

Please contact:

Anthony Chardella
105 Mohawk Trail Dr.
Pittsburgh, Pa. 15235

Recruiting Posters

I am an avid collector of World Wars I and II military memorabilia. I have been trying, unsuccessfully, to locate a supplier for WW I and II recruiting posters. Since I am active-duty Air Force, my real preference is those from the Army Air Corps or Army Air Forces. Original copies are not necessary; color reproductions would be most satisfactory.

Lt. Col. Bruce F. Eakle, USAF
14205 Vista Ct., N. E.
Albuquerque, N. M. 87123

Return to Korea

John W. Shannon, National Commander of the Regular Veterans Association, has announced plans for the RVA, in cooperation with the government of South Korea, to tour Korea during the 1981 celebration of the period known as Alphabet Day, October 6–23, 1981.

Veterans of wartime service in Korea or any other period of service interested in the gala seventeen-day visit to Seoul and other areas are urged to contact the RVA at once for details.

John W. Shannon
RVA Return to Korea
610 Polk St.
San Francisco, Calif. 94102

September 3–6, 1981. **Contact:** James T. Pace, 1530 Dorsal St., Merritt Island, Fla. 32952.

90th Bomb Group (H) "Jolly Rogers"
The 90th Bomb Group "Jolly Rogers" will hold their reunion on September 17–19, 1981, at the Niagara Hilton, Niagara Falls, N. Y. **Contact:** Tom Keyworth, 38 Crestlyn Dr. E., York, Pa. 17402.

97th Bomb Wing
A reunion for the 97th Bomb Wing will be held September 17–20, 1981, at the Holiday Inn North, Denver, Colo. **Contact:** Edward E. Brooks, 7360 E. 12th Ave., Denver, Colo. 80220. Phone: (303) 355-0557.

CF-100 (Clunk) Retirement Ass'n
In recognition of the passing of this renowned aircraft, the 414th Squadron and the Canadian Forces Base North Bay will host a retirement day and reunion in September 1981. **Contact:** CF-100 Retirement Association, c/o 414th Squadron, Canadian Forces Base North Bay, Hornel Heights, Ontario, Canada POH 1PO.

246th Signal Operations
A reunion for the 246th Signal Operations will be held August 1, 1981, at Ramsey's Cafeteria, Knoxville, Tenn. **Contact:** Johnnie Huggins, Jr., 30031 S.W. 169th Ave., Homestead, Fla. 33030. Phone: (305) 247-0150.

304th Fighter Squadron
Members of the 79th, 304th, and 440th Fighter Squadrons who were stationed at Pinellas AFB, St. Petersburg, Fla., during WW II, are invited to attend the reunion to be held August 27–30, 1981, in Milwaukee, Wis. **Contact:** Stan A. Landes, 4062 N. Maryland Ave., Shorewood, Wis. 53211.

341st Fighter Squadron, 5th AF
A reunion for the 341st Fighter Squadron and the 348th Fighter Group will be held on September 24–27, 1981. **Contact:** Albert V. Arnold, 109 Ferris St., Apt. 3, Ypsilanti, Mich. 48197. Phone: (313) 482-0164.

347th Fighter Squadron
The 347th Fighter Squadron will hold its reunion on July 2–5, 1981, at the Twin Bridges Marriott Hotel, P. O. Box 24240, Washington, D. C. 20024. **Contact:** Bob Edberg, 347th Fighter Squadron, 2701 Hewitt Ave., Wheaton, Md. 20906. Phone: (301) 460-3494.

376th/Halverson Project Bomb Gps.
The 376th and Halverson Project Bomb Groups will hold their reunion on August 14–16, 1981, in Colorado Springs, Colo. **Contact:** Gilmer E. Mayfield, P. O. Box 7124, Kennewick, Wash. 99336. Phone: (509) 627-3810.

442d Air Force Reserve Ass'n
Members of the 442d will hold their eighth annual reunion on June 12–13, 1981. **Contact:** MSgt. Alice Rupert Morris, 924 Crestline, Wichita, Kan. 67212. Phone: (316) 722-7337.

447th Sub Depot
The 447th, stationed at Polebrook, England (Station 110), during WW II, will hold its reunion on September 17–20, 1981, in Southport, Me. **Contact:** Fred Larsen, P. O. Box 1, Yalaha, Fla. 32797.

452d Bomb Group (H)
A reunion for the 452d Bomb Group will be held September 10–13, 1981, at King of Prussia, Pa. **Contact:** Rom Blaylock, P. O. Box 2536, New Bern, N. C. 28560.

452d Bomb Wing (L)
The 452d Bomb Wing will hold its reunion on August 8, 1981, in Long Beach, Calif. **Contact:** Norman Stone, 81 Barclay St., Long Beach, Calif. 90805. Phone: (213) 638-9913.

463d Bomb Group, 15th AF
Members of the 463d Bomb Group will hold their second reunion on October 8–10, 1981, at the Holiday Inn in Fairborn, Ohio. **Contact:** Charles R. Hewitt, 114 W. Xenia, Fairborn, Ohio 45406. Phone: (513) 879-3869.

500th Bomb Squadron
Former members of the 500th Bomb Squadron (345th Bomb Group-Medium), WW II, are urged to contact me about our reunion to be held in Las Vegas, Nev., in September 1981. **Contact:** Col. William J. Cavoli, USAF (Ret.), 4314 Planters Court, Annandale, Va. 22003. Phone: (703) 827-9100 (office) or (703) 978-3830 (home).

IN FOCUS...

By Edgar Ulsamer, SENIOR EDITOR (POLICY & TECHNOLOGY)

Washington, D. C., May 5

Soviet Disinformation Concerning the Shuttle

Soviet President Leonid Brezhnev and other Soviet spokesmen responded to the first flight of the US Space Shuttle with a volley of charges alleging that the spacecraft is a weapon system in disguise and that its sole purpose is to further "America's dominance of the earth."

Topping off the Kremlin's propaganda gambit was the sanctimonious assertion that the USSR, on the other hand, was committed to a "great and humanitarian aim—to preclude the militarization of outer space." President Brezhnev shifted into propagandistic overdrive when he expressed the hope that the "shoreless cosmic ocean [remain] pure and free from weapons of any kind."

What the Kremlin boss forgot to mention was that the Soviet Union, as the possessor of the world's only operational space weapons, the so-called ASATs, indeed could ensure orbital tranquility by dismantling its space weapons and reversing its policy of treating space as an extension of the military realm. In fact, the character of the Soviet space program is essentially military. Of the more than 100 satellites the Soviets put up each year, more than seventy-five percent serve a purely military role and another fifteen percent perform both military and civilian functions.

The most demonstrable aspect of Soviet militarization of space is its arsenal of offensive space systems whose mere existence belies Soviet rhetoric of treating space as a sanctuary from military operations. The Soviet ASAT program goes back more than fifteen years. The US, by contrast, has never tested an ASAT and even dismantled its nuclear ASAT capability at Johnston Island in the Pacific in 1967. Current US efforts to develop a nonnuclear ASAT capability to counter Soviet space interceptors—initiated belatedly after recognition set in that Moscow did not plan to emulate the US policy of free passage in space — won't lead to first test of the so-called miniature ASAT homing vehicle before 1983.

The primary Soviet ASAT system — which was first tested in the 1960s and achieved operational status in the early 1970s—has undergone steady improvement as the result of more than twenty flight demonstrations to date. US efforts to negotiate a treaty banning ASATs with the Soviets have not been successful.

Beyond the ASAT weapons that the Soviets have test flown is another type of space interceptor that, although never observed by US intelligence in flight test, appears to be part of the Soviet arsenal. There is fragmentary evidence that this system is a direct-ascent nuclear-armed interceptor that could kill satellites at altitudes in the 1,000-km range. This weapon probably is a modification of the antiballistic missile (ABM) interceptors deployed around Moscow. These ABM interceptors are equipped with nuclear warheads. There is basis for the assumption that the direct-ascent ASAT derived from the ABM system also includes a version with a nonnuclear warhead.

Other intelligence information suggests that the Soviets have developed various facilities that can be used to interfere with the communications links of US satellites by electronic means. Lastly, there is also some evidence that the Soviets are working on a ground-based high-energy laser weapon system that appears to be directed against satellites. It is not clear how far away from operational status or how effective once completed this system might be.

The Long Search for a New Bomber

Public Law 96-342, dated September 8, 1980, specifies that the Secretary of Defense "shall vigorously pursue full-scale engineering development of a strategic multirole bomber that maximizes range, payload, and ability to perform the missions of conventional bomber, cruise missile launch platform, and nuclear weapons delivery system in both tactical and strategic roles."

This law, passed by the Ninety-sixth Congress, mandated further that such an aircraft is to achieve initial operational capability (IOC) "as soon as practicable, consistent with the aircraft selected, but not later than 1987." In this context, Congress requested that the Secretary of Defense submit a status report to the Committees on Armed Services of the two Houses of Congress by March 31 of this year on the results of development efforts to date, along with a comparative evaluation of the various candidate aircraft "in terms of cost and military effectiveness. Candidate aircraft shall include, but not be limited to, advanced technology aircraft, the B-1 bomber aircraft, and derivatives of the B-1 aircraft and the FB-111B/C aircraft."

The Defense Department, at the urging of the Air Force, delayed submission of the report because "of our desire to conduct the study and make the decisions on the basis of firm cost and schedule data solicited from industry. The Air Force has obtained detailed proposals from industry on the various aircraft and plans to have negotiated contracts in hand with each company by the time a decision is made."

Early in April, a "Joint OSD/Air Force Bomber Alternative Study" was submitted to Congress, however, to provide an interim status report, until, by June 1, 1981, the Administration reports to Congress its decision on specific courses of action it will take concerning this crucial program.

The interim report eschews any specific recommendations on which aircraft should be chosen. Also, because of the secrecy of information surrounding the Advanced Technology Bomber (ATB), which is popularly known as "Stealth," the interim report provides no assessment of that family of aircraft.

The study, nevertheless, represents an exceptionally thorough and cogent analysis of the increasing importance of strategic bombers in both central nuclear conflicts as well as for worldwide force projections.

The basic premise that impels de-

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This trainer will automatically establish problematical situations, monitor pilot performance and demonstrate proper operations.

The F/A-18 simulator is one example of Sperry aircraft trainer technology. Our EA-6B Weapons Systems Trainer is considered to be the U.S. Navy's most technically advanced flight simulation training device. Our A-6E trainer realistically portrays night carrier launch and recovery functions. Our A-4 attack aircraft simulators cover the entire range of aviator training.

Sperry math modeling techniques are being incorporated in our design of the operational flight trainers for the CH-53 helicopter. Our conversion of U.S. Air Force B-52 trainers to the latest digital systems is a cost-efficient alternative to the design and construction of new trainers.

And we've developed a wide range of simulators for other applications—from improving the firepower accuracy of infantry and armor to assuring the combat readiness of shipboard crews, from enhancing the skills of commercial ship pilots to researching the behavior of deck officers.

This technology is making training more practical and less expensive—often at one-tenth the cost of actual exercises.

For more information on what we're up to in simulation, just ask us...we understand how important it is to listen.

Write to: Sperry Division Headquarters, Systems Management Marketing, Great Neck, NY 11020. Or call (516) 574-1543.

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SINGER was there from the ground up.

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velopment of a new bomber is that the present operational inventory of 316 B-52s probably will lose the ability to penetrate Soviet air defenses in the second half of this decade. After 1990, therefore, only the FB-111A—sixty of which are in the operational inventory at present—will be able to penetrate. The FB-111A, however, is limited in range and payload.

If confined to the less-demanding and less fatigue-inducing standoff cruise missile carrier role, the B-52Gs and Hs should be able to perform adequately well into the 1990s on the basis of recent structural analyses. But an all-standoff force clearly is not as effective as one that combines standoff and penetration capabilities. For in the case of the former the Soviet Union need tailor its defenses only to one threat and the US is confined to a single type of air-breathing system—the cruise missile—which is preprogrammed and hence lacking in responsiveness and flexibility.

The B-52 fleet is handicapped further because it can't be dispersed widely in times of crisis and in light of its vulnerability to surprise attacks on its bases by SLBMs. At maximum gross weight of almost 490,000 pounds, the B-52 has access to only about 100 runways in the US, many located in coastal areas and thus especially vulnerable to SLBM attack.

Over the long term — some time after 1995 — when the B-52 fleet's average age will exceed thirty-six years, and its maintainability and supportability will become marginal and extremely costly, the present fleet of more than 350 strategic bombers will have to be replaced in its entirety.

Four basic options for modernizing the strategic bomber fleet were examined by the Air Force and the Defense Department. One involved acquisition of the FB-111B/C and procurement later of the ATB. The earliest possible IOC (initial operating capability) of the FB-111B/C is late in 1984, while the ATB's IOC probably can't be achieved until some time between 1987 and the early 1990s.

Modifications of the existing fleet of FB-111A/F and F-111D aircraft would include a fuselage stretch of about fifteen feet to increase the aircraft's fuel capacity, which translates into greater range; a new main landing gear to accommodate the increased gross weight on takeoff (almost 150,000 pounds); and installation of two B-1 (F101) engines to provide the greater thrust required by the increase in weight.

In addition, an upgraded auxiliary power unit (APU) would be installed to quick-start the engines (essential

IN FOCUS...

for rapid base escape, or "flushing") and to provide an autonomous engine-start feature in case no support equipment were available at dispersal bases.

Other modifications include redesigned engine inlets to cope with the greater airflow of the new powerplant; reduction of radar cross section (RCS) to improve electronic countermeasures by adding radar-absorbent materials to the airframe, antennas, and the reshaped engine inlets; upgrading of both the defensive and offensive avionics to cope with more severe threats, greater weapons load, and excessive maintenance requirements; and the addition of hard points on wings and fuselage to carry up to fifty-two conventional weapons.

Nevertheless, the Air Force/OSD study concluded that the FB-111B/C when carrying fifty-two conventional weapons could lose considerable range because of the added aerodynamic drag induced by external carriage of these munitions. The FB-111B/C, when assigned to the strategic nuclear (properly called the SIOP —for single integrated operational plan) role, could carry up to six SRAMs (short-range attack missiles) as well as six gravity bombs.

(Although these types of aircraft theoretically could carry a small number of ALCMs, for air-launched cruise missiles, the resultant additional drag would exact unacceptable range reductions and violate nuclear safety criteria on takeoff because of inadequate ground clearance of these externally carried nuclear stores.)

Even with the added fuel-carrying capacity, which results from the "stretch" of the aircraft, the FB-111B/C would be far more dependent on aerial refueling to achieve useful mission ranges than a B-1 variant or an ATB. The latter's dependence on tankers varies with the selection of specific configurations. Lastly, conversion of the F-111Ds to an FB-111C configuration would require replacement of these vital tactical assets. A number of options concerning replacement of the F-111Ds are being considered by USAF and range in cost from $2.5 billion to $5 billion.

Configured for average SIOP missions, the FB-111B/C could carry a total of ten nuclear weapons with a combined yield of about 2.5 megatons, compared to an average of twenty-two weapons with a total yield of about thirteen megatons in the case of a B-1 variant. Range of the FB-111B/C would be about 500 miles less than that of the B-1 variant, now referred to as the B-1V. The radar cross section at a zero degree angle azimuth (head-on) is less than one-tenth that of the FB-111A. Assuming no budget constraints, a fleet of 150 FB-111B/Cs could achieve operational status by the end of 1987. These aircraft appear to be essentially of stopgap utility since after ATBs enter the inventory in force and assume the penetrator mission, the FB-111B/Cs can't be shifted to either ALCM carriage or a significant force projection role.

The second option for modernizing the strategic bomber force centers on acquisition of a fleet made up exclusively of B-1Vs, with the notion of depending on it to serve in the strategic nuclear, ALCM launcher, and force projection roles. The pivotal question involved in this approach is whether or not — and for how long — such an aircraft can be assured of reliable penetration in the face of potential advances in air defense capabilities.

Presumably the make-or-break issue here is effectiveness of the aircraft's defensive avionics. There is little question that the B-1V, which the Air Force views as well suited for the Long-Range Combat Aircraft (LRCA) mission, can perform effectively in the force penetration and ALCM launcher role.

With a maximum takeoff gross weight and unrefueled range almost identical to that of the B-52H—yet generally greater payload capacity — the B-1V can carry up to 142 conventional weapons when used in the force projection role or up to thirty ALCMs when assigned to the cruise-missile-launcher mission. The B-1V weighs more and carries a significantly larger payload over greater distances than the original B-1 design.

A host of modifications make the B-1V a far more survivable and versatile aircraft than its progenitor. The single most important enhancement of the B-1V probably is a radar cross section (RCS) markedly smaller — about fifty times so under the most crucial azimuth angles—than that of the original design. It is possible to argue that even such a drastic RCS cut — similar gains can be realized in the transmutation of the FB-111A to the FB-111B/C—pales in comparison with the low observable characteristics of an ATB Stealth airplane.

It is equally possible to argue back

that, because of significant recent advances, the B-1V's RCS reduction — although falling short of making it the "invisible" airplane the ATB is expected to be—could result in vastly improved survivability and increased ability to penetrate. The main reason here is the synergism that results from combining new electromagnetic countermeasures (ECM) technology with low radar cross section. This synergism stems in part from the fact that the amount of power needed to drive ECM drops sharply as the aircraft's radar cross section is reduced to the one square meter range or below.

The other fact that makes RCS reductions of this magnitude so worthwhile is that ECM techniques that are ineffective—and hence not applicable—when the bomber presents a cross section in the 100 square meter range become highly effective in the one square meter or lower category. Among the more promising ECM techniques from which low-flying bombers incorporating low observable traits benefit is a system that spoofs radar homing missiles.

While the details of this technique are classified, the fundamental principle involved in this so-called terrain-bounce technique hinges on causing homing missiles from such Soviet weapons as SA-10 surface-to-air missiles (SAMs) and new Soviet look-down/shoot-down systems to home on a "mirage" of the penetrating bomber on the ground rather than where the aircraft actually is.

(This technique and similar ones would seem to benefit aircraft of the B-1V and FB-111B/C more than a pure "Stealth" bomber, which ordinarily will penetrate at higher altitudes. At this time, at least, it appears that ATBs — like their distant forerunner, the SR-71—lack maneuverability and hence might not perform well in a terrain-following, on-the-deck penetration mode.)

An element of uncertainty that could affect all aircraft employing low observable technologies — whether a Stealth design or the B-1V/FB-111B/C type of aircraft that relies on them to a lesser extent—is difficult maintenance. Small changes in the surfaces of such aircraft—brought on by aging or damage due to maintenance — can cause radar reflectivity and, thus, "visibility" to go up drastically. However, at this inchoate state of the low-observable technology, it would seem that ECM can ameliorate this problem.

The B-1V and the FB-111B/C drastically reduce RCS essentially by two means: the use of special radar-absorbing materials at selected surface locations, and by engine-inlet shaping. In the case of the B-1V, an additional factor helps lower RCS. By limiting the sweep of the variable-geometry wing from 67.5 (of the original design) to sixty degrees, RCS is reduced while at the same time aircraft drag is reduced and the wing-glove fairing design is simplified.

Other changes from the original B-1 to the new variant include both improved offensive and defensive avionics. Since the radar systems of the B-1 no longer are being produced, it is attractive from the point of view of economics and performance to shift to substitutes that are more advanced and in production. Included here is multirole radar, which provides greater flexibility and includes the ability to deliver terminally guided conventional munitions.

At the same time, the capabilities of the aircraft's defensive avionics can be bolstered by widening the range of their receiver and transmitter frequencies, thereby increasing their effectiveness against netted defenses and look-down/shoot-down interceptors. Because of the twenty percent increase in maximum gross weight, the B-1V requires a beefed-up landing gear. Other changes of the new design include the ability of one engine to start the others. This is accomplished by cross bleed of the auxiliary power unit and enlargement of both forward and aft weapon bays to accommodate more weapons and increase flexibility.

The third means for modernizing the air-breathing element of the strategic triad—and probably the one that over the long term assures its effectiveness best—consists of the acquisition of a mixed force of B-1Vs and ATBs. Obviously, the B-1V would have to be procured first, with the ATB being phased in when it reaches sufficient maturity. The advantage of such a mix is that it forces Soviet air defenses to cope with two generically different threats. Further, if and when the B-1V loses ground to ATB in penetration capability, it can revert to the cruise-missile-carrier and force-projection roles even though eventually some ATBs might also become available for one or the other of these special missions.

The fourth way of achieving modernization of the strategic bomber force means putting all eggs into the ATB basket and foregoing nearer term enhancements of the bomber fleet. Obviously, the risks attending this approach are high, and full operational capability would be about fifteen years away. Many questions remain about a pure "Stealth" bomber's ability to cope with advanced optical and infrared systems. A failure in either one discipline could turn out to be far more consequential than if a conventional design is available to backstop.

Lastly, the B-52 eventually will have to be replaced by a cruise missile carrier of largely conventional design since the use of ATBs for this role does not appear to be cost-effective or even feasible.

While at the time of this writing there are no reliable clues for predicting how the Defense Department and the White House will decide the issue, it is safe to suggest that there will be "linkage" between this decision and the one concerning the MX and its basing mode, since both are due at about the same time and both systems require massive, concurrent funding.

Washington Observation

The then acting Under Secretary of Defense for Research and Engineering, James P. Wade, Jr., informed the chairman of the Senate Armed Services's Subcommittee on Seapower and Force Projection early in April that the Defense Department could not meet Congress's deadline concerning a mobility study mandated by the 1981 Authorization Act. This tardiness appears to have been a major factor in the Senate Armed Services Committee's decision to provide only token funding of the Air Force's proposed CX strategic airlifter.

Mr. Wade's letter to Sen. William S. Cohen (R-Me.), chairman of the Seapower and Force Projection Subcommittee, brought out that "the national security requirements of the United States for additional military airlift capability merit initiation of the CX aircraft program."

The letter further pointed out that "the magnitude and nature of cargo and material to be transported by air are sufficiently well defined to provide clear justification and design parameters for such aircraft." This column, meanwhile, was told by a senior official of the Rapid Deployment Joint Task Force who declined to be identified by name that the requirement for a CX-like aircraft was categoric and that there also was a need to increase the nation's tanker capability by continued acquisition of the KC-10 and reengining of the KC-135s. ■

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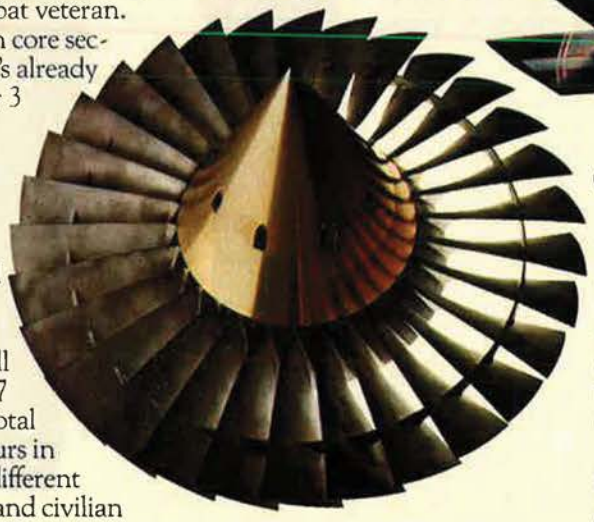

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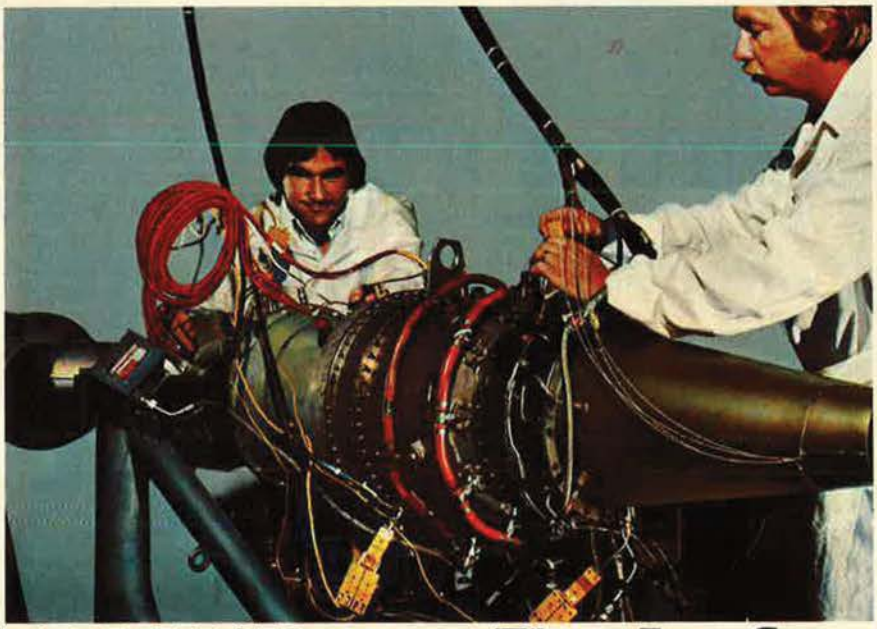

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AEROSPACE WORLD
News, Views & Comments

By William P. Schlitz, SENIOR EDITOR

Washington, D. C., May 6

★ Now that the Space Shuttle's first flight has been a resounding success, we can hope to see the routine delivery and retrieval of cargo in space.

"It's not that simple," cautioned Dr. Marshall H. Kaplan, professor of aerospace engineering at Pennsylvania State University. "While the Shuttle's success has been an astounding feat, tremendous problems remain concerning the launch, maintenance, and retrieval of the Shuttle's major cargo—the weather, communications, surveillance, planetary probe, and other satellites whose positioning in space is a major Shuttle goal."

Dr. Kaplan pointed out that when a satellite is launched by expendable rocket, the upper stage provides much of the guidance to inject the satellite into the planned orbit. This will not happen with satellites launched by the Shuttle, which itself becomes a huge satellite in orbit.

Once expelled from the Shuttle's cargo bay, satellites will have to have systems and "intelligence" to attain the correct orbits on their own, Dr. Kaplan explained. (A related safety factor is that the satellites must in some manner be propelled well clear of the Shuttle before their boosters ignite.)

These considerations will define the satellites' size, shape, weight, and fuel needs and systems, Dr. Kaplan said.

Space engineers are also considering methods of using the Shuttle to capture and dispose of "space junk" to reduce the chance of collisions. The relics and debris of past space activities could either be returned to earth for disposal or by some means deorbited to burn up in the atmosphere. To retrieve such material, the design, docking capacity, and other details of remotely controlled "space scavengers" are under study, Dr. Kaplan said, adding that the chances of Shuttle or satellite collisions with meteors are remote.

In the jubilant aftermath of the Shuttle's first flight, NASA named the backup crew—Joe H. Engle and Richard H. Truly—to fly the second orbital test mission expected this fall. *(For an article on Shuttle prospects and possible problems in the future, see p. 68.)*

In 1977, Engle was pilot and Truly

Astronauts John Young and Robert Crippen fared well during the initial test flight of the Space Shuttle system. Orbiter Columbia *lost a few heat-shield tiles during the mission but was deemed sound and quickly transported piggyback aboard a 747 from touchdown point at Edwards AFB, Calif., to Cape Canaveral, Fla., to be readied for a second flight this fall.*

Preflighting a C-140 are, from left, SrA. David K. McLane, Capt. Marty J. Pruden, Capt. Rick Kleinhans, and SSgt. Albert Cobb, all members of the 1866th Checking Squadron, Scott AFB, Ill. Attention to detail by aircrews and maintenance people has resulted in the 1866th flying more than 50,000 hours in the last eighteen years without a single serious accident or incident.

copilot during two flights when Shuttle Orbiter test vehicle *Enterprise* was launched from an airborne Boeing 747 for glide and landing tests.

Engle is an Air Force colonel who earned astronaut's wings in the 1960s flying the experimental X-15 rocket plane. He's piloted more than 130 types of aircraft.

Truly, a Navy captain, was a member of the support team for the 1970s Skylab space station missions and the US/Soviet space linkup in 1975.

Engle, forty-eight, and Truly, forty-three, are scheduled for a four-and-a-half-day space mission, during which they are to conduct the first tests of the Shuttle's mechanical arm, among other things.

★ Fairchild Space & Electronics Co., Germantown, Md., recently rolled out its first Multimission Modular Spacecraft (MMS).

The MMS is now ready for integration with NASA's Landsat-D—a $500 million satellite scheduled for launch in late 1982 with the aim of surveying the earth's surface.

An extension of the Space Transportation System, the MMS incorporates standard modules to make maximum use of the Space Shuttle for retrieval, replacement, and refurbishment.

★ The world's only aircraft powered by direct conversion of sunlight to electricity—*Solar Challenger*—will attempt to make aviation history in June with a day-long flight between Paris and London.

The plane was designed by Dr. Paul MacCready, noted for his human-powered *Gossamer Condor* and *Gossamer Albatross*. *Albatross,* piloted by Bryan Allen, flew the English Channel in 1979.

Challenger's two-and-a-half-horsepower motor runs on electricity produced by 16,128 photovoltaic cells built into the aircraft's wings and tail. It carries no batteries. During tests in Arizona last December, the plane flew almost twenty miles (32.2 km) and attained an altitude of more than 3,000 feet (914 m).

The planned June flight is much more ambitious, covering more than 200 miles (322 km) at cruising altitudes of from 200 to 5,000 feet (sixty-one/1,524 m). Estimated time: seven hours.

The aircraft has a forty-seven-foot (fourteen m) wingspan and weighs only 200 pounds (ninety kg). It is built of high-strength, lightweight materials produced by the DuPont Co., which is sponsoring the flight. Probable pilot will be Janice Brown, a school teacher from Bakersfield, Calif., who weighs under 100 pounds.

Challenger, with a top speed of forty mph, is designed to handle a positive load of six Gs and a negative load of four Gs. The propeller, because of its controllable pitch, will turn at 300 rpm at all speeds.

★ Air-to-ground gunnery competition will be revived when TAC conducts "Gunsmoke '81" at Nellis AFB, Nev., in early September.

Gunsmoke will involve air-to-ground bombing and strafing to identify the most proficient pilots, aircrews, and support people. The operational result will be honed low-level ordnance delivery and egress maneuvers, a spokesman said.

The last air-to-ground meet was conducted at Nellis as part of William Tell in 1962.

As planned, air-to-ground meets will alternate with the William Tell air-to-air competition year by year. As with William Tell, awards will be presented to Gunsmoke's "top gun" in team and individual categories and to support and maintenance victors.

★ USAF, in agreement with the British government, will activate a TR-1 reconnaissance squadron at RAF Alconbury in early 1983, increasing manning at the base by about 1,450.

Associated with the action will be some $18 million in improvements to base support facilities and up to $100 million in new construction of aircraft shelters and other operational structures.

The single-seat TR-1 is a tactical reconnaissance version of the U-2R and is designed for high-altitude standoff surveillance of the battle area day and

Charming a participant in the Special Olympics in Bossier City, La., is TSgt. Earl Crain, a student at the SAC NCO Academy at Barksdale AFB and one of 300 USAF volunteers at the April event sponsored by the Ark-La-Tex Chapter of the NCO Association.

night and in all weather. It is to provide direct support to US and allied ground and air forces during combat and crisis situations.

RAF Alconbury is home of USAFE's 10th Tactical Reconnaissance Wing, currently equipped with RF-4s. Also stationed there is the F-5E-equipped 527th Tactical Fighter Training Aggressor Squadron.

★ By June 1, crews that load munitions on TAC aircraft will have been reduced from four members to three, in a move to generate higher potential sortie rates.

Maj. Robert Bangert, chief of the Armaments Division of TAC's Directorate of Munitions, said that tests ended last year revealed that three-member crews could perform the loading role as well as, and in some cases better, than four-member crews.

"Each crew member will assume more responsibility," Major Bangert explained. "One will verify that all equipment on the aircraft is properly installed and serviceable. A second will inspect the weapons and drive the bomblift truck. The crew chief, in addition to his supervisory task, will become a working member of the crew. He'll be responsible for the post-load check."

Squadrons previously authorized twelve loading crews per twenty-four aircraft will gain an additional four crews through the realignment.

AEROSPACE WORLD

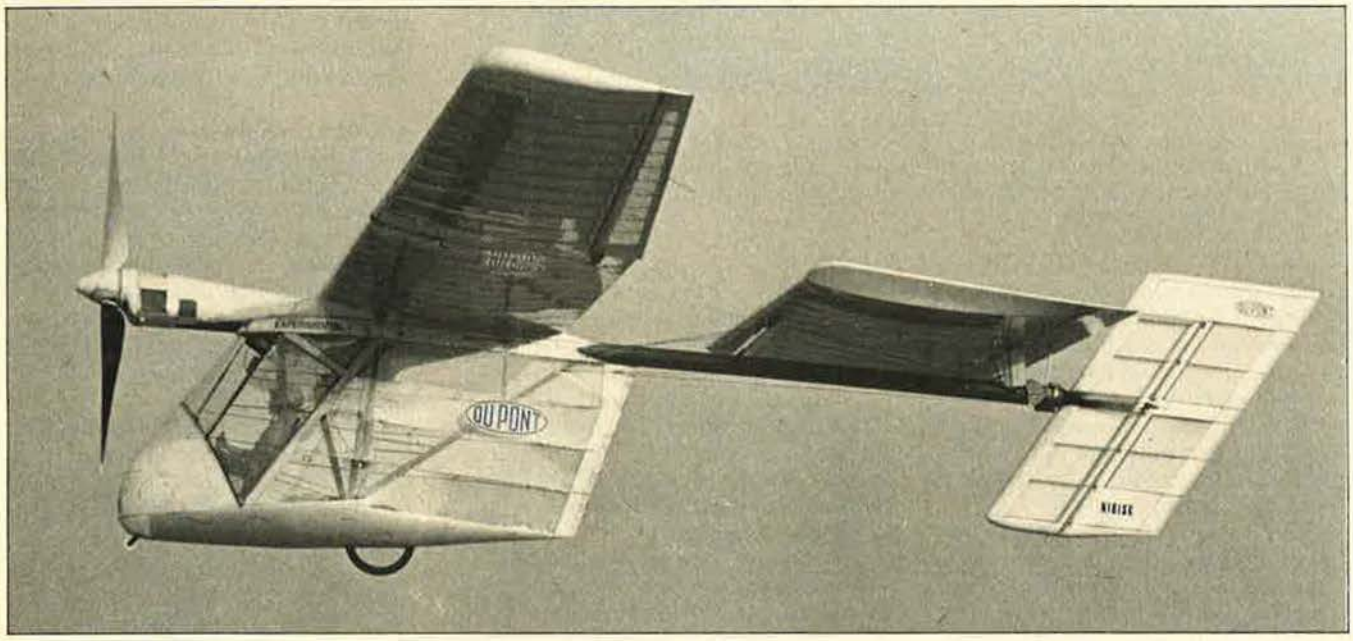
★ The US and France have signed a memorandum of understanding for the cooperative research, development, and test for reengining USAF KC-135 and French C-135F tankers.

The reengining program entails the CFM56 engine developed by CFM International, a consortium composed of General Electric Co.'s Aircraft Engine Group, Evendale, Ohio, and SNECMA of Paris. Boeing Military Airplane Co., Wichita, Kan., is performing the retrofits, under a $13.65 million contract let last year.

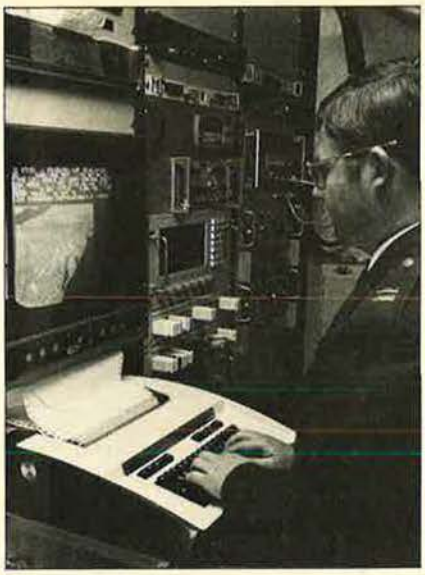
For USAF, AFSC's Aeronautical Systems Division, Wright-Patterson AFB, Ohio, is supervising the project. A retrofitted KC-135 is to undergo a flight-test program at Edwards AFB, Calif.

Officials predict that the new engines will allow the tankers to carry more fuel, incur lower operational and support costs, reduce noise and emission pollutants, and operate from shorter runways.

★ Under way at the FAA Technical



The Solar Challenger, *above, designed and built by a team headed by Dr. Paul MacCready, right, and to be piloted by California school teacher Janice Brown, far right, is set to attempt a historic flight this month. See item, p. 25, for details.*



Satellite/computer interface panel of the Mark IV Defense Meteorological Satellite Program van is demonstrated during a visit to Scott AFB, Ill. See adjacent item for details.

Helicopter TERPS is one segment of the effort at the Center aimed at the realization of the helicopter's operational potential, officials declared. Others involve the development of helicopter area navigation routes within the US; evaluation of equipment and procedures for offshore helicopter operations; helicopter microwave landing system procedures; evaluation of LORAN-C and GPS navigation systems; airborne radar approaches to remote sites; and icing tests and crashworthiness studies.

★ USAF is currently operating a limited-edition type van that fits easily into a C-130 or C-141 for delivery to almost any part of the world.

Once landed, the Mark IV Defense Meteorological Satellite Program van can be operating within hours. It is equipped with a ten-foot-diameter dish antenna that folds and can be placed inside for easy shipment.

Processing and display equipment inside the van receives data from weather satellites and produces high-quality visual or infrared pictures of ground weather conditions in just five minutes. Areas of specific interest or bad weather conditions can be enlarged to show detailed cloud information needed for planning and operations.

The van provides weather data for computerized flight plans, cloud-cover forecasts for air refueling operations, weapon systems testing, and calculation of courses for electro-optical guidance systems. Different temperature levels are provided by infrared sensors, and all data can be stored on memory discs for later use.

The van's data can be used by Air Force forecasters to detect and observe developing weather patterns and track weather systems over remote areas, including oceans. This is

USAF's Capt. Fred Whitney recently completed his 100th landing aboard USS Independence, *thus joining the elite aviators who wear the "Centurion" patch. An Air Force Academy graduate who has seen service in the US, Germany, and Korea, he is at present an exchange officer with USN flying the F-4J Phantom II.*

Center, Atlantic City, N. J., is a flight-test program to evaluate "helicopter-only" instrument approach procedures.

The program "could result in greater helicopter utilization and efficiency," officials said.

Helicopters have traditionally been bound by the same instrument flight rules applying to fixed-wing aircraft, in the face of helicopter industry arguments that rotor aircraft have unique capabilities and several advantages over airplanes—especially in the approach and landing segments of flight.

These have convinced FAA to add Chapter 11 to its Terminal Instrument Procedures (TERPS) handbook, based on the helicopter's ability to fly approaches at airspeeds much less than ninety knots and to climb and descend within a minimum of horizontal airspace. But the TERPS chapter is ahead of its time, with no copter-only instrument approach procedures currently in use. The flight-test program is to determine whether there can or should be.

"The project is designed to check minimum values associated with Chapter 11 and verify that they can be performed safely," explained Capt. Dick Huber, an Air Force pilot on assignment to the Center's Helicopter IFR Program as project manager. The program should take about a year.

Test aircraft will include the Center's Sikorsky CH-53A and Bell 206L JetRanger, and a Sikorsky S-76 Spirit to be delivered later in the year.

Air Force Sergeants Association Twentieth Anniversary

The month of May marked the twentieth anniversary of the Air Force Sergeants Association and the dedication of its new headquarters, the Airmen Memorial Building, at Camp Springs near Andrews AFB in Maryland.

Since its formation in 1961, the AFSA has expanded to include all Air Force enlisted ranks from E-1 to E-9. Membership including auxiliary members currently stands at 156,000, forming 200 chapters worldwide.

The AFSA's ties with AFA have been cemented through the years by shared goals, among them sponsorship of the Air Force Enlisted Men's Widows and Dependents Home Foundation at Fort Walton Beach, Fla.

Since its foundation in 1961 by TSgt. Lee R. Thompson and MSgt. Benny McGehee, AFSA's "one voice" on Capitol Hill and in the Pentagon has benefited both its members and the Air Force through its efforts to improve enlisted quality of life via better pay and promotion policies. It has also been in the forefront, along with AFA, in guarding against diminished benefits for both active and retired enlisteds, as well as protecting the retired pay structure.

Through the years, AFSA support led to the adoption of the Weighted Airman Promotion System (WAPS); giving enlisted aircrew per diem pay equal to that of officers (after twelve years of prodding and testimony); and the adoption of the Widows Equity Bill, which now provides an important Survivor Benefit Program (SBP) for dependents of both active and retired enlisted men and women.

AFSA—as is AFA—is a member of the Council of Military Organizations (COMO) and a special *ad hoc* group, which together represent several million members. They meet monthly to review personnel-related matters affecting active duty, Guard, Reserves, and the retired.

In the 1970s, AFSA expanded its government-relations sphere by establishing full-time offices to deal daily with veteran and retired military problems and individual state legislative matters.

AEROSPACE WORLD

especially useful in gathering weather data over unfriendly areas, perhaps during conflicts.

Military meteorologists use van data to help identify such severe conditions as thunderstorms, and to locate and determine the intensity of hurricanes and typhoons. Weather information is also provided to form three-dimensional cloud analyses that form the basis for computer simulation of various weather conditions. All of the available weather information aids military commanders in performing their missions.

Satellite weather data can also be used by civilian agencies and educational institutions. The University of Alaska uses DMSP data routinely to check arctic ice flows.

The DMSP van is a DoD research and development project with three Air Force commands sharing the responsibility. AFSC's Space Division in Los Angeles, Calif., owns the van, while Air Force Communications Command operates and maintains the equipment. Air Weather Service interprets the data, makes forecasts, and provides information to aircrews and military decision-makers.

Four vans have been procured by DoD and will be assigned to RAF Upper Heyford, UK; MacDill AFB, Fla.; Clark AB, the Philippines; and McClellan AFB, Calif.

★ Fourteen US experiments, launched in late 1979 aboard unmanned Soviet Cosmos-1,129, have yielded valuable data about the effects of weightlessness on the physiological process, NASA scientists reported.

Changes in enzymes and in animal bone strength, growth rate, and mineral content similar to some changes experienced by human space travelers have brought new explanations for problems associated with weightlessness.

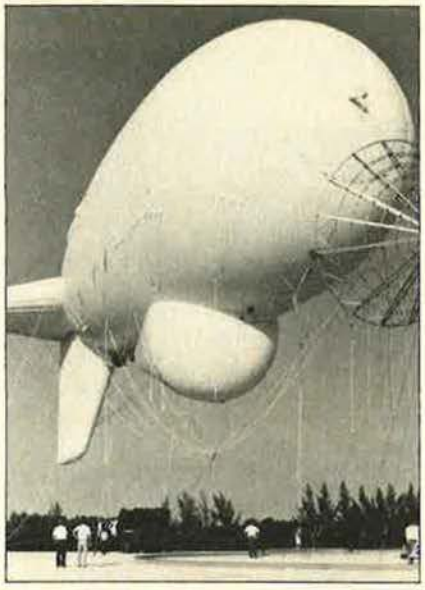
The Vostok spacecraft, launched into elliptical orbit and recovered nineteen days later in the USSR, was similar to two Cosmos missions in 1975 and 1977 in which the US also participated.

Major payload of the 1979 Cosmos was thirty-seven laboratory rats, which were then studied for bone and strength loss. Normally, bone is constantly reabsorbed and replaced by newly formed bone. During spaceflight, formation of new bone slows, while reabsorption continues, resulting in a net loss and decreased strength.

When the animals returned to normal gravity, some changes were reversed in a few days while others took longer, the scientists said.

Encouraging for prolonged spaceflight, plants aboard the Cosmos satellite showed no ill effects, said project manager Kenneth A. Souza and deputy manager Dr. Milton R. Heinrich of NASA's Ames Research Center, Calif.

The US is next to participate in a Cosmos mission in mid-1982, during which rhesus monkeys will be orbited for about two weeks and then studied for changes in metabolism, biorhythms, and bone metabolism.



This unmanned balloon recently broke the world altitude record for a tethered aerostat when it soared to more than 18,000 feet. See item below for details.

★ The world altitude record for a tethered aerostat was broken recently when AFSC's Electronic Systems Division lofted a blimp-shaped balloon at Cape Canaveral AFS, Fla., to 18,180 feet (5.53 km).

The previous record for a lighter-than-air craft attached to the ground was 15,500 feet (4.57 km).

The record-setting balloon's skin is of a lightweight fabric that weighs only eight ounces per square yard. Yet, the 180-foot-long by eighty-foot-diameter (54.9 by 24.4 m) aerostat can ride out winds up to sixty knots while aloft and withstand ninety-knot surface winds when moored on its ground launch tower, officials reported. A pressurized fabric pod beneath the balloon houses the payload.

Telemetry equipment used to transmit and receive balloon control commands is mounted just outside the pod, and electric power is provided by a gasoline-driven generator backed up by batteries. Electricity is used to operate payload equipment, navigation lights, and the balloon's radio-activated remote-control pressurization system.

Two similar radar-equipped aerostats, also built by RCA Corp.'s Aerostat Systems Division, Patrick AFB, Fla., were delivered recently to TAC at Cudjoe Key AFS near Key West, Fla. The balloons are now being flown

Mitchell Aircraft Corp.'s "Podule," designed to improve the performance of ultralight-weight aircraft. The Porterville, Calif., firm is producing Podule kits for sale.

alternately at 12,000 feet (3.65 km) to provide around-the-clock surveillance of air and sea approaches to the southeastern US.

★ The China-Burma-India Hump Pilots Association will hold its thirty-sixth annual convention in Milwaukee, Wis., September 10–12.

The organization is made up of more than 3,500 former pilots and crewmen who flew over the Himalayan Mountains during World War II.

Details of an association project, a memorial to the more than 1,000 men who died in action in the Hump airlift, is to be presented to the membership during the convention.

The association is seeking new members from those eligible: CBI pilots and crews who flew the Hump, air search and rescue, aerial weather reconnaissance and aeromedical evacuation units, the Flying Tigers, and units of the Fourteenth and Twentieth Air Forces.

Also being sought is contact with the families of those who died flying the Hump so the men's names can be inscribed on the monument. Contact Mrs. Jan Thies, Executive Secretary, Hump Pilots Association, 917 Pine Blvd., Poplar Bluff, Mo. 63901. Phone (314) 785-2420.

★ **NEWS NOTES**—The Air Force Museum, Wright-Patterson AFB, Ohio, wants to replace its **facsimiles of World War I Army Air Service enlisted chevrons with the real thing,** if possible. Wanted: one-stripe private first class; three-stripe sergeant; three-stripe, two-rockers battalion sergeant major; and three-stripe, three-rockers regimental sergeant major. Write the Museum (ZIP code 45433) or call Dave Addison (513) 255-2592.

The **grand opening of the Castle AFB, Calif., Air Museum** is scheduled for June 19–21. There will be ten historic World War II aircraft on display; other aircraft are in stages of acquisition. Highlights of a fund-raiser preceding the public opening: Big-Band-sound music, a war-years fashion show, historic cars, buffet dinner. Call Maj. Leo Vrana (209) 726-2878.

A **national aviation photography contest** open to amateur and professional photographers is being sponsored by the **Aviation Hall of Fame of New Jersey.** Entries are due by September 30 and winners will be selected on how well they illustrate the "Spirit of Flight." Thirty-five prizes ranging from vacation trips to cameras will be awarded. Underwriting the contest: Minolta Corp., Pan Am, Hewlett Packard, and Prentice-Hall. For additional information, call H. V. Pat Reilly (201) 288-6344.

What a surprise! That's the reaction of TSgt. and Mrs. Larry Hogue on learning of his promotion to master sergeant under USAF's new Stripes for Exceptional Performer (STEP) program. He's a flight engineer with MAC's 463d Tactical Airlift Wing, Dyess AFB, Tex.

Died: General of the Army Omar Bradley, who as Commander of the Twelfth Army Group in Europe in World War II led 1,300,000 troops, the largest American force ever united under one man's command. Called the "GI's General" and the last of the war's five-stars, Bradley, because of his rank forbidden by act of Congress to retire, served sixty-nine years on active duty—longer than any soldier in US history. The first Chairman of the Joint Chiefs of Staff, he was eighty-eight when struck down by a heart attack in New York City in April.

Died: Brig. Gen. John L. Hoar, USAF (Ret.), former assistant adjutant general for the Connecticut ANG whose military career began in 1940 and who flew eighty-three combat missions in World War II and Korea, in Middletown, Conn., in April. The long-time AFA member was sixty-two.

Died: Juan T. Trippe, pioneer of over-ocean flying and founder of Pan American World Airways, of a long illness in New York City in April. He was eighty-one. ■

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CAPITOL HILL

By Kathleen G. McAuliffe, AFA DIRECTOR OF LEGISLATIVE RESEARCH

Washington, D. C., May 1

CX in Trouble

The outlook for the Air Force's getting its new long-range outsize cargo transporter, CX, is bleak.

The Senate Armed Services Committee, which last year authorized R&D funds for the aircraft, allotted only $1 million out of the $245 million R&D request for FY '82. This limited funding permits continuation of the aircraft source-selection process and further development of a comprehensive acquisition strategy for added aircraft.

Gen. Robert E. Huyser, Commander in Chief of the Military Airlift Command (MAC), made a strong plea for the program in testimony. He told the House R&D panel that CX is "the very best way to solve our nation's airlift shorfall."

Airlift has a strong supporter in the R&D and full committee chairman, Rep. Melvin Price (D-Ill.), but even he told the MAC chief that though our strategic mobility is currently in an "unacceptable" state, Congress will be hesitant to write a $245 million check without knowing specifics on what kind of aircraft CX will be. DoD still has not submitted the details on the CX, as mandated by Congress last year.

The House Armed Services Committee has not yet made a decision on the CX, although it is now expected that $100 to $150 million will be authorized for procurement and $20 to $50 million for R&D. This allows the Air Force to continue studies on a new aircraft and to purchase existing aircraft to add to the overall airlift force. Last year, the House deleted all funds requested for R&D on the CX, but the program was finally appropriated $35 million with stipulations.

Again this year, the CX funding will probably be used as a bargaining chip when the House-Senate conference meets to iron out differences in the two versions of the bill.

DoD Supplemental

A difficult session is expected when House and Senate conferees meet to settle differences in the two versions of the FY '81 DoD Supplemental Appropriation.

Earlier this month, the full Senate passed a $2.8 billion spending package for added procurement, R&D, and military construction. The House Armed Services Committee reported its version with $2.6 billion in additional spending authority. The Administration requested a total of $3.04 billion.

Both bills contain the requested funding for major Air Force procurement programs, *e.g.*, $40 million will cover F-15 long-lead items to allow for the increase of twelve aircraft to be bought in FY '82; $34 million will pay for the long-lead of sixty A-10s; $30 million for five more UH-60 helicopters; and $7 million for F-5 long lead.

Only the House bill provides $65.7 million to support a buy of 180 F-16s in FY '82, although the Administration requested only 120. The House committee reasoned that funds in FY '81 were provided to support the production of 180 aircraft per year and thus the planned reduction to 120 was uneconomical and inefficient, delaying modernization by twenty-two months.

The major differences between the two bills are in Navy programs. The Senate deleted $96 million earmarked for an additional seven F-18s because it said the program is strapped with technological and cost growth problems which "encourage a cautious approach toward full procurement." The Senate also zeroed the request for $146 million to begin reactivation of the aircraft carrier *Oriskany*.

The House committee okayed funds for the full procurement of sixty F-18s and also approved the money to begin taking the *Oriskany* out of mothballs.

USAF Warned on Bomber

Members of a House panel on military procurement raised concern over the $2.5 billion being sought for a new multirole bomber. Committee members Rep. Nicholas Mavroules (D-Mass.) and Rep. Beverly Byron (D-Md.) warned that the Secretary of Defense, on behalf of the Air Force, must supply them with "ammunition" to sell the as-yet-unspecified aircraft to a House which will be looking for defense cuts if the Democratic budget proposal is passed.

The problem foreseen by panel members is that the final recommendation on the Long-Range Combat Aircraft (LRCA) will not be submitted to Congress until after the FY '82 Authorization goes to the House floor for consideration. Without specifics on LRCA, the House may be reluctant to authorize the $1.9 billion in procurement funds, although authorizing funds without program details is not unprecedented.

The Senate Armed Services Committee has completed markup on the strategic portion of the Authorization and funded LRCA as requested. The committee included a proviso that spending the funds would be subject to approval by the committee of the final bomber choice. The intent is to protect the program from potential amendments to cut funds because of "lack of program firmness."

June 1 is now the target date for submission of the final report. The delay has resulted from a desire to conduct the study and make a decision with firm cost and schedule data from industry. The Air Force expects to have negotiated contracts with industry in hand when the decision is reached.

C^3I Package Added

The Senate Armed Services Committee concentrated on the critical issue of command control communications and intelligence (C^3I) during consideration of the strategic portion of the authorization. The committee authorized eighteen programs to enhance current capabilities in the C^3I field, thus adding $335 million to the defense budget.

This action was the result of information previously requested by the committee and subsequently furnished by the Commanders in Chief of SAC and NORAD and the Organization of the Joint Chiefs of Staff. ■

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LT. COLONEL DON GASAWAY,
U.S.A.F., B.S.C. Retired, military hearing conservationist.

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How wide is the "two-way street" in transatlantic weapons development, and what is its potential traffic flow? This summary by the dean of the Pentagon press corps probes the vital questions . . .

Transatlantic Weapons Development: How Much? How Soon?

BY CHARLES W. CORDDRY

PRIME Minister Margaret Thatcher had serious business—British arms sales—on her mind when she called at the Defense Department last February 27.

The impression at the time was that her forceful arguments on widening the "two-way street" of armaments cooperation drew a decidedly positive response from Secretary of Defense Caspar W. Weinberger. Nothing in the months since then has seemed to alter that general interpretation, though it must be said that transatlantic cooperation in arms development and procurement has its own rather deliberate pace.

Mrs. Thatcher already had seen President Reagan, of course, and the word had gone out that there was an instant match of views on how to approach domestic and foreign problems. Now, appropriately welcomed at the Pentagon and comfortably seated in Mr. Weinberger's large office on that February day, Mrs. Thatcher quickly got past the pleasantries that a new American defense secretary may have expected to occupy most of their first meeting. The opening exchange itself dealt, happily enough, with an arms agreement—the new one for US purchase of British Rapier missiles to defend USAF bases in England—and thus formed a proper lead-in to the Prime Minister's main purpose.

Prime Minister Margaret Thatcher and Secretary of Defense Caspar W. Weinberger in the latter's office during her visit on February 27. She offered a list of British-built military items the US could buy.

As the leader of a country with a comprehensive defense industrial base and firm convictions about its competitiveness in price and performance, Mrs. Thatcher tabled an extensive list of military items that she thought the United States would do well to consider acquiring for its forces.

Britain, after all, had determined to modernize its nuclear deterrent with the American Trident missile, and it had the dollar costs of that submarine-based weapon to think about. The AV-8B Harrier V/STOL aircraft, to be sure, looked like becoming a major US-British cooperative program. The Rapier agreement, signed last February 13, with America buying the defense systems and Britain operating them, could become a precedent for host-nation manning of air defense at US facilities.

But Mrs. Thatcher wanted the British lane of the two-way street to be much more crowded, and she was driving home the point early for the new Administration in Washington. In greater or lesser degree, a succession of other Western officials made similar representations.

While the Reagan Administration is still formulating its policies for armaments cooperation, as it is for many other aspects of national security, the positive response of Mr. Weinberger to his visitors is taken as a good omen. Secretary of State Alexander M. Haig, Jr., is a natural ally of cooperative enterprises; as the Supreme Allied Commander Europe during much of the 1970s, General Haig was intimately associated with those undertakings that came to be known by the mouth-filling expression Rationalization, Standardization, and Interoperability (RSI). He regarded NATO's Long-Term Defense Program and aim of increasing defense outlays by three percent annually in real terms as moving up to "the bottom edge of prudence."

The early evidence indicates that the new Administration will continue the fairly broad range of cooperative programs that were in effect when it took office and will pragmatically support new efforts that have a good chance of succeeding.

The most emphatic statement in this regard was made

by Mr. Weinberger in the course of his budget testimony before the Senate Armed Services Committee on March 4 of this year.

The United States, he said, had gone through a period of uncertainty about its role in the world, "projecting an image of weakened will and irresolution, and sowing doubt among our allies." The Administration was "determined to demonstrate once again to our allies the reliability and value of American friendship." The allies would be expected to pick up a fair share of an increased defense effort, and the Administration would make a major push for a "more rational division of labor" in defense. Then, on the specific issue of armaments cooperation:

"There are two broad ways of achieving greater collective defense capabilities: one is for each ally to spend more; the other is to achieve greater multinational capability in what we do spend collectively. We will propose cooperative ventures in the development and production of new weaponry and high technology equipment as a means of modernizing allied as well as US forces. The greater the efficiency in coalition defense, the less added spending will be needed. My meetings with several NATO defense and foreign ministers [and here he surely should have included Prime Minister Thatcher] lead me to be quite encouraged as to the prospects for this approach."

Other Possibilities

Arms cooperation alone is not enough, however, and there must be intense efforts to achieve more commonality in doctrine, tactics, training, and procedures. Mr. Weinberger cited as a useful model for greater cooperative efforts a recent twelve-nation agreement for joint undergraduate jet pilot training. *(See "The Melting Pot of Pilot Instruction," p. 40.)*

Much of this sort of advocacy and reasoning has been heard before over NATO's long life, and especially since the mid-1970s when the urgency of greater standardization and more efficient use of money began to be self-evident. It is, therefore, an open question how much the deliberate pace of a large coalition of nations can be speeded up.

"Ultimately," Mr. Weinberger told the Senate committee, "it is the task of political leadership to reinstate, reinvigorate, and redirect a unified response by the Western Alliance to its and our vulnerability." Unified responses already were in progress—*e.g.*, the RSI efforts, the Long-Term Defense Program, the unique $1.8 billion NATO AWACS program—and so there was some hyperbole in the Defense Secretary's assertion. But all the strong leadership he promised on the Reagan Administration's behalf will be needed, certainly, to accelerate and broaden armaments cooperation.

The factors that work against, as well as those that work for, such acceleration are all still present.

National economic and political influences operate to retard the development of an open market in arms and cooperative arrangements for research, development, and production of new military equipment. In times of economic distress, such as NATO nations now are enduring, there is pressure to do the work at home, whatever the greater efficiencies of shared enterprise may be. Endorsement of RSI in principle does not encompass voluntary sacrifice of income in practice.

During his tenure as Supreme Allied Commander, Europe, Gen. Alexander M. Haig laid the groundwork for the Long-Term Defense Program of the NATO alliance.

Military requirements are set nationally, and new NATO bureaucracies have a distance to go before they resolve such problems as differing national modernization schedules and procurement methods.

In the United States itself, it is not easy to tell when surprises may develop in Congress with new impact on long-range cooperative efforts.

It has been congressional policy for seven years (beginning with the 1974 Nunn amendment) to foster commonality and standardization in NATO military equipment, not just for economy's sake but to enhance conventional defense and raise the nuclear threshold.

If the Secretary of Defense starts procurement action on a new major weapon system that is not interoperable with equipment of other NATO members, he must explain why in an annual report to Congress. It by no means follows, however, that Congress will auto-

Charles W. Corddry is the Pentagon correspondent for the Baltimore Sun, *and dean of the Pentagon press corps. His articles for AIR FORCE Magazine have included visits to Thule, Greenland, and to the Distant Early Warning (DEW) Line. He has the longest tenure among Washington correspondents on the Public Broadcasting Service program "Washington Week in Review." He wrote this article after a wide-ranging swing through European capitals and interviews with US government officials upon his return.*

matically endorse development or procurement of a standardized system. Multiyear programs undertaken with one or more NATO countries are subject to the annual congressional budget review process, just as any other arms projects are. The results sometimes cause considerable heartburn for US and allied officials. Programs can be wiped out, cut back, or reduced to lower priority. The Roland air defense system, to be produced here under license from France and West Germany, has had its ups and downs in this regard.

"Our internal budgetary process suffers from disconnects between long-range arms cooperation and the annual review process," an internal Pentagon memorandum laments.

A key current example of such difficulties is a program with the unprepossessing designation JP-233. This is a joint United States-British effort to develop a low-altitude airfield attack weapon, but deletion of funds from the Fiscal '81 budget leaves America's continued fifty percent participation very much in doubt. The situation was described in the latest annual defense posture report, submitted to Congress by former Defense Secretary Harold Brown just before he left office:

"When costs are measured against performance capabilities, no other available alternative has been found to be as cost-effective as JP-233. The program was in full-scale engineering development, with completion expected on schedule in mid-1984.

"This is a significant RSI cooperative program, not only because of its military potential but also because it is the only cooperative project in which an allied nation is performing all of the development work. The United Kingdom views US participation in this program as an important demonstration of US commitment to cooperative development programs with Alliance partners. Unfortunately, the Congress deleted the appropriation for JP-233 from the 1981 DoD budget; unless reversed, that decision will force us to terminate our participation in the program in spring 1981."

In short, while countries increasingly recognize a need for arms cooperation and some strong roots have been put down, centrifugal forces—political, economic, military, and legislative—continuously burden efforts to make swifter progress.

Rationale for Cooperation

The factors arguing for, and indeed compelling, cooperation are well known and documented in the record since 1974 when Sen. Sam Nunn (D-Ga.), the then-Defense Secretary, James R. Schlesinger, and others of like mind began to press the case for greater collective conventional military capabilities.

US strategic nuclear superiority had given way to (at best) a condition of strategic parity with the Soviet Union. The Soviet threat in theater nuclear forces (SS-20 missile, Tu-26 Backfire bomber) and conventional

The NATO AWACS, shown at the Boeing plant, is generally similar to the US Air Force E-3A version of the aircraft. Some eighteen NATO AWACS aircraft, to be bought by the alliance under a cost-sharing arrangement, will be based in West Germany.

Four F-16s of the four NATO nations participating in the multinational fighter program; from lower left, clockwise, they are aircraft of Denmark, the Netherlands, Belgium, and Norway.

forces was increasing. The alliance came alive to the need, at least, for balancing the theater nuclear threat and giving urgent attention to upgrading its general-purpose formations. In this context, the groundwork for expanding armaments cooperation was laid. This was imperative, given the rising costs and demands on national treasuries for weapons to mount a credible conventional deterrent.

The roles of nuclear and conventional forces were changing—the former still underlying the American commitment to the alliance but not carrying the full weight they once did, the latter of increasing importance.

"Thus a strong conventional capability is more than ever necessary," Mr. Schlesinger said in his 1974 defense posture report, "not because we wish to wage conventional war but because we do not wish to wage any war."

Seven years later, Mr. Weinberger was telling Congress that the nation could not "temporize any longer . . . refusal to respond to a major challenge, by preparing for conflict, has invited conflict." It was then that he gave his prescription for bolstering multinational capabilities.

The record over those years, whether one of temporizing or not, has surely been spotty and no great testament to NATO alacrity in meeting needs the alliance itself continually recognized in its formal statements.

After long study, the alliance adopted in 1978 its Long-Term Defense Program, emphasizing readiness, strengthened air, land, and sea conventional capabilities, arms collaboration, and modernized theater nuclear forces. It agreed on the three percent rule for annual real increases in spending—a sort of point of departure for greater increases as far as the Reagan Administration is concerned.

For all that, Gen. Bernard W. Rogers, the commander of NATO's military forces, told Congress earlier this year that there had been a "continuous relative decline" in the alliance's capabilities, with too many commitments turned into "overdue promissory notes."

Arms collaboration lies near the center of NATO's efforts to reverse the adverse trends and logically should be of increasing importance.

Mechanisms for Cooperation

Three basic vehicles are used by the United States and its allies to deepen and broaden the cooperative undertaking:

- **Memorandums of Understanding.** These are bilateral and multilateral agreements, designed to clear away "buy national" obstacles and tariff penalties, and promote competition in arms procurement in a common market. The first was signed with Britain in 1975. The results from Britain's (and probably other European countries') standpoint are seen thus far as modest but encouraging. The British, as Mrs. Thatcher made plain to Mr. Weinberger, now are pressing such programs as "Searchwater" radar for over-the-horizon targeting for naval aircraft, the Hawk naval training aircraft (in heavy competition with American proposals), and a light man-portable antiarmor weapon represented as able to knock out a Soviet T-72 tank at 300 meters.
- **Dual Production.** This is described by the Defense Department as a main means of avoiding proliferation of "noninteroperable identical systems" and of saving development money. In many cases, weapons will be produced in both the United States and Europe, but with success in standardization two lines likely would be needed anyway for timely equipping of forces. The department says "many new systems are or will soon be produced under license in Europe and the US."

At present the United States is producing the Italian OTO MELARA Mk. 75 gun mount for Navy frigates, a Belgian machine gun for armored vehicles, the French-German Roland surface-to-air missile system, and the German 120-mm smoothbore tank gun, and may produce a Belgian squad automatic weapon for the Army.

Dual production on the part of Europeans includes the F-16 fighter (by far the largest such coproduction program), the AIM-9L Sidewinder air-to-air missile, the Stinger man-portable air defense weapon, forward-looking infrared common modules, improved conventional artillery munitions, and armored personnel carriers.

The Advanced Medium-Range Air-to-Air Missile (AMRAAM) program is being developed by the United States for use by other NATO allies under the "Family of Weapons" concept.

Left, the British Aerospace Harrier V/STOL aircraft lifts off from a field location. Heat waves from its downward-thrusting engines can be seen. Above, a Wide-Area Antiarmor Munition blasts an overturned tank.

• **Families of Weapons.** This is the latest innovation in arms cooperation and is intended to facilitate standardization by identifying requirements early and dividing the research and development tasks between the United States and Europe. The Defense Department says the potential for savings is "enormous."

The first such weapons family is to be a new generation of air-to-air missiles, developed under a Memorandum of Understanding signed last August by the United States, Britain, Germany, and France. The US is to develop an Advanced Medium Range Air-to-Air Missile, and the European signers are to develop an Advanced Short Range Air-to-Air Missile. These missiles would replace the many types now in use in Europe. Once developed, they probably will be produced on both sides of the Atlantic, the Defense Department believes. It expects the savings for the US and Europe to total $500 million that can be used in other research and development areas. A family of antitank missiles is likely to be the next project.

The outstanding example of alliance cooperation in defense systems (along with the F-16 coproduction program) probably is the NATO AWACS enterprise. This is the largest single commonly-funded project NATO has undertaken, as the Defense Department notes, and involves the operation of eighteen E-3A aircraft by multinational crews under a NATO Airborne Early Warning and Control Command, headquartered at SHAPE in Belgium. The procurement program is scheduled for completion in 1985.

While the Reagan Administration has not yet added specific initiatives to the dozens now on the table, it has indicated its commitment to arms collaboration by steeply increasing requested appropriations for cooperative projects in Fiscal '81 and '82.

These increases were proposed to Congress:

AV-8B Harrier—$656 million. F-16—$416 million. Reengining KC-135 tankers under a joint US-French program—$187 million. Roland—$524 million. Rapier—$47 million. Division air defense gun (DIVAD)—$282 million.

At a time of American defense expansion, the Pentagon's research and engineering office is engaged in an evaluation of many European weapons and technologies with an eye, the department says, "toward whether they could satisfy existing operational needs in the US, meet a current US inventory deficiency, or contribute to the US technology base."

The possibility of second-source procurement in Europe, especially for US forces based there, is under investigation.

Studies of the effects of standardization and interoperability on combat readiness and effectiveness—which is what the whole exercise is all about—are said to have produced wholly favorable results.

It might be easy, on the basis of some assessments, to become overenthusiastic about the progress of cooperation in the alliance and overlook the mountainous problems ahead.

There is a sobering caveat in the Pentagon's latest Rationalization-Standardization report to Congress. Despite vigorous efforts over seven years, it says, "allied forces have only a limited ability to rearm, repair, reinforce, support, supply, or even communicate with one another."

That report's general conclusion is probably the right one:

"If one looks back to 1974 when all this began, it is clear that great progress has been made. If one looks ahead to the day when NATO's conventional forces are collectively, credibly and defensively equivalent to those of the Warsaw Pact, then much more needs to be done." ■

The NATO Alliance embraces many nations with diverse cultures. In pursuit of a common defense, the NATO partners have created a joint pilot training program that provides benefits for all—cost savings, enhanced standardization of equipment and tactics, better-trained pilots. This international cooperative program, known as Euro-NATO Joint Jet Pilot Training, is . . .

The Melting Pot of Pilot Instruction

BY MAJ. THOMAS L. SACK, USAF
CONTRIBUTING EDITOR

In October, the first thirty-six of 288 officers—131 from USAF and the others from seven Euro-NATO air forces—will begin undergraduate pilot training at Sheppard AFB, Tex. The thirty-six will form the first Euro-NATO Joint Jet Pilot Training (ENJJPT) class, the result of a memorandum of understanding signed by twelve NATO ministers last December. It's what one USAF official calls the start of the "largest cooperative training program ever among NATO countries."

The Air Staff Program Manager for ENJJPT is Maj. (Lt. Col. selectee) Ted Hailes in USAF International Programs. "The training program at Sheppard," he said, "will be fifty-five weeks long and provide 260 hours of flight training specifically designed to qualify the student graduates for follow-on fighter aircraft assignments." At the end of the first year, ENJJPT will possess 157 T-37s and T-38s, and is expected to graduate 241 potential fighter pilots. As the program grows, 196 airframes will be required to accommodate the 320 officers expected to be graduating annually by Fiscal Year '87. By then, the program will also produce 125 new instructor pilots (IPs) each year for ENJJPT. This portion of the training, called PIT, or Pilot Instructor Training, is also located at Sheppard and takes its name from the similar program Air Training Command uses to train its own IPs. *(See Capt. Slim Connors's article in January '81* AIR FORCE *Magazine, p. 58).*

Each country participating in ENJJPT is expected to provide its

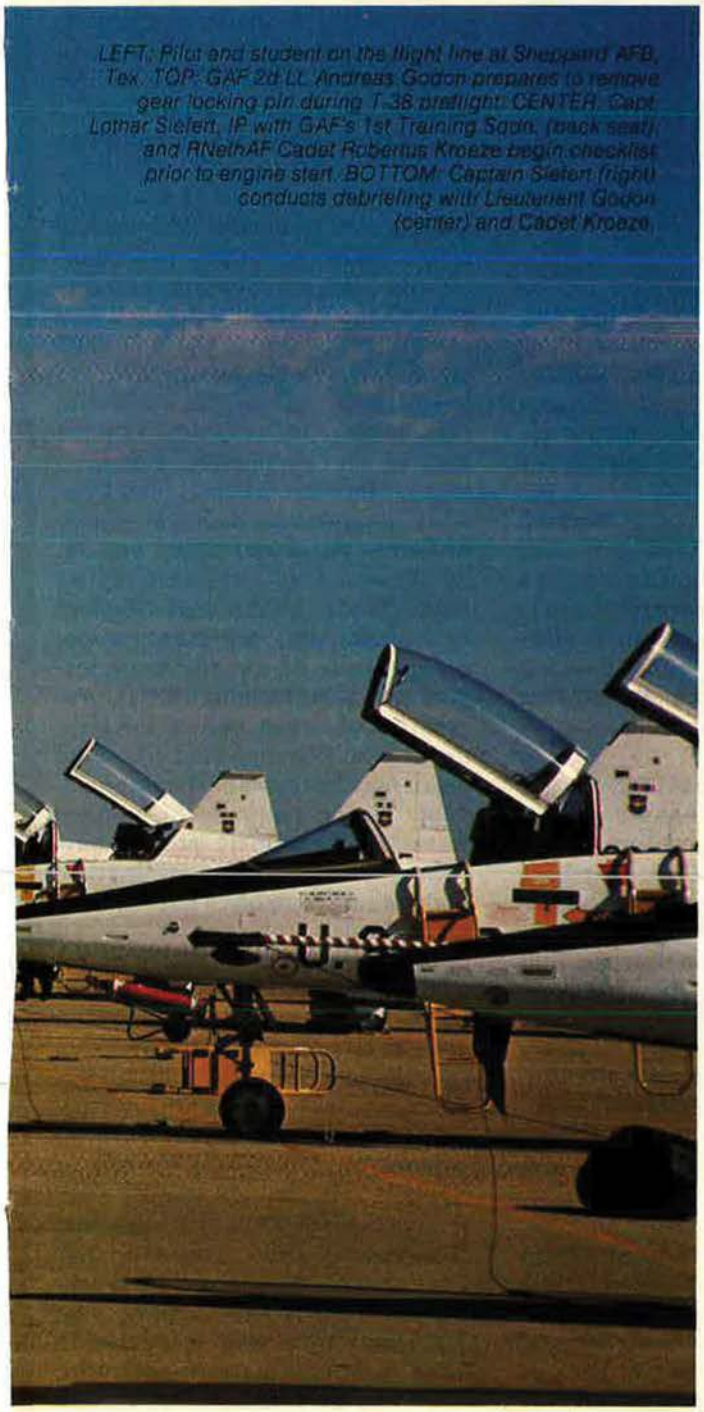
proportionate fair share of IPs based on the number of students it has in the program. The large number of instructor pilots, explains Maj. Frank Kapp, is "needed to train student pilots, future instructor pilots, and also to fill both supervisory and operations staff positions at the school." Major Kapp works in USAF Personnel Programs and monitors USAF program requirements for ENJJPT.

The ENJJPT program at Sheppard is currently programmed for a ten-year life. Long-range plans, those for FY '92 and beyond, call for ENJJPT to be producing annually approximately twice the number of pilots in the current program. The long-range program is still under development.

The Work of Twelve Nations

It has taken more than eight years to bring ENJJPT from concept to reality. Although only eight nations are represented by students in the first year, the program is the work of twelve countries. Belgium, Denmark, Germany, the Netherlands, Norway, Turkey, the United Kingdom, and the US are providing students and IPs for the first year. Canada, Greece, and Portugal are sending instructors but no students; and Italy is not sending anyone this time around. Greece, Portugal, and Italy tentatively plan fuller participation in ENJJPT. Canada will provide an IP, but will continue training its own pilots at home.

The idea for a joint pilot training program originated in Europe in 1973. About a year later, the US joined the ENJJPT Working Group



LEFT: Pilot and student on the flight line at Sheppard AFB, Tex. TOP: GAF 2d Lt. Andreas Godon prepares to remove gear locking pin during T-38 preflight; CENTER: Capt. Lothar Siefert, IP with GAF's 1st Training Sqdn. (back seat), and RNethAF Cadet Robertus Kroeze begin checklist prior to engine start. BOTTOM: Captain Siefert (right) conducts debriefing with Lieutenant Godon (center) and Cadet Kroeze.

German-owned T-37s in formation. The Federal Republic is transferring its thirty-five T-37s and forty-one T-38s to the Euro-NATO Joint Jet Pilot Training program as their separate training program at Sheppard AFB is phased out.

(WG) as it expanded to include non-European members of NATO. The WG was concerned mostly over rising training costs that "were making separate pilot training programs prohibitively expensive for the NATO nations," Major Kapp explained. Consolidating the training at one location, the air staff officers point out, allows nations to share expenses and reduces overhead normally associated with pilot training. Both of these factors are contributing to lower program training costs for most of the countries involved.

Major Hailes also sees cost benefits in sending better trained new pilots to their first operational aircraft. ENJJPT's FY '82 budget is $40 million and will increase to about $80 million in FY '83.

Usable airspace limitations in Europe and less than optimum training weather are other factors that influenced Europeans to seek common training. Also, many of their air forces, like USAF, have retention problems and suffer a lack of skilled manpower. Not every country is able to meet its IP requirements for ENJJPT immediately. Some simply can't afford the manpower losses from their operational forces.

There was also a need to standardize equipment and tactics. Just as aircraft like the F-16 and the Tornado aid in NATO standardization, so Major Hailes sees ENJJPT "as an important step in standardizing training and tactics" and "enhancing NATO's readiness posture." Moreover, the USAF students, for instance, will find themselves beginning their careers by working with the same NATO officers they may well be working with over the next twenty years or more. There is no better way for the future leaders of NATO air forces to start learning about each other and understanding their allied organization.

Sheppard—The Best Choice

In late 1974, five countries—Canada, the United Kingdom, Italy, Turkey, and the US—proposed separate plans to host the ENJJPT program. The desire was to establish it somewhere in Europe, but only the US could offer adequate existing training facilities, good flying weather, and the training capacity to accommodate the program's annual requirement. The decision was made for the US to host ENJJPT for ten years, or what officials call the Short-Term solution. Good flying weather dictated the south or southwest, and Sheppard emerged as the best choice. Both the base and nearby Wichita Falls already possessed an international flavor by virtue of the German Air Force pilot training program that has been conducted there since the early 1960s. And, added Major Hailes, "the Sheppard facilities, tailored for that program, are ideal for ENJJPT."

Negotiations that led to the common training syllabus "weren't easy," said Major Kapp, "because with twelve nations involved, all of them had to give up something." For the Germans, it was their own highly successful program at Sheppard. For others, it was accepting the number of individual flying maneuvers to be taught, expected attrition rates, and the overall training standards. With minor changes, the German syllabus has been adapted to start ENJJPT and will be modified as experience dictates.

Germany is transferring its thirty-five T-37s and forty-one T-38s to the ENJJPT program as its own program comes to an end. With the US providing the rest, other participating countries are giving cost credits to both the German Air Force and USAF for the use of those aircraft and associated support equipment.

ENJJPT reflects remarkable commitment and confidence on the part of the Europeans. For Germany, Norway, Belgium, and Denmark, it represents their sole source of fighter pilots and eighty percent of those being supplied to the Netherlands. USAF participation, by comparison, represents about 6.5 percent of its entire undergraduate pilot training (UPT) program. And, even before ENJJPT opens, the planning that has gone into it may have established a precedent for the planning of another Euro-NATO training project now being considered: a NATO Tactical Fighter and Weapons Training Center in Europe.

The Europeans still would prefer all or some part of ENJJPT located on their soil and that is the WG's next task—develop a Long-Term (European) solution and implementation plan. Also, the instrument flight simulator training offered in USAF UPT isn't in ENJJPT's immediate future, even though it's a means of reducing fuel consumption costs. This and other topics are bound to make the Working Group a lively forum. The Working Group was scheduled to meet this month to grapple with these and other issues. ■

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Addition of the F-15 air-superiority fighter to the Japan Air Self-Defense Force underscores changing attitudes in Japan, and reflects the country's determination to defend itself vigorously . . .

Japan Adds the Eagle

BY CAPT. CARY I. YANAGI, USAF

Last leg of the ferry operation from Kadena AB, Okinawa, to Gifu AB on mainland Japan. The F-15s were piloted by Lt. Col. Tom Browning and Maj. Darryl Smith of the 555th Tactical Fighter Training Squadron, Luke AFB, Ariz.

"WE ARE here today to commemorate a most visible example of Japan's progress in qualitative improvements to its Self-Defense Forces." The words of Lt. Gen. William H. Ginn, Jr., blended with the scream of F-15 Eagles over Gifu AB, Japan, to usher in a new era in Japanese aviation.

The occasion marked the arrival of the first two F-15Js to be turned over to the Japan Air Self-Defense Force (JASDF). The JASDF is scheduled to obtain ninety-eight more over the next five years.

The addition of the F-15 Eagle is significant in its own right, as it adds to Japan's defense the best air-superiority aircraft in the world. But, as General Ginn pointed out, "The arrival of the F-15 symbolizes more than just a qualitative improvement of the Self-Defense Forces; it reminds the world that Japan, while totally committed to peace, does not intend to be intimidated and would defend itself vigorously if attacked." The Eagles demonstrate a changing mood and a changing outlook in Japan.

Shifting Public Opinion

Article IX of Japan's constitution, written during US occupation, is the famous "no war" clause. It prohibits Japan from waging war or maintaining armed forces.

The Japanese Diet long ago interpreted this to mean that offensive forces are unconstitutional but not forces maintained strictly for self-defense. Even with this interpretation the Self-Defense Forces have been the subject of controversy in years past in Japan, and there was not much enthusiasm for giving them modern equipment. This has changed. The Soviet invasion of Afghanistan and the significant buildup of Soviet forces in the Far East have had a dramatic effect on Japanese public opinion. The US-Japan Treaty of Mutual Cooperation and Security and the Japan Self-Defense Forces are now seen to be supported by a greater percentage of the population than ever before.

An example of the progress made in public opinion is the work being done between US and Japanese uniformed personnel under the Guidelines for Japan-US Defense Cooperation approved in November 1978. Joint studies on defense planning, joint exercises, and joint training are allowed that would have been unheard of a few years ago. This changing public mood also made possible the consensus, so necessary in Japan, to decide to obtain the best air defense there is. With the combination of Grumman E-2C Hawkeye twin-turboprop early-warning aircraft for low-level detection, an upgraded BADGE (Basic Air Defense Ground Environment—a computerized air defense system) for command and control of the force, and the F-15Js, Japan will have qualitatively as good an air defense system for its particular geography as exists anywhere in the world.

McDonnell Douglas is building the first fourteen of the one hundred Eagles. Mitsubishi will build the rest in Japan under license.

Extensive Training for Eagles

Maj. Darrell Smith, USAF, landed the first Eagle at Gifu and turned it over to one of his former students, Lt. Col. Minoru Hoso, JASDF. Lieutenant Colonel Hoso was just one of the many Japanese who had been involved for some time in the F-15 program. Initial aircrew training was conducted at Luke AFB, Ariz. Japanese pilots and engineers visited Whiteman AFB, Mo., and Edwards AFB, Calif., to test the F-15J's performance and fire control and data link systems. Some maintenance personnel have been trained at the Eglin AFB, Fla., training course.

One of those pilots trained in the US, Lt. Col. Masakuzu Hoki of the JASDF, told what flying an Eagle means to him. "In my school days, I used to ride my bicycle twenty miles one way every day to Yokota AB, just to look at airplanes." Lieutenant Colonel Hoki is on his way to Luke to become an F-15 pilot, so the tradition continues.

JASDF pilots have had other chances for a close look at the Eagles. They have been conducting Dissimilar Air Combat Training in the F-15 since March 1979, when the 94th Tactical Fighter Squadron came from Langley AFB, Va., to Japan to participate in Cope North, a Fifth Air Force-sponsored exercise that is one of the outgrowths of the Guidelines for Defense Cooperation. There have been nine Cope Norths, and the Eagles have participated in four of them. These days, of course, the Eagles come from the 18th Tactical Fighter Wing at Kadena AB, Japan.

First Squadron in '82

The first squadron of F-15s in the JASDF will start forming in March 1982 at Nyutabaru AB, Japan. Planes will be added one at a time, and the eighteen-plane squadron will be completed by March 1983. All one hundred Eagles will be added to JASDF by 1986, replacing aging Lockheed F-104 Starfires.

General Ginn said in his remarks at the F-15 turnover ceremony: "I have been privileged to fly the F-15 on a number of occasions and, from the standpoint of a commander and as a pilot, it is a remarkable airplane with superb capabilities. As more F-15s are added to the Air Self-Defense Force, the JASDF and the Japanese people will have good reason for increased confidence in the air defense of their homeland. You have great reason to be proud of your accomplishments today." ■

Capt. Cary I. Yanagi is an Air Operations Staff Officer assigned to Fifth Air Force's Directorate of Operations at Yokota AB, Japan. He was commissioned through the ROTC program at Southern Methodist University, and now serves as a Weapon Systems Officer in the F-4 Phantom.

The product of a binational effort, the Jaguar serves in air forces in the Middle East, Southwest Asia, and South America, as well as Europe.

Flying the Jaguar

BY MARK BERENT

THERE is a fast and deadly cat prowling the NATO air jungle these days that runs low and carries awesome strike power. It's called Jaguar, and its RAF pilots rarely take it above 250 feet or under 500 knots.

Last fall, I found myself handling one from the backseat at those speeds, altitudes, and in poor visibility that brought back memories of how we Air Force pilots did it years before, first in the F-86F, then in the F-100D, over the same region. As I recall, at altitudes of 500 to 1,000 feet, we sought targets while indicating 360 knots. We had cut and folded 1:250,000 sectional aeronautical charts into carefully marked strip maps, used the left index finger as the present position indicator on our unmoving map display, and flew with our knees as we manipulated the E-6B Whiz-Wheel with the right hand to compute en route times.

Now, with deceptive ease, I was zooming over, around, and through valleys formed by the treacherous hill-mountains of West Germany's Eifel region. Thanks to remarkable devices in Jaguar, I was able to stay on track, on time, and completely safe.

Monitoring my flight from the front seat was Flight Lieutenant Mike Hill. We had met earlier that September day at No. 14 Squadron operations on the flight line at RAF Bruggen in Germany, near the Dutch border. There Mike and Squadron Leader John Bryant had discussed Jaguar characteristics and my upcoming flight.

In the RAF, they explained, the single-seat Jag is officially tagged the GR-1. The two-seater, nicknamed the T-Bird, is the GR-2. As with all lethal cats, the airplane must be handled with respect and care or, like the Phantom, it can turn on you—literally and figuratively. Mishandled, particularly the T-Bird, it can, will, and has departed from controlled flight quite viciously. It has been known to pitch and roll on all planes and then enter an oscillatory spin. Recovery is possible, they said, but the pilot must "bang out" by 10,000 feet if he

Left, an RAF Jaguar streaks across the British countryside, creating contrails from its passage. Above, rough-field trials included takeoffs and landings from such sod strips as this one at Boscombe Down test center.

hasn't regained control. To get into such a situation, however, the pilot must be ham-fisted and deaf since, prior to stall, the Jaguar will give you plenty of wing rock, the HUD (head-up display) alpha gauge will indicate the too-high angle of attack, and, if that isn't enough, a squealing audio warning will pierce your ears.

Bearing all that in mind, I suited up. Sights, sounds, and smells in RAF locker rooms on the flight line are the same in any air force: lockers, benches, unlaced boots, and joking conversations. After twenty years of hooking into USAF G-suits, my fingers on their own sought the snaps and zippers on the RAF suit. I wasn't always successful. To tighten the built-in chute harness I used muscles I didn't know I had. The heavy, rolled flotation gear hung around my neck like a hemp rope. Finally, though, Mike and I were driven to our T-Bird.

The RAF doesn't believe in neat rows of fighters exposed in show formation on the ramp. At Bruggen, airplanes are housed in steel-doored, reinforced concrete hangarettes that can protect what is inside from anything up to and including a direct hit by a 1,000-pound bomb. In a pinch, each hangarette can house two Jaguars.

Remarkable Lift and Stability

During the preflight, Mike explained that the Jaguar does not have ailerons. Instead, lateral stick movement actuates left or right spoilers (that do not dump lift), supplemented by differential tailplane movement at low speeds, to effect roll. The entire wing trailing edge is taken up by double slotted flaps. Combined with leading edge slats, which can be set on automatic or manual, Jaguar has remarkable lift and stability at high angles of attack. Huge speedbrakes (called air brakes in the RAF), measuring about four feet by two, extend out from the lower fuselage just aft of the gear wells.

In the nose wheel well is a computer terminal, or indicator board, where the pilot tells the central aircraft computer what stores are carried, where they are carried, and with what fuzing. Internal data storage then feeds in the flight characteristics for use at weapons release time. The four underwing and one fuselage hard points can carry up to 10,000 pounds of ordnance.

As we finished the preflight, Mike showed me the hook for barrier engagements and the drag chute that is rarely used since aerodynamic braking is adequate under normal circumstances. He pointed out the 30-mm Aden cannon mounted in the left fuselage. The GR-1, he said, has two. Before climbing in, we paused for a moment to view the No. 14 Squadron insignia painted on the left engine intake. Mike remarked that the motto is the only one in the RAF written in Arabic. Taken from the Koran, it translates: "I spread my wings, and keep my promise."

I climbed the ladder to the rear cockpit where Mike helped me strap in. The ground egress system, I found to my consternation, consisted of six very unfamiliar steps. Not to worry, Mike said, if you are in a bind, bang out; the Martin Baker Mk IX seat has a zero-zero capability. A rather drastic solution, I thought. There was no face curtain ("blind," he called it) ejector, just

Top photo shows details of an Indian Air Force Jaguar of its initial batch of forty. Below, RAF Jaguar at Nellis AFB, Nev., takes part in Red Flag exercises (note F-15 landing in background), now a routine event. At right, two Jaguars of the Omani Air Force carry out a low-level pass during a training exercise over the desert. (Photos courtesy British Aerospace)

the "D" handle between my legs in front of the seat pan. Mike said the RAF thought that it required too much time to reach up for the "blind." Besides, he added, its absence allowed much improved six o'clock visibility.

The cockpit was snug yet comfortable. I thought it a bit cluttered until I remembered the T-Bird is used for advanced training and an instructor pilot needed all the control and system input he could get. Mike came up on the intercom, said he had the inertial navigation system (INS) on alignment, and went through the start sequence. He fired up the microturbo (a built-in auxiliary power unit). In minutes the two Adour fans were spooled up and all systems were on the line. Since the Jaguar's *raison d'être* is high subsonic, low-level flight as opposed to air-to-air, the Rolls-Royce Adour bypass fan engines were chosen to give a fuel-conserving, low-level attack radius in the 300-nm range using only internal fuel. Radius of action with external fuel increases to 760 nautical miles using a hi-lo-hi profile.

We took off under a 2,000-foot overcast. Visibility ranged from less than a mile to more than two. The runway was dry, the winds fairly calm. Rear-seat viewing, even on takeoff, was excellent. I had no trouble keeping lined up as Mike guided me into the air. Afterburner acceleration was dynamic. We rotated at about 130 knots and were airborne cleanly around 150 with no sloppy control feel. (Unlike the F-4D, I felt enough control response to roll, were I proficient, just after liftoff.) Within seconds we turned north on the first leg of our low-level-navigation flight.

There were three big reasons I felt secure flying at an indicated 430 knots at 250 feet in the back seat of an unfamiliar aircraft in poor visibility over the Eifel. The first I've already mentioned: superb rear-seat visibility. Second and third, but equally ranked, are the HUD and PMD (Projected Map Display).

The HUD is clearly outlined on the combining glass provided for the backseater. I was able to read

airspeed, altitude (radar or barometric), heading, alpha, and aircraft attitude while looking through the glass at the terrain ahead. By flicking my eyes down to the center of the instrument panel I could see the PMD. Projected on the large screen (about eight inches square) was a 1:250,000 sectional with a blivet in the center denoting aircraft position. The map can be slewed to present north at the top or oriented to the projected flight path. One can also choose a 1:500,000 scale. Way points are selected from the INS to display heading and distance to the next checkpoint on the HSI (Horizontal Situation Indicator).

Using the HUD and PMD in combination, I felt totally in control and surprisingly at ease. The high wing loading on Jaguar gave me excellent gust response so I wasn't fighting the airplane. In fact, I had a complacent feeling with overtones of not working hard enough to accomplish what I was actually doing: flying a front-line fighter at low altitudes with a groundspeed approaching 500 mph. I've had that feeling before: driving on an interstate freeway.

Mike pushed the throttles up until we were indicating just over 500 knots, normal wartime run-in speed. There were no appreciable difficulties encountered, nor was cockpit noise excessive. We did some five- and six-G turns under full throttle without loss of airspeed. The HUD angle-of-attack indicator and the maneuvering slats told me I could have pulled more (the airplane is stressed for 8.6 Gs with a design max of twelve).

Run-in on a Target

On a target run-in, the pilot would have been steered to an IP (Initial Point) by HSI (Horizontal Situation Indicator) and HUD symbology. At the IP he could, if he wished, update the computer (as he could have at any point along the route). Just past the IP the pilot would select weapon mode, and the HUD would point out the target inserted previously into the computer's data storage component.

Once the pilot has a visual on the

Mark Berent's USAF career encompassed more than 4,000 hours' flying time, with more than 1,000 in combat during his four years in Southeast Asia. He maintains current proficiency in single and multiengine prop and jet aircraft. His last article for this magazine was "The Luftwaffe Alpha Jet," in April. He is a feature writer and columnist for several international magazines, and a novelist. His first co-authored adventure novel, Brass Diamonds, *is in bookstores, and the second novel is near publication.*

target, he flies the airplane along a HUD-provided drift compensated bombing line. By using a hand controller, he keeps a HUD-projected target bar on the target, thereby updating range information into the system. At this point the computer takes over and keeps the bar on the target. The pilot then depresses the pickle button on his control stick, which allows the computer to release the weapons automatically at the proper point. Upon weapons release, the system reverts to the navigation mode and the pilot begins his escape maneuver. The pilot can also select targets of opportunity or manual release modes as battlefield conditions dictate. Jaguar S (the GR-1) has laser rangefinding operable in all attack modes.

Mike called for and got clearance to go to altitude. We zoomed up to perform some aerobatics. Since the wings are small and set back, I had to eyeball the gauges near the top of my first loop. I went in sharp with the Gs and managed to get around without dirtying up the canopy (cockpit floor dirt floating up under negative Gs). Flick rolls were just that. The positive control response coupled with stability augmentation on all planes makes the Jaguar almost too easy to fly.

One thing did become apparent at altitude: thrust degradation. The Jaguar is a low-altitude cat and though the twin Adours have a bypass ratio of 1:1, you need a lot of burner (reheat) to power the aircraft over 30,000 feet or so. It's interesting to note that afterburner on a turbofan is more efficient since the burn section has more oxygen due to the influx of bypass air. Additionally, Jaguar has a part throttle reheat (PTR) that allows the pilot to select burner at any throttle setting. This function is vital if he must make a single-engine landing.

On the way back to Bruggen, Mike demonstrated the navigation and approach phases of the computer systems (called NAVWASS, meaning navigation and weapon aiming subsystem). The runway approach end became just another waypoint. As we came in range, Mike selected the instrument landing system (ILS) mode. All we had to do then was keep the flight director needles nulled. After a rocking chair approach, we shot some touch and go's. Though the wings have a forty-degree sweep, the slats and flaps allowed us a final speed of around 120 knots (Mike actually flew the alpha gauge—something I have difficulty with). The third time around we landed and turned off the runway in less than 3,000 feet. After taxi-in, shut down, and debriefing, he told me a bit more of Jaguar's history and current role.

A Joint Project

The 23,000-pound (clean takeoff weight) airplane is an Anglo-French creation of the mid-1960s. In a nutshell, British Aerospace combined with Dassault of France to form SEPECAT (Société Européenne de Production de l'Avion d'École de Combat et d'Appui Tactique), registered in France, to design and produce a trainer-fighter. Rolls-Royce combined with Turboméca to provide the engines. After much haggling among the French and the British as to final design and assigned role, each country settled on its own version as dictated by national requirements and budgets.

The five RAF Jaguar squadrons in Germany are under control of 2d Allied Tactical Air Force and are responsible for conventional ground attack and nuclear strike missions in support of NATO land forces. Given the long range of Jaguar, they probably have deep strike targets in Warsaw Pact countries.

The British fly Jaguar S (Strike), the GR-1, and Jaguar B (Biplace), the GR-2. The French fly Jaguar E (École or School) and Jaguar A (Appui or Attack). The French abandoned Jaguar M (Maritime) as a carrier version a few years back. The British also produce and sell the Jaguar International (the French prefer to push Mirages). This uprated Jaguar has been purchased by Oman, Ecuador, and India. The variants among the British, French, and export models concerning avionics and fire-control systems are far too numerous to go into here.

Prudent USAF crews, well aware of turbulent foreign alliances whereby one day they may be flying *with* Jaguar International and the next day *against*, know they best gain all possible knowledge of this highly versatile aircraft. (Jaguar I, for example, can carry such dogfight missiles as the Matra 550 Magic on over-wing pylons.) One way is to be briefed by USAFE members who saw the Jaguar win two trophies (conventional and low-level retarded bombing) in the 1980 Tactical Air Meet at Ramstein AB, Germany. Another is to talk to Red Flag team members at Nellis AFB, Nev., who hosted RAF Jaguars during exercises in 1979 and 1980. As USAF Col. Gerry Gentry remarked after the '79 exercise: "We're tickled to death to have the Brits out here with their Jaguars . . . they really watered our eyes." ■

JAGUAR AT A GLANCE

	SEPECAT Jaguar	International Jaguar
Engines	Two Rolls-Royce/Turboméca RT172 Adour 102 turbofans. Static thrust with afterburner = 7,140 pounds each.	Two Rolls-Royce/Turboméca RT172-26 Adour 804 turbofans. Static thrust with afterburner = 8,040 pounds each.
Normal/Max T-O Weights	23,000/32,600 pounds	24,000/34,000 pounds
Performance	T-O distance to 50 ft. = 2,900 ft. Land from 50 ft. = 2,800 ft. Max speed = Mach 1.1 lo, 1.6 hi Ferry range = 1,983 nautical miles	T-O distance to 50 ft. = 3,085 ft. Land from 50 ft. = 2,575 ft. Max speed = Mach 1.1 lo, 1.6 hi Ferry range = 1,904 nautical miles
Ordnance Load	10,000 pounds	10,000 pounds
Wingspan/Length	28 ft. 6 in./50 ft. 11 in.	28 ft. 6 in./55 ft. 2½ in.

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Link is producing F-16 simulators for installation not only in the United States but also in Belgium, Denmark, the Netherlands and Norway —the countries which are jointly producing the single-engine lightweight advanced technology fighter. At least 18 simulators are being provided, including some for other countries planning to acquire the versatile aircraft.

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Tailoring training precisely to the needs of foreign air forces is one of Air Training Command's most fruitful activities, annually involving 4,000 students from fifty countries.

USAF's Foreign Military Training

BY 2d LT. CATHY PARAMORE, USAF
Photos by Buster Kellum

TRAINING the military of foreign countries is a continuing important component of US foreign and defense policy. Each year our Air Force, our Army, and our Navy train thousands of foreign military officers and enlisted personnel, plus smaller numbers of their civilian compatriots. This is accomplished either through a Foreign Military Sales (FMS) arrangement, which accounts for about ninety-five percent of the total security assistance training costs, or under a grant aid program known as the International Military Education and Training (IMET) program, financed by US dollars. IMET is in no sense a "gift," in the usual understanding of the word. Rather, it represents a studied government policy decision that providing free military training to a friendly country that otherwise couldn't afford it is definitely in our national interest.

How We Do It

The Air Force plays a major role in the foreign military training process. Each year some 4,000 students from more than fifty friendly countries receive technical, flying, or professional training in the US from Air Force agencies, under guidance and directives provided by Headquarters USAF, Directorate of International Programs (AF/PAI). Eighty percent of these trainees get their instruction in Air Training Command (ATC), the remainder in other Air Force major commands, under administrative guidelines established by AF/PAI and its executive agent for foreign training management, FMTAG (Foreign Military Training Affairs Group). FMTAG's commander, Col. Billy M. Mobley, serves as Chief, Foreign Military Affairs, on the staff of the ATC commander, responsible for the management of foreign military training activities within the command. He is also the "central manager" for USAF-sponsored foreign military training throughout the continental US.

4,000 and Holding

FMTAG's Implementation Division authorizes, administers, implements, executes, and manages all USAF-sponsored foreign training programs conducted in the US.

Six program managers, working closely with the foreign training officers at each installation (more on the FTOs later), are responsible

Opposite page: USAF 1st Lt. William Kittle and German Naval Ensign Uwe Hanss discuss an upcoming training flight.

for the management and maintenance of all aspects of the training of more than 4,000 foreign students each year.

Vernon Gray, a program manager for four Middle East countries, remembers the first major activity that included foreign students. It was held at what is now called the Defense Language Institute English Language Center, Lackland AFB, Tex.

"We called it the Aviation Cadet Preflight Training program when it was set up in August 1952," Mr. Gray recalled. "Some 2,000 students, 200 of them foreign military trainees, were involved.

"Programs continued at a fairly low level until the Vietnam crisis," he continued. "Then came the explosion. The student load mushroomed, with some 5,000 Vietnamese alone involved.

"Now," he concluded, "foreign training has subsided again somewhat," to the present level of 4,000.

The Training Package

Before a foreign student begins training in the US, the Programming and Scheduling Division has spent up to a year in identifying, evaluating, and developing a training package tailored to his country's wishes. It's an enormous task, because the instruction might involve flying (pilot and navigator) and other aircrew positions, technical training, professional military education, or Air Force Institute of Technology (AFIT) courses. Or perhaps the foreign country wants its students to get medical training given by the Air Force, Navy, Army, Marine Corps, or civilian US government agencies. Or, where desired specialized training isn't available through government agencies, it might be obtainable from commercial sources.

Normally, a foreign country in search of training in the US first requests information through Hq. USAF Directorate of International Programs (PAI). They ask for the kinds available, plus an estimated price on a particular system or piece of equipment. FMTAG then develops the price and reviews the request. The result is definitive information on training, prices, and course subjects required, and factoring in elements requiring lead-time, such as necessary prior education, training, or equipment.

If the training is available through a military organization, coming up with the price is relatively simple. However, if commercial organizations provide the instructions, FMTAG routes a request for costs to ATC's Technical Training Directorate and its 3303d Contracting Squadron. The 3303d then invites companies that can provide the desired training to submit preliminary bids. Next, technical experts from the Technical Training Systems Division analyze the quality and quantity of instruction offered and make their recommendations to FMTAG.

In turn, FMTAG tells PAI on the Air Staff what the training will cost, and PAI passes the data on to the requesting country.

When the latter decides the training is acceptable, it requests price and availability data from PAI. Once again, FMTAG is told to provide the information. There's one additional step: In the case of US government training, quotas (classroom seating availability) in each class for each desired course must be available. These seats are reserved until the country accepts or rejects the offer. If it likes the projected program and finds price and dates acceptable, the country and PAI sign a Letter of Offer and Acceptance (LOA). This is a contract between the foreign country and the United States in which the US government acts as the contracting agent for the training, whether provided by the military or commercially.

The next step is for the foreign nation to deposit a down payment, then follow with agreed-upon periodic payments until the training is complete.

IMET cases financed by US appropriations are processed in much the same way through similar channels. One obvious difference is that IMET countries are allocated specific amounts of money annually by us to be used for the training their nationals receive.

Once the LOA is signed, preparation for student attendance begins.

From left, USAF 1st Lt. Keith Earley, Dutch Cadet John Raaymakers, German Air Force Cadet Dieter Honetschlager, and USAF's Capt. Mike McGinnis.

A Request for Purchase Package given in civilian contractor cases states precisely what training will be accomplished, what equipment furnished, and training dates and cost. If the training is from US government resources the student's attendance, tentatively scheduled during the P&A cycle, is confirmed.

Tailormade or Package Deals

Training can be tailored either to a country's needs or to an off-the-shelf package. The background of the student, the type of training the purchasing country wants, and what it expects of its returned students when they've finished are the factors which determine whether or not a tailormade, individualized program is called for.

USAF agencies train more than 4,000 foreign students each year. Here, German Air Force 2d Lt. Andreas Godon prepares for takeoff.

For example, if country "A" has purchased its first radar system, its people will probably need extensive English language instruction, basic technical training in electronics and radar principles, plus specialized contractor training on maintenance and operation of the system. However, when country "B" buys its fourth identical system from us, odds are that its in-place radar personnel can maintain it. So they'd probably only need specialized contractor training.

When an entire aircraft weapon system such as the F-15 or C-130 is bought, this same tailoring comes into play for each of their subsystems.

According to Colonel Mobley, "Training is available for almost any system, or any subject. The only constraints are whether it is in accordance with the Foreign Assistance Act and the Arms Export Control Act, whether we have capacity for additional students, and whether the price quoted is acceptable."

Our program with Saudi Arabia is a good case in point. In late 1975, they announced their intention to buy forty F-5E and twenty F-5F "Freedom Fighters." Obviously, they would need trained pilots and technicians to fly and maintain them. So an agreement was reached for the US to train 120 pilots and 1,200 technicians over a three-year period—twenty pilots arriving every six months and 100 technical trainees per quarter—with the Saudis paying for all costs associated with the training.

The first students arrived in early October 1975. The technical students would receive twenty-seven months of training, including six weeks of Air Force-type basic, fifty-eight weeks of English, and fifty-two weeks of high-school-level math and science. The latter, as decided by the Saudis, would be given by Northrop Aircraft, with USAF monitoring the contract.

The pilots, after they had received English language training and completed undergraduate pilot training in Air Training Command, would proceed to Tactical Air Command to go through its F-5 advanced fighter course.

The technical trainees learned English significantly faster than the average foreign students. Air Force officials attributed this to the fact that the Saudis were highly motivated and maintained tight military discipline and control.

The results? To date, 791 completely trained students have returned home, 238 were eliminated for varying reasons, and twenty-four of the group are still in training, expected to graduate this October.

Of the 127 pilots entered in the three-year contract period, forty-eight have completed their English and F-5 training, fifty-nine were eliminated, and twenty are still in training.

In summary, training is relatively easy to obtain for a system or skills currently in the USAF inventory. If a system is unique to a country's configuration or the equipment is no longer used by the USAF, the contracting procedure is the same, but the cost may be quite high.

Training can be conducted in the US or the home country. If here, it's given at ATC Technical Training Centers, in Field Training Detachments, or in contractor facilities. Overseas, the instruction is admin-

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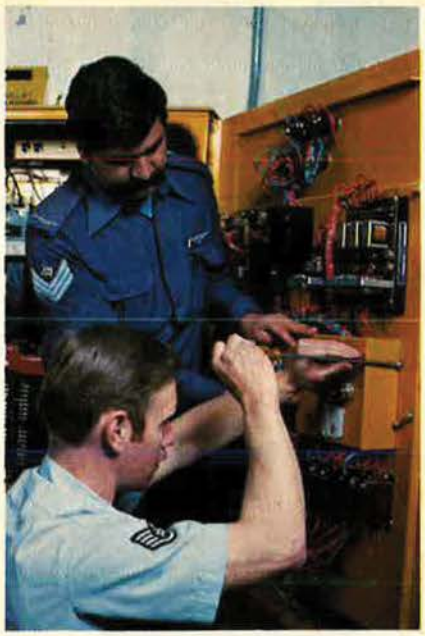
2d Lt. Cathy Paramore, Chief of Services Branch at the Foreign Military Training Affairs Group since August 1980, earned a college degree during USAF enlisted service, then attended Officer Training School, graduating in June 1979. She pins on first lieutenant's bars on June 18.

istered by USAF mobile training teams. The time consumed in various training programs varies from orientation courses lasting one day to the very long time required to become a system qualified pilot—more than a year.

Additional methods include three types known as "training of opportunity," in which the student gets to do his or her particular kind of training only if the occasion for maintenance or repair exists. These are: observer training, in which the student watches qualified persons perform tasks; familiarization training, where the student observes and does some work, but doesn't become personally qualified or proficient; and qualification training, which requires students to practice specified tasks until qualified.



Above, Jordanian MSgt. Jadallah Sukhni and USAF's SSgt. Malcolm Redman perform electronic maintenance. Top right, a spirited classroom discussion. Above right, Moroccan SMSgt. Benari Mohammed inspects aircraft undercarriage.

Getting to Know You

A most important part of the total training program—second only to the military training objective—is the DoD Informational Program, designed to give foreign students the best possible understanding of the US, through personal contact with, and observation of, our people, our government, and our cultural institutions. The end goal is to deepen the foreign student's understanding of, and respect for, our nation as a world force whose beliefs and policies are based on democratic principles, "government by consent of the governed." The long-range benefits the US realizes from the program, as the students take this understanding of the real America back to their countries, are difficult to measure.

Every base with foreign students is required to have an Informational Program. A Foreign Training Officer is appointed to develop activities exposing the trainee to many facets of our national mores. These run the gamut from government institutions, the judicial system, political parties, the press, minorities, agriculture, economy, labor and labor-management relations, education, public and social welfare events, to the diversity of American life in such activities as rodeos, concerts, civic clubs, and participation in our national holidays. In this way, technical and flying training is complemented by a fostering of mutual cultural awareness and understanding, and lasting friendships between US citizens and our foreign guests.

Role of the FTO and CLO

The Foreign Training Officer (FTO) is an American responsible for the administration of foreign military trainees on his base. "He briefs them on the local installation and surrounding community," Colonel Mobley explained, "maintains student records and handles all administrative details pertaining to training progression, ID cards, drivers' licenses, in and out processing, and, if necessary, correspondence relating to civil law violations. The FTO also establishes an Informational Program for his base. As the primary contacts for the students, FTOs and their foreign counterparts, Country Liaison Officers, function in about the same capacity as Air Force Squadron Section Commanders."

A Country Liaison Officer (CLO) is a foreign military officer or NCO selected by his government to serve with a DoD activity to assist in the administration of trainees from his country. He makes sure that they follow appropriate regulations; enforces dress standards; initiates disciplinary action for any infractions; assists in administrative details having to do with the disposition of graduates and those who "wash out"; helps when language difficulties arise; and gives necessary orientations to the trainees. He may be assigned either to FMTAG or a designated location within the command.

Colonel Mobley predicts that foreign military training will remain fairly constant in the coming years, primarily because there are no projected large programs like those of the Saudis and Iranians currently on the horizon. "However," he said, "training will become less expensive for some countries mainly because of congressional changes in our pricing policy already applied to IMET countries. In the past," he explains, "we required full reimbursement for everything involved in supporting a student, including a percentage of the cost for roads and grounds, base security, utilities, and all other base operating expenses. Our proposed cost schedule, in which we charge only for actual training costs, will, we hope, soon come into being for the FMS countries."

Colonel Mobley praises the foreign trainees highly. "These foreign students meet the same standards and requirements as USAF students, often accomplishing their training side-by-side with them. In general, they do extremely well, and upon graduating return fully qualified to their country." ■

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JANE'S

ALL THE WORLD'S AIRCRAFT SUPPLEMENT

JUNE 1981

The modest scale of the changes required to re-engine an F-16 with the General Electric F101-DFE derivative fighter engine is emphasised by this photograph. The F-16/101 (left) is almost indistinguishable from the standard F-16A alongside it

GENERAL DYNAMICS

GENERAL DYNAMICS CORPORATION, FORT WORTH DIVISION: PO Box 748, Fort Worth, Texas 76101, USA

GENERAL DYNAMICS F-16 FIGHTING FALCON AND DERIVATIVES

By early 1981, more than 300 standard F-16s, comprising both single-seat F-16As and two-seat F-16Bs, had been delivered from the multinational production lines at Fort Worth, Tex.; Gosselies, Belgium; and near Amsterdam, Netherlands. Of this total, almost 200 have entered service with the US Air Force, following receipt of the initial F-16A on August 17, 1978, the major proportion with the 388th Tactical Fighter Wing at Hill AFB, Utah. This wing comprises four squadrons, the 16th and 34th devoted to pilot training, and the 4th and 421st Tactical Fighter Squadrons, which attained IOC in October 1980 and January 1981 respectively. Fort Worth is also building F-16s for Israel, this nation having planned to acquire 75, of which eight will be two-seat F-16B trainer/fighters. The first was handed over officially to the IAF at Fort Worth on January 31, 1980, being flown to Hill AFB after the ceremony for temporary attachment to the USAF's 388th TFW. Joined later by six other Israeli F-16s, they are being used initially for IAF pilot and maintenance training. It is planned also to supply 40 F-16s to the Egyptian Air Force, with the first scheduled for delivery in 1982.

Initial deliveries of production aircraft from the European assembly lines were made to the air forces of Belgium, the Netherlands, Norway, and Denmark on January 26, 1979; June 6, 1979; January 25, 1980; and January 28, 1980, respectively. The first NATO squadron to attain IOC is No. 349 Squadron of the Belgian Air Force, based at Beauvechain AB, Belgium. Assigned to an air defence role with NATO forces in Europe on January 16, 1981, it is to be joined later by a second air defence squadron from the 1st All Weather Fighter Wing of the Belgian AF. Two more of this nation's F-16 squadrons are scheduled to join NATO in 1982–83, and will be deployed in a strike-attack role. A detailed description of the F-16A/B can be found in the 1980–81 and earlier editions of *Jane's*.

General Dynamics is working currently on two separate modification programmes that are intended to improve, or make provisions for future improvement of, the F-16 Fighting Falcon. Under

Take-off shots of the two re-engined F-16s, with General Electric J79-GE-119 (left) and F101-DFE engines

the overall blanket title of the multinational staged improvement plan, this embraces at the moment engineering change proposal (ECP) 0350, and ECP 0425. The first covers the introduction of wiring and structural changes on the production line; these will make it possible for the F-16s to accept planned new avionics and weapons, as and when they become available, without the need for further modification. The structural changes include strengthening of equipment racks, of the engine inlet structure to permit the carriage of external pods, and of wing stores stations 3 and 7 to increase the loaded capacity of each by 453 kg (1,000 lb). In addition, provision is being made for the vertical fin to house a brake-chute, as is standard with RNoAF F-16s.

ECP 0425 covers the introduction of a new tailplane, with its area increased by 30%, and which has as primary structure graphite epoxy upper and lower skins fastened mechanically to a full-depth corrugated aluminium sheet substructure. This displaces skin bonding to honeycomb, and the use of costly titanium for the pivot shaft/subspar; in any event, the increase in tailplane area was considered desirable to cater for increased CG shift resulting from the carriage of new equipment and stores. It is anticipated that the elimination of titanium, plus the more simple method of tailplane construction, could reduce the cost of this surface by about 20%.

New systems to enhance the capability of the F-16, and for which provisions have been made under ECP 0350, include for introduction by the end of 1984 a LANTIRN (Low-Altitude Navigation, Targeting, Infra-Red for Night) pod, mounted externally on the engine inlet, with a terrain-following radar pod on the opposite side, plus a LANTIRN HUD; global positioning system; Seek Talk secure communications system; and Westinghouse AN/APG-66 fire control radar. The advanced medium-range air-to-air missile (AMRAAM) and joint tactical information distribution system (JTIDS) are expected to be available for the F-16 in 1985, and an advanced self-protection jamming system by 1986.

Although the standard HUDSIGHT of the F-16 has growth capability that will allow it to integrate with such equipment as FLIR, LLTV, or raster scan radar, the US Air Force realised that an even more advanced HUD was needed if maximum advantage was to be gained from the LANTIRN pod that was under development. This is a low-altitude night vision system that will enable attack aircraft to operate far more effectively by night.

Details of the requirement were circulated to appropriate manufacturers, including Marconi Avionics of Rochester, Kent, which is prime contractor for the standard F-16 HUD. The design team of Marconi Avionics's Airborne Display Division realised that existing optical technology would impose limitations for this application. For example, contemporary HUDs have a lateral/vertical field of view of approximately 13.5°/ 9° respectively, and could feasibly be expanded to 20°/15° using conventional optics. This was considered inadequate for the task, leading to the development of a HUD with a diffractive (holographic) optical system. This not only provides a 30°/18° field of view, but can also combine raster and cursive scan information in a single display. Thus, for night operation, Marconi's LANTIRN HUD projects an easily interpreted 'daylight' image of the ground ahead of the flight path, simultaneously providing the pilot with essential data and cues. For normal day use it offers advantages over conventional HUD design because of its expanded field of view.

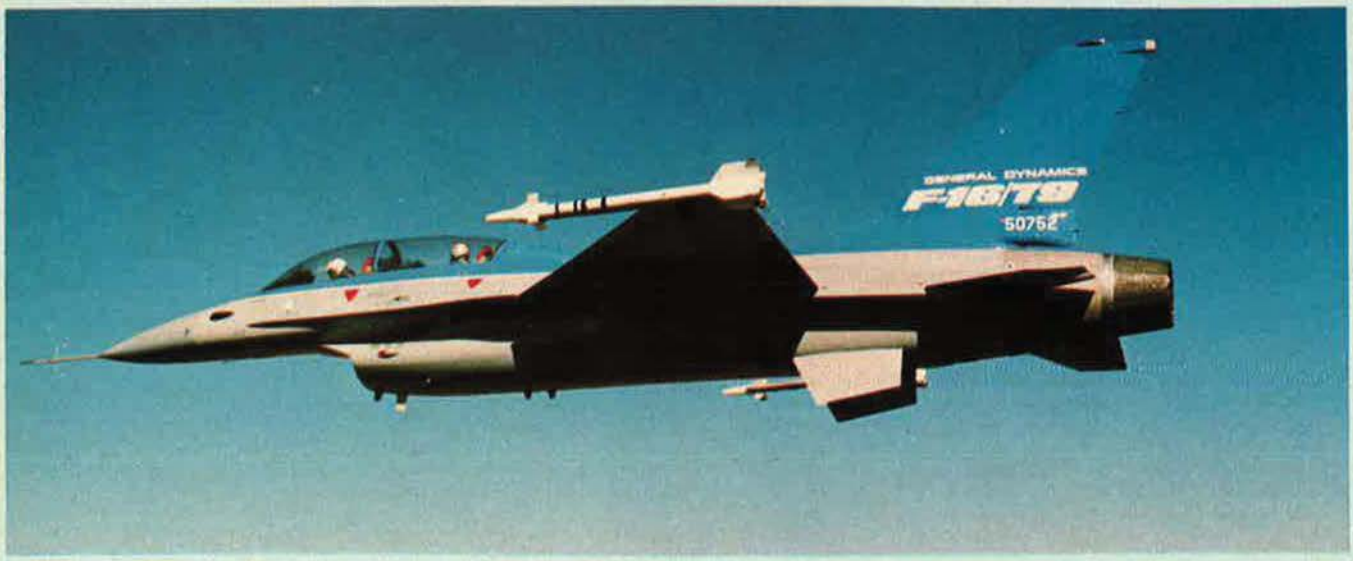
The LANTIRN HUD has already won from the USAF a development and production contract valued at $13 million, plus production options totalling some $90 million. Intended to equip both the F-16 and the Fairchild Republic A-10, production of the holographic HUDs will be shared with two European partners. This could follow the pattern established for the standard F-16 HUDSIGHT, under a production agreement which links Marconi Avionics as prime contractor with Kongsberg Vapenfabrikk of Norway, and Oldelft of the Netherlands.

F-16/79

To meet a known requirement for a fighter aircraft with cost and performance characteristics that lie between the current US export fighter, the Northrop F-5E Tiger II, and the standard F-16, General Dynamics initiated design and development of a variant of the F-16. Suitable also for export to nations to which the supply of Pratt & Whitney F100 turbofan engines might not be approved by the US government, it is based on the General Electric J79 turbojet. This well-proven engine, which has seen service with some 17 nations in F-4 Phantom II and F-104 Starfighter combat aircraft, offers considerable cost saving over the F100, and is expected to provide this variant with approximately 75% of the performance of the Fighting Falcon.

Development of this aircraft, designated provisionally as the F-16/79, had been spurred as the result of guidelines issued by the US State Department on January 4, 1980. According to this statement, President Carter had decided that in certain cases the sale to foreign countries of intermediate fighter aircraft, in a category between the F-5E and F-16, could be in the national interest, and would be consistent with the objectives of the US arms transfer policy. It was considered that the availability of such an export fighter, superior in performance and capability to the F-5E, would contribute to arms transfer restraint objectives. A study had indicated that, in the absence of such an aircraft, intended primarily for an air defence role, an increasing number of countries might turn to more potent types to satisfy their fighter needs.

The company-funded F-16/79 prototype has been converted from the second F-16B development aircraft, which was leased back from the US Air Force in early 1980. Modifications include the installation



Proof of the potential of the F-16/79 is that evaluation pilots from foreign air forces have already flown this two-seat prototype

of a fixed compression ramp air inlet to tailor the airflow for the J79's specific requirements; the addition of a nozzle fairing to the aft fuselage, to accommodate the 0.46 m (1 ft 6 in) longer engine; and the introduction of a new engine transfer gearbox with power take-off shaft, which is needed to drive the airframe-mounted gearbox from which engine-driven accessories derive their power input. The change from a bypass turbofan engine which has a valuable flow of cooling air inherent in its design, to a turbojet with a far higher surface temperature, has required special provision to be made for protection of the surrounding airframe structure. This has resulted in the introduction of a bypass valve to provide the engine with a cooling airflow, and the introduction of Hitco heat shields to give the fuselage increased thermal protection.

Powered by an 80.1 kN (18,000 lb st) General Electric J79-GE-119 turbojet, the prototype was flown for the first time on October 29, 1980, slightly ahead of schedule. Less than three months later, in mid-January 1981, it had completed its flight test qualification and certification programme. During this period of test flying, the fighter had attained an altitude of 15,240 m (50,000 ft), demonstrated a maximum airspeed in excess of Mach 2, and carried out routine 9*g* manoeuvres during simulated combat operation. On January 30, 1981, General Dynamics announced that the F-16/79 was being prepared for evaluation flights by pilots of potential customer air forces, with Austria and Taiwan heading the list. The company has estimated that some 25 countries are expected to have a requirement for a new intermediate fighter of this class during the next 15 years, representing a total which may exceed 1,000 aircraft.

F-16/101

In addition to the F-16/79 programme, the first F-16 development aircraft was sent back to Fort Worth for re-engining with a General Electric F101-DFE (derivative fighter engine) advanced augmented turbofan. This engine has been developed from the F101-GE-100 designed by General Electric to power the Rockwell International B-1 strategic bomber, and has a rating of approximately 116–125 kN (26,000–28,000 lb st).

Designated as the F-16/101 programme, the intention was to flight test this engine over a five-month period to determine its suitability as a power plant for advanced military aircraft. The contract called for approximately 100 flight hours, during which engine controls and response, emergency controls, air start capability, acceleration, afterburner operation, and performance in simulated combat were to be evaluated. Following this, the engine is to be used to power a US Navy Grumman F-14 Tomcat in a similar evaluation.

First flown on December 19, 1980, the F-16/101 was scheduled to complete its flight test programme by the end of May 1981. General Dynamics is due to submit a final detailed report of its evaluation of this aircraft to the USAF's F-16 System Program Office at Wright-Patterson AFB, Ohio, during September 1981.

DORNIER

DORNIER GmbH: Head Office: Postfach 1420, 7990 Friedrichshafen/Bodensee, German Federal Republic

DORNIER/BREGUET Br.1150 ATLANTIC/KWS

The current force of maritime reconnaissance aircraft in service with the German Navy utilises a version of the F-104F Starfighter, which is used for surveillance in coastal waters, and the Breguet 1150 Atlantic which is deployed in a long-range overwater anti-submarine and reconnaissance role. The operational areas for which these aircraft of the German Navy have responsibility include the Baltic, North Sea, and the north European reaches of the Atlantic Ocean. Their task includes reconnaissance, surveillance, engagement of enemy naval targets, support of NATO naval units, and SAR missions.

Wingtip ESM pods help to identify this German Navy Atlantic as one of the first to be updated by Dornier

The Navy has operated a fleet of 20 Br.1150 Atlantics since 1968, 15 of them dedicated to the maritime reconnaissance role. Early deployment revealed serious corrosion problems, but these were overcome by the adoption of new honeycomb cores, and the use of more effective bonding materials. As a result of these modifications, it was estimated that the Atlantics had a life expectancy of some 10,000 hours each, which at their normal rate of utilisation meant they could remain in operational service until the early 1990s. It was realised that their continuing deployment to such a date would be dependent upon the installation of more advanced operational equipment. The Dornier company, which was a major contributor to the original production programme, and has since provided the German Navy with maintenance and logistic support for these aircraft, drew up a detailed programme of the modifications necessary to ensure adequate operational capability. The overall knowledge of this aircraft and its systems which had been gained by Dornier pointed to this company as the ideal prime contractor for the modernisation programme, and led to the award of a contract valued at approximately DM 170 million by the German Federal Defence Technology and Procurement Agency.

Under this programme Dornier is responsible for integrating advanced ESM, navigation, radar, and sonobuoy equipment into the Atlantic's weapon system. The supply of such equipment involves a number of subcontractors, in Europe and the USA, and Dornier is co-operating with and co-ordinating the activities of these suppliers, Loral Corporation of Yonkers, N. Y., is responsible for the ESM which is carried in wingtip pods; the navigational equipment was developed by Litton Industries and Decca; long-range high-definition unjammable radar by Texas Instruments of Dallas, Tex.; new sonar systems by Emerson Electric, St. Louis, Mo.; an IRIG-standard tape recorder system by Bell & Howell GmbH of Friedberg; and new sonobuoy launch and storage equipment by Dornier.

The programme, which began in 1978, is providing the German Navy's Atlantics with much enhanced capability. This comes not only from the improved radar, but from ESM systems that incorporate automatic analysis, a greater frequency range, and high angular accuracy; plus a sonar system with increased capacity and a wider frequency response that is far more effective for the passive location of underwater targets. To speed the updating of the aircraft, much 'off the shelf' equipment is being used, and it is anticipated that all 15 aircraft will be fully operational by 1983.

A description of the basic Breguet Br.1150 Atlantic can be found in the 1973–74 *Jane's*.

SHIN MEIWA

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SHIN MEIWA LIGHT STOL AMPHIBIAN PROJECT

Japan's long coastline and numerous distant islands make the country particularly appropriate for the introduction of a seaplane air transport system. At least 330 locations along city shorelines, on isolated islands, or canals are potential sites for water take-offs and landings. Of these, 40 are regional cities, tourist attractions, and isolated islands not at present served by high-speed train or air services.

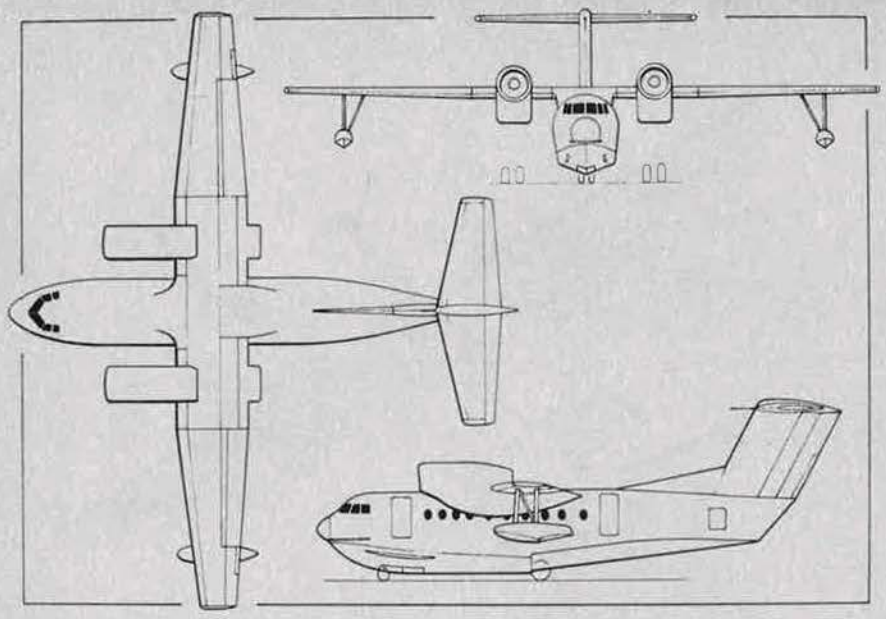
A nationwide seaplane service between these 40 locations and existing land airports could have an estimated 127 routes in operation by the mid-1980s, carrying more than 10 million people per year. These services would be linked to 47 land airports, making a total of 87 points in the system.

The Mechanical Social Systems Foundation in Japan has been making a study of this project since 1976 and, using the described network as a basis, has devised a specification for a suitable aircraft to operate on the routes concerned. This would have 30–50 seats; need 1,000 m (3,280 ft) for water landings and 800 m (2,625 ft) for regular airport landings; cruise at 297–324 knots (550–600 km/h; 342–373 mph); have a normal range of 485 nm (900 km; 560 miles), and a maximum range of 1,185 nm (2,200 km; 1,365 miles). It would be turbofan-powered, and would feature all-new USB (upper surface blowing) technology.

As a member of the study group, Shin Meiwa has completed preliminary design, wind tunnel, and water tank tests of a STOL amphibian to meet this requirement. The following description applies to this aircraft, project development of which is continuing while awaiting a firm commitment from the Japanese government.

TYPE: Twin-turbofan STOL amphibian.

WINGS: Cantilever high-wing monoplane. Aluminium alloy box-beam structure, with constant-chord centre-section and tapered outer panels. Upper surface aft of exhaust outlets covered with polyimides honeycomb panels; trailing-edge USB flaps have titanium alloy skin on upper surfaces. Leading-edge slats outboard of



Shin Meiwa's light STOL amphibian project, designed to carry 10 million people annually on Japanese local services *(Michael A. Badrocke)*

engine nacelles. Inboard and outboard flaps, and ailerons, over virtually all of trailing-edge. Two-segment spoilers forward of outboard flaps on each wing. Trim tab in each aileron.

FUSELAGE: Conventional semi-monocoque single-step fail-safe pressurised hull, built mainly of adhesive-bonded aluminium alloy. Anti-spray strake on each side of hull planing bottom at front.

TAIL UNIT: Cantilever T tail, with aluminium alloy box-beam fin and variable-incidence tailplane. Dorsal fin. Two-segment double-hinged rudder; single-slotted elevators. Trim tab in rudder.

LANDING GEAR: Hydraulically retractable tricycle type, plus non-retractable wingtip floats. Twin-wheel nose unit retracts into bottom of hull, twin-wheel main units into underside of engine nacelles. Tyre pressure 6.20 bars (90 lb/sq in).

POWER PLANT: Two high bypass ratio turbofan engines, in the 35.59 kN (8,000 lb st) class, installed in nacelles above and forward of wings with long ducts for efficient noise reduction. Thrust reversers and deflectors for use in STOL mode.

ACCOMMODATION: Crew of two on flight deck. Standard four-abreast seating in main cabin for 40 passengers, at 74 cm (29 in) pitch, with galley and toilet at rear on starboard side, baggage compartment at rear on port side. Forward and rear passenger doors on port side; two emergency exits on starboard side. Entire accommodation pressurised and air-conditioned. Provision for mixed passenger/cargo operation (18 passengers, with smaller baggage compartment at front on starboard side, plus three cargo pallets and loading system, and large cargo door, at rear). Alternative search and rescue configuration provides, in main cabin, seats for navigator/radio operator and observer (fwd, stbd), radar operator and observer (fwd, port), six stretchers and eight troop seats (amidships, port and starboard), with rescue equipment at rear. Can also be equipped for ocean condition monitoring, with seats for navigator/radio operator (fwd, stbd), two observers (fwd, port and starboard), and operators for infra-red radiometer and STD recorder (amidships, stbd).

SYSTEMS: Bootstrap-type cabin air-conditioning system (max differential 0.38 bars; 5.5 lb/sq in), supplied by engine bleed air or by compressed air from APU. Triplex independent hydraulic systems, driven by propulsion engines and interconnected with AC/DC electrical buses to actuate flying control surfaces, high-lift devices, landing gear, water rudder, steering, and windscreen wipers. Electrical power provided by engine-driven generators, APU generator, and battery, via an AC bus (115/200V 400Hz), AC essential bus, and DC bus. AC power and compressed air from APU used for engine starting and air-conditioning.

AVIONICS AND EQUIPMENT: Navigation avionics include VOR, ILS, DME, two ADF, weather radar, ATC transponder, R/Nav system or microwave landing system, and radio altimeter. Automatic flight control system and ground proximity warning system. Two VHF com standard; HF com available optionally. Passenger address system and interphones. Marker ejector (aft, stbd), rescue set (aft, port), and other rescue equipment, in SAR version. Marker ejector (aft, stbd), infra-red radiometer and STD gear (amidships, stbd), chart table (amidships, port), and ventral camera, in ocean monitoring version.

DIMENSIONS, EXTERNAL:

Wing span	24.81 m (81 ft 4¼ in)
Wing aspect ratio	9.5
Length overall	21.81 m (71 ft 6¼ in)
Hull: Length	18.00 m (59 ft 0¼ in)
Max width	2.40 m (7 ft 10½ in)
Length/beam ratio	7.5
Height overall	7.68 m (25 ft 2½ in)
Tailplane span	9.30 m (30 ft 6¼ in)
Wheel track (c/l of shock struts)	5.83 m (19 ft 1½ in)
Wheelbase	6.375 m (20 ft 11 in)
Wingtip float track	19.80 m (64 ft 11½ in)
Passenger doors, each:	
Height	1.75 m (5 ft 9 in)
Width	0.80 m (2 ft 7½ in)
Emergency exits, each:	
Height	1.40 m (4 ft 7 in)
Width	0.65 m (2 ft 1½ in)

DIMENSIONS, INTERNAL:

Cabin, excl flight deck:	
Length	9.85 m (32 ft 3¼ in)
Max width	2.54 m (8 ft 4 in)
Max height	1.95 m (6 ft 4¾ in)
Floor area	23.30 m² (250.8 sq ft)
Volume:	
Crew compartment	4.23 m³ (149.50 cu ft)
Passenger cabin	33.30 m³ (1,176 cu ft)
Baggage compartment	2.16 m³ (76.25 cu ft)
Galley	1.44 m³ (51.00 cu ft)
Toilet	1.29 m³ (45.50 cu ft)

AREAS:

Wings, gross	64.8 m² (697.5 sq ft)
Ailerons (total)	1.5 m² (16.0 sq ft)
Trailing-edge flaps (total)	22.1 m² (238.0 sq ft)
Leading-edge slats (total)	7.0 m² (75.0 sq ft)
Fin	13.7 m² (147.0 sq ft)
Rudder, incl tab	10.7 m² (115.0 sq ft)
Tailplane	19.5 m² (210.0 sq ft)
Elevators (total)	3.1 m² (33.0 sq ft)

WEIGHTS:

Operating weight empty	11,342 kg (25,005 lb)
Max fuel load	4,300 kg (9,480 lb)
Max payload	4,300 kg (9,480 lb)
Max T-O and landing weight	17,500 kg (38,580 lb)
Max zero-fuel weight	15,642 kg (34,485 lb)

PERFORMANCE (estimated, at max T-O weight, ISA, except where indicated):

Max level speed at 7,620 m (25,000 ft)	390 knots (723 km/h; 450 mph)
Max cruising speed at 7,620 m (25,000 ft)	360 knots (667 km/h; 415 mph)
Econ cruising speed at 7,620 m (25,000 ft)	300 knots (556 km/h; 345 mph)
Normal T-O speed:	
land	82 knots (152 km/h; 95 mph)
water	59 knots (109 km/h; 68 mph)
Rate of climb at S/L:	
max	1,320 m (4,330 ft)/min
one engine out	426 m (1,398 ft)/min
T-O configuration	246 m (807 ft)/min
Max cruising altitude	8,200 m (27,000 ft)
Balanced field length (land), ISA + 20°C	655 m (2,150 ft)

PZL Swidnik W-3 Sokól, a 12-passenger helicopter developed from the Soviet-designed Mi-2

FAR T-O to 10.7 m (35 ft), ISA + 20°C
490 m (1,610 ft)
FAR landing from 15 m (50 ft) 750 m (2,460 ft)
T-O run (water), ISA + 20°C 270 m (885 ft)
T-O time (water), ISA + 20°C 16.7 s
Landing run (water) 205 m (675 ft)
Max range, with reserves, at 7,620 m (25,000 ft):
with 40 passengers
440 nm (815 km; 505 miles)
with max fuel
1,030 nm (1,910 km; 1,185 miles)

PZL SWIDNIK

WYTWORNIA SPRZETU KOMUNIKACYJNEGO Im. ZYGMUNTA PULAWSKIEGO-PZL SWIDNIK; Head Office and Works: 21-045 Swidnik k/Lublina, Poland

PZL SWIDNIK W-3 SOKÓL (FALCON)

From 1955, the WSK at Swidnik began licence production of the Soviet-designed Mil Mi-1 helicopter, some 1,700 of which were built under the designation SM-1. At a later stage, a small design office was established at the factory to work on variants and developments of the basic SM-1 design as well as original projects; following the conclusion of an agreement in January 1964, PZL Swidnik became responsible for further development, production, and marketing of the Mil Mi-2. More than 3,000 Mi-2s have been built by this factory in 24 different civil and military versions, the majority of them for export, and this aircraft has served also as the basis for more recent developments.

The Mi-2, in its basic form, is powered by two 298 kW (400 shp) Polish-built Isotov GTD-350P turboshaft engines, has accommodation for a pilot and seven passengers or, with seats removed, can carry up to 700 kg (1,543 lb) of internal freight. From this helicopter, and in collaboration with the Detroit Diesel Allison Division of General Motors Corporation in the USA, PZL Swidnik is developing a modified export version of the Mi-2 under the name Kania or Kitty Hawk. Powered by two Allison 250-C20B turboshaft engines, each of which has a take-off rating of 313 kW (420 shp) and continuous rating of 298 kW (400 shp), this will accommodate a pilot and eight passengers, or 800 kg (1,764 lb) of internal freight in lieu of passengers and seating.

PZL Swidnik also has under development a larger helicopter which benefits from constructional experience with the Mil Mi-1 and Mi-2, and from assistance in design finalisation given by consultants from the Soviet Mil bureau. PZL believes that the new aircraft, which has the designation W-3 Sokól, is of a size to have considerable sales potential in both home and export markets. Powered by two turboshaft engines, it will accommodate a crew of two and 12 passengers, or without passengers and seating can carry a maximum 1,500 kg (3,307 lb) of internal cargo.

Design of the Sokól began in May 1974, and the first flight of the prototype was made on November 16, 1979. In addition to the basic passenger/cargo aircraft, it is planned to develop also special-purpose agricultural and ambulance versions. All available details follow:

TYPE: Twin-turboshaft medium-weight utility helicopter.

ROTOR SYSTEM: Four-blade fully-articulated main rotor and three-blade tail rotor. Blades of both rotors constructed of laminated glassfibre impregnated with epoxy resin. Three hydraulic boosters for longitudinal, lateral, and collective pitch control of main rotor. Blade de-icing by electrically heated elements.

ROTOR DRIVE: Transmission driven via main rotor, intermediate, and tail rotor gearboxes. Tail rotor driveshaft of duralumin tube with splined couplings.

FUSELAGE AND TAIL UNIT: Conventional light alloy semi-monocoque structure, with circular-section monocoque tailboom. Fin integral with tailboom structure. Horizontal stabiliser, at end of tailboom, has a single continuous spar and is built up of laminated glassfibre impregnated with epoxy resin. This tail surface is interconnected with the main rotor pitch control system.

LANDING GEAR: Non-retractable tricycle type, plus tailskid beneath tailboom. Twin-wheel nose unit; single wheel on each main unit. Main-wheel tyres size 500 × 250; nosewheel tyres size 400 × 150. Pneumatic brakes on main wheels. Float or ski installations optional.

POWER PLANT: Two PZL-10W (Polish-built Glushenkov TVD-10) turboshaft engines, each with take-off rating of 648 kW (870 shp), and emergency rating of 746 kW (1,000 shp). Engines and main rotor gearbox are mounted on a structural frame, eliminating any possibility of drive misalignment due to deformations of the fuselage structure. It is intended to investigate the potential of reducing noise and vibration by attaching this frame to the fuselage by elastomeric pads. Bladder-type fuel tanks beneath the cabin floor, with combined capacity of 1,100 litres (242 Imp gallons).

ACCOMMODATION: Pilot (port side), and co-pilot or pupil on flight deck. Dual controls and dual flight instrumentation optional. Accommodation for 12 passengers in main cabin. Seats removable for carriage of internal cargo. Ambulance version will carry four stretcher cases and a medical attendant. Baggage space at rear of cabin. Door to flight deck on each side; large door for passengers and/or cargo loading on port side at forward end of cabin; second door at rear of cabin on starboard side. Design of flight deck permits use of optically flat windscreens, improving vision and enabling windscreen wipers to sweep a large area. Accommodation heated and ventilated. External cargo hook and cargo hoist standard in all-cargo version.

SYSTEMS: Duplicated and independent hydraulic systems. Electrical system provides both AC and DC power. Pneumatic system. Automatic power control system linking power plant and rotor pitch for optimum performance. Fire protection system. Air-conditioning and oxygen systems optional.

AVIONICS: Includes navigation and communications equipment that will permit all-weather operation by day or night. Automatic pilot standard.

DIMENSIONS, EXTERNAL:
Main rotor diameter 15.70 m (51 ft 6 in)
Length overall, rotors turning
18.85 m (61 ft 10¼ in)
Height overall 4.15 m (13 ft 7½ in)
Passenger/cargo door (port, fwd):
Height 1.20 m (3 ft 11¼ in)
Width 1.25 m (4 ft 1¼ in)

DIMENSIONS, INTERNAL (passenger cabin):
Length 3.20 m (10 ft 6 in)
Max width 1.56 m (5 ft 1½ in)
Max height 1.40 m (4 ft 7 in)

WEIGHTS:
Basic operating weight empty
2,490 kg (5,489 lb)
Max payload 1,500 kg (3,307 lb)
Normal T-O weight 5,810 kg (12,808 lb)
Max T-O weight 6,000 kg (13,227 lb)

PERFORMANCE (estimated):
Max level speed 140 knots (260 km/h; 161 mph)
Cruising speed 119 knots (220 km/h; 137 mph)
Max rate of climb at S/L 564 m (1,850 ft)/min
Max vertical rate of climb at S/L
120 m (394 ft)/min
Service ceiling 5,000 m (16,400 ft)
Hovering ceiling OGE 1,850 m (6,070 ft)
Range:
standard fuel 324 nm (600 km; 373 miles)
auxiliary fuel 593 nm (1,100 km; 683 miles)

THvK (KIBM)

TÜRK HAVA KUVVETLERI, HAVA IKMAL BAKIM MERKEZI KOMÜTANGLICI KAYSERI (Turkish Air Force, Kayseri Air Supply and Maintenance Centre Command); Address: Kayseri, Turkey

The Kayseri Air Supply and Maintenance Centre Command was formed by the Turkish Ministry of Defence in 1932 as the Kayseri Aircraft Factory. Between 1933 and 1940, in addition to aircraft maintenance work, it produced Gotha Go 145, Curtiss Hawk, and PZL P-24 aircraft under licence from their German, US, and Polish manufacturers. In 1950, after Turkey became a member of NATO, its name was changed to Air Supply Centre and its function was restricted to the overhaul of aircraft and aero-engines. In 1970, to reflect an increasing emphasis on maintenance work, it was renamed as the Kayseri Supply and Maintenance Centre General Directorate; the present title was adopted in 1975.

Mavi Isik 78-XA prototype general-purpose light aircraft, built by Turkish Air Force personnel in 1978–79

Currently, the KIBM overhauls all of the Turkish Air Force's propeller-driven aircraft, their engines, and accessories, as well as the anti-submarine aircraft of the Turkish Navy and their engines. The Centre also manufactures aircraft spare parts and various types of parachute. It is responsible for development of the Mavi Isik nationally-designed series of aircraft, of which a description follows. Another agricultural aircraft, of all-metal construction and with a more powerful engine, is being constructed; this is expected to fly in September 1981.

KIBM MAVI ISIK (BLUE LIGHT)

The Mavi Isik programme, to design and develop an aircraft for primary training, agricultural, and surveillance duties, was launched in April 1978, and construction of a prototype began in the following month. This aircraft, designated **Mavi Isik 78-XA**, flew for the first time in February 1979, and made its public debut at Kayseri on May 25 of that year after completing ground and flight testing. It was awarded a C of A by the Turkish Civil Aviation General Directorate and registered to the Turkish Air Force on June 19, 1979.

Development of the agricultural version, designated **Mavi Isik B**, has continued under the direction of the Turkish Air Force. The prototype, modified to this configuration, resumed flight testing in February 1980 and was displayed publicly in Ankara on June 19 of that year.

The following description applies to the Mavi Isik B:

TYPE: Single-seat agricultural aircraft.

WINGS: Low-wing monoplane, braced to fuselage by overwing inverted-V struts and jury struts on each side. Wing section NACA 4412 (modified).

Dihedral 7° from roots. Incidence 1° 30'. Constant-chord structure, with aluminium leading-edge, spars, and ribs. Dacron covering, with Duraclad fire-resistant plastic finish overall. Ailerons and trailing-edge flaps are of similar construction. No tabs.

FUSELAGE: Welded SAE 4130 steel tube structure, with Dacron covering and Duraclad plastic finish overall.

TAIL UNIT: Conventional cruciform structure of welded SAE 4130 steel tube, with fabric covering. Wire-braced tailplane. No tabs.

LANDING GEAR: Non-retractable tailwheel type, with main wheels carried on side Vs. Castoring tailwheel. Oleo-pneumatic shock-absorption. Tyre sizes 6.50 × 8 in on main wheels, 2.50 × 8 in on tailwheel.

POWER PLANT: One 157 kW (210 hp) Continental IO-360-D flat-six engine, driving a McCauley two-blade constant-speed propeller. Single aluminium fuel tank aft of firewall, capacity 80 litres (17.5 Imp gallons), of which 75 litres (16.5 Imp gallons) are usable. Oil capacity 9.5 litres (2 Imp gallons).

ACCOMMODATION: Pilot only, in heated cockpit. Combined window/door on each side, hinged at bottom to open outward and downward.

SYSTEMS: Hydraulic system: 24V 35Ah battery.

DIMENSIONS, EXTERNAL:

Wing span	10.77 m (35 ft 4 in)
Wing chord, constant	1.60 m (5 ft 3 in)
Wing aspect ratio	6.73
Length of fuselage	7.48 m (24 ft 6½ in)
Height overall	2.21 m (7 ft 3 in)
Tailplane span	2.86 m (9 ft 4½ in)
Wheel track	2.08 m (6 ft 10 in)
Propeller diameter	1.93 m (6 ft 4 in)

AREAS:

Wings, gross	17.23 m² (185.46 sq ft)
Ailerons (total)	1.75 m² (18.84 sq ft)
Trailing-edge flaps (total)	0.80 m² (8.61 sq ft)
Fin	0.37 m² (3.98 sq ft)
Rudder	0.66 m² (7.10 sq ft)
Tailplane	1.18 m² (12.70 sq ft)
Elevators (total)	1.32 m² (14.21 sq ft)

WEIGHTS AND LOADINGS:

Weight empty, equipped	741 kg (1,633 lb)
Max payload, incl pilot	450 kg (992 lb)
Max fuel load	60 kg (132 lb)
Max T-O and landing weight	1,270 kg (2,800 lb)
Max wing loading	73.71 kg/m² (15.10 lb/sq ft)
Max power loading	8.11 kg/kW (13.32 lb/hp)

PERFORMANCE (at max T-O weight):

Max level speed at S/L	98 knots (182 km/h; 113 mph)
Max cruising speed (75% power)	92 knots (171 km/h; 106 mph)
Stalling speed, flaps down	44.5 knots (82 km/h; 51 mph)
Max rate of climb at S/L	202 m (662 ft)/min
T-O run	256 m (840 ft)
T-O to 15 m (50 ft)	435 m (1,427 ft)
Landing run	285 m (935 ft)

MARSH

MARSH AVIATION COMPANY; Address: 5060 East Falcon Drive, Mesa, Arizona 85205, USA

MARSH/BEECHCRAFT T-34 TURBO MENTOR

During 1980 Marsh Aviation continued its development of a turboprop conversion of the Beechcraft T-34A/B Mentor two-seat primary trainer (last described in the 1960–61 *Jane's*). This involved replacement of the original 168 kW (225 hp) Continental O-470 piston engine that powered the aircraft by a 526 ekW (705 ehp) Garrett TPE331-1 turboprop which, in this application, is flat rated to 298 kW (400 shp). Power plant of the prototype conversion, which has been flying in this development programme, is a TPE331-43A, but production versions will have a TPE331-1-101, driving a Hartzell constant-speed fully-feathering and reversible-pitch propeller.

It is intended to market the Marsh Turbo Mentor as a low-cost, high-performance military trainer.

Marsh Turbo Mentor turboprop conversion of the Beechcraft T-34 primary trainer

By comparison with the piston-engined Beechcraft T-34A/B it will have improved performance and reliability, and require less maintenance. Economic fuel consumption is a feature of the TPE331 engine, and the variant selected for this installation is certificated for operation on avgas, diesel, and aviation turbine fuels.

The prototype conversion was flown for the first time in December 1979. Marsh intends to market a retrofit package for installation in customers' aircraft, or to supply complete aircraft which will comprise a refurbished airframe plus the new engine installation. It was anticipated that the first deliveries of converted aircraft would be made in early 1981.

DIMENSIONS, EXTERNAL:

Wing span	10.00 m (32 ft 9½ in)
Length overall	8.05 m (26 ft 5 in)
Height overall	2.98 m (9 ft 9½ in)

WEIGHTS:

Weight empty	1,088 kg (2,400 lb)
Max T-O weight	1,497 kg (3,300 lb)

PERFORMANCE:

Never-exceed speed	243 knots (450 km/h; 280 mph) IAS
Cruising speed at 7,010 m (23,000 ft)	305 knots (565 km/h; 350 mph) IAS
Normal operating speed	219 knots (406 km/h; 252 mph) IAS
Stalling speed, landing gear and flaps up	56 knots (104 km/h; 64.5 mph) IAS
Stalling speed, landing gear and flaps down	47 knots (88 km/h; 54.5 mph) IAS
Max rate of climb at S/L	762 m (2,500 ft)/min
Service ceiling	7,620 m (25,000 ft)
T-O and landing run	91 m (300 ft)
Range	912 nm (1,690 km; 1,050 miles)

McDONNELL DOUGLAS

MCDONNELL DOUGLAS CORPORATION; Head Office and Works: Box 516, St. Louis, Missouri 63166, USA

McDONNELL DOUGLAS RF/A-18 HORNET

McDonnell Douglas, which has in production for the US Navy and Marine Corps the F/A-18 Hornet strike fighter, has under development a reconnaissance variant designated RF/A-18 Hornet. This is required in only limited numbers, to provide a substantial increase in fleet reconnaissance capability; and an important factor in its development has been the design of a system that will allow rapid conversion from reconnaissance to the fighter/attack role, while retaining the performance features that led to selection of the F/A-18 for service with the USN/USMC.

Planned initial capability, which is identified as Baseline, will substitute a sensor pallet for the M61 20 mm gun system that is mounted in the nose of the standard F/A-18. All other weapon system interfaces and stores capability will be retained for rapid and easy conversion back to a fighter/attack role; the Sidewinder air-to-air missiles which are carried at the two wingtip stations will also be retained for self-protection. The internal sensor pallet will carry a variety of cameras to provide panoramic photo coverage from all altitudes, and an infra-red linescanner for night operations. These sensors will augment the Hughes AN/APG-65 multi-mode digital radar carried by the standard F/A-18, as well as the Ford Aerospace/Texas Instruments AAS-38 FLIR pod which it can carry.

During the development programme a variety of sensors in current USN/USMC use, as well as development sensors, have been installed in the nose pallet to obtain frame, panoramic, and linescan imagery on a day or night, overfly or standoff, clear-weather mission basis. The RF/A-18 Baseline onboard displays for radar and FLIR systems are the same as those used for the F/A-18, and provide for navigation, terrain avoidance, and some target detection/recognition capability in adverse weather conditions. This aircraft's Baseline capability is designed to accept, in later development stages, high-resolution synthetic aperture radar technology for all-weather enhancement, long-range high-resolu-

Artist's impression of the McDonnell Douglas RF/A-18 Hornet reconnaissance fighter

tion infra-red sensor technology for standoff enhancement, and a data link interface with surface stations for real-time data transfer.

Details of the standard F/A-18 Hornet can be found in the 1980–81 *Jane's*.

SIKORSKY

SIKORSKY AIRCRAFT, DIVISION OF UNITED TECHNOLOGIES CORPORATION: Head Office and Works: Stratford, Connecticut 06602, USA

SIKORSKY EH-60A QUICK FIX II

During October 1980, Sikorsky Aircraft received from the United States Army a $3.2 million design and development contract for modification of the UH-60A combat assault helicopter, under the Army's Special Electronic Mission Aircraft (SEMA) programme. It involves the installation of an electronics package that is identified as Quick Fix II, with an overall weight of 816 kg (1,800 lb). This is intended to expand the capability of the Quick Fix IA, and later IB systems, which have been undergoing a research and development flight programme in Army Bell EH-1H helicopters.

Quick Fix I was the Army's first operational airborne communications interception, emitter locating, and jamming system suitable for installation in a helicopter. Quick Fix II has similar, but advanced, capability and can also interface with equivalent airborne or ground-based units via secure voice and/or data links. Sikorsky's development contract covers the period from October 1980 to February 1982, and it is understood that the Army plans to procure 36 EH-60A Quick Fix II aircraft for the support of active Army units. Details of the basic Sikorsky UH-60 Black Hawk combat assault helicopter can be found in the 1980–81 and earlier editions of *Jane's*.

The US Army's SEMA programme covers a number of interesting electronics modifications to aircraft that should enhance their capability to maintain in-depth surveillance of an enemy's activities forward of the battle area. The availability of such constantly updated information would make it possible for commanders to predict enemy movements and tactical dispositions. This becomes of immense value if, simultaneously, the enemy can be prevented from gaining and/or communicating similar knowledge to his own commanders.

SEMA represents an attempt to achieve such an objective. It involves the Grumman OV-1D Mohawk, which carries infra-red, photographic, and SLAR equipment to provide film imagery that can be transmitted over a secure data link to tactical commanders. The Grumman Mohawk is used also in an RV-1D Quick Look II configuration, serving as a corps level radar identification and location system. Beechcraft RU-21Hs are also used currently to carry Guardrail V sensor systems that intercept and locate enemy communications emitters. It is planned to improve the capability of this system by incorporating an improved data link and INS, and also to transfer the Guardrail V systems gradually to Beech RC-12D aircraft which have a higher operational ceiling.

The ability of these systems to achieve the Army's ideal degree of battlefield intelligence will depend very much upon the ability of the EH-60A Quick Fix II to limit enemy communications, and also upon a second version of the Black Hawk, the EH-60B. This carries a Stand-Off Target Acquisition System (SOTAS), which is intended to provide division commanders with a new capability to detect and track moving targets deep in enemy territory. It incorporates moving target indicating radar which will give real-time information of enemy movements, and this SOTAS data can be used also to cue RPVs assigned by division artillery to the target acquisition role. Linked with SOTAS development is that of an ECCM hardened data link to provide secure transmission of this important information. Used as planned, SEMA aircraft should collectively prevent or limit enemy communications, and provide accurate information on communications, radar, and tactical targets that, when eliminated, should stifle the enemy's initiative.

Artist's impression of Sikorsky EH-60A communications jamming version of the Black Hawk

USAF

UNITED STATES AIR FORCE: Air Force Systems Command, Andrews AFB, Maryland 20334, USA

USAF/BOEING NKC-135 ALL (AIRBORNE LASER LABORATORY)

A Boeing KC-135 tanker has been modified as shown in the accompanying illustration to serve as a research tool for the US Air Force's Weapons Laboratory, which is established at Kirtland AFB, N. M. This highly instrumented aircraft has the designation NKC-135 ALL.

The modification has been carried out as a part of the Defense Advanced Research Projects Agency (DARPA) programme, this organisation being responsible for certain areas of research on behalf of the US Department of Defense. One of DARPA's current projects is investigating the capability of high-energy laser (HEL) beams to provide a new weapon system that could revolutionise tactical and strategic attack, as well as defence against airborne targets, both in the atmosphere and in space. The military capability of a HEL was based on the assumption that the beam would be able to burn through the surface of a target and destroy a vital component, ignite propulsive fuel, or activate its warhead. This capability was demonstrated to be practical as early as 1973, when the US Air Force destroyed a winged drone over the Sandia Optical Range at Kirtland AFB, using a gas-dynamic HEL application for this purpose. Both the US Army and Navy have since achieved similar success, the latter using a chemical laser developed jointly with DARPA to engage and destroy a TOW missile in flight.

Such experiments have proved beyond doubt the feasibility of using HEL beams to destroy moving targets, and the NKC-135 ALL will help DARPA gain a deeper insight into problems related to the operational deployment of such a weapon. HEL beams can now be directed over long ranges, and continued research and development should result in their becoming even more effective. It should be understood, however, that for a HEL weapon to be practical, it requires a guidance system that will be able to direct this high-intensity light beam over a range that could extend to several hundred kilometres (miles), focus it as an intense spot of energy, and track a small rapidly moving target with such accuracy that the laser beam is held steady. If the focussed spot is blurred, or moves, then its energy is dispersed, requiring much longer contact with the target to achieve its destruction.

The task of DARPA is to develop a control system that, in a high-density threat environment, can methodically direct the HEL from target to target, focus the beam on each selected aim point, and hold it steady irrespective of speed and manoeuvre until the target is destroyed. The HEL must then be redirected automatically to the next most threatening target. The NKC-135 ALL, working together with a new high energy laser system test facility that should become operational at White Sands Missile

USAF/Boeing NKC-135 airborne laser laboratory, for laser weapon research

Sperry (North American) QF-100D in pilotless flight

Range in late 1982 will, it is hoped, speed the development of a fire-control system that will have just such a capability. It will, at the same time, investigate the propagation of laser beams from an airborne vehicle against an airborne target.

SPERRY

SPERRY FLIGHT SYSTEMS DIVISION, SPERRY CORPORATION: Address: PO Box 21111, Phoenix, Arizona 85036, USA

In addition to its current programme to convert 148 Convair F-102A Delta Dagger fighters into PQM-102B target drones (described in the 1980–81 edition of *Jane's*), Sperry is also converting North American F-86 Sabres and F-100 Super Sabres to drone configuration under current contracts.

SPERRY (NORTH AMERICAN) QF-86F SABRE

Under a $350,000 contract announced on August 18, 1980, Sperry Flight Systems is converting ten North American F-86F Sabre jet fighters into QF-86F target drones for the US Naval Weapons Center at China Lake, Calif. The conversions are due to be completed by October 1981. Follow-on orders to convert an additional 90 F-86Fs are in prospect.

The QF-86F drone programme is similar to other current Sperry programmes to convert F-100 (see following entry) and F-102A fighters for the US Air Force.

AIRFRAME: As F-86F Sabre (see 1961–62 *Jane's*).

POWER PLANT: One 26.56 kN (5,970 lb st) General Electric J47-GE-27 turbojet engine.

DIMENSIONS, EXTERNAL:

Wing span	11.91 m (39 ft 1 in)
Wing area, gross	29.12 m² (313.4 sq ft)
Length overall	11.43 m (37 ft 6 in)
Height overall	4.49 m (14 ft 8¾ in)

WEIGHTS (F-86F):

Weight empty	5,046 kg (11,125 lb)
T-O weight 'clean'	6,893 kg (15,198 lb)

PERFORMANCE (F-86F):

Max level speed at S/L
588 knots (1,091 km/h; 678 mph)

Max rate of climb at S/L, AUW of 6,446 kg (14,212 lb) 2,987 m (9,800 ft)/min

Service ceiling, AUW as above
15,120 m (49,600 ft)

SPERRY (NORTH AMERICAN) QF-100 SUPER SABRE

Conversion of US Air Force/Air National Guard F-100 fighter-bombers for remotely piloted operation as QF-100 aerial targets is being undertaken by Sperry under a full-scale engineering development (FSED) contract from the US Air Force Armament Development and Test Center, Eglin AFB, Fla. This FSAT (full-scale aerial target) programme is for a multi-service interim target to provide air-to-air and ground-to-air missile evaluation and combat crew training. The QF-100 will fill the gap between the PQM-102 and the recommended target conversion of the McDonnell Douglas F-4 Phantom, which will not be available until well into the 1980s.

The initial FSED programme involves the conversion of nine Super Sabres into four different configurations. Of these, No. 2 configuration, converted from the single-seat F-100D, will be the standard US Air Force target version; No. 1 will incorporate additional cockpit controls to permit evaluation of system performance from within the cockpit; No. 3 is the same configuration as No. 2, except that it is converted from the two-seat F-100F; No. 4 is the target configuration for the US Army, and incorporates a drone formation control system (DFCS) for multiple-target missions. The FSED programme includes DT&E (development, test, and evaluation) and IOT&E (initial operational test and evaluation). Conversions are carried out at Sperry's facility at Phoenix-Litchfield Airport (formerly the Naval Air Facility, Litchfield Park) in Goodyear, Arizona.

Deliveries began on March 13, 1981, to Tyndall AFB, Panama City, Fla., for US Air Force DT&E; that for the DFCS will be carried out at Holloman AFB, N. M. The development contract includes an option for up to 72 'production' QF-100D/F conversions, delivery of which would begin in March 1983. Initial operational capability is due to be achieved by June 1983.

The QF-100 uses current Sperry PQM-102 drone ground control and test equipment, as well as many PQM-102 airborne subsystems. While sharing a common conversion and operational scheme with the PQM-102 series, the QF-100 utilises a digital flight control computer instead of four analog computers for ease of testing and flexibility of future growth of operational modes.

AIRFRAME: As F-100D/F (see 1961–62 *Jane's*).

POWER PLANT: One Pratt & Whitney J57-P-21A turbojet engine, rated at 75.40 kN (16,950 lb st) with afterburning.

LAUNCH AND RECOVERY: Normal runway T-O and landing.

GUIDANCE AND CONTROL: Dual Vega command guidance and telemetry systems. Fully redundant digital tracking and control system, in conjunction with AN/FPS-16 ground-based range radar.

SPECIAL EQUIPMENT: Digidops miss-distance scoring system standard; installation and test of vector miss-distance indicator (VMDI), currently under development, is planned; this will provide a directional parameter to help further in evaluating missile performance. Other equipment generally similar to that of PQM-102B; major difference is the use of a digital flight control computer (FCC) system, which incorporates air data sensors, an SDP 175 processor, analog/digital and digital/analog converters, a power supply, and the necessary interface electronics. Use of FCC permits automatic checkout of many primary autopilot functions; it also provides a flexible system for incorporating target system functions, or for adaptation to other target programmes. Automatic control modes for T-O, loss of command carrier, T-O abort, and other safety modes. Redundant AC and DC power systems, and redundant dual autopilots. Visual augmentation (smoke) system, operable at any altitude or power setting. Radar and infra-red augmentation not required, in view of size of aircraft. A DLQ-3B ECM pod and ALE-40 infra-red/chaff pod are incorporated to provide realistic evaluation of missile performance against anticipated countermeasures. Drone formation control system incorporated in US Army version to permit formation flight of two or more targets, to provide a realistic challenge for missiles equipped with a seeker head.

DIMENSIONS, EXTERNAL:

Wing span	11.82 m (38 ft 9⅓ in)
Wing area, gross	35.79 m² (385.2 sq ft)
Length overall, incl probe	16.54 m (54 ft 3 in)
Height overall	4.95 m (16 ft 2⅓ in)

WEIGHT:

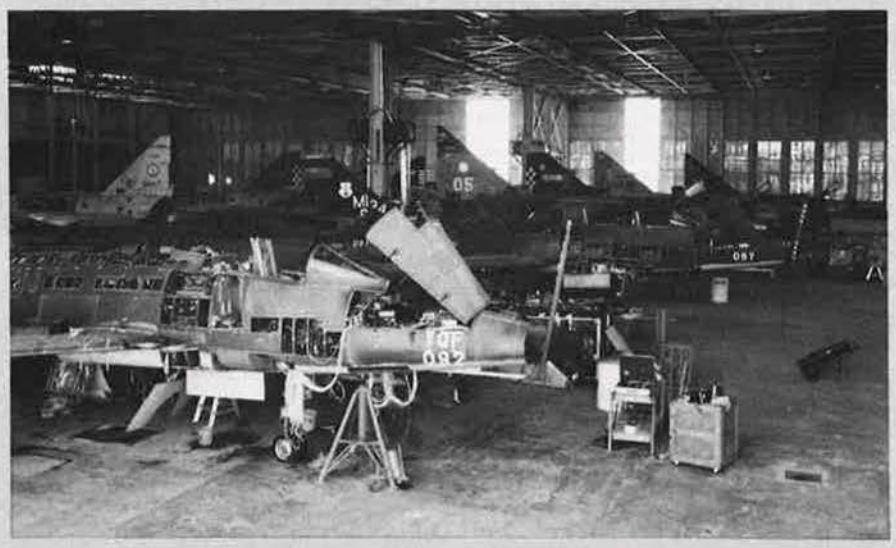
Mission operational T-O weight
14,060 kg (31,000 lb)

PERFORMANCE:

Max speed at altitude
Mach 1.2 (688 knots; 1,274 km/h; 792 mph)

Range, nominal (guidance radar range-limited)
120 nm (222 km; 138 miles)

Normal mission endurance	40–55 min
g limit	+8



F-100 and F-102A aircraft undergoing conversion to target drone configuration at Sperry's Arizona facility

Berliners tend to survive and even prevail, as the last four decades of their history show. But there is a difference between the two Berlins, apparent to all.

The Two Different Berlins

By Gen. T. R. Milton, USAF (Ret.)

The Airlift (Luftbrucke) Memorial arches into the sky at Tempelhof.

THERE is a monument at Tempelhof—an arching concrete structure symbolizing a bridge in the sky—commemorating the Berlin Airlift. It is set in a nicely kept little park across the way from those massive buildings left over from Hitler's Thousand Year Reich. Around the base of the monument are the names of aircrews killed in the Airlift. Like the people who took part in that unique rescue operation, the monument has taken on the patina of age, but the years notwithstanding, there are still a lot of Berliners around who remember the days when their survival hinged on those old propeller airplanes getting through. They turn out handsomely each May, along with their children and grandchildren, around the air bridge monument to remember.

Otherwise, Berliners are too busy these days to spend much time remembering, whether the awful hammering they took during the war, the blockade, or the various Soviet threats in later years. There is, of course, the Wall, that hideous wall, as an everyday reminder of what lies to the east. The East German guards are more polite now than they once were, but the whole process of getting through Checkpoint Charlie remains an affront to civilization.

There is the same atmosphere as that surrounding any maximum security prison: the searches, even to include a mirror rolled under the vehicles in case any prisoner is reckless enough to try that method of escape. Then there is the exhaustive and suspicious paperwork and, of course, the ominous guard towers overlooking the scene. Despite considerable cosmetic improvements, East Berlin seems a sterile and joyless city. Not surprising for a place whose entrance is a prison gate.

And so, despite all the changes the years since 1948 have seen, the French expression *Plus ça change, plus c'est la même chose* holds true. We still participate, along with our allies, the French and British, in a little theater called the Berlin Air Safety Center. The Soviets, as they did during the Airlift, play the role of the heavy.

Allied air traffic in and out of Berlin is coordinated through the Center. The Russians, as always, make their own rules. Nonetheless, the Air Safety Center does provide an essential service in letting everyone know what is in the local airspace. It could do a far better job if the Soviets would really cooperate, but, as we have noted, there is nothing new there. The Safety Center is one of the two surviving relics of the Four Power accords for the governing of Berlin, accords arrived at in the brief and heady time after the war when we were still ingenuous and hopeful about the behavior of the Soviets. The other relic of those accords is Spandau Prison, a grim pile whose only remaining prisoner is Rudolph Hess. The Soviets are evidently determined Hess will die in Spandau despite an Allied desire to let the sick old man go.

Away from the wall and its ugly connotations, West Berlin is a glittering city, a showcase for the Western way of doing things. Admittedly, the Bonn government pays a heavy price in subsidies to keep the good life going, but if West Germany were not itself prosperous, there would be no way to afford the luxury of Berlin. There is a University of Berlin, tuition-free to attract students from the rest of the Federal Republic, and various other inducements—no conscription is one—to keep the city from turning into an old folks home. That is not to say Berlin is free from troubles. There is the occasional outbreak of violence, confrontations with squatters, and the almost ritual demonstrations that any self-respecting city has to put up with these days. For the most part, however, Berlin is a tranquil place compared with much of the rest of Europe.

An added expense to Bonn comes from the fact that Berlin is still technically occupied. The costs of maintaining the allied garrisons are borne by the Federal Republic, still another reminder of how time has stood still here and there in this otherwise fast-moving city.

But getting back to the Airlift, this prosperous community of West Berlin dates from that show of Allied unity and the signal the Allies gave to the Soviets in standing firm, however shaky a stand it may have seemed at the time. The tourists coming into Berlin's Tegel Airport have no way of knowing the fascinating history behind that modern terminal. How thousands of Berliners turned out with shovels, wheelbarrows, baskets, or whatever to help spread bombed-out building rubble as foundations for the runways, taxiways, and apron. Or how a steamroller was sliced up by acetylene torch, flown in pieces into Berlin, then somehow welded back together to complete the job of compacting the rubble.

Then finally, when the airport was ready, there was the problem of the radio tower in the traffic pattern. Since it was a Soviet tower, albeit in the French zone, the problem was to be a tricky one for our diplomats to negotiate away. They were saved the trouble. A French general with a practical view of how to deal with the Soviets ordered the tower blown flat. After a small champagne celebration, Tegel became the third Berlin Airlift terminal (along with Tempelhof and Gatow). As befits an airfield that owes so much to human sweat and resolve, it has lived happily ever after. ■

Ship aground! Disaster threatens. But Cook's misfortune led to a fortune in scientific data.

The 1760's. Europe is astir with tantalizing questions raised by early Pacific discoveries. Could there be an immense southern continent, a vast new frontier ripe for development and trade? What unknown life forms exist around the mysterious Pacific basin? Can navigation be more accurate with the newly invented chronometer?

England's three naval expeditions under James Cook, spanning 1768-1780, answered these questions and more. In the process, they started a tradition of careful study and complete reporting by onboard scientists and artists. Including Cook himself, who was a skilled astronomer as well as navigator and seaman.

Today it's the space shuttle that will carry scientists and others to explore productive uses of a vast new frontier: outer space. No craft relies more completely on its computerized systems. Or on the abilities of its crew to use them. From early pre-launch preparations through post-landing analysis, smooth data systems integration is vital. And that is the major role of IBM.

Virtually every crew-to-orbiter command is processed by computer, since even simple com-

mands deal with millions of information bits and require many coordinated, split-second actions by different systems. On board, IBM computers are almost like an extra crew member...a doublecheck against error. On the ground, IBM enables mission control to monitor and respond to flight events as they happen.

With NASA we also designed a launch processing system for fast turnaround with minimum personnel. And a checkout facility for making sure all cargo interfaces efficiently with the vehicle itself.

In addition, IBM's systems integration skills are being applied to global position navigation. Antisubmarine warfare. Avionics. Electronic countermeasures. Command, control and communications. Plus a wide range of other fields.

In fact, the more complex the task and systems are, the more IBM can help.

IBM

Federal Systems Division
Bethesda, Maryland 20034

1. 11 June 1770. Lieutenant James Cook's first Pacific voyage. After completing first charting of New Zealand, Cook's converted coal hauler *Endeavour* inches northwestward within Australia's uncharted Great Barrier Reef. She strikes and remains fast on submerged coral ledge. All hands take vigorous steps to save badly leaking ship, including jettisoning of over 40 tons of ballast, equipment and supplies.

2. *Endeavour* finally refloated after 23 hours aground. Led some 30 miles by her small boats, which were taking soundings and scouting possible repair sites, she barely makes it past shallow mouth of river.

This ad is one of a series.
Historical facts verified by Historical Evaluation and Research Organization.
Shuttle photo superimposed on Apollo view of earth.

The stunning success of the first launch of the Space Shuttle heartened those who had hoped it would live up to its promise. So far, they have been vindicated, but will the Shuttle's built-in limitations render it ineffective for the national security missions depending on it?

CAN SHUTTLE FILL THE AIR FORCE BILL?

BY JIM HARTZ

BY ALMOST every standard imaginable, the maiden flight of the US Space Shuttle during the second week of April 1981 was an unqualified success. The fifty-four-hour mission went almost exactly as planned, the most sophisticated spacecraft ever built performed nearly flawlessly, and the spectacular reentry and touchdown at Edwards AFB, Calif., thrilled the nation.

Before, during, and immediately after the flight, the media were filled with glowing predictions about the bright future the Shuttle will bring—a cheaper way to orbit satellites, repair them, bring them back to earth, and construct space stations, as a gateway to the stars. It was heady stuff, reminiscent of the Apollo moon landings. Besides, according to most commentators, it was good the United States was back into manned spaceflight after a hiatus of nearly six years.

And the maiden flight did something else as well, something that for the most part was overlooked in the popular press. It eased some of the tensions that had been building between NASA, the civilian agency charged with the development of the program, and USAF, the biggest single user.

USAF, like other potential Shuttle customers—corporations, government agencies, foreign governments—and the Congress, was beginning to wonder if the Shuttle

Columbia and her crew, Astronauts John Young (commander) and Robert Crippen (pilot), gently touch the earth on Runway 23 at Edwards AFB, Calif., after their 54.5-hour mission.

program was ever going to get off the ground, and if so, would it ever be able to fulfill the ambitious promises NASA had made concerning the regularity with which it could be flown.

USAF Shuttle Requirements

In addition, USAF had other concerns, still not alleviated, about the ability of the Shuttle system to perform as a military program.

"AT&T may have the luxury of being able to wait a month for a launch," one high-level USAF officer said, "but when we have to go, we *have* to go."

It is the "launch-on-demand" capacity the Air Force needs most.

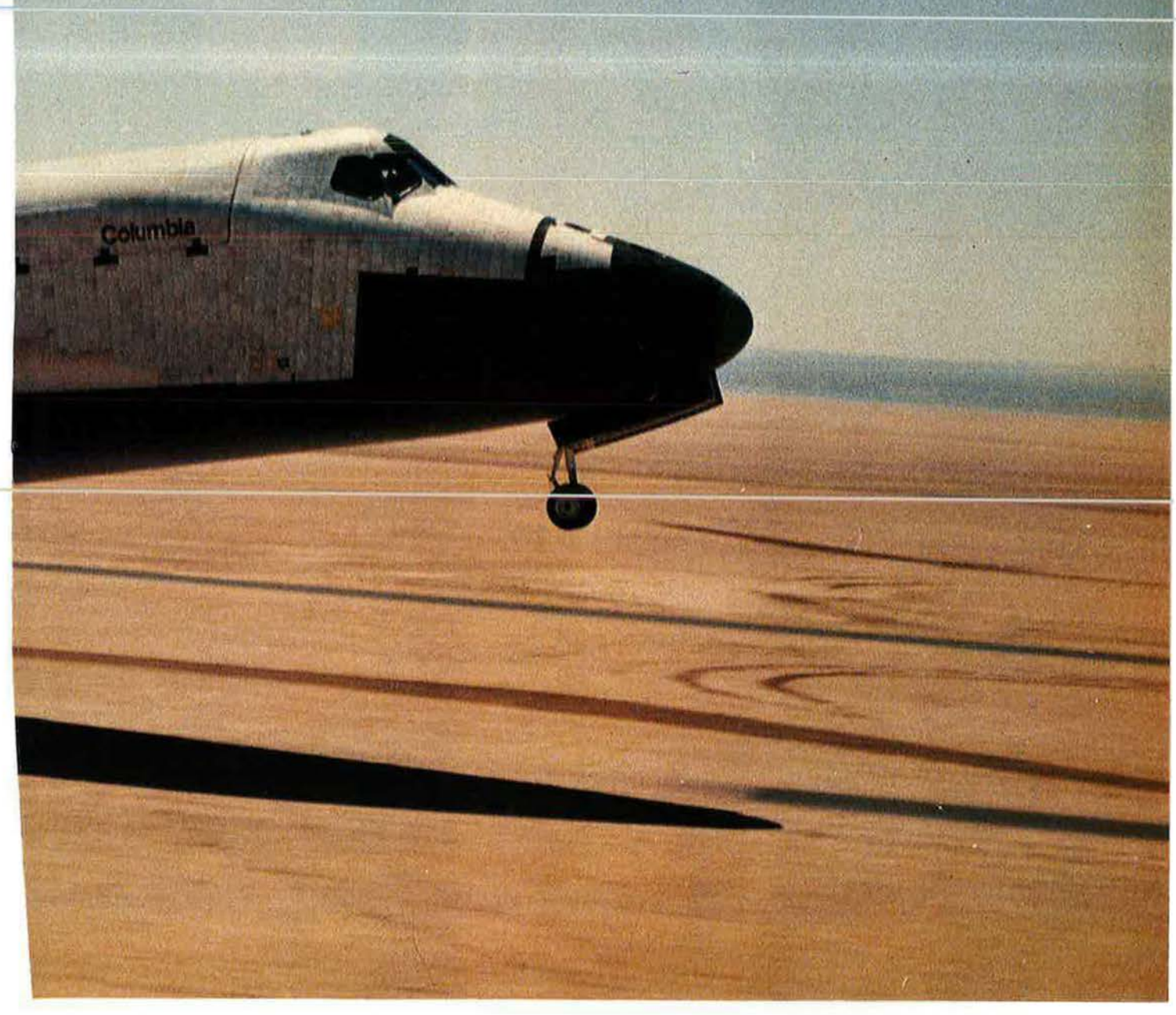
At the moment, USAF is scheduled to fill the cargo bays on one-quarter of the first fifty-two Shuttle flights scheduled through 1986. The payloads, highly classified, are reconnaissance, communications, navigation, early warning, and so forth. The launch schedule does not include emergency replacement or repair.

USAF doubts about NASA's ability to meet the ambitious launch schedule resulted last year in a memorandum of understanding between DoD and NASA that USAF payloads would take precedence over civilian cargoes and that, upon a declaration of a national security interest, USAF could displace civilian missions.

The slow pace of the Shuttle development—the first flight was more than two years late—also prompted USAF to retain extra Titan expendable boosters for critical payloads. And USAF has quietly kept the Titan assembly line open, turning out one to two engines per year. But the Titan cannot carry the heaviest payloads envisioned by Air Force planners.

"We have to have the Shuttle," the same officer, familiar with the program, said. "We've got a lot of eggs in this basket." What worries USAF? he was asked. "Choke points," he replied. "There are too many places where small problems can cause a complete shutdown."

For example, the Shuttle Orbiter is ferried around the United States atop a specially modified 747, the only one of its kind in the world. If it was disabled, the program would halt in its tracks. If the Orbiter was at, say, Edwards AFB, it could not be moved to the launch site until the 747 was repaired, or another one had been modified to take its place, a process that would take months.



Space Shuttle Columbia *lifts free of earth's restraints to begin the maiden flight of the Shuttle system. A remote camera at Launch Pad 39A captured this view, which began the 54.5-hour spaceflight by Astronauts John Young and Robert Crippen.*

Logistical Nightmare

The real logistical nightmare is the possibility that the Orbiter would be forced to divert to an alternate landing site. Four are designated and staffed: Rota, Spain; Kadena AB, on Okinawa; Hickam AFB, Hawaii; and Northrup Strip at White Sands, N. M. Actually, under extreme emergencies, the Orbiter could land at nearly any major airport with modern navigational aids. To retrieve it, however, is another matter.

According to the best USAF estimates, an overseas landing would require the use of five to six C-5s to carry the equipment needed to "safe and condition" the Orbiter, and the massive crane necessary to hoist and delicately position it atop the 747. The whole process could take four to five months. And this is presuming the aircraft would be available on short notice. In a national emergency they might not.

USAF also worries about earth transportation of the two other vital components of the Shuttle system, the external fuel tank and the twin solid rocket boosters.

Fuel—liquid hydrogen and liquid oxygen—is carried in a massive bullet-shaped tank, 154 feet long, twenty-seven feet in diameter. It is assembled by Martin Marietta in Michoud, La. The tanks are shipped by barge from Michoud to the Kennedy Space Center on Florida's east coast for launches into equatorial orbit, and through the Panama Canal to the Western Test Range at Vandenberg AFB, Calif., for polar launches. Obviously, adverse weather conditions at sea and political instability in Central America could cause prolonged launch delays.

The two solid rocket boosters (SRBs), 150 feet long, twelve feet in diameter, are manufactured by Thiokol Chemical Co. in Brigham City, Utah, and are shipped by rail to the launch sites. It's not so much the possibility of an interruption in rail shipments that bothers USAF as it is the scheme to reuse the SRBs.

The SRBs used on the Shuttle are the most powerful ever built—each develops 2,900,000 pounds of thrust at sea level. Fully fueled, each weighs 1,293,000 pounds. They provide the main thrust at liftoff, and burn for two minutes before being jettisoned at approximately twenty-four miles' altitude. The empty SRB casings then descend to a parachute landing in the ocean. The plan is to recover them by ship and reuse them twenty times. Five pairs of SRBs are dedicated to each Orbiter.

Variables and Unknowns

But the successful functioning of the scheme depends on many variables and unknowns. It is assumed that the SRB casings will not be seriously damaged at splashdown; yet it's hard to imagine a fifteen-story steel cylinder weighing 182,714 pounds hitting the ocean at eighty-eight feet per second (sixty miles per hour), the impact speed, and not sustaining some damage. Further, the empty casings must hit vertically and must float on the air trapped inside. The ships must find them, divers must insert a plug in the engine nozzle, water must be pumped out, the casings must be towed some 140 nautical miles to port, flushed of sea water, and returned to Utah for reloading.

In fact, on the maiden flight, the aft engine skirts on both SRBs were badly damaged. Divers had difficulty inserting the plugs. And both SRBs were riding low in the water when they reached port. "Clearly, this is one area we're going to have to improve," according to one NASA official. A detailed inspection of the two casings will not be finished for some time.

The first flight was carried out in nearly calm wind and sea conditions. The question is whether the recovery will even be possible under adverse circumstances.

The two solid-rocket boosters used in the April 12 launch of the Space Shuttle Columbia. *They are towed by the UTC* Freedom *and UTC* Liberty *(not shown in this photo).*

Weather, in fact, is a severe launch constraint, especially on the first four "test" flights. It must be nearly perfect at the launch site, at the recovery runway at the Kennedy Space Center, and at the primary recovery area at Edwards AFB. Just how difficult it might be to match up such conditions is illustrated by the fact that for ten days prior to the Flight Readiness Firing test on February 20, 1981, the weather at one or more of the locations was not satisfactory for launch.

Sudden weather changes at the launch site, not infrequent at the Kennedy Space Center, could cause another kind of delay, related to a critical flight control system.

Hydraulic pressure for control-surface movement and rocket-engine gimbaling is provided by three independent systems. The hydraulic pumps are driven by turbines powered by hot gases created by decomposition of hydrazine. All three hydraulic power units must function in the early stages of launch. The failure of any one requires an automatic abort to the landing strip near the launch site.

In addition, the supply of hydrazine is limited. The pumps are started five minutes before launch. If there is a hold after that, perhaps caused by weather, lasting only two to seven minutes (depending on mission requirements), the launch would have to be scrubbed, and it

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Jim Hartz, an Oklahoma native, worked as a reporter for radio station KRNG while a pre-med student at the University of Tulsa. Deciding on a career as a newsman, he joined KOTV in Tulsa in 1962, then in 1964 moved to NBC News in New York. During the next ten years, his assignments as reporter and anchorman included coverage of the Gemini and Apollo flights, including the moon landings. For several years beginning in 1974, he was co-host of the "Today" show on NBC. In August 1980, Jim Hartz became the first journalist to fly in the SR-71 strategic reconnaissance aircraft. This summer he becomes co-host of the "Over Easy" series on public television.

would take twenty-four to forty-eight hours to recondition and replenish the hydrazine fuel system.

Landing requirements for the hydraulic system, incidentally, are not quite so restrictive. The Shuttle can land normally with only two systems functioning, and with only one with reduced rate control surface (elevons and rudder) response. A total hydraulic failure would obviously cause a crash. It is for this reason, and to save weight in plumbing and piping, that engineers are actively seeking an alternative actuator system. Future Shuttles could be equipped with electro-servos.

Electrical Power

Once again, though, designers will face a potentially hazardous tradeoff. All electrical power on board the Orbiter is generated by three very efficient, redundant, cross-connected fuel cells.

The fuel cells create electricity (12,000 watt peak for payload operation) by reverse electrolysis—combining hydrogen and oxygen chemically. A byproduct is potable water.

Fuel cells are generally considered to be highly dependable devices. They were used on all the Gemini and Apollo spacecraft and performed flawlessly. With two notable exceptions, that is.

On Apollo-12, on November 14, 1969, a rocket-induced bolt of lightning created an overload on the electrical system that automatically disconnected all three fuel cells from the main power buses during the critical launch phase of the flight. Fortunately, backup entry batteries A and B supplied enough power to keep the spacecraft functioning until the astronauts could "reset" the fuel cells on the line.

On Apollo-13, launched April 11, 1970, a liquid-oxygen tank that supplied fuel to the generators exploded during the lunar coast phase of the flight. The force of the explosion destroyed the entire fuel cell system and deprived the main spacecraft of all but battery power. The moon landing was, of course, called off, and the astronauts returned to earth huddled inside the Lunar Module, depending on the power from its batteries to keep them alive. They then transferred to the Command Module for the actual reentry and return to earth.

There are no batteries aboard the Orbiter. A sudden fuel cell failure at any stage of flight would mean an almost instant disaster.

These concerns, of course, stem from Air Force planners who are conditioned to think of "worst cases." When national security is at stake, the system must function, and function properly. As time goes on, their concerns might be alleviated. A speed-up in the NASA timetable would help.

Indeed, less than a week after the first successful test flight, NASA engineers were talking privately about moving the second flight up from its scheduled September launch date. There was also discussion of making only one more landing at Edwards AFB, and of putting working payloads on the test flights.

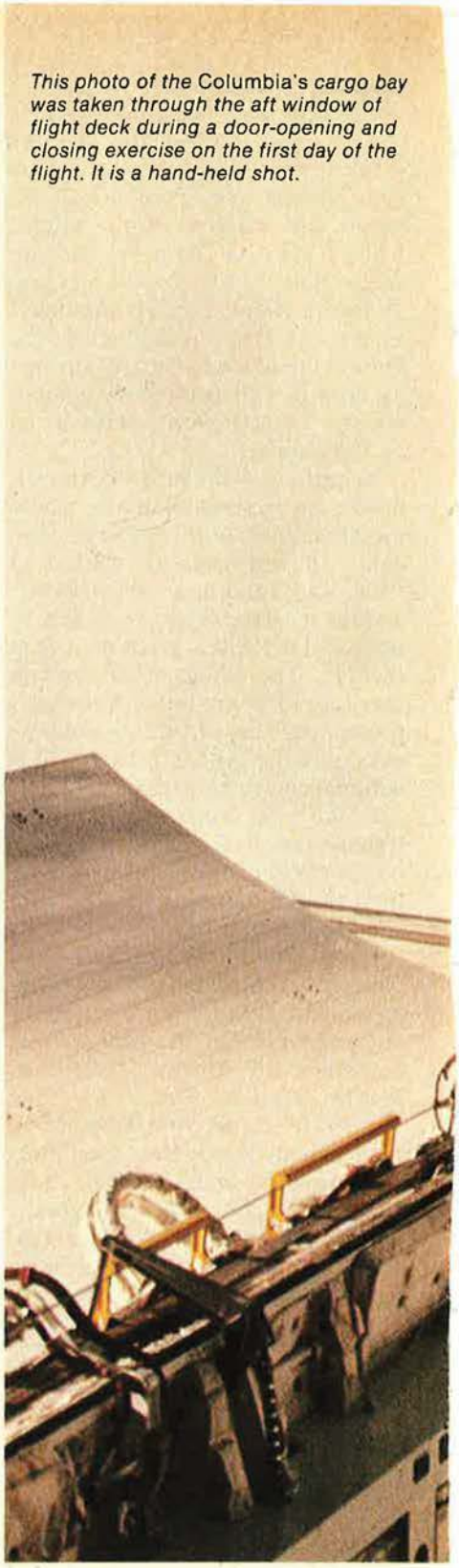
The Orbiter survived the fifty-four-hour flight remarkably well. The only damage seemed to be a few missing tiles used for heat absorption on reentry. Their loss was not critical, and the structures beneath these missing tiles did not seem to be damaged.

Initial press reports of serious damage to Launch Pad 39-A were apparently not true. A detailed inspection showed no more damage than occurred during the Apollo lift-offs; thus, turnaround time on the pad seems accurately predicted.

"What Ifs" and "Worst Cases"

Another concern—the ability of the astronauts to control the Orbiter in a "heads-up" position after fifty-four hours of weightlessness—proved unwarranted. During the entire reentry, they seldom pulled more than one G, and neither John Young nor Robert Crippen reported any blackout tendencies, nor was either man ill in orbit. This does not mean, however, that NASA or USAF has entirely dismissed the possibility that future astronauts, having spent as much as thirty days in space, will not develop cardiovascular insufficiencies. Thought has already been given to providing the astronauts with G-suits.

Obviously, the list of "what ifs" and "worst cases" in a program of the complexity of Shuttle could go on forever. But central questions

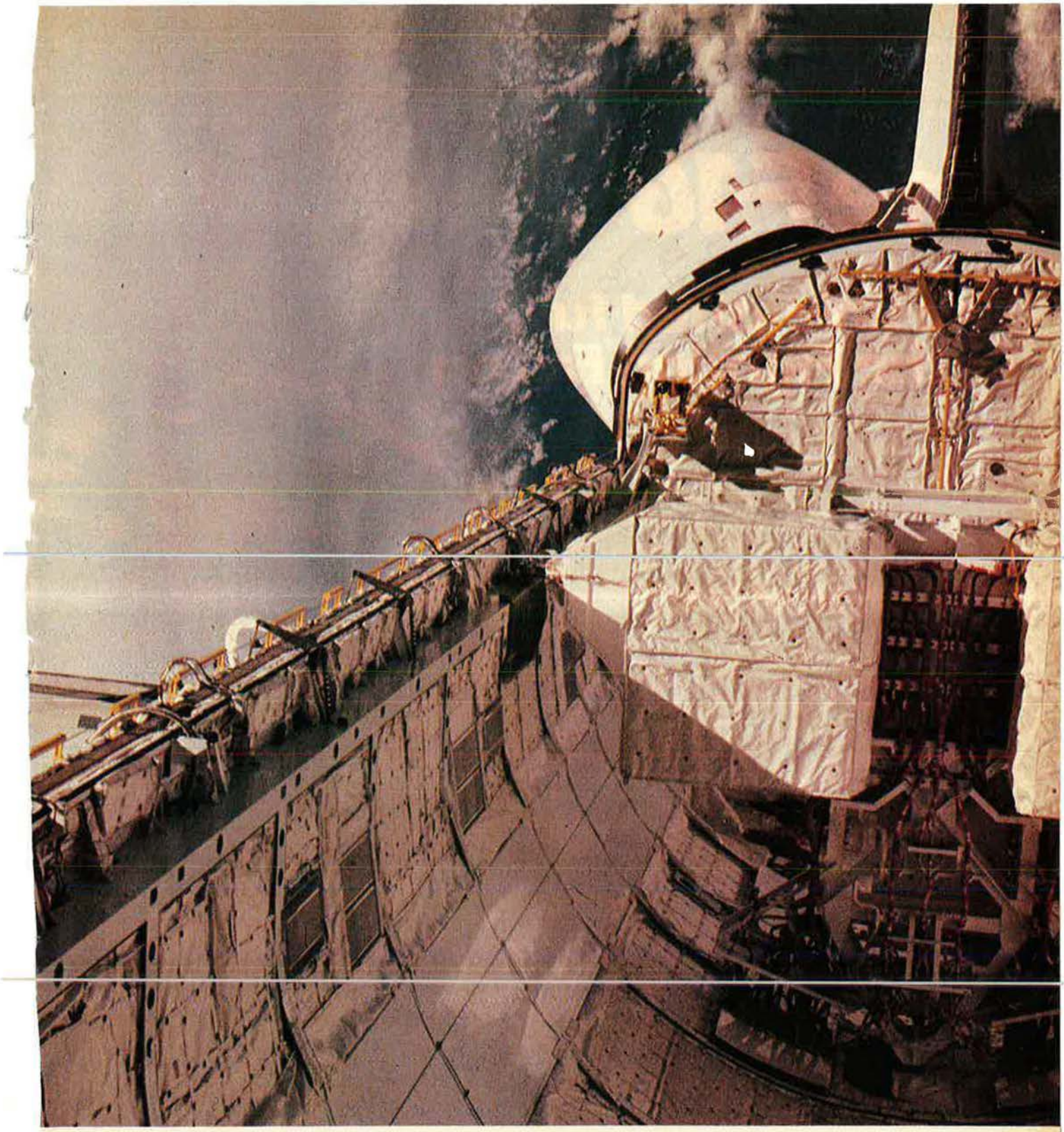


This photo of the Columbia's cargo bay was taken through the aft window of flight deck during a door-opening and closing exercise on the first day of the flight. It is a hand-held shot.

are: What if we lose one, or what if Congress refuses to fund the four that are scheduled to be built?

The answer from the Air Force, off the record, is: "You might as well paint it blue." Their national security missions will preempt all others.

The resultant scheduling problems would undoubtedly leave pri-



vate industry and other users frustrated and angry. That is, if users keep buying space as they have in recent months.

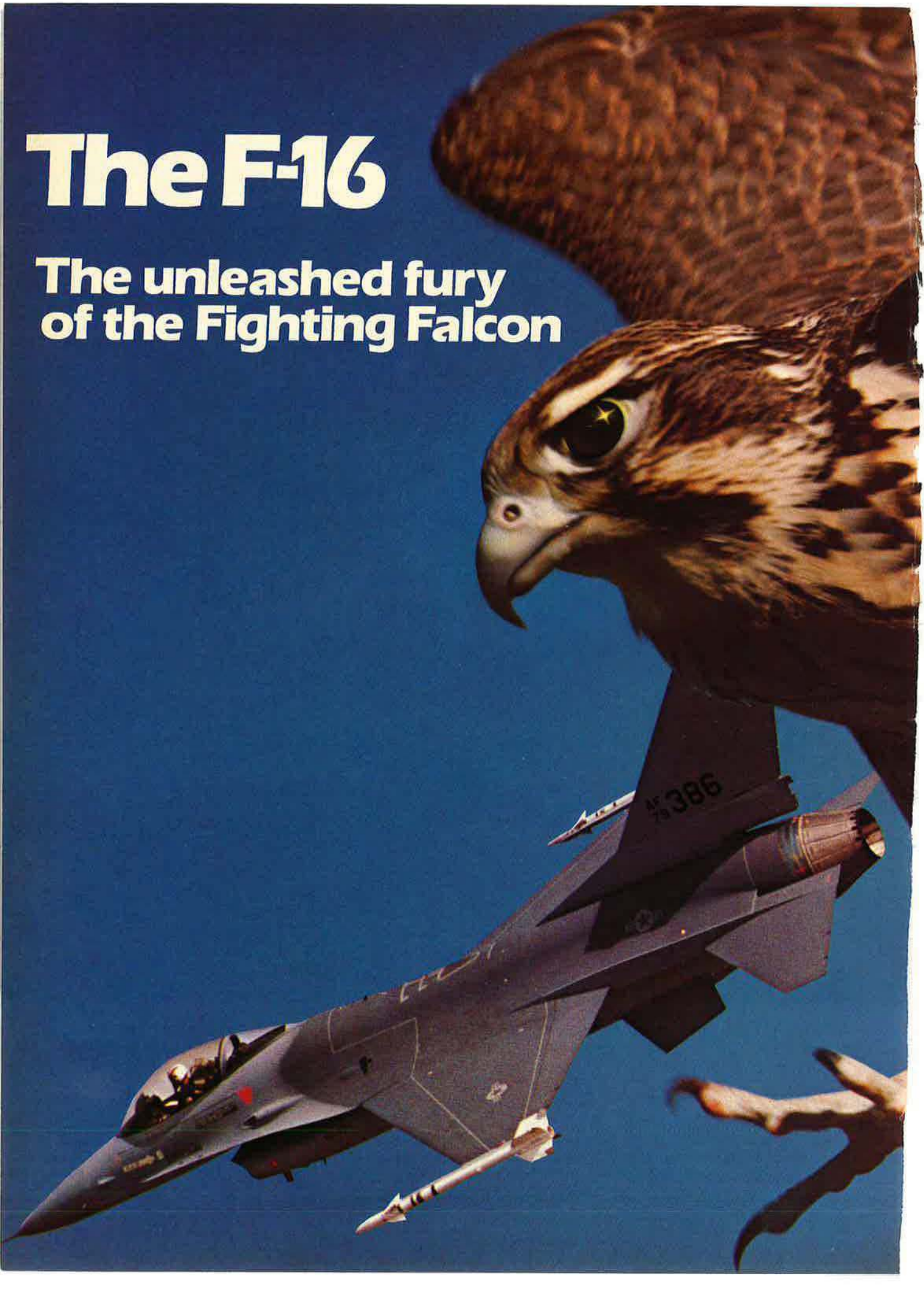
If demand increases, the situation would become intolerable and there would be enormous pressure to build additional Orbiters, and the country could end up with something along the lines of a production schedule suggested by Sen. Harrison Schmitt (R-N. M.), a former astronaut.

Senator Schmitt believes a minimum of eight Orbiters should be built, thus lowering the unit cost, with four of them devoted to civilian uses and four dedicated to USAF.

In the meantime, USAF is watching closely the turnaround times for Orbiter and SRB refurbishment, and urging NASA to be bolder in its launch criteria and less stringent in its mission criteria. NASA, for its part, with a successful first flight under its belt, now seems more inclined to agree. The success of Shuttle, after all, is not embodied in the maiden flight. It's the long haul that counts. ■

The F-16

The unleashed fury of the Fighting Falcon




GENERAL DYNAMICS

When fighter pilots are in their element and doing their jobs, there is usually no great need for diplomacy or tact. However, with the end of World War II, one fighter pilot found himself exchanging his flight suit for a morning coat in a metamorphosis . . .

FROM FIGHTER PILOT TO DIPLOMAT

BY COL. LESTER J. JOHNSEN, USAF (RET.)

LIFE is full of surprises, shocks, and adjustments. The surprises came when we discovered that the enemy could build planes in many ways superior to ours. Someone in another airplane trying to kill you supplied the shocks. Adjustments followed when World War II ended in Europe, and I followed orders that sent me to Norway as Air Attaché. No longer a fighter pilot, now a diplomat.

As a fighter pilot, I had served a tour in the Southwest Pacific flying P-40s in Java; Darwin, Australia; and New Guinea in 1942. *(See "You Men on Java Are Not Forgotten," September '80 issue, p. 106.)* The Japanese in Java had the famous Zero fighter, which took a toll of our young pilots until we learned how to counter it. In Darwin, we held the line. And in New Guinea we turned the Japanese around and started them back to Nippon. First up the Owen Stanley Range, then from Milne Bay, Buna, and Gona.

Then a few pilots were ordered home to peddle combat expertise to new pilots fresh from flying school in 1943. We sold our wares for a year or so and then went off in many different directions to combat.

But while at Seymour Johnson Field, N. C., I was asked to be the Air Attaché to Norway after the war. I thought this would be interesting, even though I didn't have much of an idea what it entailed. Off I went to Strategic Intelligence School for instruction in codes, photography, reasons for one country knowing about another—in short, legal spying.

After finishing the course I arrived in London, and since I would be going to Norway I got the idea that I should somehow become attached to the Norwegian Air Force. I could become acquainted with the personnel, live and eat with them, and hone my language skills. Mr. Lithgo Osborne was the American Ambassador to the Norwegian government-in-exile in London. He bought the idea, and called on General Riiser-Larsen, Commanding General of the Royal Norwegian Air Force, who graciously granted me permission to join his fighter wing in Holland. Col. Everett Stewart, Commander of the AAF's 4th Fighter Group at Debden, England, let me have a P-51. Maj. Willie O'Donnell and I, plus many bottles of Schenley's Black Label, took off for an adventure on the Continent with the Allied air force of fighting Vikings.

A Government in Exile

Occupied Norway, a country of 3,000,000 people, had established a government-in-exile in London with their Royal Family, a navy, army, and air force. At the time, Norway had the fourth largest merchant marine in the world—5,000,000 tons. Its Air Force consisted of three Spitfire squadrons, one PBY squadron, one Sunderland squadron, one transport squadron, one Mosquito squadron, and one training squadron. The Norwegian airmen had escaped the German occupation on skis, bikes, afoot, in boats of all kinds, and in the empty holds of gasoline tankers that escaped the occupation. Many went around the world to Canada for training before embarking to England. Following the invasion, they set up shop in Holland.

Maj. Wilhelm Mohr, in 1964 to be the Commanding General of the RNAF, welcomed me at A-65 Airfield near Nijmegen. Col. Helge Mehre, later major general,

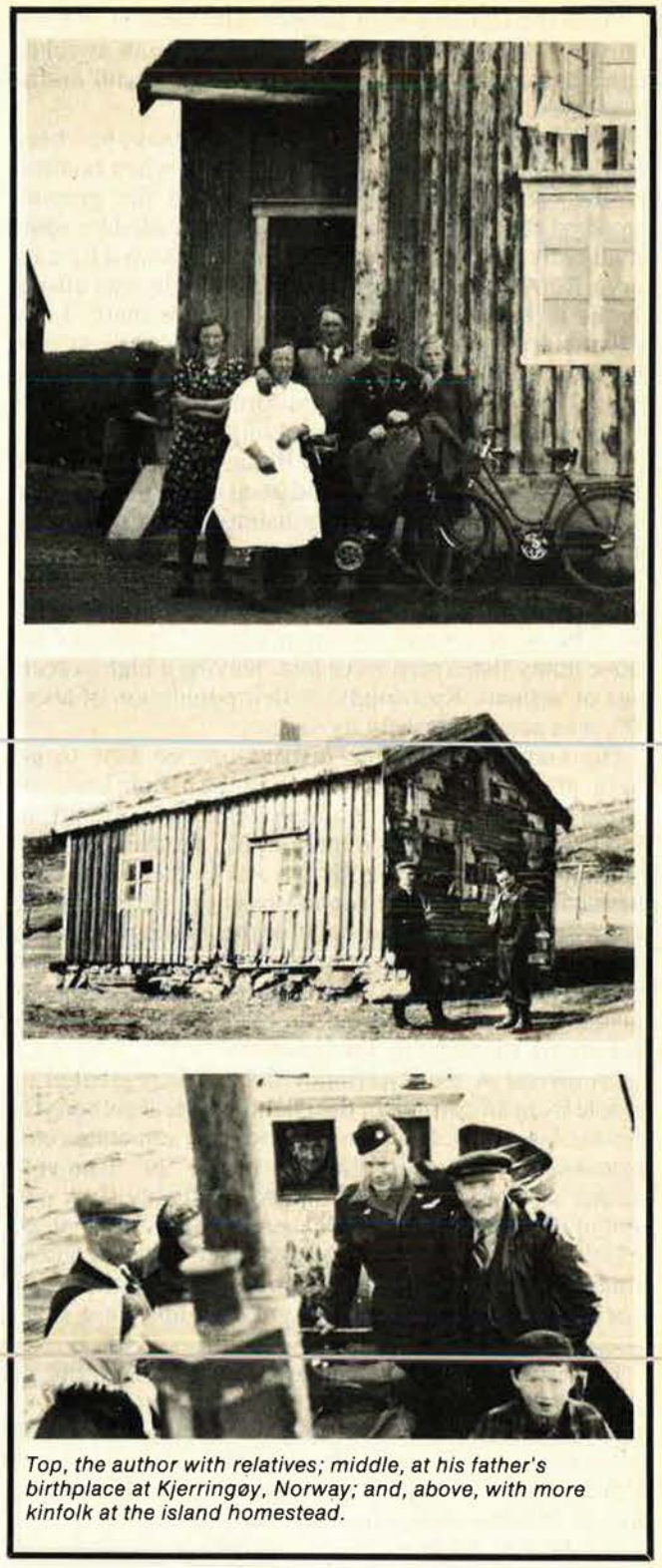
The author, right, and Maj. Wilhelm Mohr of the Norwegian Air Force prior to a check flight in a Spitfire: "Just a bit of talk and off into the blue."

was Wing Commander. The wing's mission was to strafe trains, convoys, or anything that moved to keep the hard-pressed Germans from regrouping. The unit's Spitfires had only about an hour and twenty minutes of fuel, but my P-51, an early model with the greenhouse canopy, had three times that flying time. It had been painted a bright red, a beautiful sight. The main fuel tank, normally located behind the pilot, had been removed, leaving a compartment big enough for a brave soul without a parachute to ride in. While at A-65, many of the Norwegians did, even lining up for short hops.

During some of the missions at that time we shot up ammo stored in barns and haystacks, and when hit they really blew, as did steam engines.

We lived in tents and moved from one base of pierced steel planking to another every few weeks. As winter came on, it got muddier and colder, and we always seemed to be wearing all the clothes we owned. A sheepskin jacket, the British-designed "Irving" jacket of fur-lined leather, saved our lives. Each of our tents had a kerosene stove. A pan of water on top of it would get hot enough to wash a bit, a luxury because there were no showers. A good tentmate left a clean pan of water on the stove when he left, so it would be hot for his returning buddy.

By May 1945, the war began to wind down. We still flew missions, but had time to make excursions into the area near Essen and Duisburg to view some of the destruction to the German war machine, which was unbelievable. Once we joined US paratroopers for several days in the Nijimegen Bridge area. Norwegian Capt. Fridtjof Høyer was delighted to be with the young Americans. Høyer, a hero in his own right, had escaped to England when the Germans discovered his identity as a member of the Norwegian underground.



Top, the author with relatives; middle, at his father's birthplace at Kjerringøy, Norway; and, above, with more kinfolk at the island homestead.

Capitulation

Then came the German capitulation. Would the various pockets of Nazi resistance go along with the surrender or would Norway, as long rumored in Allied intelligence circles, be used as a redoubt to make a last stand? The fighter pilot instinct in me was to press on to Norway as ordered.

Norway was the land of my forefathers, the birthplace of both my parents. The countryside filtered through the clouds below me, and I wondered what kind of legacy the war would leave. Better show the US aircraft markings, so around and around the city of Oslo I flew, pulling tight turns. A stadium full of people caught my eye and I went down for a closer look and then another pass, dipping into the bowl. I'm sure the people must have enjoyed my salute, but the speaker must have been annoyed. Crown Prince Olav had returned to Norway after five years of exile and was addressing his countrymen. He had preceded me by several hours and had received a tumultuous welcome. Later, I learned that he had to stop speaking with each of my passes. During my subsequent audience with him as a US Embassy official, you can be sure that I didn't mention the flyby.

Visiting Airfields and Relatives

A first important task as Air Attaché was to survey all of Norway's airfields. I believed one was close to where my relatives lived. My first landing after leaving Oslo was Vaernes, the airport for Trondheim. One Norwegian was in overall command, with still-armed Germans under him. They were kept armed to keep order and prevent looting in the airdrome areas. German officers took me to their mess for a lunch of coffee, cheese, and bread. They asked very politely if they could sit down with me. I'll never forget those immaculately dressed officers and airmen, with their Lugers strapped to their sides. I wonder how they felt when an unarmed American emerged from the cockpit.

From the German-built airports and landing strips in Norway, Allied convoys to Russia had been attacked with devastating ferocity. The planes were still on the airdromes, minus their propellers.

The city of Bodø, like so many in Norway, had been built entirely of wooden structures. And when bombed by the Germans in 1940, it burned to the ground. Amongst the rubble were a few buildings used by some small entrepreneurs, one a radio shop operated by a reserve RNAF lieutenant, Carsten Harr. He was also in charge of Bodø Airfield and the Germans there. Lieutenant Harr wore a baggy uniform assembled from various sources that was much too big for him. He weighed about 120 pounds, and the "uniform" would have fit a 200-pounder easily. But the elegantly dressed Germans jumped when he gave orders. Being fluent in German, Harr, with his radio ability, had been a key underground operative in that area. From a listening post in a truck, he had kept constantly on the move.

My parents had come from Kjerringøy, an island north of Bodø, about 350 miles north of the Arctic Circle. The word means "woman island," probably because many fishermen were lost, leaving a high percentage of women. Kjerringøy, with a population of about 200, was accessible only by sea.

The Germans gave me instructions on how to get there, after a phone call ascertained the people knew my parents and who I was via mail delivered through the Red Cross during the occupation. My mother had written that she had a son in the US Air Force. I flew over the island and after the second pass the people ran up many flags. What an emotional sight. I then returned to the airfield and made arrangements with a local fisherman to haul me and a load of coffee, sugar, tobacco, raisins, rice, and other food supplies that had not been had on the island since the invasion.

On arrival at the Kjerringøy dock, I was greeted by people from all corners of the island who had gathered to see the American. It was moving to have someone come up and say, "I am your father's brother," or "I am your mother's sister." It turned out that probably sixty percent of the people at dockside were relatives! In contrast to Oslo, where my Norwegian produced smiles, I had no trouble understanding every word spoken in the North Norway dialect I had learned growing up. Here I was among my own.

There were horse-drawn carts on the island, but no cars. We loaded aboard and, with a procession following, started out for a cousin's house. There, the first coffee in years was brewed. The people said that seeing an Allied pilot, and enjoying the aroma of coffee again, proved that the occupation had truly ended.

My days at Kjerringøy were spent seeing where my mother and father were born, visiting many relatives, and sorting out the complicated family relationships. There and elsewhere in Norway I learned details about the occupation.

Tales of Occupation

Tales of the occupation varied. Some areas the Germans dominated completely with barbed-wire fences, trenches, gates, and guards all over. If enclosures happened to surround homes, the Germans took them over and crowded the owner's entire family into one room.

Rep. Henry M. Jackson—now Senator Jackson—with his cousin, Major Johnsen, after the Congressman's cure of pneumonia was brought about by the administration of penicillin procured via a hasty flight to Germany.

Though isolated areas were not bothered as much, it was still a matter of survival. Enough food to keep alive, enough stove wood and clothing to keep warm. The Nazis took what food they wanted and conscripted any labor needed. A family was very fortunate to have a cow, a pair of sheep for wool, and a few chickens. They also had abundant fish, although this was also controlled by the Germans. So although the diet was monotonous, it was sufficient. Sharing and helping one another became a way of life.

Further north, the German super-battleship *Tirpitz* lay bottom up in Tromsø fjord, sunk by "Tallboy" 12,000-pound bombs dropped by RAF Lancaster bombers. The Norwegian-American liner *Stavangerfjord*, once on the Oslo-New York run, had been confiscated by the Germans in April 1940. Thereafter, the Germans had tried to get it into sailing shape, but the Norwegians continuously sabotaged it. The Germans finally gave up and camouflaged it in a fjord.

In May 1944, Norway and the Allies signed an agreement giving the Norwegian Home Guard the responsibility for governing the area north of Tromsø during the transition from occupation to Norwegian rule. The German forces had been driven out of Finland and pursued by the Russians into northern Norway. Under the terms of the 1944 pact, the Soviets had agreed to allow a Norwegian force to participate in the campaign against the Germans. The Russian invasion of northern Norway was, in the Russian view, the initial step in the liberation of Norway. They hoped for an ice-free port on the Atlantic as compensation for their efforts and were reluctant to withdraw. But in the face of a resolute Norway and Allied pressures following the German capitulation, the Russians did finally pull out.

Col. Lester J. Johnsen, USAF (Ret.), served as Air Attaché to Norway from 1945–48, and again from 1964–68. He has commanded fighter squadrons, groups, and a fighter wing, flying aircraft from P-40s to F-106s. He has served as Executive Secretary to the Joint Chiefs of Staff. His two sons are pilots, Jon flying F-4s at Ramstein AB and Mike flying 747s and DC-8s for Flying Tiger. He and his wife now operate a successful Christmas tree farm in Shelton, Wash. Colonel Johnsen was knighted a Commander of the Royal Norwegian Order of St. Olav in 1967.

VIP visitors are welcomed to Oslo in 1945. Top, former President Herbert Hoover, center, was head of the Truman Commission concerned with feeding the people of war-torn Europe. Above, from left, the author, Jimmy Doolittle, former RAF Wing Commander Sir Douglas Bader, and Mr. Westblad, director, Shell Oil Co. Norway.

A Liberated Country

Once back in Oslo, my job as Air Attaché was made easier because of my acquaintance with nearly all the people in the Norwegian Air Force from the Commanding General on down to the officers and enlisted men at the bases. All had either met or heard about the Yank in the red P-51.

In the capital city, the Norwegian government was faced with a country short of food, housing, utilities, etc. Officials had a difficult time containing the natural euphoria stemming from the liberation but nevertheless insisted on stringent measures. Whereas in Denmark the flood gates were open and the country was soon in economic crisis, in Norway all sugar, coffee, meat, cheese, eggs, and the like were rationed.

My family soon arrived from the States, and we were fortunate to live on a farm about twenty minutes from downtown Oslo, and had fresh milk. The farm was the home of Sigurd Klowman, one of Norway's most famous engineers, then living in Sweden. (He had designed, among other things, the famous Rjukan heavy water plant.)

After five years of occupation, the Norwegians had much to celebrate. Thus the summer of 1945 was a jubilation, and those who had lived so long under the Nazi yoke still talk about it. The weather was perfect and celebrations were constant, filled with the exhilaration of people just being able to walk where they chose, talk, and laugh without restraint. People were everywhere, happy people enjoying freedom.

During the occupation red had been a forbidden color—the color of resistance. With the liberation, red blossomed everywhere. Norwegian ingenuity came into full flower during the occupation. A small apartment contained everything from a garden to pigs and chickens. One housewife said proudly, "My husband had an egg every morning."

Most of the stores in Oslo and other towns were boarded up, and there was only a little change during that first year. Life was still difficult, but people were free, and rejoicing was the order of the day.

One day the Ambassador summoned me to announce that a US Congressman from my home state of Washington was in the Rikshospital with pneumonia. Rep. Henry M. "Scoop" Jackson is a cousin, and college and the war had kept us apart. I didn't know he was a Congressman or that we both had attended Stanford University. The doctor said Scoop was seriously ill and he needed penicillin, the miracle drug developed during the war and not yet available in Norway.

We flew to Germany in the C-45 recently assigned to the Embassy. The crew chief, Sgt. Jimmy Olsson, and I braved weather and an all-night flight to secure the drug. Scoop soon recovered. Over the years, the story Scoop tells has grown more elaborate as he relates how "They saved me from my death bed."

First Air Attaché

The attaché office I was in charge of consisted of two other majors, a captain, and seven or eight enlisted men. We had to find office space, set up a code room, a finance center, and establish liaison with the Norwegian Army, Navy, and Air Force. We were in the intelligence business—legal spy work—and the duties varied in each country. My Norwegian counterpart in Washington, D. C., was Commander Østby, there throughout the war years. I was the first US Air Attaché in Norway.

At an embassy reception, from left, Norwegian actress Asse Bye, Assistant Army Attaché Major Hendricks, Mrs. Josephine Bay, Ambassador Charles U. Bay, aviation pioneer Bernt Balchen, and the author.

Before the war, the US had one attaché in Germany responsible for the Scandinavian countries. That attaché had been killed in Norway during the Nazi invasion. Until the reorganization act of 1947, the Air Attaché was called the Assistant Military Attaché for Air. The senior attaché on post would be the commander of both the Army and Air attachés, and I was called the Military and Air Attaché. This continued until Col. Charles E. Rayens, US Army, arrived to take command. The witty and intelligent Rayens kept everything on an even keel. Many other stations had problems with "who owns the airplane," and the notion that the air attaché was there just to pilot people around. Not "Uncle Charlie," a practical and clever officer, and one of the best bosses I ever had.

All of the military attachés ranked high on the protocol list. Most of the military attachés in Oslo were younger than some of the career State Department people, and this created some tension. Fortunately, most of the military were not concerned about ranking according to protocol. Their main interest was to enjoy meeting the many prominent guests visiting the Embassy. For example, King Haakon, Gen. Omar Bradley, and former President Herbert Hoover, who was head of the Truman Commission concerned with feeding the peoples of war-torn Europe. It was a special thrill to drive through the Embassy Residence gates and up the gravel driveway to the great front door. The Residence had been given to the American people by the Nobel family, and was a stately, magnificent manor with a large formal garden.

The Residence always assumed the personality of its occupants, and Ambassador Osborne and his wife Lillen were gracious and congenial. As a result, the Embassy personnel felt at ease at the Residence. Mrs. Osborne was of Danish extraction and had met the Ambassador when he was a young State Department officer on duty in Denmark long before the war. She was very artistic, and it was fascinating to watch her make lace, tat, or weave and develop a lovely tapestry before your eyes. We were fortunate to spend some interesting evenings with them. Maybe we were favored because their daughter-in-law was a classmate of ours at Stanford.

The attaché system was started from scratch after the war. What did they want in an attaché in those days? First, someone who spoke the language. I had learned Norwegian at home in South Bend, Wash. Second, a college graduate. Then, a combat pilot. Preferably married. I fit the profile, and they had sent me to Strategic Intelligence School. Intelligence collection is a matter of taking the pulse of a country, its strengths and weaknesses. Are they for or against us? What can we do to help? In Norway there has never been any reason to do anything undercover to gather intelligence. If there was information that the US wanted that was not available in an open manner, *i.e.*, newspapers, magazines, etc., we would ask the official who knew. Usually we got the answer unless it was a classified matter or detrimental. The healthiest relationship between two countries exists when there is a mutual flow of information.

Recovery and Return

By the time I left, after three and a half years, the Norwegian life-style was in much better order. Most shops were open, and even the "varmepolser" (hotdog) was now made of meat instead of fish. The Norwegian sense of humor surfaced in full force after the war. One example was the great play the newspapers made of April Fools' Day, when they competed for a plausible story to fool their readerships. One story ran that a ship in the harbor had a very rare animal aboard, and officials were having difficulty acquiring enough cabbages to feed it. People were requested to bring their surplus cabbages to the pier. The story had its beginning days and even weeks before April 1. Well, there were cabbages carried in bags, briefcases, under arms—all en route to the pier. Gradually the realization spread that it was a prank, and the cabbages surreptitiously disappeared under coats, streetcar seats, trash cans, etc., with a great amount left at the pier.

Those are unforgettable years. The first ship to arrive with oranges and bananas. The sea of red hats at the first Holmenkollen Ski Jump Championships.

I was, therefore, very fortunate and happy to return as the Defense Attaché in 1964. Then it was General Wilhelm Mohr, Commander of the Royal Norwegian Air Force. Otto Tiedemand was the Minister of Defense. It was now King Olav, and most commands were headed by Norwegian comrades from Belgium and Holland. Coming through Customs, the agent asked me, "Do you remember me?" "Not really," I said. His response: "I flew with you in your red Mustang." That was a great beginning to another four years in Norway. The Ambassador was Margaret Joy Tibbets, a delightful, intelligent person.

To end my story. In 1979, while waiting in London to board a plane to Oslo, a man kept staring at me. Finally he approached and asked in Norwegian, "Weren't you in 332 Squadron?" "Yes," I said, "But I'm not a Norwegian; I'm an American." He said, "I know, I used to refuel your red Mustang and flew with you once." "My golly," I replied, "How can you still remember me? That was thirty-three years ago." "You haven't changed a bit," he said.

Flattering or not, I liked the remark. ■

SCIENCE/SCOPE

The F-15's record of reliability and ease of maintenance is carried over to the F-15 Strike Eagle, the two-seat fighter proposed to meet NATO's need for an aircraft to fly attack missions in the severest weather. One reason is because the Strike Eagle uses a multimission version of the AN/APG-63 radar. The APG-63 has established an outstanding reliability record due in part to the extensive screening given each radar set and its spares before delivery to the customer. The radar is easy to maintain -- requiring just over one maintenance man-hour per flight hour at the flightline maintenance level -- because it has a built-in test capability and needs no external test equipment. Hughes manufactures the APG-63 radar under contract to McDonnell Douglas Corp., builder of the F-15.

The Royal Netherlands Army is the first outside the United States to obtain the AN/TPQ-36 Firefinder weapon-locating radar. The Hughes TPQ-36 is designed for rapid deployment with front-line units to detect the source of enemy artillery, rocket, and mortar fire. The radar uses new clutter-rejection techniques in its signal processor to filter out ground clutter, enemy jamming, and bad weather conditions. It plots the incoming projectile's trajectory, backplots the track to the source, and predicts where the projectile will hit. Friendly firing units can use this information to return fire accurately on the first round.

An imaging infrared Maverick missile scored a direct hit on a tank target in the first launch of the development test program. The air-to-ground missile, designated the AGM-65D, was fired at night by an Air Force crew from an F4 Phantom aircraft. The launch began a series of development test and evaluation flights to verify that the missile meets engineering specifications and operational requirements. The new Hughes missile seeker maps the target and surroundings by scanning with sensitive infrared detectors and transforming this picture to a TV display in the cockpit. The crew then locks the seeker on target, launches the missile, and either takes evasive action or locks on to successive targets. The missile homes autonomously to the centroid of the target.

Avionics on a NATO early-warning radar aircraft can be checked for failures in the field or at a depot by an advanced test console. The Hughes Intercommunication Set Test Bench Set automatically checks the audio distribution system (ADS) on the E-3A Airborne Warning and Control System (AWACS) aircraft. ADS, also built by Hughes, lets crew members communicate securely while furnishing air threat surveillance, detection, and countermeasure action in both tactical and strategic situations. The system has been delivered to Dornier Reparaturwerft of West Germany, which is the system integrator for the NATO E-3A program.

The United Kingdom is updating its air defense network to cope with the threats posed by evermore sophisticated attack aircraft. The brains of the system will be provided by UKADGE Systems Ltd., a company owned jointly by the Plessey and Marconi companies of Britain and Hughes, with additional engineering expertise coming from Thomson-CSF of France. Innovations for this command and control system include four-color display consoles. Hughes will be responsible for the central data processing equipment and software, and a large-screen display.

When Hitler's Wehrmacht smashed into Poland in 1939, the British and French intensified their efforts to purchase American aircraft for their forces. At first settling on the P-40, farsighted US Army Air Forces officers and an American manufacturer maneuvered, often without official government sanction, to develop a better fighter. Their dedicated efforts resulted in . . .

THE FOALING OF THE MUSTANG

BY JEFFREY L. ETHELL

"SIRED by the English out of an American mother," recalled the Assistant US Air Attaché in London, Maj. Thomas Hitchcock, in 1942. The North American P-51 Mustang emerged at the end of World War II as the finest piston-engine fighter in service. It was an aircraft that found its place in history against the odds through the courage and determination of a few believers in the US Army Air Forces (AAF), men who often resorted to unorthodox methods and acted without official government approval.

With Hitler's invasion of Poland in September 1939, the British and French renewed their efforts to purchase US-built aircraft, settling on the P-40 as the best US fighter. Lt. Benjamin S. Kelsey, head of the Pursuit Projects Office at Wright Field, Ohio, and his boss, Col. Oliver P. Echols, regretted the decision to build more P-40s. The development of a new Curtiss fighter, known as the XP-46, was now going to be denied the assembly lines. The P-40 was basically a reengined P-36, but Gen. H. H. "Hap" Arnold, Chief of the Army Air Corps, decided he could not spare the four months it would take to get a new aircraft on the line. With war clouds on the horizon, Arnold opted for quantity rather than fewer, more advanced aircraft. As he put it to Echols, "We just can't lose any P-40s."

Looking for an Airplane

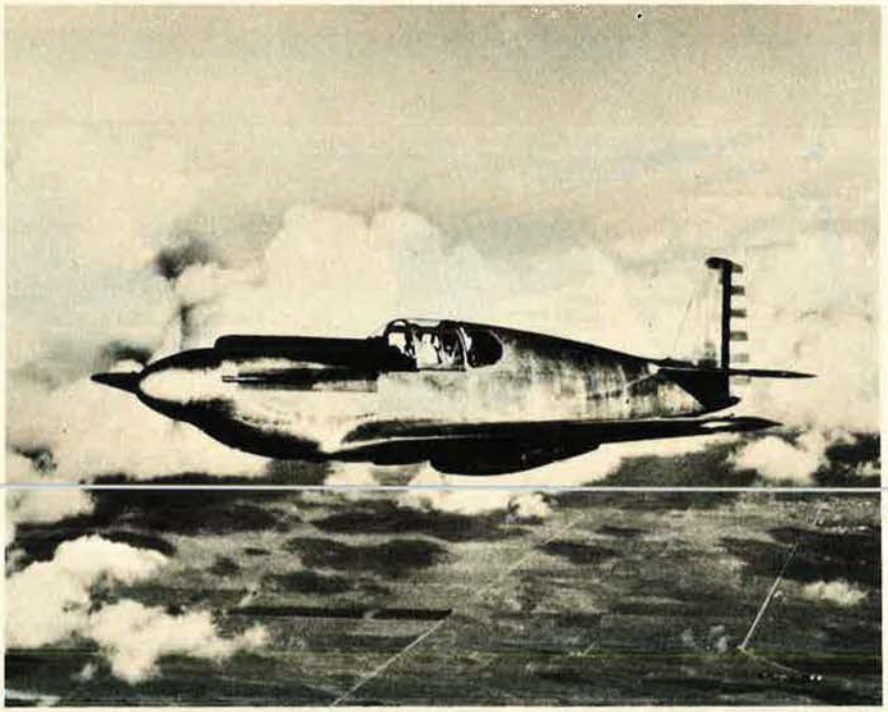
In the late fall of 1939, the Anglo-French Purchasing Commission began to scout around for other companies that might build the P-40 under license. Sir Henry Self, who oversaw the Commission's activities in New York, had particularly good relations with North American Aviation, Inc., of Inglewood, Calif., which had built the sturdy Harvard trainer (later to become the AT-6 in the AAF) for both the British and the French.

In January 1940, recalled Ben Kelsey, "Echols made a suggestion to the British Purchasing Commission to find a manufacturer who wasn't already bogged down in high-priority stuff. Curtiss-Wright and the Air Corps would make available all the data we had on the XP-46 to help them build a new fighter. This was our secret talk in the halls to get P-46s in place of the P-40, to find some way of getting around the problem."

(During World War II, Kelsey served in England, first as Deputy Chief of Staff of IX Fighter Command and later as chief of Eighth Air Force's Operation Engineering Section. After the war, he served in various assignments at Wright Field, and in June 1952 became

Deputy Director of R&D in the office of the DCS/Development at Hq. USAF. He retired in 1955 as a brigadier general, and died in March 1981 at the age of seventy-four. —THE EDITORS)

Self, who had approached North American earlier about building P-40s, returned to its President and General Manager James H. "Dutch" Kindelberger. The two discussed designing a new fighter using Curtiss wind-tunnel data and practical belly scoop data collected from flying the XP-40. Agreement was reached and, from January to April 1940, J. L. Atwood, the Vice President and Assistant General Manager of North American, negotiated the matter with both the British and Curtiss-Wright.



Opposite page: one of the first P-51s from the RAF Mustang IA production run of 150 aircraft. The plane appears in an RAF camouflage paint scheme but carries US insignia. TOP: North American Aviation test pilot Lou Wait flying the NA-73X after the aircraft had been rebuilt following a crash during its fifth test flight. ABOVE: the Curtiss XP-46. Note the similarity between this Donovan Berlin design and the NA-73X in top photo. Berlin, designer of the P-40, spent the better part of two years developing the XP-46.

Donovan R. Berlin, designer of the P-40, had spent the better part of the past two years developing the XP-46. With his go ahead, and for $56,000, Atwood bought the XP-46 data.

In his letter to Sir Henry Self on May 1, 1940, Atwood reported, "We have reached an extremely satisfactory agreement with the Curtiss Aeroplane Company of Buffalo wherein they are furnishing to us data covering a comprehensive series of wind tunnel, cooling, and performance tests of a similar airplane, which data will assist us in the design and manufacture of these airplanes."

After accepting a contract for the new fighter, North American Aviation signed, on May 4, 1940, a Foreign Release Agreement with the Air Corps. It permitted foreign sale of the Model NA-73, as North American designated the fighter, and promised two of the aircraft for the Air Corps itself. Kelsey and Echols had maneuvered hard to get their new fighter built at a time when the Air Corps had no procurement money.

Innovations in Design

North American's Chief Engineer Raymond Rice and his team, under the Chief Designer, Edgar Schmued, began a seven-day work week to get the job done. "The original concept did not include the laminar flow wing," according to Lee Atwood. Wing design was placed under the group headed by Larry Waite, who listened to Edward Horkey and finally incorporated the National Advisory Committee for Aeronautics (NACA) laminar flow wing section into the new aircraft.

Kelsey had also pushed from behind the scenes with NACA's Eastman Jacobs to get the wing into North American's design, and soon Jacobs was on the West Coast working to get the fighter built. "The records show all this happened," recalled Kelsey, "without anybody at Wright Field having the foggiest notion of what was going on. We [of the Air Corps] had to stay out of it, because it was a British procurement."

The North American team's genius lay in its ability to conceive the best design possible from the newly acquired Curtiss data. In striving for the cleanest configuration possible, the team not only incorporated the basics of the XP-46 and the laminar flow wing but de-

parted from the rounded shapes in vogue to use square cut wings and tail.

There was no 120-day requirement for completion of the prototype, as has often been asserted. The only completion date noted in the contract was initial delivery by January 1941 and all 400 aircraft delivered by September 30, 1941.

Using internal systems from the AT-6 such as hydraulics, wheels, brakes, and electrics, the men at North American pushed the NA-73X out of the shop in a remarkable 102 days minus engine, which arrived twenty days later. On October 26, 1940, Vance Breese took the prototype into the air from Mines Field, Calif., now Los Angeles International Airport, for the first time.

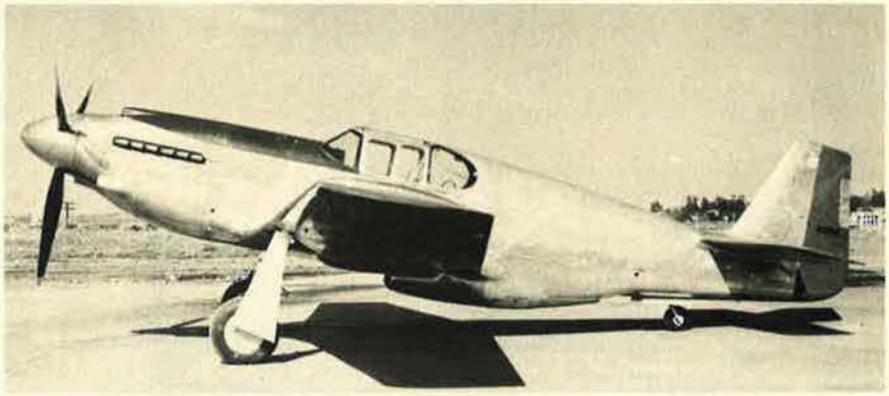
There were cooling problems. The ventral radiator scoop for oil and glycol cooling needed aerodynamic refinement. The problems it caused weren't solved until the scoop was redesigned and lowered away from the boundary layer disturbances on the underside of the fuselage. The initial Mustangs, as a result, did not fully realize the benefit of the "Meredith effect" that created thrust with the exit air, offsetting the drag created by the scoop.

Vance Breese made three more flights in the NA-73X before turning over flight test work to North American's Paul Balfour, who made his first flight in the prototype on November 20, 1940. Due to carburetor starvation at a particular throttle setting, the engine quit and Balfour crash-landed into a plowed field, seriously damaging the aircraft.

Even though the aircraft was rebuilt, flight testing had to be completed with the first aircraft off the production line originally scheduled for the Royal Air Force. Mustang I, as the British designated the P-51, production number AG 354, was flown for the first time on April 23, 1941, by Louis Wait, one of North American's test pilots, and retained by North American for project testing.

AAF Responds

The AAF was to have received its first aircraft in February 1941 and the other in March. Designated the



Right, Mustang AG 345 flew in April 1941 and, along with the NA-73X, provided most of the initial flight test data. Middle photo, Air Corps 41-038 was the first XP-51 and the fourth aircraft of the British Mustang production run. Lower photo, the second XP-51, 41-039, during test flight at Wright Field in Ohio. It was the tenth in the production run of aircraft ordered by Great Britain.

Jeff Ethell, the son of an Air Force officer, grew up around military aircraft and has been writing about aviation since 1967. A commercial pilot with instrument and multiengine ratings, he's also a certified flight instructor, and regularly flies with USAF, the Navy, USMC, and in such older aircraft as the B-25, P-51, and T-6. His article on the T-6 appeared in the January '81 issue, and his report on "Watson's Whizzers" was in the April '81 issue. His article this month resulted from research for his latest book, Mustang: A Documentary History of the P-51 *(Jane's Publishing Co., London/New York, 1981).*

XP-51, the first didn't arrive at Wright Field for performance tests until August 24. The second came in December. Contrary to the long-standing story of official neglect delaying acceptance of the fighter by the AAF, Ben Kelsey and others wanted to initiate production, but there were genuine problems. The war started only eight days before the second XP-51 was delivered. Even then, problems continued to surface. Among them, according to a 1942 P-51 acceptance report, were Mustang production delays, bad weather, needed refinements to the engines used in the XP-51s, and the higher priorities given to other aircraft being evaluated.

In addition to these difficulties, the XP-51 had to undergo gun-charging mechanism tests for the new automatic hydraulic system, but arrival of the components was delayed. Originally the system was to be installed in both aircraft but the requirement was waived in favor of having at least one example for flight test at Wright.

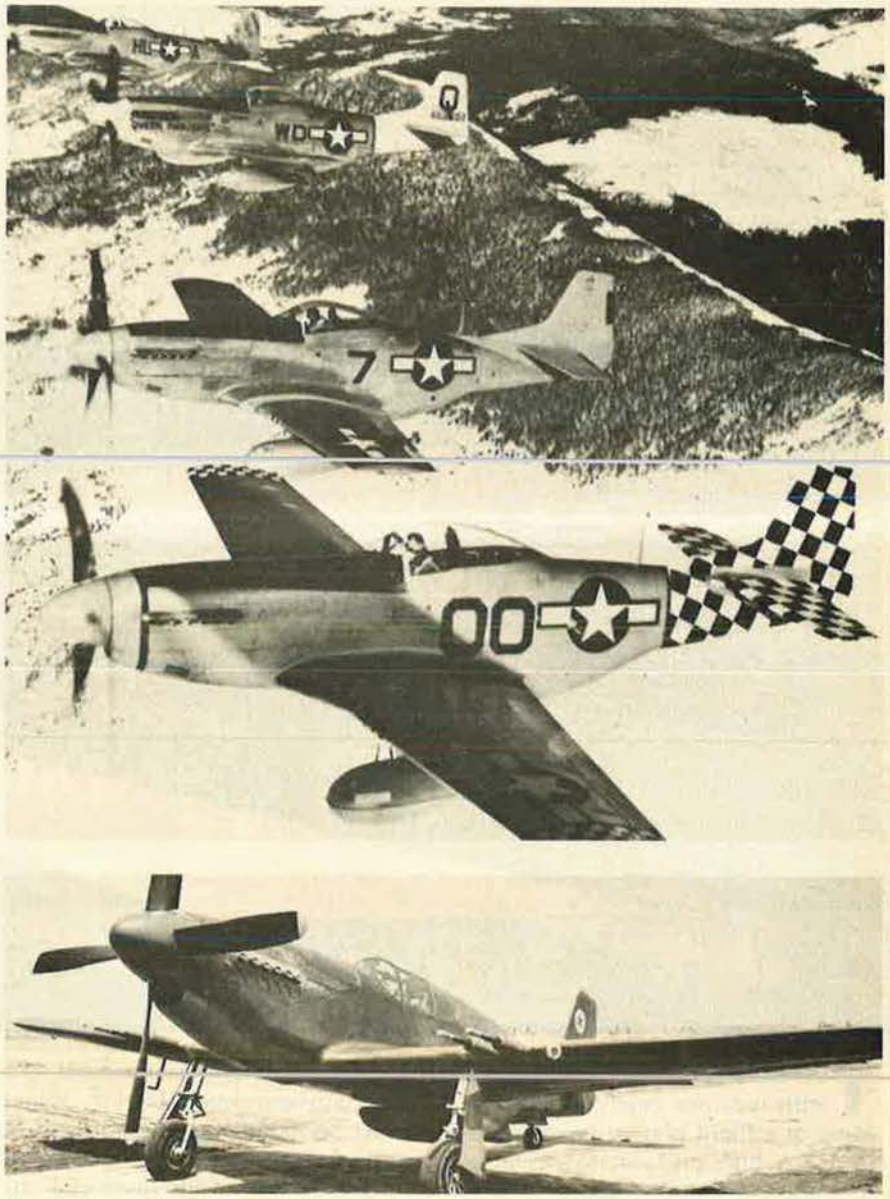
On July 7, 1941, long before the XP-51 was in full flight test, the AAF placed an order for 150 P-51s to be furnished to the RAF. Only ninety-three went to the RAF, and fifty-five were kept by the AAF, eventually to become F-6A tactical reconnaissance fighters. Two were set aside for the XP-78 project (later XP-51B) that fitted a Packard-built Rolls-Royce Merlin engine to the airframe.

On May 29, 1942, Louis Wait made the first flight in a genuine production AAF P-51. The irritating aspect of this promising start for US service was a lack of funds. No more money was available in that year's budget for fighter aircraft.

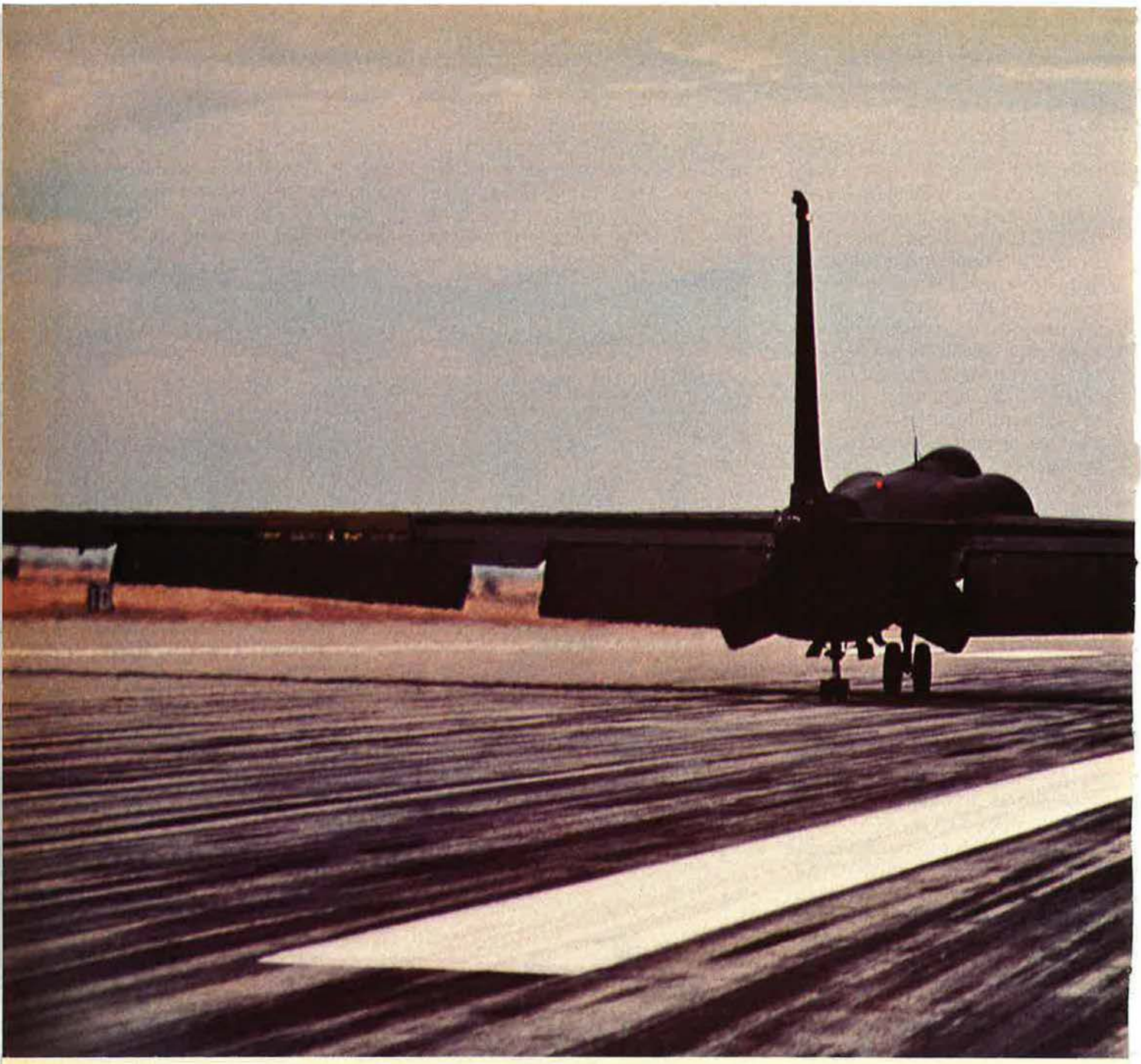
No time was lost in rapid maneuvering between Echols's Washington office, the Pursuit Projects Office at Wright, and Dutch Kindelberger's cubbyhole at Inglewood. They hadn't come this far to see the aircraft die. After finding money in the attack portion of the AAF budget, the solution was to find the next number allocated for an aircraft, which happened to be A-36. Adding bomb racks and dive brakes to the airframe, and calling it an attack bomber instead of a fighter kept the production line open.

Before the first P-51 flew, an order was placed for 500 A-36 aircraft on April 16, 1942. As Ben Kelsey later recalled, the birth of the A-36 had nothing to do with a need for a new dive bomber or attack aircraft—they wanted the Mustang in AAF service regardless of what had to be done. By March 1943, the first F-6As were in North Africa to fly combat; by June the A-36 was in action over Sicily. That same year, the P-51B began long-range escort duty of the bombers over Europe and is considered by many that effort's salvation.

The P-51 Mustang is a tribute to the American aviation industry and to those who contributed to its development. The aircraft was in every sense a product of the American aviation industry as a whole, with all willing to get the job done regardless of proper credit. ■



Upper photo: The Mustang in its most famous role, that of the long-range fighter escort, and in its most famed version, the P-51D. From the foreground, these aircraft represent each of the Fifteenth Air Force Mustang groups in the Mediterranean during the war: the 325th, 332d, 52d, and 31st Fighter Groups. Lower photo: One of the early P-51s retrofitted with a Packard-built Rolls-Royce Merlin engine, a combination that spurred the Mustang to greatness.



THE mission began before dawn with weather briefings and the filing of a flight plan at base operations. A high-protein, low-residue breakfast in the Physiological Support Division (PSD) dining room was followed by the routine preflight physical.

With the aid of highly skilled PSD technicians, the pressure suit was donned, pilot and aircraft oxygen and communications systems interconnected, and the U-2 launched into the clear morning sky.

Hours later, cruising at more than 60,000 feet, the details of those morning activities are a dull blur in the past.

In its high-altitude regime, the U-2 is really in its environment. Unlike conventional aircraft, which must be maneuvered cautiously at extreme altitudes to avoid flameout or drastic loss of airspeed and altitude, the U-2 at peak height can maneuver effectively without loss of performance capability.

The mission is high-altitude photography. But as the photo run is completed, the greatest challenge may yet lie ahead. Still several hundred miles from home, in a confined cockpit environment, the U-2 pilot preparing to descend and land might allow himself at least one comforting thought. If he should experience complete simultaneous electrical, hydraulic, and engine failure, he could still glide over long distances to a desirable emergency airfield and spiral down to make a "dead-stick" landing.

Descent to Landing

The descent from altitude is a slow process in the U-2. Engine rpm is reduced gradually at first, to avoid flameout, and every drag device available must be used to lose altitude. As lower altitudes are reached, the power may be reduced further to increase the rate of descent. Because the U-2 is out of its element at low altitudes, the controls soon become less responsive. Due to the low wingspan and its high lift characteristics, the aircraft

The U-2R is a highly specialized aircraft that thrives in its element, the thin atmosphere of high altitudes. Unfortunately, the long-tapered wings that make the U-2 handle so well up high make landing it akin to . . .

WALKING A TIGHTROPE

A PHOTO ESSAY BY WILLIAM A. FORD, ART DIRECTOR
Text by 2d Lt. Michael F. Walther, USAF

Top: Followed closely by the mobile officer, a U-2R touches down on the runway at Beale AFB, Calif. Left: After the U-2 lands, pogo wheels are installed under the wings to keep them level while the aircraft taxis. Above: A crew chief checks the oversize intake, signaling to the pilot that the engines have completely stopped.

is very sensitive to vertical thermals, and after a long mission the pilot must tap his mental and physical reserves to land the aircraft safely.

Local approach control provides instructions for final approach, and the pilot completes his landing checklists. Nearing the airfield, a welcome radio call of "Mobile Up" announces that the second key player in the U-2 landing drama is in position. The mobile officer is another fully qualified U-2 pilot who assists the mission pilot in safely recovering the U-2 aircraft. He acts as the pilot's eyes during landing, when crosswinds, fuel imbalances, fatigue, and a bicycle landing gear can combine to create one of the great challenges in modern flying.

Across the Threshold

In the finest tradition of "stick and rudder pilots," the U-2 pilot adroitly coaxes the aircraft to the runway. As the U-2 crosses the threshold, the mobile officer accelerates onto the runway behind the U-2 in a radio-equipped, high-performance vehicle in order to be in an optimum observation position. The U-2 is designed to land at or near stall speed. While a knot or two variation in another aircraft might make little difference, it could cause the U-2 to bounce back into the air, possibly causing a wing to drop and forcing the nose to swing in that direction. The result could be disastrous.

Closer to touchdown, the mobile officer announces the altitude above the runway from ten feet to touchdown. Inside the cockpit, the pilot applies the appropriate control inputs based on altitude calls from the mobile officer to position the aircraft in a stalled attitude at optimum altitude above the runway—usually six to twelve inches.

Still working at a fever pitch, control inputs are made continuously to keep the wings level and the aircraft tracking straight down the runway. The wing flaps are retracted to make aileron response more effective at the slower airspeeds. The aircraft makes contact with the run-

Below: After a short roll, the U-2 leaps into the air and climbs rapidly. Right: The U-2CT trainer with its double canopies. All training for the U-2 is done at Beale AFB, Calif. Above: Special "howdahs" shield the delicate instruments from the sun. The U-2, designed more than twenty-five years ago, is going back into production for the third time as the TR-1 is to be activated in August.

way. Then, with the pilot gently touching the very sensitive hydraulic brakes, the aircraft comes smoothly to a stop. If the pilot has been accurate in his attempts to balance fuel, the wings remain level while the ground crew rushes out to install the pogo wheels for taxiing.

U-2 pilots agree that the U-2 is the most difficult and challenging aircraft they have ever flown. It is terribly unforgiving. Yet these high flyers accept the challenge. Their reward—a unique experience in flying and the daily satisfaction of accomplishing a critical Air Force mission as a member of the famous 99th Strategic Reconnaissance Squadron of the 9th Strategic Reconnaissance Wing. ■

U-2 Pilot Selection Process

Located at Beale AFB, Calif., the 99th Strategic Reconnaissance Squadron is unique. It is the only USAF unit equipped with U-2 aircraft. Designed to fly at its absolute limits, the U-2 demands a highly skilled and motivated pilot who can endure long hours in a pressure suit environment.

The selection process is highly competitive. The basic selection criteria are contained in Air Force Regulation 36-20. To be eligible for the U-2 program, a pilot must:

- Be a regular Air Force officer or Reserve officer with less than sixteen years' total active federal military service;
- Be medically qualified to fly the U-2;
- Not exceed thirty-nine inches sitting height;
- Not exceed 25½ inches buttocks–knee length;
- Possess at least 1,500 hours total flying time, of which 1,000 hours are jet; or 1,350 hours total flying time, of which 1,000 hours are first pilot or instructor pilot [Note: Diversification to include pilot in command experience in two or more types of military aircraft: single engine/centerline thrust is desirable but not mandatory];
- Possess at least eighteen months as pilot in command;
- Be eligible for top secret clearance.

The U-2 program is a voluntary, special duty assignment, and interested officers apply by entering "RB" in Block 38 on their Air Force Form 90 (Officer Assignment Preferences). Applicants must also submit copies of flying records, officer effectiveness reports, and letters from commanding officers.

The records of all applicants who meet minimum eligibility criteria are screened by a committee of officers from the operations, training, and command section of the 9th Strategic Reconnaissance Wing. Although many pilots meet the minimum requirements as set forth in AFR 36-20, the committee considers such other factors as the individual's military record and the variety of aircraft flown.

Once an applicant is identified as acceptable to the preliminary selection committee, the individual is scheduled for a TDY trip to Beale AFB for a two-week session of personal interviews, medical examinations, altitude chamber checks, and flights in the U-2CT (two-seat trainer) to evaluate skills and adaptability to the aircraft and pressure suit environment.

Only one in ten applicants is selected for the U-2 program. Once selected, the pilot candidate enters a rigorous course of ground school and flying training in the U-2 and T-38 aircraft. While in training, pilots will accumulate approximately seventy-five flying hours in the U-2.

Tactical Air Command's 2d Aircraft Delivery Group, with detachments in the US, Europe, and the Pacific, is the only unit of its kind in the Air Force. It has the job of planning and controlling . . .

USAF's Worl

BY WILLIAM P. SCHLITZ
SENIOR EDITOR

vide Aircraft Deliveries

THE sale of US-built military aircraft to allied nations. The deployment of Tactical Air Command early warning aircraft to European and Mideast crisis areas. The movement of aircraft from American factories to US Air Force bases abroad.

Unheralded but crucial to these news-making events is the work of TAC's 2d Aircraft Delivery Group. With headquarters at Langley AFB, Va., the 2d ADG is the only unit of its kind in the Air Force.

"The Group is in the business of planning and controlling the delivery flights of military aircraft to destinations around the world," said Col. James W. Dearborn, Commander of the 2d ADG. "Our mission, in simple terms, is threefold: swapouts of major command [MAJCOM] aircraft; the movement of aircraft stationed overseas to and from CONUS for programmed depot maintenance and modifications; and, last but far from least, the delivery of aircraft to foreign purchasers under the Department of Defense's Security Assistance and Foreign Military Sales Programs."

The Group also has miscellaneous responsibility for planning special flights such as those of US military aircraft to international air shows like the Farnborough Air Show in the United Kingdom and the Paris Air Show in France. It directed the deployment of the E-3A AWACS aircraft mentioned above. And it will organize and supervise the flights of the aircraft of the other services from the States to locations overseas on request.

The Group's entire staff consists of forty-eight officers, thirty-five enlisted members, and four civilian employees. They are located at its Langley headquarters and at eleven strategically placed detachments in the US, Europe, and the Pacific.

Last year, the Group saw to the movement of nearly 1,000 aircraft around the world, including forty-six different types delivered to twenty-seven countries. The aircraft ranged from USAF's newest—F-15s and F-16s which are also being sold to friendly nations—to such old-timers as the T-33A Shooting Star and the F-102 Delta Dagger. (In the case of a World War II-vintage C-47 Gooneybird, the Group found a qualified pilot employed by the US Department of Agriculture.)

OPPOSITE PAGE: Among US-built aircraft being sold to friendly nations is one of the latest to equip the US Air Force—the F-16. ABOVE: An F-15 is decorated with the JASDF emblem before delivery to Japan. (See also the article on p. 46.) In all, TAC's 2d Aircraft Delivery Group is responsible for planning and controlling the delivery of about 1,000 aircraft to and from CONUS each year.

Besides F-15s and F-16s, however, the Group's stock in trade are F-4s, F-111s, C-130s, and C-135s slated for routine programmed depot maintenance. The Group is currently gearing up for swapouts of earlier-version A-10s in Europe for upgraded models. (Following their return to the US and circulation through the depot, the earlier A-10s are to be assigned to TAC or to ANG and AFRES units.)

"The country is really getting its money's worth from what the Group's small number of people accomplishes worldwide," said Lt. Col. James G. Watts, chief of the Group's Delivery Control Center. He pointed out, for example, that the 2d ADG detachment at Rhein-Main AB in Germany, one of the most heavily tasked units, consists of but four officers and two enlisted members.

The 2d ADG's Delivery Control Center at Langley is manned around the clock in three eight-hour shifts. Group personnel are constantly on the telephone, ironing out details and bringing involved parties up to date on delivery mission planning. To this end, they have access to a dedicated worldwide AUTOVON system. Group people from whatever detachment are constantly on the road TDY to aircraft pickup points to brief aircrews on delivery missions.

Attention to Detail

Underscoring the Group's mission is the massive amount of detail that must be attended to before an aircraft ever leaves the ground. This

The C-130 Hercules is a transport workhorse that dates back to initial production in the early 1950s. It has been produced in many versions and continues to enjoy a worldwide market. Detachment 21 of Air Force Systems Command's Contract Management Division is assigned to the Lockheed-Georgia plant in Marietta primarily for aircraft flight-acceptance chores, but its five pilots also participate in C-130 deliveries abroad under the aegis of the 2d Aircraft Delivery Group. Above, in a distinctive camouflage paint scheme, a C-130 being delivered to Egypt.

is reflected in Air Force Regulation 55-17—"Flight Delivery of Aircraft"—the Group's bare-bones "Bible" that in some twenty pages of small print lays out how the 2d ADG meshes with the MAJCOMs in conducting its activities. It is a process that leaves as little as possible to chance.

Each month, the Group's plans section reviews the master plan of anticipated aircraft movements for the year ahead and updates it with inputs from such sources as Air Force Systems Command, in the case of new aircraft coming off assembly lines, for example. As a specific aircraft delivery date approaches, plans become more fully defined. Two weeks before an aircraft is to be available, say, from the factory for delivery to a unit overseas, the Group's plans section issues a directive tasking the respective MAJCOM—TAC's numbered air forces would respond in the case of fighters—with providing a pilot or crew. (While all 2d ADG officers are rated pilots or navigators, none actually engages in delivery flights.) AFRES and ANG crews also are assigned to delivery missions, and from time to time manufacturer-related civilian pilots fly them.

Not just anyone with pilot's wings will do. For aircraft commanders, for example, AFR 55-17 specifies qualification levels in terms of how recent and the number of hours flown in the type of aircraft

A Brief History of the 2d Aircraft Delivery Group

The antecedents of the 2d Aircraft Delivery Group date back to May 1941 when, as the Army Air Corps Ferry Command, its mission was to fly aircraft from factories to ports of embarkation for shipment to Europe and Southeast Asia.

Late in 1941, the unit's mission was expanded to include the air delivery of aircraft to overseas locations. In July 1942, the Ferry Command was designated a division of Air Transport Command and at war's end was disbanded.

Reactivated in 1950 for the Korean War as the 1708th Ferrying Wing under Military Air Transport Service (now Military Airlift Command) and headquartered at Kelly AFB, Tex., it reached a peak strength of 952 including a large number of delivery crews. Following the truce, the Wing remained active, delivering aircraft overseas during the US military buildup of the 1950s.

In 1958, the delivery mission was reassigned to Tactical Air Command and the unit redesignated the 4440th Aircraft Delivery Group. TAC was keen to have the delivery mission because of training opportunities afforded the command's pilots during extended over-water flights. After some shifting of parent organizations, in October 1963, the currently designated 2d Aircraft Delivery Group was assigned directly to Hq. TAC, and was given the collateral mission of providing air transport for VIP personnel of the various continental US Army headquarters, Army regions, Army Corps of Engineers, and other designated DoD personnel. To perform this task, four air transport squadrons each equipped with several aircraft (C-131s, T-29s, and aging C-47s) were assigned at various sites in CONUS. Since relieved of this mission, the 2d ADG possesses no aircraft of its own.

But attesting to the 2d ADG's importance is that it is one of the few groups in the Air Force that has a permanent full-time historian assigned to it. MSgt. Charles Mitchell files quarterly reports with Hq. TAC on the Group's achievements.

under consideration, aerial refueling experience, if that is to be called for, and the like. In aircraft deliveries, the crews as well as the aircraft come under operational control of the 2d ADG. The regulation also declares what the crew's parent unit must provide in the way of survival gear and other specialized equipment—exposure suits for northern overwater flights, for instance.

Meanwhile, a Group Launch Control Officer is organizing a host of other important requirements. An airspace request is made of the civil authorities. Diplomatic clearances are arranged through a State Department contact. (There are no blanket clearances; Greece, for example, must clear a specific aircraft to overfly Crete. On the other hand, some European countries, sensitive to the problems in the Mideast, don't allow Foreign Military Sales aircraft such as the US-built F-15s and F-16s to land at US bases on their soil. In fact, some forbid even the use of their airspace. This adds to the importance of USAF's Lajes Field in the Portuguese-owned Azores as a transatlantic refueling and rest stop.)

Planning the Mission

For an aircraft under its control, the 2d ADG plans the entire mission from engine start (following manufacturer aircraft prep and crew preflight check as dictated by AFR 55-17) to shutdown and turnover to the receiving party. The flight plan includes routes to be flown, aerial refuelings, altitudes, stops along the way (maybe Base X can't repack an F-4 drag chute), contingency abort bases, the care (that might include ground transport) and feeding of aircrew, plus many other details.

There is considerable computer help in all this, based on inputs from previous similar missions and experience, but to an outsider the undertaking seems staggering. However, the details are all worked out in a computer printout that is in reality a complex equation involving such nonvariables and variables as type of aircraft, optimum airspeeds, fuel consumption rates, aircraft configuration considerations (such as an F-4E with leading edge slats), the location of abort bases (which determine the frequency and site of aerial refuelings—particularly important on the long Pacific hops), and finally the bottom line in mission planning: up-to-the-minute wind and weather forecasts.

The two Air Force pilots stationed at the Northrop Corp. assembly plant in Palmdale, Calif., do not ordinarily perform overseas deliveries of aircraft. But, supplemented by instructor pilots from Williams AFB, Ariz., an F-5 training base, they regularly ferry F-5s from the factory to McClellan AFB, Calif. There, after equipment tests, the aircraft are dismantled and loaded eight at a clip aboard MAC C-5s for flights to foreign purchasers. The F-5 flights to McClellan are routinely supervised by the 2d ADG.

Wind and weather minimums are among the key factors that determine a mission go or no-go (or twenty-four-hour delay, perhaps) decision by the Group Launch Control Center at Langley. To this end, the Group's computer is linked directly to those at Air Force Global Weather Central, Offutt AFB, Neb.

While the computer does the bulk of the drudge work—in it is stored a catalog of 800-plus flight plans—in the end the mission profile must be hand-polished to account for such factors as guiding aircraft around political hotspots.

The computer has been instrumental in reducing the six and a half hours required to hand-build a flight plan back in 1962 to one and a half hours, from initial concept to hand-off to the Delivery Control Officer complete with latest weather forecast.

Once the final planning document is complete it will be sent automatically via the Group communications center computer to a long list of interested parties. A partial rundown: involved MAJCOMs and subordinate units; civil aviation authorities; foreign civil and military authorities; rescue and recovery units along the route; American embassy officials; the involved 2d ADG detachments either in the US or abroad. (It is standard procedure for detachment personnel to travel TDY to aircraft pickup points and brief aircrew using the mission planning profile.)

A Key Element: Tanker Support

There is give and take between Group planners and SAC in the allocation of tankers for aerial refuelings during delivery flights, with each adjusting schedules to fit the other's requirements. In some cases, Group planners will order a "dedicated" tanker specifically assigned to meet a critical USAF aircraft delivery schedule or keep within the delivery provisions of the contract signed by a foreign purchaser and the US aircraft manufacturer. The cost, though, can be astronomical.

Usually, ocean-spanning aircraft being ferried across the Atlantic link up with the "opportune" SAC AFRES and ANG tankers routinely rotated to and from Europe.

Besides refuelings, the tankers often provide ancillary services: navigation assistance and communications relays through their high-frequency radios, capabilities fighters lack over long water passages.

The 2d ADG will take other extraordinary steps to keep to delivery schedules. For example, when a new aircraft type begins to come off the assembly line there usually is a shortage of sufficiently experienced pilots. If so, the Group may arrange for qualified pilots sited outside CONUS to return by commercial airliner rather than delay deliveries.

Maintenance and Logistics

A key figure among Group personnel is Director of Logistics CMSgt. Lee Keesee, responsible for getting parts and often maintenance specialists to aircraft that have "broken" en route. "Unit commanders want those aircraft repaired 'right now' and on their way. So we in the Group monitor the status of broken aircraft being delivered very closely," said Chief Keesee. "We are responsible for getting them fixed when they are under our control, but we have to tap other sources for the actual repair work. We do try to have stocks of routine parts and maintenance support equipment along major routes," said the Chief, "for jobs a generally qualified mechanic can do."

But thorny problems in repairing broken aircraft are not the exception. "For example," Chief Keesee explained, "the F-16 is a new and sophisticated aircraft. Experienced F-16 maintenance people are still in relatively short supply. In another case, say an F-4 has a problem while at Guam where no fighter maintenance support is available. We have to go through PACAF headquarters to direct people from Kadena AB on Okinawa or other PACAF bases," the Chief related.

In some cases, said Colonel Watts, "we'll send a controller from the nearest Group detachment to supervise repairs and assist the crew, which will remain with the aircraft if the delay in fixing it is not too long."

While broken aircraft are normally fixed at en-route bases that have the required spares and know-how, Chief Keesee may have to contact the appropriate Air Logistics Center or manufacturer for parts and people. In one case, McDonnell Douglas factory representatives were summoned to Loring AFB, Me., to replace an F-15's faulty fuel cell.

But whether at Wake Island, Guam, or Lajes, the solution is tailored to the problem. In this, Hq. TAC coordinates with Hq. AFLC to make use of scheduled MAC logistics flights, commercial carriers, or in a high-priority situation a dedicated aircraft to speed parts and people to broken aircraft. "If the priority is high enough," said Chief Keesee, "we'll have someone hand-carry the required spare to the location."

In the case of foreign military sales where allies have purchased varying maintenance packages, the logistics of fixing broken aircraft can become complicated. "But we're in the business of moving aircraft," said Chief Keesee, "so we'll fix the plane and let the paperwork follow, perhaps making note 'that Country-X owes us an F-4 generator.' " A further complication is when Country-X hasn't purchased the support package and thus AFLC isn't involved. Then Chief Keesee may have to contact the manufacturer or "get the part from Country-X itself."

An interesting sidelight is that while Hq. TAC has a deployment section of its own for planning unit-size moves like Crested Cap, it relies on the 2d ADG for flight-plan data and briefings. And, when aircraft break on such deployments, the 2d ADG is obligated to see that they get fixed and on their way.

The Costing Process

In the case of foreign military sales of aircraft, "strict measures are taken to assure that the purchaser pays all the costs—including those of delivery—and that US tax dollars are not used," said Lt. Col. Myron Willis of the Group plans staff.

"For example," explained Maj. Fred Russell, in charge of logging expenditures to be charged to foreign buyers, "when a US Air Force pilot goes TDY to fly a delivery mission, it is charged to the foreign military sales contract, as are the Group briefing crew TDYs."

Major Russell estimates that it costs several million dollars to ferry the F-16s to Israel from Fort Worth, Tex. "In large aircraft buys by friendly nations, costs are reimbursed to the US government from a revolving account linked to a payments schedule. The money is there before the plane leaves the factory," he said.

"The purchaser pays per flying hour costs not only of the aircraft being delivered but tanker and air rescue support and the commercial flight of the returning delivery crew, among a lot of other things," said Major Russell.

Israel-bound F-16 as seen from tanker. Such unarmed aircraft flown by Air Force pilots are met at a rendezvous point well out over the Mediterranean and escorted in by Israeli fighters.

Delivery to Israel

The pilots of the 61st Tactical Fighter Training Squadron, MacDill AFB, Fla., are among the most experienced flying the F-16. As such, they are often assigned to flight-deliver spanking new aircraft to foreign purchasers.

It's duty they consider a treat: a new airplane, an ocean crossing, the opportunity to visit faraway places. The assignment is rotated among the pilots, and this time it was Capt. Michael S. Brake's turn.

He packed his personal things and in "a tote bag drag" (containing flight gear) flew commercially to Fort Worth, the site of General Dynamics Corp.'s F-16 production facility. At the plant, Captain Brake ensured that the company had prepped the new aircraft, performed his own preflight check and, accompanied by a wingman in another F-16, flew the plane to MacDill.

After a "hot" preflight and other performance tests, Brake and his wingman were briefed on the coming flight to Lajes Field in the Azores by Lt. Col. Tom Gassman, who was TDY from the 2d Aircraft Delivery Group detachment at Robins AFB, Ga.

Brake and his wingman took off the next morning, climbed to 27,000 feet, linked up with their tanker (SAC usually dedicates a tanker to flights of F-16s to the Mediterranean), and settled down for the long flight to Lajes, punctuated by two aerial refuelings.

At the island air base, Brake & Co. received a briefing on the final leg of their journey from Maj. J. C. Caviness of the 2d ADG detachment stationed there. Final destination: Israel.

Israel-bound F-16s flown by US Air Force pilots are unarmed and are met at a rendezvous point well out over the Mediterranean and escorted in. True to fashion, Brake's flight was joined by two Israeli F-16s that *were* armed. "On the Israeli end, you can always expect a well-organized, well-run operation," said Brake, who was then given a short tour of the Holy Land, courtesy of the host nation. The next step was a commercial flight to Athens and then back to the States.

Pilots assigned to aircraft delivery missions file after-action reports with the 2d ADG upon their return. Crew recommendations are studied eagerly by Group staffers to improve operations. "For example," said Lt. Col. Phillip Hass, Deputy for Operations, "under the original flight plan, we had F-15s landing at Hickam in Hawaii in the afternoon and departing for Andersen on Guam the next morning. Crews complained they hadn't enough rest. So we extended the stopover to thirty-six hours. Jet lag is yet another factor we have to contend with."

"Also, we are particularly interested in fuel consumption numbers of new or reconfigured aircraft that deviate from those produced by the test-flight program. These we use to update our computer flight plans to more closely align with what's really happening," said Lt. Col. Darrell VanCitters. ■

Coming in September . . .

In commemoration of the thirty-fourth anniversary of the US Air Force as a separate service, and the thirty-fifth anniversary of the Air Force Association, AIR FORCE Magazine will present a special anniversary issue in September.

This special anniversary issue will be distributed at AFA's National Convention and Aerospace Development Briefings and Displays.

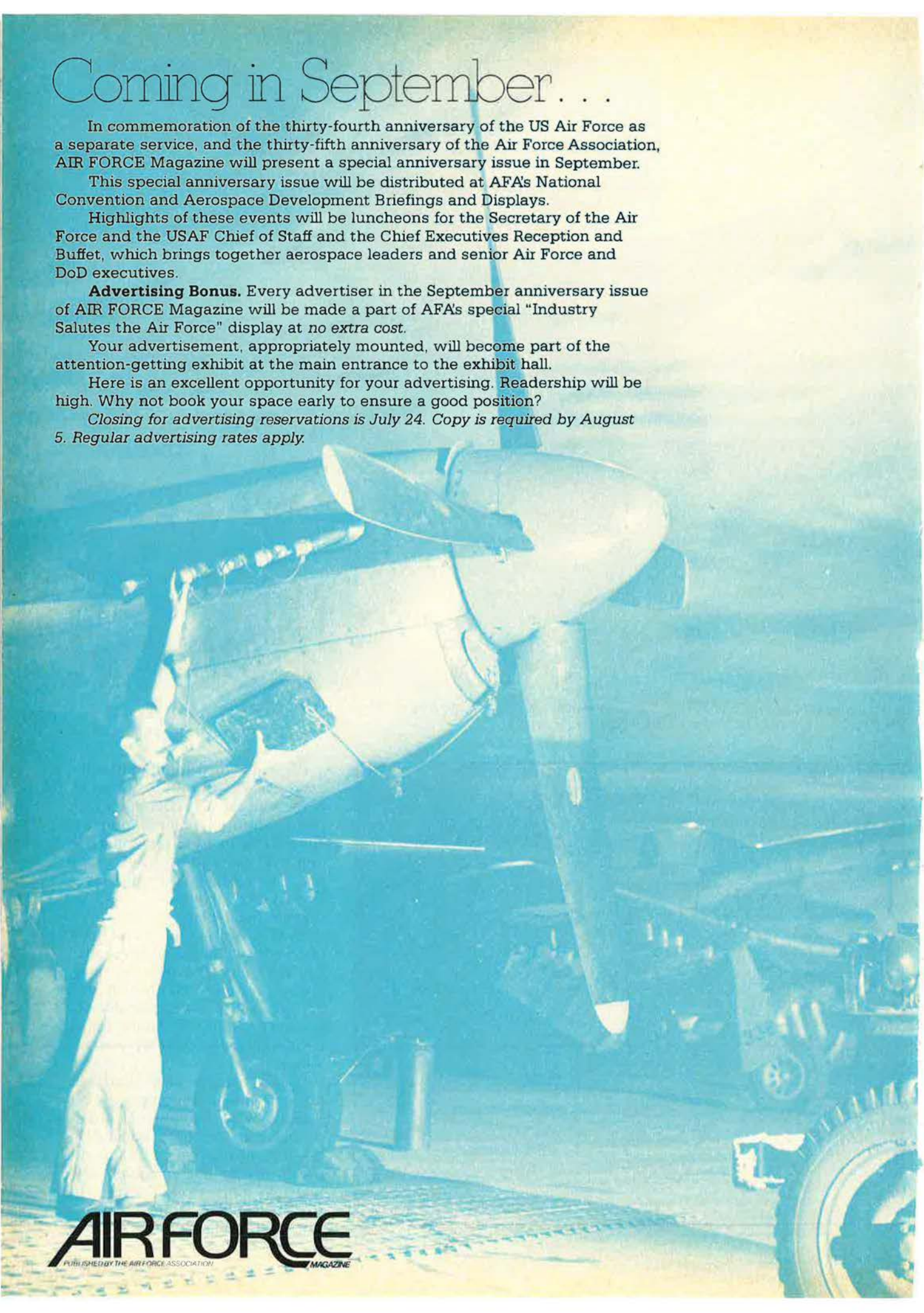
Highlights of these events will be luncheons for the Secretary of the Air Force and the USAF Chief of Staff and the Chief Executives Reception and Buffet, which brings together aerospace leaders and senior Air Force and DoD executives.

Advertising Bonus. Every advertiser in the September anniversary issue of AIR FORCE Magazine will be made a part of AFA's special "Industry Salutes the Air Force" display at *no extra cost.*

Your advertisement, appropriately mounted, will become part of the attention-getting exhibit at the main entrance to the exhibit hall.

Here is an excellent opportunity for your advertising. Readership will be high. Why not book your space early to ensure a good position?

Closing for advertising reservations is July 24. Copy is required by August 5. Regular advertising rates apply.



AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION

In the struggle to maintain a technological edge over the Soviet Union, taking and holding the high ground of space is essential. The new budget emphasizes . . .

ADVANCED TECHNOLOGY IN SPACE

BY EDGAR ULSAMER
SENIOR EDITOR (POLICY & TECHNOLOGY)

THE Ninety-seventh Congress is learning—and seemingly heeding—a lesson that past Administrations and Congresses tended to dodge. The axiom at stake is, as Secretary of Defense Caspar W. Weinberger told the Senate Armed Services Committee, "nations may reach such a level of unpreparedness that they will become afraid to redress the situation for fear of provoking the conflict they are seeking to prevent." In warning against slipping to such levels of unpreparedness, the Defense Secretary offered a sobering assessment:

". . . [W]e are being forced into a continuing and apparently long-term military and political competition with the Soviets, and we are not maintaining a competitive position."

There is a plethora of information backing up Secretary Weinberger's concern, none perhaps more telling than that from a ranking member of the previous Administration, which tended to mute its assessments of the Soviet threat. In his farewell report to Congress, Dr. William J. Perry, the recently departed Under Secretary of Defense for Research and Engineering, highlighted four portentous factors:

- The Soviet Union is now outinvesting the US by about a two to one margin. The cumulative gap in military investment between the US and the Soviet Union during the past decade now approaches $350 billion (1982 dollars).
- The Soviet Union is outproducing this country by more than two to one in most categories of military equipment.
- The Soviet Union is now deploying equipment that increasingly matches the quality of our deployed equipment.
- The Soviet Union now has about twice as great an effort as we have in military research and development, creating a growing risk of technological surprise.

The meaning of the $350 billion investment lead, he said, is awesome: "If this differential had been available for US military investment, we could have procured an additional 1,500 F-16s, 1,500 F-15s, 1,000 Advanced Attack Helicopters, 20,000 XM-1 tanks, twenty CG-47 guided missile cruisers, fifty Los Angeles class attack submarines, twenty Trident submarines with missiles, the entire MX program and entire ALCM program, with enough residual funds to add roughly $10 billion per year to the RDT&E program through the 1970s."

Lt. Gen. Kelly H. Burke, USAF Deputy Chief of Staff for Research, Development and Acquisition, in his testimony, elaborated on the USSR's spending lead. The Soviets, he said, have outproduced the US approximately two and a half to one in the number of intercontinental ballistic missiles, two to one in the number of SLBMs, and better than two to one in tactical aircraft over the past decade. If this country produced aircraft at the same rate as the Soviets, he pointed out, "we could completely re-equip our active force tactical inventory every eighteen months."

Crediting Frontal Aviation (the Soviet equivalent of TAC) with an arsenal of some 4,800 aircraft—most of which came into the inventory since 1970—General Burke warned that the Soviets are fielding systems of increasing quality and sophistication. He cited specifically the high production rate of Fencer (Su-24), "the first modern Soviet fighter designed to carry a weapon system officer in the side-by-side cockpit. It has several times the weapon load and range of its immediate predecessor. Its armament includes a variety of guided and unguided air-to-surface weapons, including nuclear weapons."

Asserting that the Soviets probably will acquire comprehensive look-down, shoot-down capabilities by the early 1980s, he said that "their fighters are already equipped with radar missiles similar to our AIM-7s that give them substantial beyond-visual-range capability."

Soviet R&D Leads

Measured in 1982 dollars, Soviet military RDT&E expenditures over the past ten years exceeded in the aggregate those of the US by about $90 billion, according to Dr. Perry. While the US is holding its own in most critical technology fields because of this country's com-

Dr. Perry told Congress Soviet weapon quality now equals that of the US.

The USSR outproduces the US in strategic systems, according to General Burke.

mercial technology edge and the momentum derived from the lead built up in the 1960s, "we are losing our lead in some key technologies, including electro-optical sensors, guidance and navigation, hydro-acoustic technology, optics, and propulsion," Dr. Perry reported to Congress.

Of special concern is the Soviet concentration on "several unconventional technologies at a level far in excess of the US program," the Pentagon's former R&D head said. The Soviet high-energy laser program, for instance, is five times the US level of effort and is tailored to the development of specific laser weapon systems, while the US confines its program to exploratory work, Dr. Perry reported to Congress. He underscored the momentum of the Soviet military R&D effort by disclosing that "we can identify about fifty major Soviet systems at this point in various stages of test and evaluation. Many of these systems are quite significant; for example, a new SLBM, a new ballistic missile submarine (the world's largest), a new cruise missile submarine (also the world's largest), a new interceptor and associated look-down, shoot-down missile, a new tank, and a variety of precision-guided munitions."

The intense, steadfast Soviet commitment to outdistance this country in military technology clearly will make it more difficult to "maintain our technological advantage in the future than it has been in the past. When we consider the secrecy with which they conduct their activities, it is clear that we will be facing in the '80s a significantly greater risk of technological surprise than ever before," according to Dr. Perry.

The intense, steadfast Soviet commitment to outdistance this country in military technology clearly will make it more difficult to "maintain our technological advantage in the future . . ."

Redressing the Imbalance

The Reagan Administration, after reviewing US and Soviet military capabilities and the defense budget plans it inherited, decided to increase the FY '82 budget request by almost $26 billion—a thirteen percent boost over the Carter total—and vowed to keep up this rate of increase for the remainder of the current Five-Year Defense Plan. Obviously, the new investment strategy, if enacted by Congress, will halt further US declines; equally obviously, it can't overcome the two-to-one margin by which the Soviets are outinvesting the US.

The problem is being compounded by the fact that because of the eroding effects of unplanned inflation, the US achieved no real growth in weapons procurement in spite of moderate increases in its recent defense budgets. Pentagon officials warned that inefficient production rates for weapon systems appear unavoidable for some time to come because of above-normal inflation rates and declining productivity of the defense industry causing an invidious pattern of higher unit costs, lower buy rates, program stretchouts, cost increases, and, in extreme cases, program cancellation.

A first step toward breaking out of the vicious circle of higher unit costs causing lower production rates and vice versa is being taken in the form of accelerating USAF's tactical aircraft acquisition. USAF Chief of Staff Gen. Lew Allen, Jr., told Congress that "with the added funds requested by the Reagan Administration . . . we will be able to restore aircraft production to a more cost-effective level and bring the pace of tactical aircraft modernization closer to that needed in light of the multiple demands on our general-purpose forces and the steadily increasing numbers of quality aircraft being deployed by the Soviet Union."

That increase in fighter and attack aircraft acquisition ups the FY '82 buy from 126 aircraft to 222. F-15 production goes from thirty to forty-two, and advance procurement reaches forty-two in FY '83, rather than the eighteen units previously scheduled. At the same time, the total programmed F-15 buy jumps from 729 to 765 aircraft, with the additional thirty-six aircraft serving as peacetime attrition replacements in the tactical fighter forces. These additional aircraft will extend the full-strength life of the seventeen-squadron F-15 tactical force by about three years.

Similarly, F-16 production will be increased from the previously proposed annual total of ninety-six to 120 aircraft, thus accelerating the transfer of older F-4s to the Reserve components. Rather than shut down the A-10 production line, the revised budget calls for the acquisition of an additional sixty aircraft, made up of forty-six single-seat attack and fourteen two-seat trainer variants. The added A-10s will serve as peacetime attrition replacements to sustain the twenty-three-squadron force at full strength through the late 1980s.

The Growing Importance of Space

Over the last decade, Soviet space launches have exceeded those of the US by a factor of three and one half to one. Most of the Soviet launches were for military purposes. The brilliant performance of the US Space Shuttle on its maiden flight, on the other hand, presages dramatic gains in the quantity and quality of payloads that can be orbited per launch, thus justifying the hope that this country will continue to be able to achieve more in space than the USSR, with fewer launches.

Several of the most promising military space projects already are tied to the Shuttle. One of them is a potentially revolutionary means for detecting "dim aircraft targets against the earth's background clutter," according to the Defense Advanced Research Projects Agency (DARPA). The Teal Ruby project, which is centered on

advanced infrared sensor technology, will be incorporated in the USAF P80-1 Space Test Program satellite. This space system is to be launched by the Shuttle in 1983, and operate in space for a minimum of one year. The purpose of the program is to demonstrate the feasibility of multimission surveillance of air-breathing systems from high-altitude space platforms.

The Teal Ruby experiment combines an advanced, lightweight telescope with a two-dimensional infrared detector array using infrared-sensitive charge coupled devices (IRCCDs) that initially will be test-flown on 400-nautical-mile-altitude orbits. Because of this relatively low altitude, Teal Ruby gets by with a smaller telescope and detector array than would be required in the case of operational satellites orbiting at high altitudes. The Teal Ruby program, which is also to compile a global radiometric background map, will be transferred to the Air Force upon completion of the initial experiment. Its long-term potential is reliable detection and tracking of aircraft and cruise missiles at any altitude.

The Shuttle also is key to an umbrella program known as the "space laser triad," which seeks to develop and prove out the three key technologies required for space defense by means of laser weapons. The three technologies are acquisition, precision pointing, and tracking (Project Talon Gold); high-efficiency infrared chemical laser devices (Project Alpha); and mirror and beam control optics (Project LODE).

Significant improvements in fire control and precision beam direction are required before laser weapons can become useful for space defense. Hence Project Talon Gold, which uses a low-power laser to improve the pointing and tracking capability of high-energy laser weapons. Talon Gold, which is scheduled to be launched by the Space Shuttle as part of the Air Force Space Test program, will be tested against both high-altitude aircraft and space targets to provide fundamental information about fire-control requirements and other design features of space-based laser weapons. Building on the experience gained from a laser radar tracking program at the MIT Lincoln Laboratory, Talon Gold combines these findings with improved inertial reference platforms, sensors, and alignment systems to provide laser weapons with highly accurate acquisition, pointing, and tracking capabilities. AFSC's Space Division initiated the program on behalf of DARPA.

Project Alpha, the second component of the space laser triad, involves development and demonstration of a chemical laser suitable for space operation. Initially confined to demonstration on the ground, this project is focused on technologies that permit the design of laser devices generating extremely high-power beams and evaluation of a scalable laser. DARPA will transfer Project Alpha to USAF once the feasibility of such a system has been demonstrated.

The third element of the space laser weapon program is LODE, the large optics demonstration experiment. LODE is concerned with large aperture beam control for high-performance space systems and, according to DARPA, "will integrate significant advances in large mirrors, high-bandwidth fine tracking and beam stabilization, and advanced structures into an ultra-high-performance electro-optical system."

A prime program goal is development and testing of a complex mirror that, although far smaller than eventually required, could meet the stringent weight and optical performance criteria of space laser weapons. Space-based high-energy lasers require very large yet low-weight glass mirrors that can be taken aloft, presumably in segments, by the Space Shuttle to focus the laser energy on targets thousands of miles away. Broad advances in a host of subordinate technologies are required before space-based laser weapons can become operational. They include large optics technologies, adaptive optics (meaning adjustable or "rubber" mirrors), lightweight space structures, high-bandwidth control systems, and precise vibration isolation systems.

While the overall task is of herculean dimension, recent significant progress in such fields as large optics technology justifies the assumption that space-based laser weapons could be tested in prototype form by the 1990s. Following LODE's hardware demonstration by DARPA—a task that will last several years—the mirror and beam technology derived from the project will be transferred to the Air Force for ground-based systems integration and ultimate space demonstrations.

Advanced Space-Based Sensors

DARPA's Advanced Sensor Demonstration program takes a step beyond the present level in space sensor technology. Purpose of the program is to incorporate second-generation infrared sensor technology into an advanced spacecraft that will be placed in geosynchronous orbit in 1988 and remain operational for more than two and one half years. The sensor payload incorporates a telescope with optical filters, a focal plane that "stares" rather than scans over a wide field of view and is kept at super-cold (cryogenic) temperatures, and a processor that controls the system and converts focal plane data into target track information for use by small ground terminals. The integrated sensor package is expected to point the way to operational space sensors that can track selected targets anywhere in the world for strategic and tactical air war missions as well as fleet defense.

Another key program in the field of advanced space-based sensors is aimed at the development of radar satellites. Preliminary development of such a space-based phased-array radar incorporating agile radar beam technology got under way two years ago and is meant to serve the CONUS air defense and fleet defense missions by detecting and tracking bombers and ships. An operational system of this type would have to be assembled in space since its full size far exceeds the Shuttle's payload capabilities.

An important element of USAF's Space-Based Phased-Array Radar program is a comprehensive Space Signal Processing program to support military space missions through the year 2000. Designed to operate in space for at least ten years without performance degradation, this specialized computer is primarily meant to process raw data generated by radar satellites but will be able to perform a range of other space-related tasks as well. When used for surveillance missions, this computer processes vast amounts of raw data on board the satellite.

By relieving the satellite's communication system of

the need to transmit floods of irrelevant information and concentrating on data the users require, the weight, size, and power requirements of space-based communications systems can be reduced sharply. When assigned communications tasks, the Space Signal Processor boosts resistance to hostile jamming and other electronic countermeasures through a variety of sophisticated techniques ranging from "null forming," meaning tuning out jamming, to "spread spectrum coding" to cause the system to "hop" frequencies and thereby ease the effect of electronic countermeasures.

Another challenging military space program that could bring about radical change involves strategic laser communications. This joint DARPA/Navy effort is to provide—over the long term—crucial communications links with submerged strategic missile submarines. This communication technology eliminates the need for submarines to come close to the surface to receive instructions and, in so doing, give away their location to Soviet sensor systems. Pulses from a so-called blue-green laser communications system deployed in space are theoretically capable of penetrating clouds and water to reach deeply submerged submarines. The laser pulses carrying information could be provided directly from a satellite-based laser or from a ground-based laser whose beam is reflected into the ocean by a space-based relay mirror.

Either approach involves major technical problems that can't be solved quickly or easily: If the laser is based in space, power and efficiency levels would have to be boosted considerably over present capabilities; if the ground-based approach is chosen, the power requirements go up astronomically. While it is far easier to build a high-powered laser for use on the ground than in space, it is not yet clear whether or not that advantage outweighs the much lower but still-hard-to-come-by power requirements of a blue-green laser transmitting directly from space.

Once such a system becomes operational, several important payoffs suggest themselves: The survivability of the SSBN force will be helped by reducing the danger of detection; the nation's strategic command control and communications capabilities would be strengthened, possibly even providing continuing command and control for the Fleet Ballistic Missile force into the trans- and post-attack periods; and there is the potential for improving tactical communications over a broad range, not necessarily confined to naval application. The feasibility of blue-green laser pulse propagation through clouds has been demonstrated already, as has been the practicality of suitable optical receivers. In the near future, DARPA plans to transmit blue-green laser beams from an aircraft through clouds and water to submerged submarines. This is to be followed, at an as yet unspecified date, by feasibility demonstrations of a full-up system.

The Crucial Question: Spacecraft Survivability

The obvious glamour and attractiveness of space, from the military point of view, must be weighed against the harsh and implacable criteria of warfare: Will these systems be there when they are really needed? Is it easier for one side to put a constellation of laser battle stations into space than it is for the other side to shoot it down? Will the orbiting Space Shuttle be able to outmaneuver attacking Soviet ASATs (space interceptors) or should it eventually carry a defensive laser weapon? The answers could well turn out to be the toughest national security challenges we face in the remainder of this century.

For the time being, the obvious imperative is to build as much survivability into critical space assets as is cost-effective and to close the ASAT gap. As long as the Soviets have the option of attacking US satellites at low to medium altitude while the US can't retaliate in kind because it lacks operational ASATs, an intolerable imbalance will exist. Of the $5.8 billion the Defense Department plans to spend on military space programs in FY '82, the approximately $150 million allocated to ASAT R&D thus may well turn out to be pivotal.

The primary US ASAT effort involves development of a high-technology interceptor that can be launched from F-15 aircraft. The interceptor would be boosted into space by a modified SRAM. The present development contract has an option for full-scale intercept tests in space. The miniature vehicle, which is designed to "collide" with its target at extremely high speed, flies a direct ascent trajectory, thus reducing the time available for response by Soviet satellites equipped with maneuver capability. The basic problem with the US ASAT program is that no decision to test the system in space has been made as yet and that, even if developed on an expedited basis, it could not reach operational status until the second half of this decade.

The need for an operational US ASAT was underscored by the FY '82 Arms Control Impact Statement issued by the Arms Control and Disarmament Agency, which affirmed that "in the absence of an agreement constraining antisatellite systems, a Soviet advantage in ASAT capability could contribute to strategic and regional instability. . . . To the extent that the US space defense program provides an incentive for the Soviets to negotiate an antisatellite agreement, it helps avoid this risk and thus contributes to stability."

The Agency argues trenchantly that if both sides deploy ASATs, two factors might lessen the effects on strategic stability: In case of a major or nuclear attack, crucial satellites—presumably including those that provide early warning—are likely to be degraded or negated anyway because their ground control and launch facilities represent high-priority targets. Conversely, if one side were contemplating a limited strike, it might well wish to spare the other side's satellites, especially those required for attack assessment and command and control. Otherwise, the attacker compels the defender to retaliate blindly, which probably would mean assigning all available strategic nuclear forces to his counterstrike rather than responding in a manner commensurate with the level of the attack. Further, if under such a circumstance the attacker envisions an eventual settlement based on negotiations with the defender, the latter's communications satellite might well be crucial.

The second component of the US space defense effort involves measures that enhance the survivability of satellite systems. Among the techniques the US is pursuing in this context are proliferation of the number of satellites that perform a given mission, designing satellites so that they are not easily observed, hardening

satellites against laser radiation, and employing decoys to deceive or a maneuver capability to evade an attacking space interceptor.

The Defense Support Program

A fundamental step toward reducing the vulnerability of the US strategic warning system is to proliferate and hide the ground terminals of the early warning satellites known also as the Defense Support Program (DSP). This is being done and involves the deployment of truck-mounted mobile terminals that are indistinguishable from other service vans and can be proliferated easily. To increase survivability further so-called Simplified Processing Stations that provide emergency backup of existing fixed ground stations also have gone on line this year.

Three DSP satellites are deployed in geostationary orbit over the eastern and western hemispheres to cover Soviet ICBM and SLBM launch areas and thus to provide primary early warning of a ballistic missile attack on CONUS. Last year, a DSARC (Defense Systems Acquisition Review Council) meeting decided on several modifications of replacement DSP satellites to boost the system's survivability. At the same time, preliminary steps were taken to launch a follow-on program. Because of the technological complexity of such an advanced program these satellites "could not be operationally deployed until at least the early 1990s," according to General Burke.

Since DSP satellites—like other spacecraft—have limited life expectancy, they have to be replaced. USAF plans to buy four additional and modified satellites for this purpose on a block basis, one per year between FY '82 and FY '86. This block buy will save approximately $134 million compared with the normal procurement of one satellite each year. These replacement satellites will be modified to make them compatible with both the Titan IIID/IUS (inertial upper stage) and the Shuttle/IUS launch systems.

Particle Beam Technology

Two fundamental technologies lend themselves, at least theoretically, to directed energy (DE) weaponry. One is the high-energy laser (HEL), now being readied for test against airborne targets by the Airborne Laser Laboratory ALL-1, a specially equipped NKC-135, and subsequently by ALL-2, a modified wide-body jet aircraft capable of accommodating a yet larger, mature version of this weapon system and associated fire-control systems. The other category of DE weapons—far more tenuous and at best decades away from practical feasibility—involves charged and neutral particle beam designs.

Electron beams, which deliver large amounts of energy at velocities near the speed of light and deposit them deep within a target, offer a wide range of potential applications, according to DARPA officials. Particle beam systems could, among other weapons applications, provide point defense of naval forces against nonnuclear threats and defense of hardened sites against nuclear attack. Theoretical and experimental research programs directed toward demonstrating the propagation of charged-particle beams in the atmosphere have been under way for more than twenty years. But these efforts have been limited because no means were available for providing the required high-energy current and pulse repetition rates. In short, particle beam systems, whether meant for weapons application, fusion research, or simulation of nuclear weapons effects, are pushing the state of the art across a broad front.

As long as the Soviets have the option of attacking US satellites at low to medium altitude while the US can't retaliate in kind . . . an intolerable imbalance will exist.

Typical problem areas include primary power systems; short-term energy storage; the sources of particles known as accelerator injectors; pulse forming networks; pulse power switches; accelerator beam dynamics; beam-target interaction; and a host of others. In the case of many of these problem areas, present technological approaches appear deficient and incapable of providing the means for building operational systems that could meet military requirements.

The Lawrence Livermore National Laboratory—in concert with DARPA—therefore, is building the free world's most powerful accelerator to demonstrate the scientific feasibility of propagating intense electron beams within the atmosphere. Known as the Advanced Test Accelerator, this elaborate device is to furnish fundamental scientific information for the services to plan experimental devices that could serve as precursors of future particle beam weapon systems. The principal answer that ATA is expected to provide centers on the feasibility and nature of beam propagation over distances of interest to military users.

ATA is scheduled for completion in about two years. The building and tunnel housing the accelerator as well as the associated hardware are nearing completion, and the system is to achieve operational status in 1983. DARPA is working with the services on specific experiments. Whether or not ATA turns out to be a catalyst for the development of exotic particle beam weapons, it is essential that this country stay abreast of this and other technologies having military potential and to gain insight into what the Soviets and others may be discovering through their own massive research. ■

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FROM THE Budd COMPANY

AIRMAN'S BOOKSHELF

Bravery, Chivalry, Discipline

Mr. Kipling's Army, by Byron Farwell. W. W. Norton & Co., New York, N. Y., 1981. 256 pages with index. $13.95.

This latest of Byron Farwell's books on military lore is a social history of the British army during the Victorian and Edwardian eras—roughly from the mid-nineteenth century to the eve of World War I. It is a unique and fascinating book about a unique military *institution.* "Organization" would not be the right word. During most of the period the army's structure defied description.

Queen Victoria's small army of 186,000 men in 1870 (compared to Prussia's 888,000) was not designed for war on the European continent; hence, it was little affected by continental military ideas and practices. Its purpose was to fight the dirty little wars and skirmishes that were part of expanding and defending the Empire in an age of imperialism conditioned by neo-mercantilism, social Darwinism, and religious fervor for taking up "the white man's burden."

The army's basic unit was the regiment, which could have anywhere from two to twenty battalions. In 1868, sixty-three of the 110 regiments were serving overseas. The Somerset Light Infantry spent 111 of its first 173 years outside the British Isles. The army had no general staff until 1906, and there was a recurring debate over whether it belonged to the Crown or to Parliament. Never was it under the command and control of one person or agency.

With rare exceptions, the officer corps was made up of "gentlemen," all products of the public (*i.e.,* private) schools, which concentrated on developing character rather than educated men. Until 1871, commissions were purchased and an outside income was necessary to live, even as a bachelor. Officers joined and stayed—often into their seventies—because of what Gen. Garnet Wolsley spoke of as an "intense love of fighting and all out-of-door amusements."

In 1861, only 7.4 percent of other ranks (enlisted men) were literate, and not until 1913 was literacy a requirement for enlistment. The social gulf between officers and men was unbridgeable; yet they were bound together by loyalty to the Crown and to their regiments, in which many served for an entire career. The regiment was the engine of esprit in a spirited but not very efficient army.

Both officers and men were apolitical, anti-intellectual, and remarkably resistant to new ideas—even to new weapons. Military education and training were minimal, but what they lacked in professionalism as we understand the term was made up by acts of incredible bravery, recounted throughout the book.

The British army was a world unto itself in more ways than one. During the Boer War of 1899 to 1902, the Boers, who had no regular army but had bought up all the modern equipment they could lay their hands on, confronted the British with the fast-firing pom-pom gun. ". . .[T]he British officers, who had never seen such a gun, were impressed with its effectiveness. It was made by Vickers in England, and originally designed for naval use, but as the army and navy rarely spoke to each other, the pom-pom appeared on the veldt as a secret weapon as far as the army was concerned." So much for interservice cooperation.

Each of Mr. Farwell's nineteen chapters dissects a different element or aspect of the pre-World War I army, from some often hilarious regimental customs through discipline, prejudices, language, and training, to the reforms that helped prepare it for World War I. Readers who have served with the British will find much here that helps explain the character and attitudes of today's truly professional British fighting man.

There are three words that perhaps best epitomize Britain's Victorian army: bravery, chivalry, and discipline. "It must never be forgotten," Mr. Farwell concludes, "that in this quixotic, eccentric, peculiar army these qualities existed to a very high degree and that these were the men who built the British Empire." They were the unprofessional professionals who, despite an often narrow and always arrogant view of the world outside, set standards of honor, courage, and loyalty that seldom have been equaled.

—Reviewed by John L. Frisbee, former Editor, AIR FORCE *Magazine.*

New Books in Brief

Knights of the Sky, Vol. I, by Jerry Valencia. This book is the first of two volumes of "autobiographical stories" of great fighter aces. Fourteen aces are covered in this book, a labor of love for Jerry Valencia, son of former Navy Cmdr. Eugene A. Valencia, a World War II ace with twenty-three confirmed victories who died of a heart attack in 1972 while attending a Fighter Aces Association convention in San Antonio, Tex. Jerry spent more than eight years fulfilling his father's dream of saving the stories of these brave men for posterity, and his efforts have resulted in a valuable and entertaining book. With a foreword by Col. Raymond F. Toliver, USAF (Ret.). Photos, index. Write to Jerry Valencia, P. O. Box 758, La Jolla, Calif. 92038, 1980. 208 pages. $21.95.

The Naked Flagpole, by Richard C. Mallonée. Based on Colonel Mallonée's wartime diaries and edited by his son Richard, *The Naked Flagpole* is believed to be one of the few complete eyewitness accounts of the fall of the Philippines to have survived the war intact. Mallonée recounts the retreat to Bataan, the infamous death march that followed, and the forty-two months he spent as a "guest of the emperor" that ended with his liberation by the Soviets in Manchuria at war's end. Though the book is to be valued as a historical document, it is also a vivid personal account of a great catastrophe in American military history. With illustrations. Presidio Press, P. O. Box 3515, San Rafael, Calif. 94902, 1980. 224 pages. $11.95.

—Reviewed by Hugh Winkler, Associate Editor.

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Wayne H. Coloney, Inc.
Western Electric Co., Inc.
Western Gear Corp.
Western Union Telegraph Co., Government Systems Div.
Westinghouse Electric Corp.
Williams Research Corp.
World Airways, Inc.
Wyman-Gordon Co.
Xerox Corp.

*New affiliation

THE BULLETIN BOARD

By James A. McDonnell, Jr., MILITARY RELATIONS EDITOR

GI Bill Widely Supported, But . . .

Early enactment of a GI Bill has been endorsed in recent months in a number of influential quarters. Key legislators, top-level military officials, military and veterans associations (including AFA), Reserve Forces leaders, educational groups, and rank-and-file service members stand four-square behind quick action.

But chances of approval this year or during the first three quarters of next year do not appear bright. The Administration and DoD clearly do not want such a measure now, preferring to delay a decision until conclusion of the current educational assistance test program all the services are conducting *(see below)*. That would delay a GI Bill until at least October 1, 1982.

Another potential barrier to early passage is diverging opinion about what the measure should contain, particularly the "transferability" issue. Many GI Bill supporters, the Air Force included, favor transfer of unused benefits from the service member to spouse or children. Others oppose across-the-board transferability. Rep. G. V. (Sonny) Montgomery (D-Miss.), the key figure in the growing controversy, would give the Defense Secretary authority to allow persons to transfer their entitlements, provided the members were in critical skills. This idea has drawn some fire, and it could be confusing and difficult to operate.

Cost is another consideration that has not been resolved; there is no GI Bill money in DoD's FY '82 budget. According to a high-placed USAF source, a GI Bill "if it should get through Congress this year could very well be vetoed."

Among the dozens of GI Bills introduced, the one receiving the most attention is H.R. 1400, sponsored by Montgomery, the new Chairman of the House Veterans Affairs Committee. A subcommittee has been holding a series of hearings on the measure.

H.R. 1400 provides one month of benefits for each month of service, up to thirty-six months, for high school graduates only (or equivalency). A three-year commitment (or two years of active duty and four years of Reserve service) is required. The stipend is $250 per month. However, if the person reenlists for another three years, the monthly stipend jumps by $300, for a total of $550 per month. Other features include the aforementioned transferability proviso.

The cost of Mr. Montgomery's bill would be split between the VA and the Defense Department, a sharp departure from previous procedures. Some quarters, in fact, feel that since any forthcoming GI Bill will be mainly a DoD show, the Veterans Affairs Committees should back out of the picture entirely.

USAF's personnel and manpower chief, Lt. Gen. Andrew P. Iosue, told the subcommittee his service needs a GI Bill "to get quality people to enlist and then to keep them after they are trained. A properly designed bill will do both of these," he said.

Others urging quick action include Sen. William Armstrong (R-Colo.). He's supporting his own measure, S. 25, which does not include a transferability section. He said transferability would be too expensive. GI Bill watchers expect the House to approve some sort of a compromise measure this summer. The status in the Senate is highly uncertain. The Senate Veterans Affairs Committee has delayed hearings on the matter until July 22 and 23.

For the Air Force, DoD's educational assistance test program won't amount to much. It involves offering first-term airmen in just three skills (304X1, Navigational Aid Equipment Specialist; 316X2X, Missile Electronic Equipment Specialist; and 553X0, Site Development Specialist) up to $15,000 for college purposes. Part of the money is payable after participants have served two years of their new terms. There are several options. The idea is to see if college is an incentive to re-up. Fewer than 200 airmen are expected to participate.

AFA Chairman of the Board Dan Callahan, right, and Executive Director Russ Dougherty, left, share a lighter moment during a recent visit with new Air Force Secretary Verne Orr. Secretary Orr noted that he was impressed with the activities of AFA he had observed to date and is looking forward to working closely with the Association during his tenure.

Insurance Hike in Works

The climate seems favorable for early approval of a bill to provide service members $35,000 of Serviceman's Group Life Insurance (SGLI).

The present maximum is $20,000. The Air Force had wanted to provide members $40,000 worth of SGLI, but "Defense chiseled us down," an informed source said. Various military and veterans associations supported increases of up to $50,000, in testimony before a House Veterans Affairs subcommittee. A $35,000 ceiling is sufficient to offset inflation, a DoD spokesman told the subcommittee. Informed sources expect the legislation to be approved this year.

Club Membership Rises

Membership in USAF's 291 officer and NCO clubs increased again slightly last year to 448,593, or sixty-two percent of the active-duty force. Record sales and an overall income of $336.3 million were also reported for 1980, and the Air Force said that overall "the club system is improving."

Five years ago, in 1976, fifty-eight percent of the force—414,000 persons—belonged to an Air Force club. Except for a small drop in 1977, membership has risen each year since.

But there are troubles ahead. Many club buildings are deteriorating, and Congress won't cough up funds to replace or refurbish them, so nonappropriated funds must be found. But where? USAF isn't saying, but it did reveal that future club construction "requirements" will exceed $100 million. Day-to-day club labor costs are also causing problems.

The report said despite the competition clubs face from nearby fast food restaurants, cable TV, and "the ever-increasing sophistication of the individual military member . . . there is still much interest in clubs. We are not necessarily promoting 'back to the club' drives, but through improved quality and service and attention to membership desires, we are gradually getting more satisfied members," the report said.

Sixty-two of the USAF clubs, mostly at small bases, have some type of consolidated mode. Officials said they encourage separate bars and lounges in the same building at consolidated clubs. The few strictly airmen's clubs have disappeared, but the Air Force now has about seventy annexes to NCO clubs, which include Top 3 and Top 4 annexes, all-ranks annexes, and lower-rank (E-4 and E-3) annexes.

Club dues have been kept remarkably low. Currently officers' club dues average $10.75 per month and NCOs' just $3.50. This compares with $9.40 and $2.80, respectively, in 1976, the Air Force said.

DoD Trims Benefits Requests

The Defense Department has endorsed some, but not all, of the new personnel benefits the Air Force proposed for inclusion in the FY '82 legislative program. The USAF list appeared in last month's "Bulletin Board."

DoD officials, in a late April review of personnel funding, rejected USAF's bid for (1) a six-day house-hunting trip for transferring members and spouses providing transportation and per diem ($50 a day for members, $37.50 a day for spouses); (2) funded emergency leave travel; and (3) the accession bonus of up to $15,000 and continuation bonus of $3,000 a year for scientific and engineering officers. An Air Force official said the service would appeal the anti-S&E decision.

DoD also decided to delay the recommended effective date of USAF's bid for a Stateside temporary lodging entitlement until next April. Proposed USAF programs that got Defense Department approval and thereby improved their chances in Congress include the following:

A recruiters' pay raise, increased and expanded hazardous-duty incentive pay, another twenty-five percent increase in flying pay, bigger scholarships for future military physicians, increased death gratuity, and an increase in government life insurance to $35,000 and CHAMPUS dental care. The latter would be delayed until April 1982; the rest would be effective next October 1.

Other benefits improvement programs such as travel pay and weight allowance increases not requiring new legislation are expected to receive congressional blessing. In doubt at press time, however, was the 5.3 percent across-the-board pay raise, earlier scheduled for July 1.

Conditioning Programs OK, USAF Says

Air Force members are not required to jog regularly, lift weights, play tennis, or otherwise endure some form of regular physical activity, so no statistics are available on how many people exercise.

However, an annual fitness test is required by all members and, Hq. USAF officials say, "it is our observation that many, if not most, members participate in some kind of regular exercise to pass this test." Such participation "has substantially increased in recent years," the officials continued.

Despite the apparent satisfaction with the existing program and its companion "weight management" project, the Air Force is revising the basic regulation, AFR 35-11. The changes, due out this summer, will update the procedures, make the rules more understandable, and help the field manage the overall program better. It will also stress the positive aspects and eliminate such negative terms as "weight control" and "remedial."

The aerobic exercises the service hopes all members will perform are still there, and so is the official requirement that they take and pass an annual test. Also untouched are the test options, *e.g.*, a mile and a half "run" that can be performed by running, jogging, walking, or by any combination thereof. These test options have been ridiculed by numer-

Kathy M. Baringer, named the outstanding AFROTC cadet at Auburn University, accepts the first annual Lt. Gen. Kelly H. Burke ROTC Scholarship Award during the unit's annual Dining In. She is the first recipient of the award established in honor of General Burke (left), Hq. USAF DCS/Research, Development and Acquistion, and a 1952 Auburn graduate. Kathy is a straight-A engineering student. At right is Col. William K. Rector, Auburn AFROTC Commander.

ous members as being far too easy.

Also apparently limiting the program's credibility is the fact that some members avoid the annual test. "I've never taken it and no one's asked me," one ten-year service member told AIR FORCE Magazine.

Meanwhile, the Air Force members who fail to meet weight standards will continue to be enrolled in thin-down classes. AFR 35-11 spells out the steps unit commanders and medics must take to get the job done. A major aim, of course, is to get the heavyweights to present an acceptable military appearance.

The weight tables in AFR 35-11 do not allow for exceptionally muscular or large-framed individuals. However, waiver authority—in the revised reg—is being delegated to base commanders. Accordingly, those people who exceed their maximum allowable weight because of body build, bone structure, or exceptional physical development but still present an acceptable military appearance and are not termed obese by the medics may recieve a weight waiver.

Is the weight control apparatus working? Hq. USAF reports that during the past three fiscal years, about 1,200 members have been separated for unsatisfactory progress in losing excess weight. But considering that about 15,000 persons were enrolled in weight-loss programs, it means that the big majority persevered and were returned to duty.

THE BULLETIN BOARD

DoD Rule Invites Invasion of Privacy

An Air Force family living off base near Wright-Patterson AFB, Ohio, no sooner got transfer orders than they were bombarded with calls and unsolicited visits from real estate agents battling for the listing of their home. How did the agents know transfer was near? The Air Force told them!

Headquarters confirmed that this harassment is SOP service-wide. Here's the official response to AIR FORCE Magazine's query as to why this invasion of privacy is permitted:

"It is true that members of the general public, including real estate agents, may receive upon request the names, grades, and organizations of people arriving or departing a particular Air Force installation. The procedure is standard Air Force-wide and implements an October '79 OASD [Office of the Assistant Secretary of Defense] decision.

"OASD applied the balancing test of invasion of privacy vs. public interest as required by the Freedom of Information Act of 1967, as amended in 1974, and ruled the services must provide such information when asked. However, personal data including home address and home phone is protected by the Privacy Act of 1974 and is not released to the general public without the service member's written consent."

(The last sentence of the above quote, of course, is nonsense. Once armed with the names of transferring members, all the real estate people—and any other salespeople—need do is match them with the names and addresses and phone numbers in the local phone book.)

Here's an irritant few civilian firms would encourage. Why should the Air Force?

Overseas Buildup Threatens Kin Travel

Over the next five years USAF has programmed force structure changes resulting in 10,700 additional manpower authorizations abroad. It means that the 123,000-person ceiling USAF command-sponsored dependents overseas, unless removed by Congress, will be reached early next year, at which time delays in moving families will begin.

Early this year USAF command-sponsored dependents abroad numbered 121,900, only 1,100 below the ceiling. Under the manpower authorization changes, the number of kin abroad—if the ceiling is lifted—will rise to an estimated 132,000, the Air Force said.

Service leaders have been urging Congress to remove the ceiling, which was primarily the brainchild of Sen. John Stennis (D-Miss.), former chairman of the Senate Armed Services Committee. He held that families will clutter up the scene during an emergency abroad and service members will be more concerned about getting them to safe havens than performing their military duties.

But with the Republicans now controlling the Senate, Sen. John Tower (R-Tex.) is the new committee chairman and he is reportedly sympathetic with regard to families overseas. The services forecast severe morale problems if travel is delayed or barred. Officials see the ceiling as harmful to morale and thus retention and will result in overseas-bound members choosing shorter, unaccompanied tours. This in turn increases unit turn-

Air Force Secretary Verne Orr greets 1981 Cystic Fibrosis Foundation representatives Jennifer Lyn Haninger, three; Douglas Leon Mohler, eighteen; and Attilio D'Agostrine, nine, during their recent visit to Washington accompanied by their parents. The Foundation's mission is to discover the means for the prevention, control, and effective treatment of cystic fibrosis, the nation's number-one genetic killer of children and young adults.

over, hurts readiness, and increases the need for training.

At the end of February, the Air Force also had 2,865 non-command-sponsored dependents overseas, a figure officials would like to see lowered. This is the group of families most likely to get into financial trouble and to cause problems for commanders and units.

Unique Tax Measure Introduced

Sen. Steven D. Symms (R-Idaho) would solve the services' retention problem by giving members unusual income tax breaks. His recently introduced bill, labeled the Serviceman's Retention Act (no mention of the fair sex, but we're sure they're included too), would give persons with four years of service a twenty-five percent tax break.

After eight years in uniform, thirty-five percent of their pay would be tax-free; after twelve years, forty percent; and after sixteen years, fifty percent.

While the plan just might persuade more people to stay on board, the bill's chances of passage are about as slim as Defense Secretary Caspar W. Weinberger's proposal that the first $20,000 of military pay be tax-free. In other words, no chance. Critics of Weinberger's plan were quick to note that while it would do great things for generals and colonels, it wouldn't do much for the low-paid troops.

Women who become Life Members of AFA receive a newly authorized stickpin in addition to the other benefits of the membership. In this photo, Alice Turner of Membership Fulfillment on the AFA staff is pinned with hers. Alice has been a member with the AFA staff for more than twenty years.

Short Bursts

Latest figures show **22,834 collegians enrolled in the AFROTC,** a twelve percent increase over last year. This continues the upward trend that began in 1977. But USAF enrollment is dwarfed by the Army, which reports that 71,500 students are participating in its 279 ROTC units. Navy, meanwhile, trails far behind with only about 8,300 ROTC members.

Does anyone, other than **Academy cadets,** know what their pay is? We asked Hq. USAF, which explained that it is $419.40 per month (plus $3.49 subsistence daily when on TDY). Interestingly, Academy cadets would be making $462.15 per month under the former formula, which pegged their income at one-half a second lieutenant's basic stipend. But $400-plus a month and a free education aren't to be sneezed at.

USAF Col. Shirley J. Bach has become Director of the Defense Equal Opportunity Management Institute, at Patrick AFB, Fla., following three years as Deputy Director. She succeeds a Navy captain. The Institute has trained thousands of military personnel and DoD civilians for equal opportunity jobs. Colonel Bach earlier was an aide to the former Assistant Secretary of the Air Force for manpower, Antonia H. Chayes. Ms. Chayes has been replaced by thirty-three-year-old Tidal (Ty) McCoy, a former Army artillery officer who served in Vietnam.

"Frequent moves prevent a military wife from accumulating employment tenure that would entitle her to her own retirement benefits. Private employers are also wary of hiring a military wife because her husband will inevitably be reassigned to another duty station." So declared **Rep. Patricia Schroeder** (D-Colo.) as she introduced H.R. 3039 and 3040 to amend, respectively, the military and Civil Service retirement systems to entitle **divorced spouses to share in their ex-mates' retirement pay and survivor benefits.** It's a line that increasing numbers of present and past service wives are echoing. Both bills are similar to legislation that failed last year, but the Schroeder forces are buoyed by passage of the Foreign Service Act late last year, which provides similar benefits for divorced wives of Foreign Service officers.

The permissive TDY **house-hunting policy** USAF adopted last year has been "refined," according to the Manpower and Personnel Center. Members no longer need have orders in hand before asking for the TDY; now they can apply promptly after assignment notification, as long as

nine months in advance. Often under the old rule they only had sixty days. Which raises the question, why shouldn't the new rule have been invoked right from the start of the program?

Modernizing bachelor housing—it's officially called "unaccompanied enlisted personnel housing"—is slow going, but USAF keeps chipping away at the problem. The FY '82 military budget contains money to build 1,272 new airmen spaces at six bases and improve 4,178 at twelve sites. A much-needed new dining hall at Andrews AFB, Md., and a new gym for the present relic at Wright-Patterson AFB, Ohio, are also on the construction list.

A standard Air Force **grade level reading test** is under preparation, for adoption this fall. Bases were recently asked to advise Hq. USAF on the nature of any present tests "and why they are being used?" ■

THE BULLETIN BOARD

SENIOR STAFF CHANGES

PROMOTIONS:

To be **Lieutenant General:** Robert M. **Bond;** James R. **Brickel;** George M. **Browning,** Jr.; Larry D. **Welch.**

To be **Major General:** Jack I. **Gregory;** Titus C. **Hall;** John L. **Pickitt;** James P. **Smothermon.**

To be **Brigadier General:** Daniel B. **Geran;** Merrill A. **McPeak;** Robert O. **Petty;** Jimmy C. **Pettyjohn;** Henry J. **Sechler;** John T. **Stihl;** Russell L. **Violett;** Gordon E. **Williams.**

To be **ANG Major General:** Raymond E. **Hebrank;** Billie G. **Hollowell;** Curtis D. **Roberts.**

To be **ANG Brigadier General:** Frank C. **Crooks;** Marinus **Flux;** Joseph O. **Martin,** Jr.; Donald T. **McGinley.**

To be **AFRES Brigadier General:** Edward L. **McFarland;** Billy B. **Morgan.**

RETIREMENTS: L/G Marion L. **Boswell;** M/G James R. **Hildreth;** L/G James D. **Hughes;** B/G Billy M. **Knowles;** M/G Warren C. **Moore;** L/G Charles C. **Pattillo;** L/G Gerald J. **Post;** M/G Robert A. **Rushworth;** M/G Joseph M. F. **Ryan,** Jr.; L/G George H. **Sylvester;** L/G Kenneth L. **Tallman.**

CHANGES: B/G Leon W. Babcock, Jr., from Cmdr., 601st TCW, USAFE, Sembach AB, Germany, to Ass't C/S for Ops., Hq. AFCE, Brunssum, the Netherlands . . . **B/G Charles E. Bishop,** from Cmdr., 23d AD, North American Air Defense Rgn., Duluth IAP, Minn., to Vice Cmdr., 9th AF, TAC, Shaw AFB, S. C., replacing retiring M/G Billy J. Ellis . . . **B/G Schuyler Bissell,** from Dep. Ass't C/S, C-2, Combined Forces Command Korea, Seoul, Korea, to Dep. Ass't C/S for Intelligence, Hq. USAF, Washington, D. C. . . . **M/G (L/G selectee) Robert M. Bond,** from Cmdr., Armament Div., AFSC, Eglin AFB, Fla., to Vice Cmdr., Hq. AFSC, Andrews AFB, Md., replacing retiring L/G George H. Sylvester.

L/G Arnold W. Braswell, from Cmdr., 9th AF, TAC, Shaw AFB, S. C., to CINC, Hq. PACAF, Hickam AFB, Hawaii, replacing retiring L/G James D. Hughes . . . **M/G (L/G selectee) James R. Brickel,** from Ass't DCS/RD&A, Hq. USAF, Washington, D. C., to Dep. CINC,

Hq. USREDCOM, and Vice Dir., JDA, MacDill AFB, Fla., replacing retired L/G Charles C. Pattillo . . . **M/G (L/G selectee) George M. Browning, Jr.,** from Dir. of Budget, USAF Comptroller, Hq. USAF, Washington, D. C., to Comptroller, Hq. USAF, Washington, D. C., replacing L/G Hans H. Driessnack . . . **M/G Kenneth D. Burns,** from Cmdr., Hq. TUSLOG, USAFE, Ankara AS, Turkey, to Cmdr., 13th AF, PACAF, Clark AB, P. I., replacing retiring M/G James R. Hildreth.

B/G Charles J. Cunningham, Jr., from Dep. Dir. of Prgms., DCS/P&E, Hq. USAF, Washington, D. C., to Dir., International Prgms., DCS/P&E, Hq. USAF, Washington, D. C., replacing M/G Richard V. Secord . . . **B/G Christian F. Dreyer, Jr.,** from Cmdt., Sqdn. Officer School, ATC, Maxwell AFB, Ala., to Cmdr., 601st TCW, USAFE, Sembach AB, Germany, replacing B/G Leon W. Babcock, Jr. . . . **L/G Hans H. Driessnack,** from Comptroller, Hq. USAF, Washington, D. C., to Ass't Vice C/S, Hq. USAF, Washington, D. C., replacing retiring L/G Marion L. Boswell . . . **Col. (B/G selectee) Daniel B. Geran,** from DCS/Comptroller, Hq. USAFE, Ramstein AB, Germany, to Dep. Dir. of Budget, USAF Comptroller, Hq. USAF, Washington, D. C., replacing B/G Richard D. Murray.

B/G (M/G selectee) Jack I. Gregory, from Ass't DCS/Ops., Hq. TAC, Langley AFB, Va., to Cmdr., USAF Tac. Fighter Weapons Ctr., TAC, Nellis AFB, Nev., replacing M/G Robert E. Kelley . . . **B/G (M/G selectee) Titus C. Hall,** from Dep. for Reconnaissance & EW Systems, ASD, AFSC, Wright-Patterson AFB, Ohio, to Cmdr., Lowry TTC, ATC, Lowry AFB, Colo., replacing M/G William B. Maxson . . . **M/G Robert E. Kelley,** from Cmdr., USAF Tac. Fighter Weapons Ctr., TAC, Nellis AFB, Nev., to Superintendent, USAFA, Colorado Springs, Colo., replacing retiring L/G Kenneth L. Tallman . . . **B/G Donald P. Litke,** from Vice Cmdr., Oklahoma City ALC, AFLC, Tinker AFB, Okla., to Dep., J-4, Hq. USEURCOM, Vaihingen, Germany.

M/G William G. MacLaren, Jr., from Dir., Command & Control & Telecommunications, and DCS/OP&R, Hq. USAF, Washington, D. C., to Ass't Dir., Command Control & Communications Div., International Military Staff, Brussels, Belgium . . . **B/G Gordon P. Masterson,** from Dir. of Maintenance, Oklahoma City ALC, AFLC, Tinker AFB, Okla., to Vice Cmdr., Oklahoma City ALC, AFLC, Tinker AFB, Okla., replacing B/G Donald P. Litke . . . **M/G William B. Maxson,** from Cmdr., Lowry TTC, ATC, Lowry AFB, Colo., to Cmdr., Armament Div., AFSC, Eglin AFB, Fla., replacing M/G (L/G selectee) Robert M. Bond . . . **Col. (B/G selectee) Merrill A. McPeak,** from Cmdr., 20th TFW, USAFE, RAF Upper Heyford, UK, to C/S, Hq. USAFE, Ramstein AB, Germany.

Col. (B/G selectee) Robert O. Petty, from C/S, Hq. AFCC, Scott AFB, Ill., to Cmdr., Continental Comm. Div., AFCC, Griffiss AFB, N. Y. . . . **Col. (B/G selectee) Jimmy C. Pettyjohn,** from Dir. of Estimates, Ass't C/S for Intelligence, Hq. USAF, Washington, D. C., to Dep. Ass't C/S, C-2, Combined Forces Command Korea, Seoul, Korea, replacing B/G Schuyler Bissell . . . **B/G (M/G selectee) John L. Pickitt,** from DCS/Plans, Hq. TAC, Langley AFB, Va., to Dep. Cmdr. for Air Defense, Hq. TAC, Langley AFB, Va. . . . **M/G John L. Piotrowski,** from Dep. Cmdr. for Air Defense, TAC, Peterson AFB, Colo., to DCS/Ops., Hq. TAC, Langley AFB, Va.

B/G Gerald L. Prather, from Dir., J-6, Hq. USREDCOM, MacDill AFB, Fla., to Dir., Command & Control & Telecommunications, and DCS/OP&R, Hq. USAF, Washington, D. C., replacing M/G William G. MacLaren, Jr. . . . **B/G Richard W. Pryor,** from Cmdr., Northern Comm. Area, AFCC, Griffiss AFB, N. Y., to Dep. Dir. of Plans & Prgms., Defense Communications Agency, Washington, D. C. . . . **Col. (B/G selectee) Henry J. Sechler,** from Dep. Dir., Resources, DCS/P&E, Hq. USAF, Washington, D. C., to Dep. Dir. of Prgms., DCS/P&E, Hq. USAF, Washington, D. C., replacing B/G Charles J. Cunningham, Jr. . . . **M/G Richard V. Secord,** from Dir., International Prgms., DCS/P&E, Hq. USAF, Washington, D. C., to Dir., Near East & South Asia Rgn., OSD/International Security Affairs, Washington, D. C.

B/G (M/G selectee) James P. Smothermon, from IG, Hq. USAFE, Ramstein AB, Germany, to Cmdr., Hq. TUSLOG, USAFE, Ankara AS, Turkey, replacing M/G Kenneth D. Burns . . . **Col. (B/G selectee) John T. Stihl,** from Vice Dir., TRI-TAC (Joint Tactical Comm. Office), DoD, Fort Monmouth, N. J., to Dir., J-6, Hq. USREDCOM, MacDill AFB, Fla., replacing B/G Gerald L. Prather . . . **Col. (B/G selectee) Russell L. Violett,** from Ass't for Control & Support, Hq. TAC, Langley AFB, Va., to Ass't DCS/Ops., Hq. TAC, Langley AFB, Va., replacing B/G (M/G selectee) Jack I. Gregory . . . **M/G (L/G selectee) Larry D. Welch,** from DCS/Ops., Hq. TAC, Langley AFB, Va., to Cmdr., 9th AF, TAC, Shaw AFB, S. C., replacing L/G Arnold W. Braswell . . . **Col. (B/G selectee) Gordon E. Williams,** from Cmdr., 81st TFW, USAFE, RAF Bentwaters, UK, to IG, Hq. USAFE, Ramstein AB, Germany, replacing B/G (M/G selectee) James P. Smothermon. ■

AFA STATE CONTACTS

Following each state name, in parentheses, are the names of the localities in which AFA Chapters are located. Information regarding these Chapters, or any place of AFA's activities within the state, may be obtained from the state contact.

ALABAMA (Auburn, Birmingham, Huntsville, Mobile, Montgomery, Selma): **Frank M. Lugo,** 5 S. Springbank Rd., Mobile, Ala. 36608 (phone 205-344-9234).

ALASKA (Anchorage, Fairbanks): **Frank X. Chapados,** 1426 Well St., Fairbanks, Alaska 99701 (phone 907-452-1286).

ARIZONA (Phoenix, Sun City, Tucson): **John P. Byrne,** P. O. Box 1705, Sun City, Ariz. 85372 (phone 602-974-7137).

ARKANSAS (Blytheville, Fayetteville, Fort Smith, Little Rock): **Arthur R. Brannen,** 605 N. Hospital Dr., Jacksonville, Ark. 72076 (phone 501-982-2585).

CALIFORNIA (Apple Valley, Edwards, Fairfield, Fresno, Hawthorne, Hermosa Beach, Long Beach, Los Angeles, Merced, Monterey, Novato, Orange County, Palo Alto, Pasadena, Riverside, Sacramento, San Bernardino, San Diego, San Francisco, San Mateo, Santa Barbara, Santa Monica, Yuba City, Vandenberg AFB): **Richard C. Doom,** P. O. Box 2027, Canyon Country, Calif. 91351 (phone 213-887-2923).

COLORADO (Aurora, Boulder, Colorado Springs, Denver, Fort Collins, Grand Junction, Greeley, Littleton, Pueblo, Waterton): **Jack E. Ingles,** 1131 S. Nome St., Aurora, Colo. 80012 (phone 303-370-7575).

CONNECTICUT (East Hartford, North Haven, Storrs, Stratford, Westport, Windsor Locks): **Frank J. Wallace,** 935 Poquonock Ave., Windsor, Conn. 06095 (phone 203-688-3090).

DELAWARE (Dover, Wilmington): **John E. Strickland,** 8 Holly Cove Lane, Dover, Del. 19901 (phone 302-678-6070).

DISTRICT OF COLUMBIA (Washington, D. C.): **Bob Givens,** 1750 Pa. Ave., N. W., Suite 400, Washington, D. C. 20006 (phone 202-637-3346).

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GEORGIA (Athens, Atlanta, Columbus, Rome, Savannah, St. Simons Island, Valdosta, Warner Robins): **Lee C. Lingelbach,** 217 Ridgeland Dr., Warner Robins, Ga. 31093 (phone 912-922-7615).

GUAM (Agana): **Joe Gyulavics,** P. O. Box 21543, Guam 96921 (phone 671-734-2369).

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IDAHO (Boise, Twin Falls): **David P. Swearingen,** 6968 Butte Court, Boise, Idaho 83704 (phone 208-386-5787).

ILLINOIS (Belleville, Champaign, Chicago, Elmhurst, Peoria): **Kurt Schmidt,** 2009 Vawter St., Urbana, Ill. 61801 (phone 217-367-1350).

INDIANA (Bloomfield, Indianapolis, Lafayette, Logansport, Marion, Mentone, South Bend): **Donald E. Bradford,** 2420 Fox Harbour South Dr., Indianapolis, Ind. 46227 (phone 317-784-4235).

IOWA (Des Moines): **Walter Saur,** 120 E. Charles, Oelwein, Iowa 50662.

KANSAS (Topeka, Wichita): **Cletus J. Pottebaum,** 6503 E. Murdock, Wichita, Kan. 67206 (phone 316-683-3963).

KENTUCKY (Louisville): **Ray H. Sanders,** 2517 Windsor Forest Dr., Louisville, Ky. 40272 (phone 502-935-8208).

LOUISIANA (Alexandria, Baton Rouge, Bossier City, Monroe, New Orleans, Shreveport): **John H. Allen,** 10064 Heritage Dr., Shreveport, La. 71115 (phone 318-797-3306).

MAINE (Limestone, N. Berwick): **Arley McQueen, Jr.,** 153 Jelliegh Dr., Wells, Me. 04090 (phone 207-646-2718).

MARYLAND (Andrews AFB, Baltimore): **Thomas W. Anthony,** 4111 Carriage Dr., Temple Hills, Md. 20031 (phone 301-894-0067).

MASSACHUSETTS (Boston, Falmouth, Florence, Hanscom AFB, Lexington, Taunton, Worcester): **Zaven Kaprielian,** 428 Mt. Auburn St., Watertown, Mass. 02172 (phone 617-924-5010).

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MISSISSIPPI (Biloxi, Columbus, Jackson): **Don Wylie,** P. O. Box 70, Biloxi, Miss. 39533 (phone 601-374-3611).

MISSOURI (Kansas City, Knob Noster, Springfield, St. Louis): **William A. Dietrich,** P. O. Box 258, Kansas City, Mo. 64141 (phone 816-561-2134).

MONTANA (Great Falls): **Lucien E. Bourcier,** P. O. Box 685, Great Falls, Mont. 59403 (phone 406-453-1351).

NEBRASKA (Lincoln, Omaha): **Lyle O. Remde,** 4911 S. 25th St., Omaha, Neb. 68107 (phone 402-731-4747).

NEVADA (Las Vegas, Reno): **James L. Murphy,** 2370 Skyline Blvd., Reno, Nev. 89509 (phone 702-786-1520).

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WASHINGTON (Seattle, Spokane, Tacoma): **Harry E. Goldsworthy,** South 3040 Parkwood Circle, Spokane, Wash. 99203 (phone 509-534-5739).

WEST VIRGINIA (Huntington): **James Hazelrigg,** Rt. 3, Box 32, Barboursville, W. Va. 25504 (phone 304-736-9337).

WISCONSIN (Madison, Milwaukee): **Kenneth Kuenn,** 3239 N. 81st St., Milwaukee, Wis. 53222 (phone 414-747-5300).

WYOMING (Cheyenne): **Linn A. Wallace,** 409 Saddle Dr., Cheyenne, Wyo. 82001 (phone 307-771-6988).

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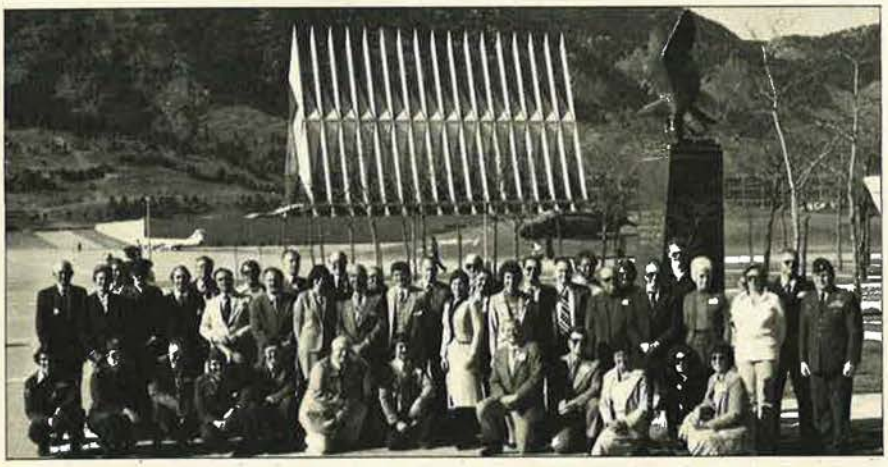
AFA NEWS

Chapter and State Photo Gallery

By Dave Noerr, AFA AFFAIRS EDITOR



Forty-four educators from Colorado, Idaho, Kansas, Montana, Pennsylvania, Utah, Wyoming, and the District of Columbia attended the Fifth Annual Aerospace Education Leadership Course held recently at the Air Force Academy in Colorado. The theme of this year's course was general aviation. The Leadership Course was sponsored by the Rocky Mountain Liaison Region/Civil Air Patrol and Colorado State AFA.

AFA Executive Director Russell E. Dougherty, left, was on hand recently to help Wichita Falls, Tex., Chapter Vice President Hal Layhee, right, present essay scholarship awards from the Chapter to the three winners. Joanie Hastings, second from right, won first prize of a $100 savings bond. Miss Hastings is the daughter of Col. and Mrs. Jack Hastings. Donna Zych, center, daughter of Col. and Mrs. Leonard Zych; and Jeff Corder, son of Mr. and Mrs. John J. Corder III, were the runners-up and received $50 savings bonds.

During Air Training Command's recent NCO Academy graduation, TSgt. Sheila A. Cowan, Randolph AFB, Tex., received the ATC Commander's Honor Graduate Trophy from CMSgt. Emory E. Walker, left, Senior Enlisted Advisor for ATC, representing ATC Commander Gen. Bennie L. Davis. Sergeant Cowan also received AFA's Honor Graduate Plaque from Alamo Chapter representative Bruce Eberhart, right.

Mrs. Shirley T. Foley was selected recently as the Huron Chapter's Civilian of the Year for her years of outstanding performance as Secretary to the Wing Commanders at Wurtsmith AFB, Mich. Mrs. Foley received a certificate designating her Civilian of the Year from Huron Chapter President Sigvard Swanberg. (Photo by Capt. Barry McQueen, USAF)

CALENDAR OF EVENTS

June 5–7, **Oregon State AFA Convention,** Portland . . . June 6, **Idaho State AFA Convention,** Boise . . . June 12–13, **Alabama State AFA Convention,** Mobile . . . June 12–14, **Illinois State AFA Convention,** Belleville . . . June 19–21, **New York State AFA Convention,** Niagara Falls . . . June 20, **Massachusetts State AFA Convention,** Bedford . . . June 26–27, **South Carolina State AFA Convention,** Charleston . . . June 26–28, **New Jersey State AFA Convention,** Cape May . . . June 26–28, **Texas State AFA Convention,** San Antonio . . . July 10–12, **Michigan State AFA Convention,** Detroit . . . July 17–18, **Ohio State AFA Convention,** Youngstown . . . July 17–19, **Pennsylvania State AFA Convention,** Hershey . . . August 13–15, **California State AFA Convention,** Lompoc . . . August 14–16, **Missouri State AFA Convention,** Springfield . . . August 21–22, **Colorado State AFA Convention,** Colorado Springs . . . September 14–17, **AFA National Convention,** Washington, D. C. . . . October 2–3, **Arkansas State AFA Convention,** Fayetteville.

The Middle Georgia Chapter donated $250 to the local chapter of the Air Force Sergeants Association to help the AFSA adapt headsets so that those with hearing impairments may be able to listen to television. The local AFSA chapter will distribute the headsets to those in the middle Georgia area who need them. Middle Georgia Chapter Secretary Janet Ferrand tries out one of the adapted headsets as AFSA member Walt Thompson looks on.

Arizona State AFA President John P. Byrne, left, looks on as Liston T. "Zack" Taylor, right, Vice President of AFA's Far West Region, presents a Chapter charter to Luke Chapter President Fred Lustig during an inaugural dinner held in March at the Luke AFB, Ariz., Officers' Club. The recently formed Chapter has more than 300 charter members.

A1C Renetta Smithson (since promoted to senior airman), a security policeman and Sheppard Technical Training Center's Airman of the Year, recently received a plaque honoring her as Airman of the Year from Wichita Falls Chapter President Dr. Art Beyer during a meeting of the Chapter at Sheppard AFB, Tex. (Photo by David Hernandez)

Hawaii Chapter President William B. Taylor, right, presents a painting of what is now PACAF Headquarters as it looked during the Japanese attack on Pearl Harbor and Hickam Field to Lt. Gen. James D. Hughes, Commander in Chief of Pacific Air Forces. The painting, by M. S. McMillan, will hang in the lobby of the main entrance to the Hq. PACAF building. (Photo by Bill Seto)

AFA NEWS PHOTO GALLERY

Mrs. Evlyn Wilcox, right, President of the San Bernardino Chapter, signs a check from the Chapter for one percent of the Norton AFB, Calif., goal for the Air Force Assistance Fund. Others participating in the signing ceremony include (from left): Maj. Larry Curtis, 63d Military Airlift Wing AFAF project officer; SSgt. Robin Hedrick, Air Force Aid Society representative; CMSgt. Joe Sains, Air Force Enlisted Men's Widows and Dependents Home Foundation representative; Col. Claudius E. Watts III, 63d MAW Commander and Air Force Village representative; and Maj. Al Rivers, AFA drive project officer.

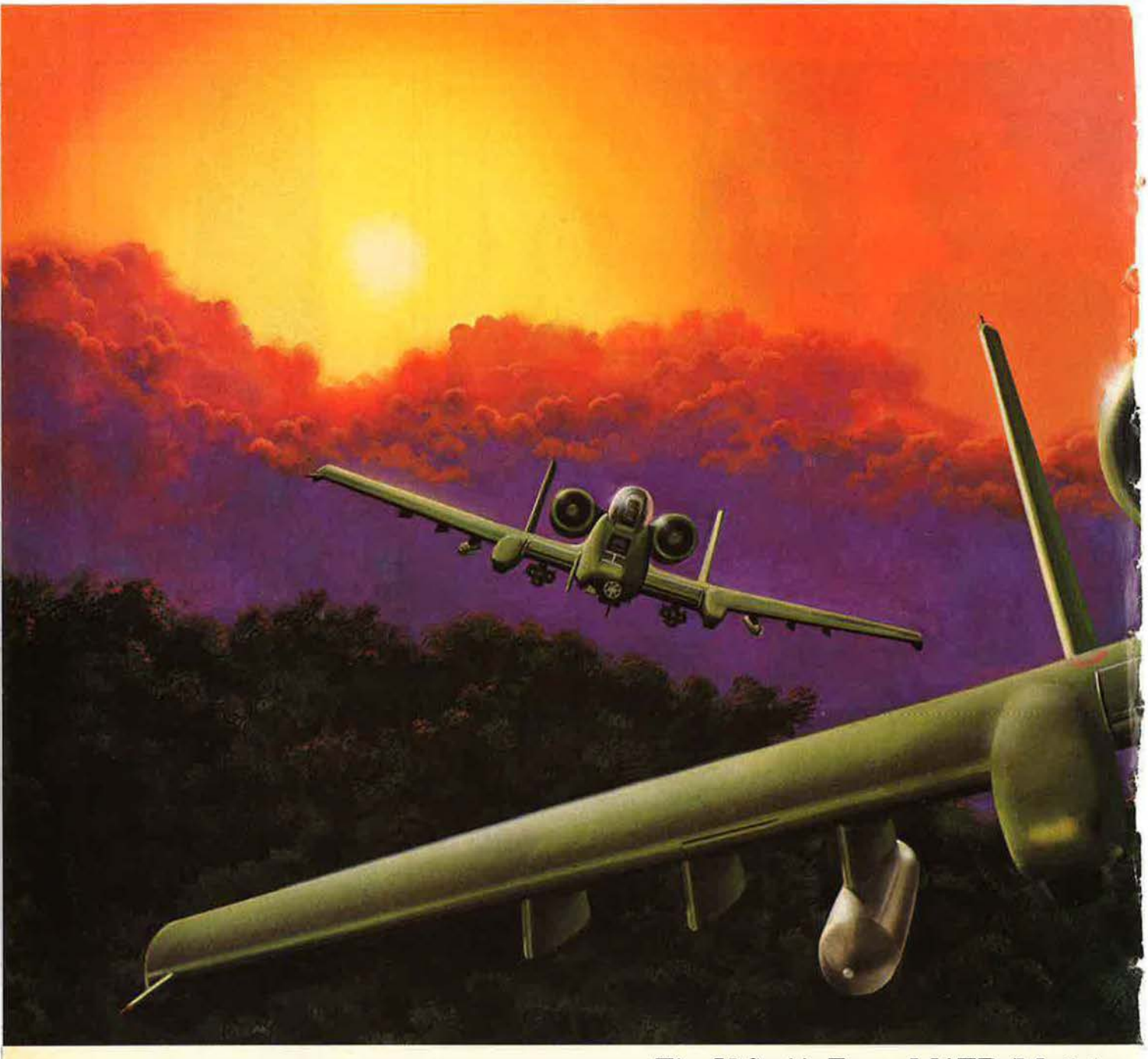
During the Fresno Chapter's recent Sixteenth Annual Air Force Honors Night Banquet and Awards Ceremony, two Fresno natives were honored for their combined total of more than seventy years of military service. Col. Ronald H. Markarian, USAF (Ret.), left, and retired Col. George R. Lindsey, ANG, right, were presented California State Senate commendations during the formal dinner. California State AFA President Richard Doom, second from right, also presented a national AFA citation to Fresno's 144th Fighter-Interceptor Wing, California ANG, during the meeting. The 144th FIW was the 1980 William Tell meet champion. The keynote speaker at the ceremony was humorist and AIR FORCE Magazine's "There I Was . . ." cartoonist Bob Stevens, second from left.

LEFT: During a recent Las Vegas Chapter Dinner, Chapter President Bob McLellan presented an AFA Life Membership to Civil Air Patrol member Kathy Perry. Mr. McLellan serves also as Deputy Commander of the local Civil Air Patrol squadron. RIGHT: During the Chapter Dinner, Mr. McLellan also presented Chuck Joeckle of the Linder Travel Service a certificate designating it a Community Partner. The Linder Travel Service is the most recent Community Partner of the Chapter. Fred Walter, right, representing the Chapter's first Community Partner, recruited Mr. Joeckle for the program.

Ed Terrill, center, a senior at Irving High School, Tex., accepts a check from Lt. Col. Peter Weber, USAF (Ret.), AFA's Dallas Chapter Awards Vice President. Mr. Terrill won the award for his essay "National Defense–Whose Responsibility?" The essay was chosen as the Dallas entry in the Texas State AFA/Earle North Barker Scholarship Contest. Also present at the ceremony was Mr. Terrill's English teacher, Mrs. Gelene Simpson.

D. N. Masone, left, President and Chief Executive Officer of the Air Force Enlisted Men's Widows and Dependents Home Foundation, accepts a check from Eglin Chapter President Lake Hamrick during a recent meeting of the Chapter at the Eglin AFB, Fla., Officers' Club. The check is part of the proceeds from a Bob Hope Benefit Show held last year for the Foundation.

The "Cream of the Crop" at Chanute AFB, Ill., were recently presented engraved wrist watches at the quarterly banquet of the Illini Chapter. Those attending the banquet included (from left): Illinois State AFA President Kurt Schmidt; Capt. Leo Ward, Junior Officer of the Year; SrA. Tom McEllin, Airman of the Year; TSgt. Carl Anthony, NCO of the Year; MSgt. George Hall, Senior NCO of the Year; and Maj. Gen. Frank Elliott, USAF (Ret.), Vice President of the Illini Chapter.



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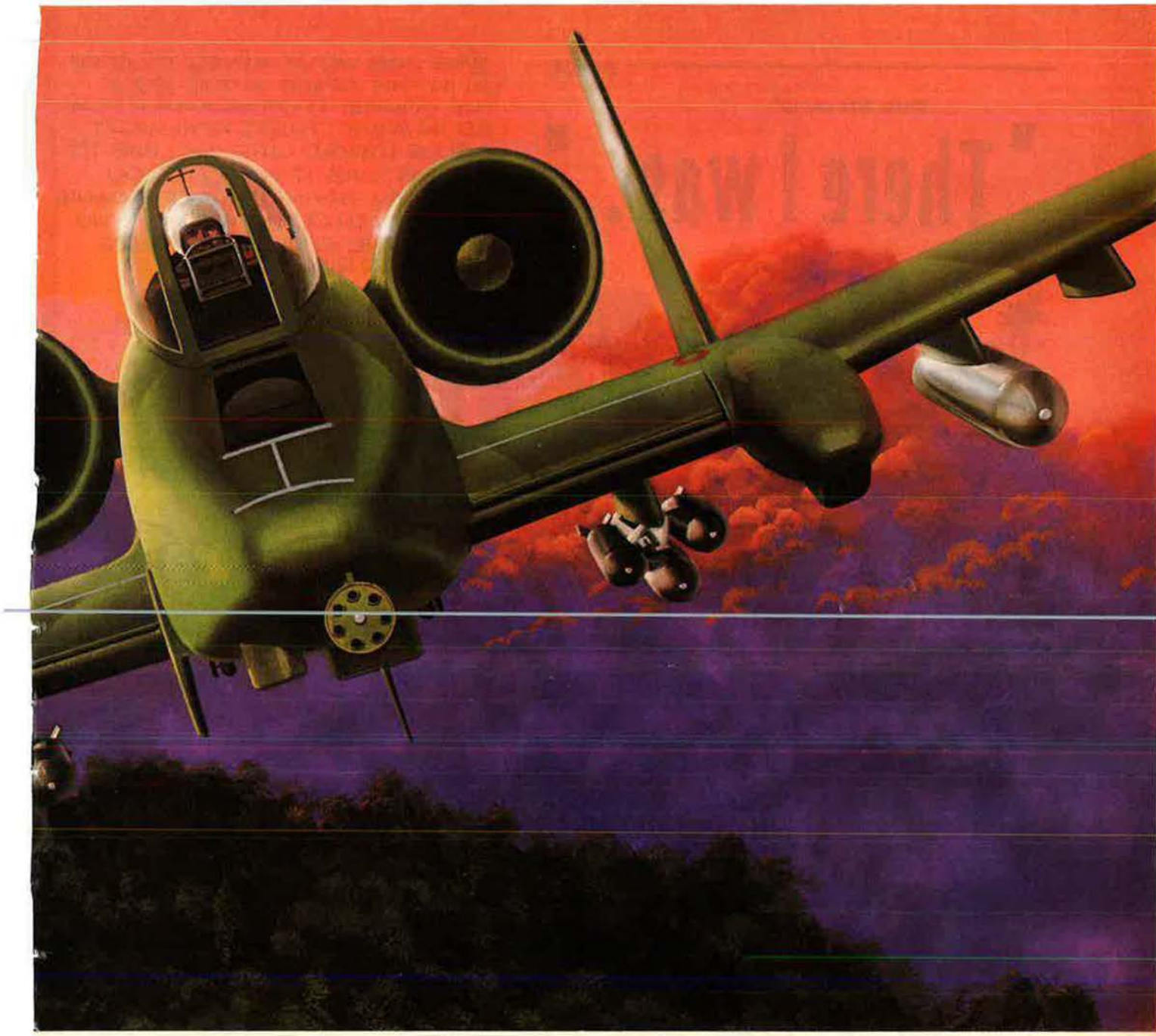

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KC-10

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