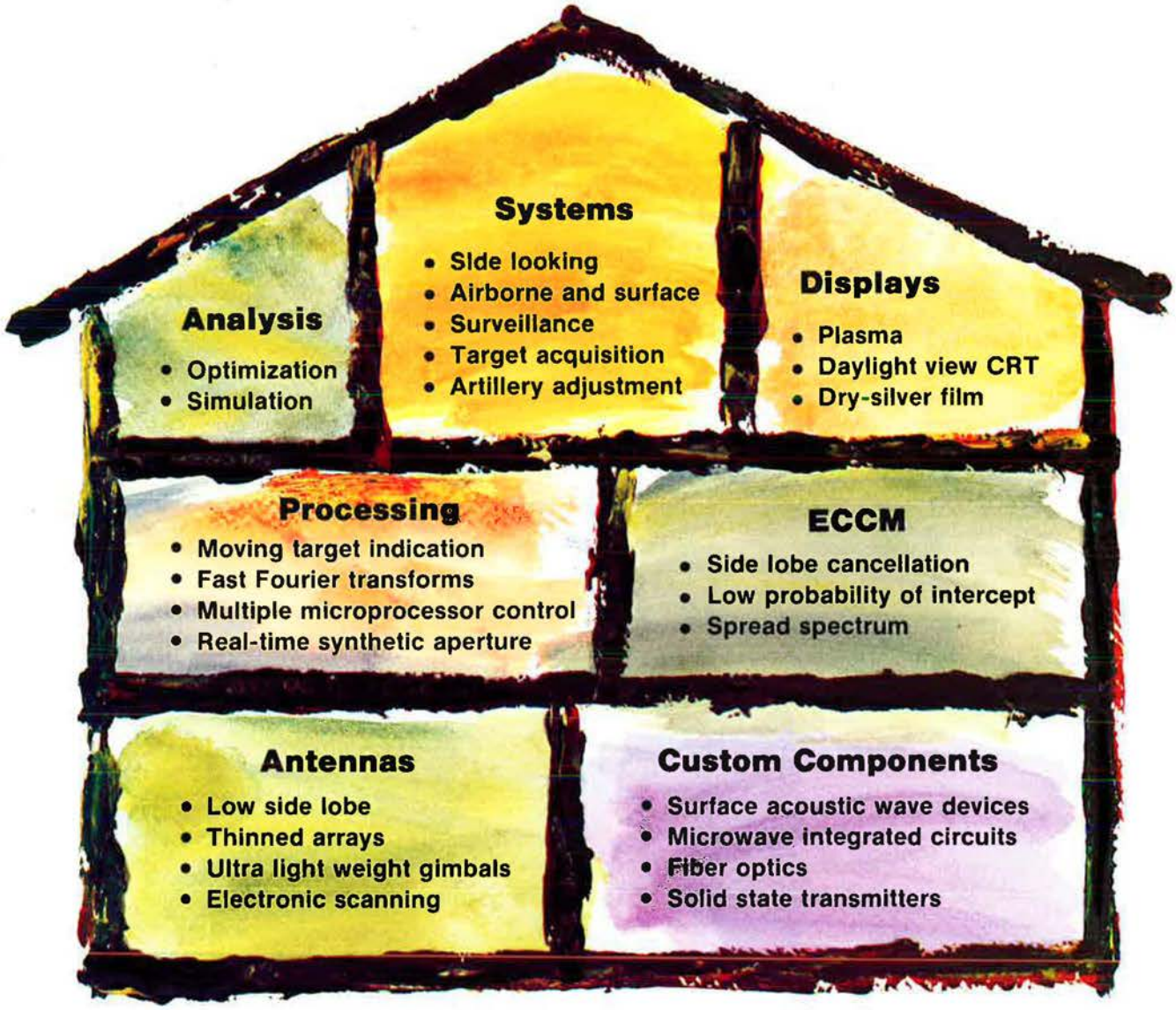
OCTOBER 1977/$1

AIR FORCE MAGAZINE

PUBLISHED BY THE AIR FORCE ASSOCIATION

A SINGLE FIGHTER STRIKE FORCE:
New Tactics from New Technology

The RADAR HOUSE that Motorola built.



When people talk about airborne and ground radar surveillance, target acquisition, and artillery adjustment--with the technology necessary to solve today's problems--you'll hear the name Motorola. The capability developed over the past two decades has earned us the reputation of a radar house known for quick turn-around conversion from advanced technology to production hardware.

Perhaps our most important single capability is the essential integration know-how so vital to putting complex systems together and making them work. Quickly. Reliably.

If you're interested in advanced approaches resulting in low-cost solutions involving airborne or ground radar systems, call Tucker Benz at 602/949-4441 or write to him at Motorola Government Electronics Division, P.O. Box 2606, Scottsdale, AZ 85252.

And we're an Equal Opportunity Employer looking for more top engineers interested in the new things our fast-growing, aggressive team is doing at Motorola's Radar House.

MOTOROLA

AIR FORCE MAGAZINE
PUBLISHED BY THE AIR FORCE ASSOCIATION

OCTOBER 1977
VOLUME 60, NUMBER 10

This Month

ABOUT THE COVER

The McDonnell Douglas F-15 Eagle was among several aircraft types participating in an Air Intercept Missile Evaluation (AIMVAL) exercise earlier this year at Nellis AFB, Nev. Maj. Gen. Frederick C. "Boots" Blesse, USAF (Ret.), reports results that "will produce the first real change in aerial tactics since World War I." See story on p. 34.

Departments

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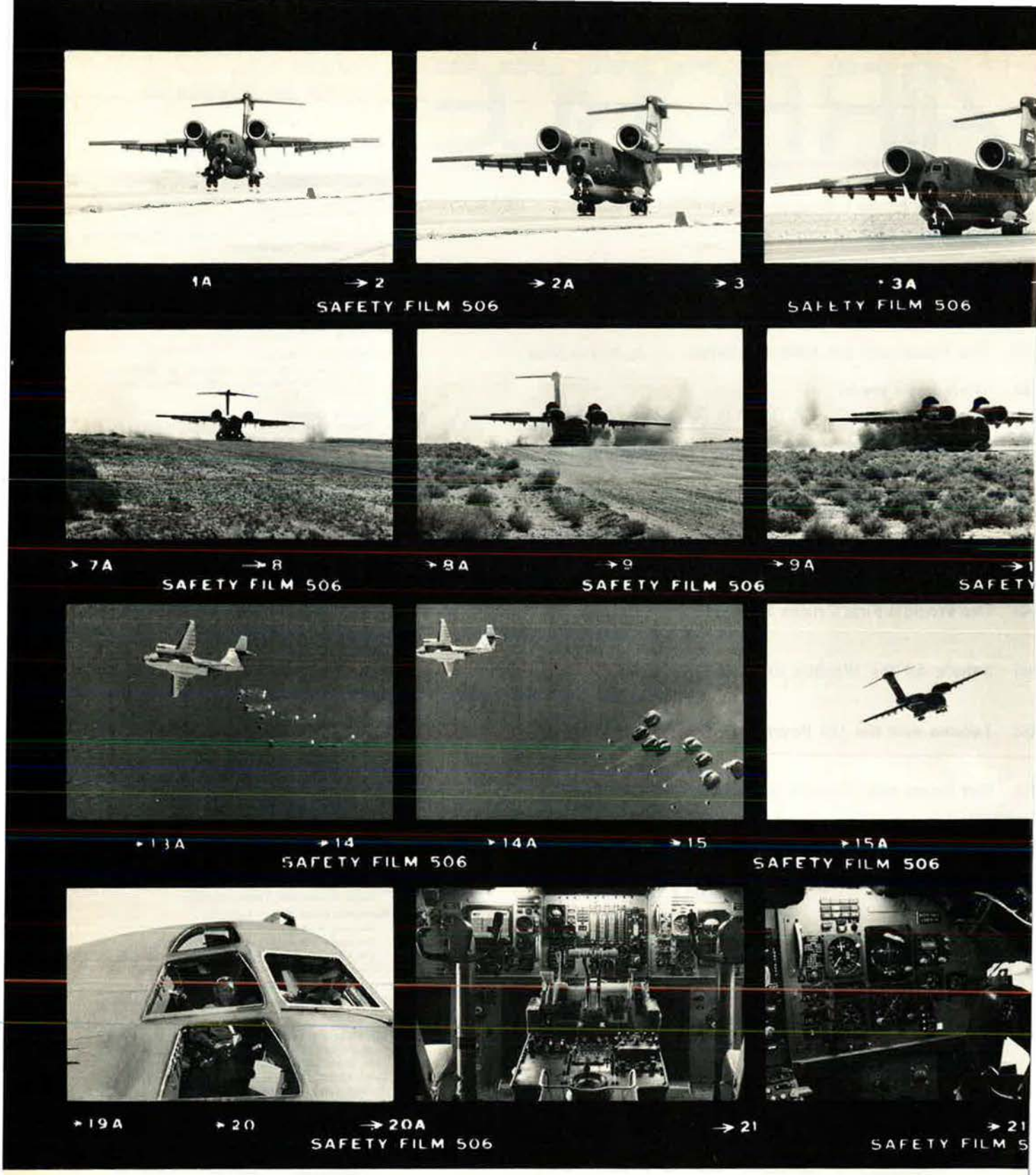


A 100,000 MILE REPORT ON THE YC-1

After 600 hours in the air and over 100,000 miles, the U.S. Air Force has completed its flight test program for the Boeing YC-14.

For a year they put the YC-14 through its paces. Flew her in good and bad weather. In and out of unimproved airfields. Empty and loaded.

They made over 900 short-field la ings. And sometimes stopped in less four airplane lengths.

This summer, they scheduled the

4 for a month-long trip. She visited
ports and flew 58 scheduled flights,
ling 7 sorties in one day.
nich is pretty remarkable for a brand new prototype airplane.

We're grateful to the USAF YC-14 test pilots. They've helped us prove what we've been saying all along.

That the YC-14 is the reliable answer for the AMST program.

BOEING YC-14

AN EDITORIAL

Pillars of SALT

By John L. Frisbee, EXECUTIVE EDITOR

IN our May issue, Dr. John F. Lehman, a former Deputy Director of the Arms Control and Disarmament Agency, observed that for those immersed in SALT negotiations, "a treaty (any treaty) is the grail, its contents not really a major focus of the machinery." That can also be true for an administration with a messianic vision of a generation of peace, or an unproven administration out to display its virtuosity in the field of foreign policy.

We don't find the Carter Administration's defense policy—as best we can understand its ebb and flow—wholly compatible with our views on national security. But at least the President and his advisors have not blundered with unseemly haste into another pact comparable to the SALT I Interim Agreement on strategic offensive systems that was signed in Moscow five years ago, and which expires on October 3 of this year.

That Agreement codified for five years US numerical inferiority in ICBMs and SLBMs, and also inferiority in missile throw-weight—the latter setting the stage for a potential Soviet advantage in deliverable warheads. But never mind. The Soviet advantages would continue to be canceled out by our superiority in MIRV and guidance technology, and by our strategic bomber force, it was said.

Well, all this has worked out, but not quite as advertised in 1972. The USSR, of course, still leads in numbers of missiles and in throw-weight, but the US technological lead on which we counted so heavily has narrowed a good bit.

The B-1, which was to modernize our bomber force, has been canceled, apparently with no *quid pro quo* from the Russians, and the air-launched cruise missile —again apparently—is to be range-limited to 1,550 miles, which really makes it a tactical, rather than a strategic, weapon. Not much has been said about the vast disparity between the deteriorating US and the growing Soviet air defenses and what that imbalance does to our lead in manned bombers. And until a few weeks ago, no US administration has showed much concern over Soviet civil defense as it relates to SALT.

In 1972, we believed that the US and the USSR were in a position of essential equivalence, if that term is taken to mean that neither side had an assured first-strike capability and neither could rationally anticipate anything but a net loss from nuclear war. We believe that essential equivalence exists today. But the spectrum of essential equivalence is broad, indeed. In five years, the US position has shifted from the high to the low end o that spectrum.

Now, in mid-September, it seems certain that a new SALT agreement on offensive weapons will not be signed by the expiration of the Interim Agreement on October 3. Probably the Agreement will be extended while SALT I negotiations continue.

Administration spokesmen have said that, through SALT, they seek deterrence, stability, and essential equivalence, but not strategic nuclear superiority. We agree with that goal, granting that one man's essential equivalence may be another's inferiority. If it can be reached on a verifiable basis, the strategic nuclear forces of both sides will have been, in effect, neutralized, so we further agree that a reduction in numbers on both sides makes sense.

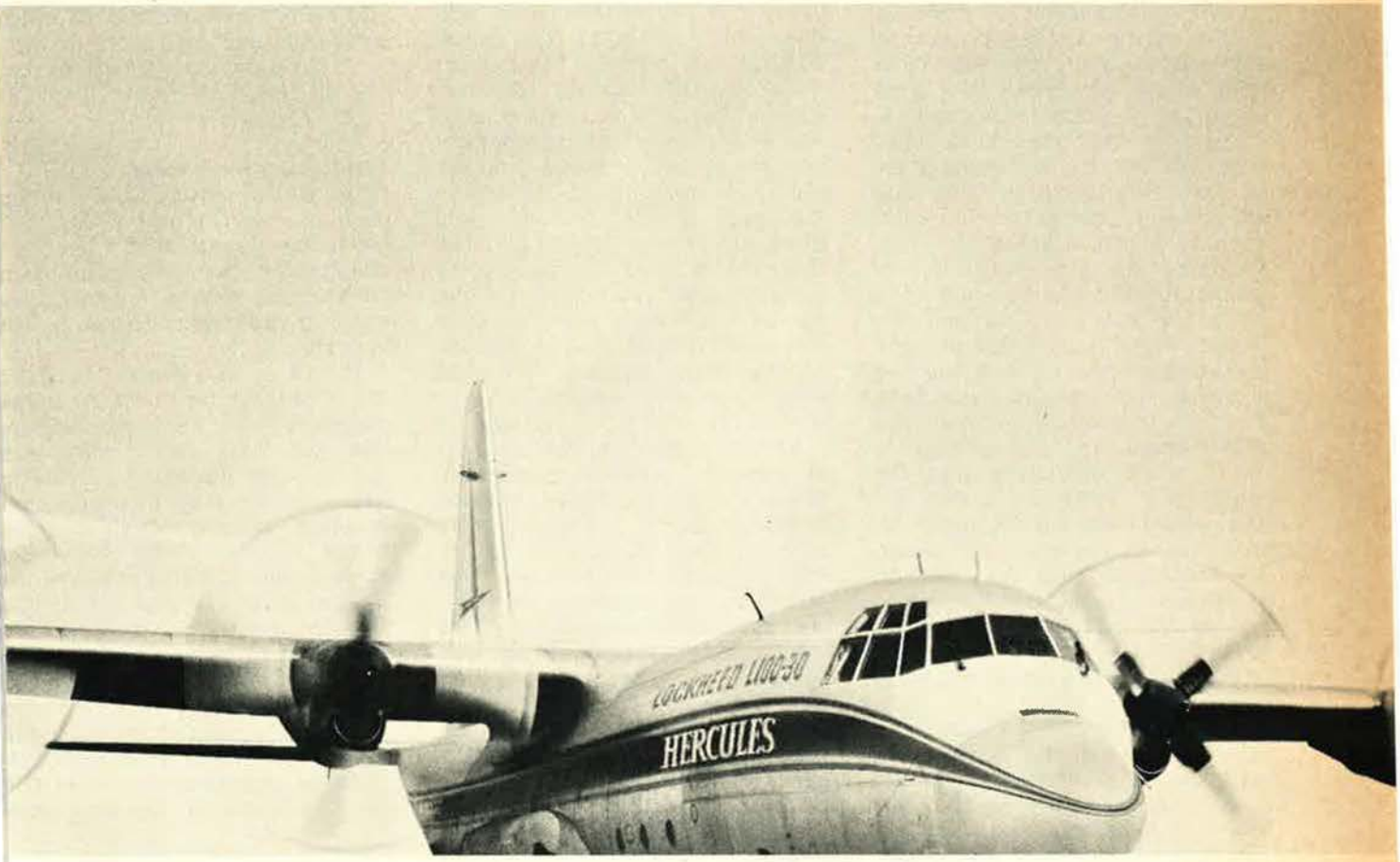
In this search for mutual security—or as Thomas Etzold more accurately puts it in his article beginning on page 38, mutual "unacceptable insecurity"—we believe that negotiations should be broadened to include at least two areas that previously have not been part of the play: air defense and civil defense.

As the US lead in missile technology narrows, SAC's bomber force should assume even greater importance as a make-weight. Yet the US lead in intercontinental bombers (470 US to 170 for the USSR, including Backfire but excluding 305 Tu-16s) is dramatically reduced by the Soviet lead in both manned interceptors (2,650 to 331) and strategic surface-to-air missiles (12,000 to zero). Some adjustment would seem to be in order here.

Soviet civil defense and war survival preparations are several orders of magnitude greater than ours. If the Kremlin genuinely shares our interest in stable deterrence based on essential equivalence, then we should seek, and they should agree to, a proportional increase in US strategic offensive capability to offset the Soviet advantage in defensive measures.

On the other hand, if the Soviets are not genuinely interested in mutual and stable deterrence—if it becomes clear that they are indeed using SALT as a means of gaining strategic superiority, as many analysts believe they are—the game should be brought to an end. We should not allow negotiations to continue indefinitely while the US slides gradually off the low end of the essential equivalence spectrum, with all that could mean in terms of reduced national prestige, economic adversity and ultimate survival as a free society.

The world's biggest airlift bargain.



Those whirling Hercules props are one of the answers to soaring fuel costs.

As fuel prices rise, Hercules looks better and better to nations and airlines that need big airlifters. Or search-rescue planes. Or photo-mapping planes, forest fire fighters or ski aircraft able to handle Arctic conditions.

Whatever the mission, the propjet engines of the versatile Hercules use far less fuel than even the best fanjet engines available. Those whirling blades biting the air will save hundreds of thousands of dollars over the life of each Hercules.

Saving money for nations and airlines has become a habit for Hercules and Lockheed's airlift experts. It costs millions and millions of dollars less to make a new plane out of an existing one than to build one from scratch. That's what Lockheed's airlift experts have been proving for years as they find new ways to make this remarkable plane even more versatile and effective since it first flew.

Payload is up 26%. Engine power, up 20%. Range stretches out 52% farther. Cruise speed is 11% faster. And structural life has risen 100%.

Hercules the weight-lifter is also Hercules the money-saver. In many ways for many nations and airlines. It just keeps getting better and better.

Lockheed Hercules

Lockheed-Georgia Company

Airmail

Pershing's Words of Wisdom

Following is a quotation by General of the Armies John J. Pershing:

"All we can say is that through the years we, the people, and those who make our laws, have gone from bad to worse, learning little, doing less, still prejudiced, lulled into inaction by an unwarranted sense of security and by false ideas of economy, instead of using plain, practical common sense and making reasonable provision in time of peace for the maintenance of a moderate policy of national defense. . . . A group of pacifists, who, by carrying placards and applying epithets, think they can end wars, proclaim in favor of our complete disarmament as a beginning to world peace, entirely ignoring the experience of the World War and the palpable fact that we should be in a class by ourselves and probably become at once the object of aggression by wiser nations. It is one of the inconsistencies of this group to be among the first to demand protection at home and intervention abroad."

After thirty years of military and civil service with the Defense Department, I find the quotation apt today, especially in view of your many articles dealing with the threat to this nation. When the substance of the Pershing quote is applied to the recent B-1 decision, it should give pause to those who think that national defense can be purchased at rummage sales. . . .

I am fascinated by the last sentence of the quotation and its application today. I am also disgusted at the lack of appreciation of history by many of our elected leaders. Perhaps they should read the two-volume work, *Black Jack, The Life and Times of John J. Pershing,* by Frank E. Vandiver. That is where I found this pertinent observation.

A. M. Ulrich
Dayton, Ohio

A Warm Fuzzie to Us

I just finished reading the August '77 magazine and would like to send a "warm fuzzie" to the editorial staff. I have been a long-time member of AFA and have read and enjoyed the magazine over the years. I found the August '77 edition to be the best. Lt. Gen. Daniel O. Graham's article, "The Decline of US Strategic Thought," provided a comprehensive and thought-provoking review of the development of, or lack of, a sound strategic policy. I feel certain the phase managers at Air Command and Staff and Air War College will have it on the required reading list. His comment that "The cold fact is that the US can survive and prosper in this world with or without any one of the hotly debated individual weapon systems" was reassuring in light of the recent B-1 decision.

Gen. T. R. Milton's "NATO's Year of Decision" provided a brief historical perspective, current thinking in NATO, and a challenge to the reader to look forward in the immediate future for NATO initiatives to enhance its capability "or else." His comments regarding NATO's "antiquated decision-making machinery" were appropriate and were the topic of much discussion by faculty and students last year when I attended ACSC. Hopefully this area is being addressed in NATO's political arm.

Lastly, Ed Gates's "USAF: Institution or Occupation?" was a thorough AFA review of a topic currently on "front burner." I made the article available to all my military and civilian members.

Maj. C. L. Martin, Jr.
USAFA/ACF
USAF Academy, Colo.

At Long Last!

I am several years overdue in writing to you about the fine job you and the staff of AIR FORCE Magazine have been doing. Your outstanding work has been mentioned to me several times by friends of mine who are members of the other services, and I also have noted the complimentary "red ink" remarks by General Greene, USMC (Ret.).

Congratulations to all of you on the timeliness and newsworthiness of your articles, as well as their comprehensiveness and breadth and depth of coverage. The June issue, in particular, has articles of interest for the entire Air Force family. Your issues containing special items such as "The Military Balance" and "The Annual Reports" are likewise very professionally done.

There is no question but that we're all most proud of AIR FORCE, and I promise to correspond again before the next century.

Lt. Gen. John B. McPherson,
USAF (Ret.)
Alexandria, Va.

The Great Balloon Bust

I note with dismay that the wording used in my "There I Was . . ." panel for August 1977 had been changed in the last scene from "antiaircraft balloons" (which they were) to "barrage balloons" (which they were not).

The latter term evolved in WW I and described the function of the observers aloft to direct artillery (barrage) fire. The former was developed to discourage low-flying Nazi bombers from attacking London and other strategic targets. (Some Heinkel 111Ks even had cable-cutters mounted ahead of the wing to sever the steel cables that held the "sausages" aloft.) No observers were carried in these balloons and no barrages directed therefrom. Pictures of the damage to low-flying aircraft done by the cables from these antiaircraft balloons as well as their correct title may be found in Gurney's book *War in the Air.*

Bob Stevens
Fallbrook, Calif.

• *Mr. Skinner, Managing Editor, replies: "I had heard of the accursed barrage balloons before, but 'antiaircraft balloons' were a new one on me. 'Tis surely a sign that I have led a sheltered life.*

"In this obviously ill-starred judgment, I was, I fear, bolstered and backed up, as it were, by The United States Air Force Dictionary *edited by Woodford Agee Heflin of the Research Studies Institute [now the Albert F. Simpson Historical Research Center], Air University, Maxwell AFB, Ala. The listing on page 48 includes antiaircraft artillery and antiaircraft barrage but none for antiaircraft balloon. Whereas, on page 73, one finds to one's shame and chagrin, the entry for barrage balloon, defining the*

object as 'A moored balloon, usually one of several, to protect vital areas or installations against low-flying airplane attack. Also called "obstruction balloon."'

"You can see why I fell into the subtle trap laid for me by Woodford Agee Heflin."

I understand that you have been exercising the blue pencil fetish of all editors and mucking about (in the vernacular of my birthplace) with the wording of Bob Stevens' recent tribute to the immortal Pilot Officer Prune, RAF.

Stevens described Britain's lumpy contribution to World War II air defences (that's the way we spelled it; it is, after all, the Queen's English, not the President's English) as: "anti-aircraft balloons."

You changed that reference to "barrage balloons."

Both descriptions are technically accurate. But your spelling is in total error.

Anybody who has ever been exposed, nay shattered, by what native Londoners can do to pronunciation knows that for true understanding of English as she is spoken, British words should be spelled phonetically.

Therefore, a "barrage" balloon must be written as "barridge" balloon. As in "garidge" (where one stores one's motor car) or "savidge" (fictional general in *Twelve O'Clock High* or early settlers in these colonies) or "marridge" (what no RAF fighter pilot ever takes seriously).

Incidentally, barridge balloons and/or anti-aircraft balloons produced some strange moments during World War II.

Leaks were a common problem and after a night on station over London, most balloons assumed the aesthetics of impotent knackvurst. During storms, they functioned rather like Ben Franklin's early experiments with kites and electricity—much to the dismay of balloon attendants in Hyde Park who had a habit of hanging on to the cables while chatting up adoring WAAFs.

The Luftwaffe, of course, built a countermeasure to the barridge balloon. It was a Heinkel 111 surrounded by a steel circle designed to cut the balloon cables.

Unfortunately, on impacting the cable, the first Heinkel spun on its vertical axis, cut through the flagpole atop Buckingham Palace, mowed seventy-five miles of grass on Salisbury Plain, and was last seen skipping across the Irish Sea toward Dublin.

As a result of this, the Germans moved ahead of the world in Frisbee research.

Paul Dean
(Ex-Pilot Officer, RAF)
Aviation Editor
The Arizona Republic
Phoenix, Ariz.

Money Well Spent

I found your recent article concerning the abolishment of flying pay [June '77 "Bulletin Board"] to be of great interest. It is beyond my comprehension why the military would deem it necessary to give pilots extra pay for incentive when there are so many young, enthusiastic, well-qualified AFROTC and OCS applicants being turned away.

I decided to do some research and found that OCS has all but abolished UPT and UNT for applicants. They only expect to place about fifteen out of an estimated 160 requests for flying status. Subsequently, I checked with various AFROTC detachments and to my surprise discovered much the same situation. It seems, with cutbacks, 1976 was an especially bad year for graduates trying to enter UPT and UNT. It doesn't appear that 1977 is too much better.

Thus, since the Air Force is supposed to be operating as efficiently as possible, I ask you why doesn't the very basic law of supply and demand enter into this question of flying pay? It seems quite obvious that an abolishment of flying pay will not only save the government millions but will at the same time reduce the number of applicants interested in flying for monetary purposes. Flying pay has no place in a peacetime Air Force that presently can't provide flying positions to all qualified applicants.

One might even carry this line of reasoning a step further and say that the money saved on flying pay could be used to give pilots increased flying hours for increased proficiency. However, I'm sure there are many other areas where this money could be directed.

John A. Loftus
Danvers, Maine

• *Rated requirements, as we have reported, decreased in recent years, and input into pilot training from OCS and AFROTC has been cut accordingly. There is an overage of qualified applicants and USAF aims to keep it that way, for this assures very high-caliber trainees. And the flying pay helps attract this talent. Without flying pay, USAF officials fear that (1) the quality and quantity of UPT applicants would plunge; (2) washout rates would increase; (3) resignations among the rated force would soar and morale would drop; and (4) overall readiness would suffer.*—THE EDITORS

The JCS and SALT

It is with interest that I read Lt. Gen. Daniel O. Graham's fine article ["The Decline of US Strategic Thought," August issue], discussing the less than overwhelming contribution that the JCS seems to make, or is able to make, in the articulation of a "national strategy."

This brings to mind the "assurances" that Adm. Thomas Moorer, then Chairman of the Joint Chiefs of Staff, made in mid-1972 during congressional testimony; and the ostensible basis on which the JCS would lend its considerable support to the then recently concluded SALT I agreements in particular and to the ongoing SALT "process" in general. Indeed, in his memoirs, *On Watch*, Adm. Elmo R. Zumwalt stated, with respect to the "assurances," that the JCS believed "that the U.S. will have to pursue vigorously our strategic programs planned or presently underway."

The essence of this position appears to have been generally endorsed in the so-called Jackson Amendment, conveying Senate support of the Interim Offensive Agreement, of September 30, 1972. This more or less established the principles of essential equivalence and equal aggregates. Short of these minimum nonnegotiable standards, the impression was clear that a SALT agreement would not be acceptable.

I would then, like to ask:

(1) What is the present JCS SALT position noting that one of

We suggest that readers keep their letters to a maximum of 500 words. The Editors reserve the right to excerpt or condense as required in the interests of space or good taste. Names will be withheld on request, but unsigned letters are not acceptable.

Airmail

its primary 1972 "assurances," the B-1 bomber program, has been peremptorily blown away by President Carter? and

(2) Is it still possible to negotiate an equitable and meaningful SALT II agreement based on the principles of essential equivalence and equal aggregates?

Jeffrey R. Thomson
Los Angeles, Calif.

• *(1) We wish we knew; (2) possible but not likely.*—THE EDITORS

Avionics Cost and Acquisition

Congratulations for continuing to bring the policymakers' views to the public. Lt. Gen. Alton D. Slay's July article ["An Air Force Avionics Policy"] is a strong statement of both the problem and the resolve of the policymakers to formulate a solution.

With General Slay's article as background, I have two additional observations on the avionics acquisition process:

1. A major factor in high aircraft modernization costs is the difficulty of incorporating new avionics into existing fleet aircraft. It is well known that the avionics in a new aircraft will be updated repeatedly over the life of the airframe, yet we still provide little capability for update or retrofit as part of an aircraft design. As a result, new capability must wait to be incorporated into an existing aircraft until a sufficient number of proposed changes have accumulated to reduce the average retrofit cost per system to an acceptable level. One result is that as an airframe ages, it tends to become further and further outdated in terms of the installed avionics equipment.

2. The two acquisition paths for avionics systems (via AFSC and AFLC) could be made to cross by requiring that all avionics be selected from a set of black boxes that have met certain requirements in the areas of performance, reliability, and interface standardization. To implement a policy of this nature requires some very bold steps on the part of senior management. The principal result should be a more global optimization of the avionics acquisition process, as opposed to the local optimization which results from the relative autonomy of the SPOs and ALCs.

Capt. Llewellyn S. Dougherty
Wright-Patterson AFB, Ohio

WW II Songs

I am compiling the words and music of World War II songs, particularly those that are not published "popular" songs available from music houses. I need your help.

All songs contributed and used will be acknowledged as to source or contributor.

Dr. Charles W. Getz
105 Braemar Dr.
Hillsborough, Calif. 94010

Vehement Disagreement

My comments are on the editorial "B-1 Aftermath," in the August issue. One part reads "A hole in our strategic force structure has been created," which reflects to me that President Carter's decision has put a hole in our strategic structure. I believe the President of the United States and, from what your article states, most members of Congress, knows better than you, the editor of AIR FORCE Magazine, what will and will not put a hole in our strategic force. And I do not believe the President of the United States would put a hole in our strategic forces.

I do think you are crying into your B-1 beer, as you put it, and I dislike your threat to, as you put it, "examine in detail and without mercy any and all palliatives that are proposed to compensate for the B-1's absence from the strategic scene." Which is just saying that whatever the President and the Secretary of Defense do to strengthen the strategic posture you will examine with intent to find fault, not the advantages. Your attitude is B-1 or nothing, and I disagree strongly that you attack the President on his tough decision he had to make.

I do not want to be just a number to the AFA. The telegram sent to President Carter, dated July 1, 1977, said "In the view of the 160,000 members of this Association, . . ." I am a member and I do not and have never supported the B-1 bomber. Do not include me as one of your numbers in the future criticizing anything you don't like without first asking me my position before you take a public stand.

I did not join AFA to support people running around Washington saying I stand for something which I don't.

I would, therefore, like to know how the AFA establishes its positions on issues of the day and who determines what the Air Force needs and doesn't need.

Sgt. Jerry D. Wolfe
Lubbock, Tex.

Equestrian Enthusiast

I have asked everyone this question and, so far, no one knows the answer: Is there such a thing as an Air Force horse show team? Almost every base has a saddle club, but is there a group of Air Force personnel who show as a team? If so, where could I contact them?

I am a fairly new AFA patron and must commend you for publishing an outstanding magazine.

Karen Clemens
Black Horse Ranch
10358 McBroom St.
Shadow Hills, Calif. 91040

• *The Community Relations Division of USAF Office of Information tells us there is no official Air Force equestrian team.*—THE EDITORS

Lost P-38 Pals

Any P-38 pilots who served with the 94th Fighter Squadron based in North Africa, April–June 1943, and/or flew this aircraft from Casablanca to Kunming, China, during July–August 1943, and/or flew with the 449th Fighter Squadron in China from September 1943–July 1944, who may remember me, please drop me a line. I've lost contact with old friends and would like to hear from them.

Gary Hammon
1980 16th Street, Apt. P-30-1
Newport Beach, Calif. 92660

UNIT REUNIONS

Air Commandos

The reunion of the Air Commandos will be held October 7–9, in Fort Walton Beach, Fla. All persons ever assigned to or associated with a USAF Air Command or Special Operations unit please contact

Air Commando Association
P. O. Box 7
Mary Esther, Fla. 32569

(Continued on page 11)

The Rocketdyne team is ready to join the Air Force. Again.

You might know us best for producing the Main Engines for the Minuteman III Post Boost Propulsion System and the propulsion systems for the Air Force Thor and Atlas.

The fact is, we have close to 30 years' experience designing, developing and manufacturing reliable propulsion systems for the nation's defense and aerospace programs.

Experience which provides us with a solid foundation on which to design, test and fabricate just about any Post Boost Propulsion System you're thinking of.

We're fully experienced in delivering producible systems on time, within budget.

We've come through time and time again on programs like Atlas, Gemini, Thor, Transtage, Lunar Ascent Engine, Lance and Minuteman III.

Plus the complete propulsion system for the Apollo program including the F-1 for launch, J-2 for 2nd and 3rd stages. The Lunar module ascent engine for takeoff from the moon. And the command module reaction control propulsion system for reentry.

We also know how to lend a hand to help keep major projects on schedule.

Rocketdyne is ready to take on the next big job — the Post Boost Propulsion System for the Air Force MX Program. We have the experience, the technology and the resources to do the job right. Right now.

Rocketdyne Division, Rockwell International, 6633 Canoga Avenue, Canoga Park, CA 91304.

Rockwell International

Five Ways to Outwit Budget Cutters in Airport Communications.

First, let's talk about cutting budgets for transmitters, receivers, transceivers, amplifiers, and direction finder systems. We'll concede, our illustrator's solution isn't the answer, but Motorola's VHF/UHF communications equipment can stretch tight budgets five ways.

1 - Reduces spares. Motorola's high module commonality throughout the entire VHF/UHF line means fewer spares are required. And that means you save money.

2 - Fights obsolescence. Module compatibility lets you mix and match as requirements change. Transform a unit by simply changing existing modules for new ones tailored to your new requirements. This building-block approach from the smallest module to entire units saves thousands of dollars in many applications.

3 - Cuts maintenance. Every piece of equipment has built-in self-monitoring and self-test available so a technician who can understand a manual and set a dial can check out this equipment in about ten minutes, or isolate a fault and get a unit back on the air in less than 15 minutes. There goes the need for in-depth backup, particularly with a minimum MTBF on the whole radio line of 8600 hours. And, the need for a big hunk of the budget.

4 - Saves space. Sometimes the biggest part of the problem is understanding the problem. We know how tight airport communications quarters can be and we have designed our equipment with low height profiles so more of it can be put in limited spaces. And, you won't have to worry about operating problems caused by the proximity of many antennas due to our excellent collocation characteristics.

5 - Lowers life-cycle costs. What all this adds up to is incredibly low life-cycle costs. And during the extended life cycle of Motorola equipment you will have enjoyed the outstanding performance of low noise high dynamic range receivers and the ability to punch your message through even under adverse conditions. And, all the radios are compatible with secure voice modems.

Matched antennas, microphones, interface and remote control units, and a bundle of other accessories are available to fill out your system requirements too.

So if you're worried about how to make ends meet, write to Jim Prebe at Motorola's Government Electronics Division, P.O. Box 2606, Scottsdale, AZ 85252, or call 602/949-3274. Outside the U.S.A. write Motorola, P.O. Box 8, Geneva, Switzerland.

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Other offices: Bonn • London • Paris • Rome • Utrecht • Toronto

Airmail

Air Rescue Association
All rescue, rescued, survivors, and spouses are invited to our reunion in Orlando, Fla., November 2–5. Membership and reunion information from

Air Rescue Association
5025 66th Avenue West
Tacoma, Wash. 98467

Class 40-G
The 37th annual reunion of Flying School Class 40-G will be held in El Paso, Tex., November 11–13. Contact

Col. H. H. "Gus" Wittrock
10229 Ridgewood
El Paso, Tex. 79925
Phone: (915) 598-5166

Class 52-B
The 25th reunion of Pilot Training Class 52-B will be held at the Casa Blanca Inn, Scottsdale, Ariz., November 2–6. Further details from

Dave Roberts
1900 Lake Lane
Plana, Tex. 75023
Phone: (214) 423-6893
or
Ron Littlefair
5512 Calle de Ricardo
Torrance, Calif. 90505
Phone: (213) 320-6451

Combat Pilots Association
The annual reunion-conference (Group Grope IV) of the Combat Pilots Association will be held in San Diego, Calif., November 10–13. Please contact

Blue Leader
Combat Pilots Association
P. O. Box 91253
Los Angeles International AP
Los Angeles, Calif. 90009
Phone: (213) 822-1755

Eagle Pass WASPS
A reunion of the Eagle Pass WASPS and Eagle Pass AAF personnel will be held November 4–6, in Eagle Pass, Tex. All WASPs are invited. Details from

Col. John H. Bundy, USAF (Ret.)
1612 Air Force Village
4917 Ravenswood Dr.
San Antonio, Tex. 78227

U-Tapao Vets
Veterans of U-Tapao Airfield, Thailand, are holding a reunion at Offutt AFB, Neb., October 14–15. Contact

Maj. Joe Bergmann
P. O. Box 13023
Offutt AFB, Neb. 68113
Phone: (402) 294-3035
Autovon 294-3035

WW I Pilots
Twenty World War I pilots in the Chicago area meet regularly at sixty-day intervals for cocktails and luncheon. Any WW I pilots in the area please contact

Sid A. Pierson
6301 N. Sheridan Rd.
Chicago, Ill. 60660

1936 Kelly Field Grads
There will be a reunion of all Kelly Field graduates of 1936, including Classes 25A, 25B, and 25C, in San Antonio, Tex., November 9–10, at the Sheraton Motor Inn. Further information from

Col. Al Ogden, Jr.
2735 Hitching Post Rd.
San Antonio, Tex. 78217
or
Ed Cullerton
7001 East 7th Ave.
Denver, Colo. 80220

55th ELINT Association
A reunion of the 55th is being held in Tucson, Ariz., October 7–10. Any members of the 38th, 340th, 343d, 4024th, or anyone in direct support between 1948–65, please contact

Robert A. Dibbell
8902 E. Maple Leaf Dr.
Tucson, Ariz. 85710

64th FW Sqdn.
The 64th Fighter Weapons Squadron is celebrating its 5th anniversary by sponsoring the first Aggressor reunion on October 14–15, at Nellis AFB, Nev. All past and present Aggressors and their wives are invited. Contact

Capt. Dave McCloud
or
Capt. Dave Bruns
64th Fighter Weapons Sqdn.
Nellis AFB, Nev. 89191
Phone: (702) 643-4405
Autovon 682-4405

99th Aero Sqdn/FEEF
The first annual reunion of the 99th Aero Squadron/FEEF will be held October 22, at Andrews AFB, Md. Further information from

Capt. Don Messier
9503 Caltor Lane
Oxon Hill, Md. 20022
Phone: (301) 248-8592

422d Night Fighters
Request that all former members of the 422d Night Fighters Sqdn., 9th AF, European Theater, WW II, forward their current address to

Leslie L. Craig
3405 Woodvale Dr.
Midwest City, Okla. 73110

446th Bomb Group, 704th Sqdn.
The 446th Bomb Group, 704th Squadron, is holding a crew reunion at the Pittsburgh Hilton Hotel, Pittsburgh Pa., October 15–16. Need help in contacting Edward Sankey, Buffalo, N. Y.; Hap Daubert, Norristown, Pa.; and Frank Forster, Bronx, N. Y.

Donald E. Roberts
337 Glaser Ave.
Pittsburgh, Pa. 15202
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Aerospace World News, Views & Comments

By William P. Schlitz, ASSISTANT MANAGING EDITOR

Washington, D. C., Sept. 7

★ The second free flight of the Space Shuttle Orbiter *Enterprise* was to take place September 13.

But it was the first—on August 12—that proved the crowd pleaser. And what a crowd! Carried live on the networks, the flight was witnessed by millions who were treated to a stunning pictorial vision of *Enterprise* being borne aloft by its 747 Shuttle Carrier Aircraft with T-38 chase planes in close pursuit. Then came separation from the 747 and a seemingly trouble-free and powerless glide to the dry lake bed at Edwards AFB, Calif.

Separation required precision and timing. The mated craft at 28,205 feet (8,596 m) pitched over in a six-degree dive angle to reach the required separation speed of 270 KEAS (Knots Equivalent Airspeed) or 310 mph. Then, the 747 crew—Fitz Fulton and Tom McMurtry—reduced engines to idle thrust and deflected spoilers to increase drag.

With explosive bolts linking the Orbiter to the carrier blown, *Enterprise* pitched up a few degrees and literally flew away from the 747, with Spacecraft Commander Fred Haise and Orbiter Pilot Gordon Fullerton practicing a landing flare on the way down.

Elapsed time between separation and touchdown was about five minutes and forty seconds.

According to Rockwell International, Shuttle Orbiter 102 is in the initial stages of final assembly. It is scheduled to fly six orbital test flights in 1979–80, followed by the initial operational missions in 1980–81.

The Solid Rocket Booster engine—the main power unit for actual Orbiter launches—underwent a successful first test firing in July, when it developed 2,400,000 pounds of thrust.

★ NASA plans to orbit its Space Telescope via Space Shuttle late in 1983.

Circling about 300 miles (483 km) above earth, the new telescope will be free from the atmospheric interference that now limits conventional ground-based telescopes. It will also be able to lock onto distant bodies with absolute accuracy for as long as thirty to forty hours. The device will be able to detect objects fifty times fainter and observe them with a clarity or resolution seven times clearer (or more distant) than its earth-bound counterparts.

The orbiting telescope, forty-three feet (13 m) long by fourteen feet (4.2 m) in diameter, will also be able to record ultraviolet and infrared measurements not possible on earth.

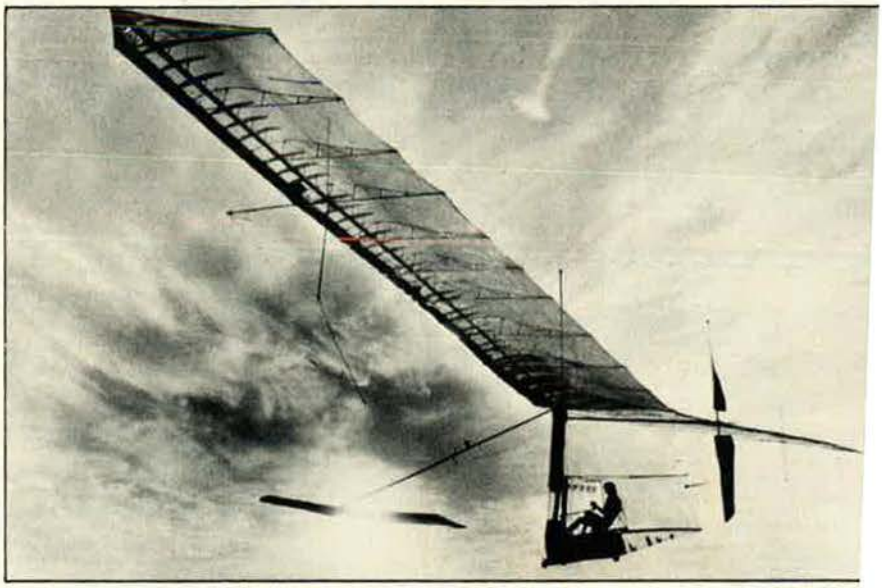
The ninety-four inch (2.4 m) diameter aperture telescope is to be built by Perkin-Elmer Corp., Danbury, Conn., under a $58.5 million contract. Lockheed Missiles and Space Co., Sunnyvale, Calif., will build the system's Support Module under a $72.8 million award under which the company will also integrate all elements, verify the overall product, and support NASA in ground and flight operations.

The Space Telescope is to be an international facility, accessible to astronomers throughout the world.

★ In its recently published *Space Settlements: A Design Study (see August '77 issue, p. 16)*, NASA described in impressive detail how permanent colonies supporting up to 10,000 people could exist in earth orbit.

Such settlements would provide their own agriculture, and their economic justification could be based on space manufacturing and the refining of ore mined from lunar deposits, scientists who contributed to the study believe.

Now a panel of scientists who assembled at the University of California in San Diego in August has



A group of Californians claimed the $86,000 prize offered by British industrialist Henry Kremer following the flight in late August of the Gossamer Condor *over a figure-eight, mile-and-a-quarter course. The craft, flown and pedal-powered by Bryan Allen, was designed by aeronautical engineer Paul MacCready. The seventy-pound (31.8 kg) plane has a ninety-seven-foot (29.6 m) wingspan and is based on the hang-glider concept. The flight lasted seven minutes and twenty seconds.*

urged the space agency to undertake a geochemical survey of the entire lunar surface with the possible objective of beginning mining operations as early as the year 2000. (Thus far, only about twenty percent of the moon's surface has been surveyed—those areas over which Apollo spacecraft orbited.)

The scientists recommended that an unmanned vehicle equipped with sophisticated sensors should chart the moon's geology, including those areas around the lunar poles where the sun doesn't shine and where huge fields of ice might exist. These could provide a source of water for lunar or earth-orbiting colonies.

NASA officials suggest the Space Shuttle as a means of launching a lunar orbiter.

The panel, known officially as the Near Earth Resources Summer Workshop, also recommended that NASA make an effort—including the construction of special telescopes—to locate near-earth asteroids from which metals might be extracted in the future. Although now uncharted, thousands of such asteroids are thought to exist.

As for lunar mining, geologists believe that they have already located on the moon large stores of materials that are rich in aluminum, iron, and titanium, among other metals and minerals.

★ Scientists have had problems with long-duration measurements of earth's atmosphere at altitudes between fifty (80 km) and seventy-five miles (120 km).

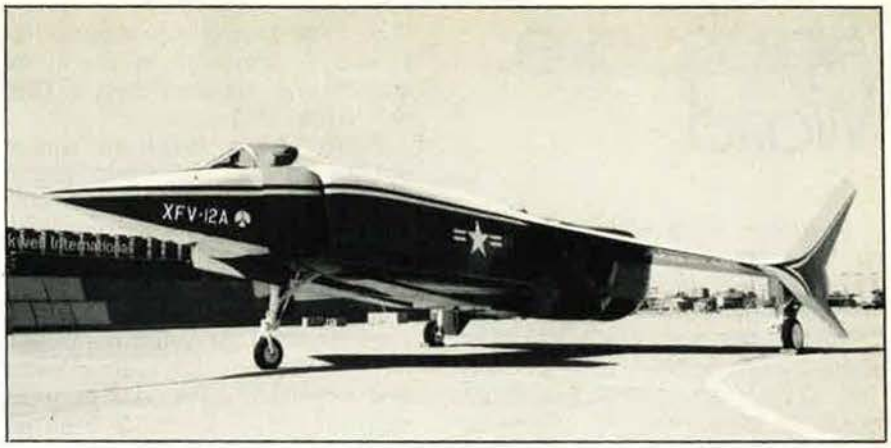
In this region of the earth's atmospheric envelope, the density is insufficient to support instrument-laden balloons or aircraft and too dense for satellites.

Thus, previous experiments were limited to the flights of sounding rockets, which lasted a scant few minutes, or those of low-orbiting satellites, good for several hours at best.

NASA has now devised the idea of a satellite "tethered" to an orbiting Space Shuttle that would "troll" through the hard-to-investigate region using a cable as long as sixty-two miles (100 km).

According to NASA, a typical mission for such a system could be global mapping of earth's magnetic and gravity fields or studies of atmospheric or plasma physics. As well, free-flying tethered lines could be used as low-frequency antennas to improve communications with submerged submarines. Many other uses are also being considered.

Industry proposals on the system were due by July 1 at the Marshall Space Flight Center, Huntsville, Ala., with contracts to be let on two systems late in September.



Rolled out recently was the Navy's new XFV-12A Thrust Augmented Wing (TAW) prototype aircraft designed for vertical takeoff and landing. The small, single-engine, single-seat aircraft generates vertical thrust by exhausting engine air through nozzles in the wings. The horizontal stabilizers, called canards, are set forward of the main wings and below the fuselage, slightly behind the cockpit. Rockwell International built the airframe, Pratt & Whitney the engine.

★ A supertough new plastic is replacing glass in the windshields of some USAF aircraft.

By November of this year, the F-111E fleet will have been retrofitted with windshields made of the high-strength polycarbonate. Windshields for the T-37 and side panels for the A-10 also are now being made of the plastic material.

According to Robert Wittman of the Air Force Flight Dynamics Lab, Wright-Patterson AFB, Ohio: "Since the polycarbonate is lighter weight than glass, it allowed us to build a new F-111E windshield that weighs only sixty pounds [27 kg] and measures less than one inch thick. To get the same amount of impact resistance with glass, we would have a windshield at least two inches thick and weighing more than 500 pounds [227 kg].

"We proved the merits of polycarbonate very early in our test program when an aircraft with a polycarbonate windshield was flying at 500 mph [804 km/h] and struck a bird. If that aircraft had been equipped with conventional windshield glass, the aircraft probably would have crashed. The polycarbonate windshield didn't even crack—it only needed to be washed off," Mr. Wittman said.

Besides obvious use in civil aircraft, spinoffs of the polycarbonate technology include "unbreakable" windows in such places as gyms and in police cars, covers for street lamps, and even detention facility "walls."

★ An Air Force flight surgeon volunteer, Lt. Col. Wayne Kendall, proved that the rear-seater in a TF-15 trainer can survive at relatively low airspeeds without ejecting in the event of a canopy loss during flight.

With the F-15 now in USAF's inventory in substantial numbers, a good bit of TAC's flight training is conducted in the two-seat trainer. Thus, the F-15 Joint Test Force, Edwards AFB, Calif., recently undertook a series of TF-15 Canopy Off Tests to determine how the rear crewman would fare.

Modifications of a TF-15 included removal of the canopy, installation of a video camera system and mirrors to permit pilot observation of the rear occupant, and instrumentation to measure effects.

First, taxi and flight tests were conducted with "Horace," an instrumented dummy, in the back seat. The pilot, Maj. Jerry Singleton, protected by the windscreen, suffered no ill effects, even at 500 knots.

Aerospace World

Next, taxi tests with speeds up to 150 knots were performed with Dr. Kendall or Dr. (Col.) Grant McNaughton in back.

Finally, the main event: With Dr. Kendall aboard, Major Singleton put the aircraft through a few flight paces to determine the effects of different airspeeds, angles of attack, and bank angles. Speeds exceeded 400 knots.

Dr. Kendall reports that conditions were uncomfortable and fatiguing but that body position could improve greatly the tolerance to conditions in an open cockpit.

★ The first two-seat F-16—the B version—made its first flight at the General Dynamics' facility in Fort Worth, Tex., in August.

On its second flight, the same day, the F-16B hit Mach 1.2, climbed to 30,000 feet (9,144 m), and encountered forces of five Gs. (The F-16 is the first fighter designed to withstand forces in excess of nine Gs, according to General Dynamics.)

F-16B is the fourth production aircraft off the Fort Worth assembly line; three F-16As are currently the subject of a test program at the Air Force Flight Test Center at Edwards AFB, Calif.

In addition to its trainer role, officials visualize the F-16B performing combat missions that require a second crewman, such as reconnaissance and the suppression of enemy radar and surface-to-air missile sites.

USAF wants to buy 204 F-16Bs; ninety F-16Bs are destined for the air forces of Belgium, Denmark, the Netherlands, Norway, and Iran.

★ The second in a series of USAF's largest and most advanced military meteorological satellites, recently boosted into a 450-nautical-mile (833 km) polar orbit, has gone operational, officials said.

The 1,060-pound (481 kg) satellite—called the Model 5D Integrated Spacecraft System, or simply 5D—is now helping to provide timely high-quality weather information to military commanders and civilian users around the world.

The core of the 5D system—designed and built by RCA—is two remarkable on-board computers that weigh less than eight pounds (3.63 kg) each, and operate on less than five watts of power. (The 5D is powered by eight solar panels that produce more than 900 watts.)

Packed with a broad array of sophisticated sensors, the 5Ds view every portion of the earth at least twice daily and transmit pictures with a resolution of up to one-third mile in both visual and infrared spectral regions. The first 5D was orbited in September 1976, malfunctioned, was remotely reprogrammed and returned to service in April 1977.

Both satellites have a mission life of eighteen months.

★ Seven Air Force Reserve and Air Guard units will be realigned during FY '78 and the changes will net 938 additional manpower spaces. The major action will see the completion of the transfer of

MIA/POW Action Report

DoD to Review Status of Remaining SEA MIAs

On August 16 the Department of Defense ordered the resumption of reviews of the status of the 712 US servicemen still listed as missing in action in Southeast Asia. Included among them are 385 Air Force personnel.

A Pentagon spokesman said that the move had the approval of President Carter.

The resumption of status reviews came eight months after the House Select Committee on Missing Persons in Southeast Asia determined that no evidence exists on which to base a belief that American military personnel missing in Southeast Asia are still alive. Rep. G. V. Montgomery, former chairman of the Select Committee, said that the reviews would take place on a case-by-case basis by boards of the individual services. He said that "it is neither fair nor realistic to the families of the MIAs and POWs to continue to hold out false hopes that these Americans are still alive."

A moratorium on status changes had been in effect since 1973, when a number of MIA/POW families brought suit questioning the constitutionality of the statutes governing the status changes. The court decided in the case that, essentially, constitutionality would be upheld if next of kin were notified of the hearing and had the opportunity to be present and be represented by legal counsel. This finding was later upheld by the Supreme Court.

The moratorium remained in effect through the eighteen-month Select Committee investigation and the trip to Hanoi by a special Presidential commission.

Lt. Col. Carlos Matthews, a top DoD advisor on MIA matters, said, "I think it would be safe to say that most, if not all, of the cases will result in a presumptive finding of death."

The National League of Families of American Prisoners and Missing in Southeast Asia has condemned both the Select Committee's findings and DoD's decision to resume hearings. Its view is that while perhaps there is no evidence to indicate the men are still alive there is none to support the conclusion that they are all dead. The League believes that no real pressure has been applied to the Vietnamese to render an accounting of the MIAs "and now the issue is being swept under the rug."

For its part, the Pentagon has declared repeatedly that the US would continue the effort "to obtain as full an accounting as possible" of the fates of the missing men.

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Kearfott's AN/ASN-128 lightweight
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The Receiver/Transmitter Antenna (RTA) and Signal Data Converter (SDC) constitute the Doppler Radar Velocity Sensor (DRVS), which continuously measures the velocity of the aircraft. The Control Display Unit (CDU) provides control and display functions for the operator, and contains the navigation computer.

With inputs from external heading and vertical references, the ASN-128 system provides accurate aircraft velocity, present position, and steering information. It is completely self-contained and requires no ground based aids.

The DRVS accepts heading, roll, and pitch as synchro inputs and converts them into digital format for transmission to the computer. The DRVS can also be used separately from the ASN-128 to provide velocity inputs to other aircraft equipment.

The CDU accepts beam velocities, heading, roll, pitch and true air speed (in some installations) from the Doppler Radar Velocity Sensor and performs the navigation computations. The front panel includes provisions for entering operator inputs and for displaying system data such as present position, steering information to 10 destinations, and status of the system. The CDU also puts out velocity and navigation data in ARINC digital format.

The CDU performs three functions for the ASN-128:

Provides mode controls, display controls, and keyboard entry of destinations and other data.
Performs all computations for LDNS including Doppler processing, velocity coordinate transformations, navigation in both UTM and latitude/longitude, steering signals to 10 destinations, and BITE functions.

- Displays navigation data on its front panel.
- BITE function identifies and displays failed LRU.
- Provides BCD and binary outputs for external equipment.

Operational Advantages:

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- FM-CW transmission, with Doppler tracking of the J1 sideband providing accurate velocity measurement from ground level, to over 10,000 feet (3,048m).
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- Navigation data in both UTM coordinates and Latitude/Longitude.
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For additional information write to: The Singer Company, Kearfott Division, 1150 Mc Bride Ave., Little Falls, N.J. 07424.

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128 KC-135 tankers from the active to the Reserve forces and the phaseout of the ANG's remaining KC-97 tankers.

At Grissom AFB, Ind., an A-37 fighter unit will exchange its aircraft for KC-135s and add nearly 500 people in the process. At Forbes Field, Kan., 292 manpower spaces will be added when the Air Guard there receives KC-135s and sends its EB-57s to Burlington International Airport, Vt.

Other shifts will find the AFRES at New Orleans NAS, La., converting from C-130s to A-37s; an ANG group at the Harrisburg International Airport, Pa., exchanging its C/EC-121s for C-130s; an ANG squadron at Dallas NAS, Tex., replacing its C-97s with C-130s; and an ANG unit at Salt Lake City International Airport, Utah, replacing its KC-97s with KC-135s. Major manpower changes will occur at Salt Lake City where 233 positions will be added and at New Orleans where 165 spaces will be lost.

The first USAF C-130 modified for aerial refueling, top, takes a drink from a KC-135 tanker over the Mojave Desert while setting a record flight of nearly twenty-eight airborne hours. Right, a prototype YC-141B stretched StarLifter is refueled over Edwards AFB, Calif., during a test flight.

★ Air University will host its second annual Airpower Symposium on February 13–15, 1978, at Maxwell AFB, Ala. Theme for 1978's symposium is "Battlefield Support in the 1980s."

Subject areas are expected to include air doctrine, tactics, systems and equipment, force options, readiness, and command control and communications.

Air University invites knowledgeable experts wishing to present documented papers at the symposium to contact Lt. Col. Joel P. Jacobs, AWC/EDRS, Maxwell AFB, Ala. 36112, telephone (205) 293-2100/2124.

Index to Advertisers

Aerospace World

★ As of October 1, 1977, all Air Force Recruiting Service detachments will be designated squadrons.

Increased recognition of the complexity and significance of the units' responsibilities was the primary reason given for the name change, officials said.

In reflecting the change, operations superintendents will have the additional duty of squadron first sergeants and sector supervisors will now be known as flight supervisors.

Tacked onto a unit's numbers will be "35" (with the current middle number removed). Henceforth, Det. 101 will be the 3511th Air Force Recruiting Squadron, and Det. 609 will be 3569th Air Force Recruiting Squadron.

Cadet First Class Edward A. Rice, Jr., has been named Commander of the Air Force Academy's Cadet Wing. *See p. 83.*

★ **NEWS NOTES**—Former **Astronaut Michael Collins,** currently Director of the National Air and Space Museum, has been named by the Fédération Aéronautique Internationale to receive its highest award —**the 1977 Gold Space Medal.**

Col. Mary A. Marsh, an eighteen-year Air Force veteran, has taken command at Hahn AB, Germany. She is the **first woman commander** of one of USAF's operational fighter bases.

Died: Maxwell Balfour, pioneer airman who retired in 1961 as director of Spartan Aircraft Co.'s aviation division, in Tulsa, Okla., in August. He was eighty-two.

Died: Brig. Gen. John C. Kennedy, USAF (Ret.), a former Flying Tiger who was a combat pilot in both world wars, in Lexington, Va., in August. He was eighty.

Died: Retired Col. Chester A. Snow, a WW I aviator who was both a member of the French Foreign Legion and the famed US "Hat in the Ring Squadron" and became General Stilwell's Deputy for Air in China during WW II, of a heart attack in August in Washington, D. C. He was seventy-eight. ■

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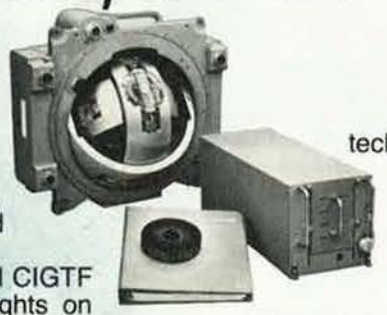

Flying aboard operational SAC B-52Gs based at Barksdale AFB, SPN/GEANS recorded average unaided positional accuracy of .079 nmph with ground alignment and .15 nmph with in-air alignment.

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SPN/GEANS was developed by USAF expressly for strategic bombers. Its balanced design blends superior performance with maximum producibility, maintainability and reliability. Which means that operational, technical and cost-of-ownership risks will be minimized for current requirements and for years to come.

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SPN/GEANS has passed USAF performance validation, qualification, maintainability and radiation-hardening tests. It is proven in-flight and ready to go now. It is the only INS that provides a performance margin for future B-52 weapon delivery systems.

For further information, contact your local Aerospace and Defense Group representative or Bob Mueller, Director of Marketing, Guidance and Navigation, in Minneapolis, 612/378-4408. Or John Bailey, Marketing Manager, Guidance and Navigation, in St. Petersburg, Fla., 813/531-3541.

Honeywell

The Wayward Press

THE PRESS AND THE 1968 TET CRISIS

For generations it has been axiomatic that the press never criticizes the press and that the press is immune to criticism. It may be that 1977 will go down in the next book about newspapering as the year in which that axiom was reversed.

An astounding development, as recent as August 22, appeared in the New York *Times*. Starting under a three-column headline on page one, the newspaper published a four-column article, including a photograph, analyzing press coverage of the "Son of Sam" murder case. The *Times* said that the way some newspapers handled the sensational New York crimes "raised some of the thorniest questions in American journalism." These questions involved basic ethics and professional responsibility. When the *Times* got through, the press had egg on its face.

As of this writing, seven weeks after publication, the *Times*, usually alert to new and newsworthy books, has not published a review of *Big Story*. *Big Story* is a monumental two-volume study subtitled *How the American Press and Television Reported and Interpreted the Crisis of Tet, 1968, in Vietnam and Washington*. At least seven years in the making, the book is the most extensive, and detailed, analysis ever made of how the press covered a major news event. It may take many more weeks, but the *Times*, and the rest of the press, will not be able to ignore *Big Story*.

The author is Peter Braestrup, an experienced newspaperman, himself chief of the Washington *Post's* Saigon bureau at the time of the Tet crisis. He also has worked for the New York *Herald Tribune*, now defunct, and was a foreign correspondent for the New York *Times*. Mr. Braestrup was a Nieman Fellow at Harvard, and now is editor of publications for the Woodrow Wilson Center for International Scholars at the Smithsonian Institution. His credentials are impeccable.

His work on *Big Story* was funded by Freedom House, where the project was conceived, but the findings are those of Braestrup alone.

What did he find? That the account given to the American people by both printed and electronic media was highly inaccurate. In Braestrup's own words:

"In overall terms, the performance by the major American television and print news organizations during February and March 1968 constitutes an extreme case. Rarely has contemporary crisis-journalism turned out, in retrospect, to have veered so widely from reality. Essentially, the dominant themes of the words and film from Vietnam (rebroadcast in commentary, editorials, and much political rhetoric at home) added up to a portrait of defeat for the allies.

"Historians, on the contrary, have concluded that the Tet offensive resulted in a severe military-political setback for Hanoi in the South. To have portrayed such a setback for one side as a defeat for the other—in a major crisis abroad—cannot be counted as a triumph for American journalism.

"Why did the media perform so unsatisfactorily? I have come to this general conclusion: The special circumstances of Tet impacted to a rare degree on modern American journalism's special susceptibilities and limitations. This peculiar conjuncture overwhelmed reporters, commentators and their superiors alike. And it could happen again."

While highly critical of the performance, Braestrup is not unkind to the perpetrators of this inky outrage. He understands perfectly, and explains in great detail, why so much misinformation was given to the American public. At the same time, and this cannot be overemphasized, he says he is convinced "that ideology, per se, played a relatively minor role in the media treatment of the Tet crisis. The big problems lay elsewhere, and persist to this day."

It is refreshing to find the conspiracy theory discarded so abruptly. The press itself should get no credit for this. It is true that some of the media—particularly CBS, NBC, and *Newsweek* magazine—persisted, long after the Tet offensive, to comment on the war with contempt. They were opposed to it and what they alleged was a US and South Vietnamese defeat at Tet was offered as proof they were right. An NBC executive, asked why the network did not set the record straight, was quoted as replying: "The public perceived it as a defeat, and therefore it was a defeat."

The detailed Braestrup book is heavy with examples of how things went wrong. One of the more important resulted in US headlines on the morning of January 31, 1968, that said the Viet Cong, opening the Tet offensive, had invaded the US embassy in Saigon. The first reports, as many Americans will recall and too many still believe, said a Communist squad had seized parts of the embassy and held them. This was not so. The main lead in the New York *Times* that day, under a four-column headline, had three factual errors in the first three sentences. To its credit, the *Times* had a separate story that made it clear the enemy had not penetrated the building. But the Associated Press (AP)—the prime source of news in this country, even for the newspapers and television stations themselves—started with a lead that said the enemy had seized part of the embassy and was holding it. There were "Viet Cong suicide guerrillas holed up inside the embassy building." The reporters got this misinformation from military police who were outside the compound and did not know the facts. They knew only that the VC had blasted a hole in the wall surrounding the US establishment and gone through it. When the State Department denied the embassy had been penetrated, AP persisted that "reporters on the scene in Saigon said attackers seized a portion of the main building and fought US troops rushing it. . . ." United Press International (UPI) embellished this by reporting that there had been a six-hour battle through "the carpeted offices of the chancery." There was no such battle and there were no carpets in the chancery, except in the ambassador's private office. It took AP about fifteen hours to fully correct its original error, despite what the State Department said and a denial from Gen. William C. Westmoreland, the US commander. When Peter Arnett, the chief AP correspondent, was asked why AP kept the first impression alive for so long, he blamed "sloppy editing in New York." Braestrup does not deny that Arnett was right. But the result, the author says, was this:

"In US eastern morning newspapers, and in most of the country's other morning editions, the impression given by AP was: (1) the Viet Cong had seized the embassy itself, and (2) Westmoreland was lying when he said they had not. Moreover, in initial late broadcast news, the impression was the same."

Braestrup goes, item by item, through development of the Tet story, focusing on our prime news sources: AP, UPI, *Newsweek*, *Time*, CBS, NBC, ABC, the New York *Times*, and the Washington *Post*. He follows their reporters in action, the account bolstered by bits of reminiscence he persuaded them to provide after the war was over. The author accepts their naïveté and, with few exceptions, their ignorance—the newsmen had never seen a war before and the one they were looking at was a freak.

It was inevitable that masses of journalistic garbage would end up on the wires and the TV tube. Back home this was regurgitated by editorial writers and commentators, as well as the editors and rewrite men who were responsible for the finished product. Braestrup says there was a big difference in how people viewed the Tet offensive, depending on whether they were in Saigon or in the news warrens of New York and Washington. The same was true of government and military officialdom. Everybody knew there would be an uproar in the United States because we were getting ready

for a presidential election. But it was the newsmen at home who sensed how the Tet story would be exploited by foes of the Lyndon Johnson Administration.

The Administration's credibility gap on Vietnam policy had been getting wider ever since 1962. Both the White House and Defense Secretary Robert S. McNamara had helped dig the gap. But, Braestrup concludes, "the Tet attacks and their aftermath did not suddenly bring to light any basic new weaknesses or virtues in administration Vietnam policy. What the attacks did do, specifically, was forcefully to direct attention to Vietnam, at least for a few weeks, and to underline the President's prior refusals to tell the public what he knew about the war's bleaker side and its probable further costs." At this point he could have added that a few of the military men of high rank tried to overcome this deficiency and had their knuckles rapped for their trouble. The press, instead of listening carefully, was likely to snarl and display its growing contempt for "military brass."

Braestrup studies, in the same detail, a related New York *Times* "scoop" that was wrong, but had "enormous impact" when it appeared in the politically sensitive spring of 1968. The date was March 10, and the *Times* told its readers, with a screaming headline, that "Westmoreland Requests 206,000 More Men." This was not true. Westmoreland did request more troops. He also had an understanding with his boss, Gen. Earle G. Wheeler, the Army Chief of Staff, that the limit was 100,000 more men.

General Wheeler, who had fish to fry and fronts to cover in other places besides Vietnam, was one of the Joint Chiefs who had been urging the Administration to call up the Reserves and bolster the military force in this time of war. He wanted 206,000 men, not more than 100,000 of them for Vietnam. Braestrup, like any good newsman, is entranced with the fact that there were men on the *Times* staff who knew the story was wrong and tried to get that message across to the editors. They included Hanson W. Baldwin, who "could pick up the telephone and call any of the Joint Chiefs and have his call returned in person." He did it many times in 1968 and in the newspaper of February 3 had given an accurate report on how the military leaders felt about the manpower situation.

William Beecher, who covered the Pentagon and later became an information officer there himself, also filed copy that was commendable. But the *Times* plunged ahead, at least partly because some of its editors and reporters wanted to believe the worst, despite evidence to the contrary. The impact of the story on the nation and Congress was immense, as it should have been, because the people closest to the reporters who wrote the story—Neil Sheehan and Hedrick Smith—were trying to reach Congress. One of them was Paul Warnke, who was known as a leader of the "McNamara civilians" and now is chief of the Arms Control and Disarmament Agency.

Then, there is the story of the massacre at Hué. According to the Braestrup book, a total of 2,810 bodies have been found, scattered in mass graves. These people were slaughtered by Communists during the Tet offensive. That is a count that was accredited in 1970. On March 9, 1968, the US embassy in Saigon told about the first 400 civilians who had been murdered at Hué, but the press paid little attention. Braestrup says the television networks made no mention of the executions at all, and showed no film reports from Vietnam on the subject.

One of the stories that did get into print appeared in the New York *Times* of May 1, 1968. At that point, US officials had confirmed that more than 1,000 South Vietnamese government workers, priests, and women had been beaten to death, shot, beheaded, or buried alive. One *Times* reader sent a clipping of the story to Sen. Eugene McCarthy, who had entered the presidential race, and offered him a campaign donation of $1,000 if he would denounce the Communists for the atrocity at Hué. The offer was not accepted. As recently as 1975, Sen. George McGovern described the massacre reports as a "hysterical misinterpretation" of history. Braestrup's study provides no support for this theory.

What conclusion does Braestrup reach about the poor media performance? It is cool and scholarly; in addition to his views reported above, along with his apprehension that the same poor performance could be repeated, the author observes:

"In most American foreign policy crises since World War II, there have been objective factors that assuaged journalistic needs and curbed journalistic excess. One thinks in particular of the 1962 Cuban missile crisis and Hanoi's 1972 offensive, the latter a far stronger military effort than Tet. In both cases, 1962 and 1972, there were perceived forewarnings of trouble, a well-defined geographical arena, a widely shared sense of the relative strengths and capabilities of the opposing sides, a conventional confrontation remote from journalistic havens, and a coherent Presidential response. None of these reassuring elements was fully present at Tet-1968.

"In Vietnam, the sudden penetration of downtown Saigon by Viet Cong sapper teams impacted personally on correspondents' lives. The geographical dispersion of the concurrent Communist attacks elsewhere in the country led to uncertainty among newsmen about the enemy's intent, strength, and degree of success in the countryside. Journalists' unfamiliarity both with the South Vietnamese and with the relative military capabilities of each side increased this uncertainty."

Braestrup continues; he says the pattern was obscure, but:

"Commentators and many reporters did not wait. By the time the fog of war began to lift . . . the collective emanations of the major media were producing a kind of continuous black fog of their own, a vague conventional 'disaster' image, which few newsmen attempted to reexamine and which few news managers at home sought to question.

"Indeed, in the case of *Newsweek,* NBC, and CBS, and of photo displays by others, the disaster theme seemed to be exploited for its own sake. The journalistic fog had thinned to a patchy haze by the time of President Johnson's March 31 speech [in which he announced that he would not seek reelection] but it had not been penetrated by a cold, retrospective light. The record was not set straight. The hasty assumptions of February and early March were simply allowed to stand."

There is a footnote at this point in which Charles Mohr of the New York *Times* says that when he wrote a later article, portraying the outcome of the Tet attacks as a setback to Hanoi, he received letters from *Times* readers expressing surprise and disbelief.

That illustrates one of the major evils of shoddy journalism. It has a way of becoming shoddy history.

—CLAUDE WITZE

To Get Your Own Copy . . .

Admittedly of limited public interest and priced at $50 for two heavy volumes, *Big Story* is not a work you can pick up at your friendly neighborhood bookstore. A first printing of 1,500 sets had been sold, mostly to libraries and serious scholars, within a month of publication. A second printing was started at once. A book dealer can order copies, or the customer can buy the volumes direct from:

Freedom House
20 W. 40th St.
New York, N. Y. 10018

Author Peter Braestrup expects that the first volume, which is his 728-page analysis, will be available some time next year as a paperback. The second volume consists of appendices, the texts of important news releases, interviews, press articles, and television news reports.

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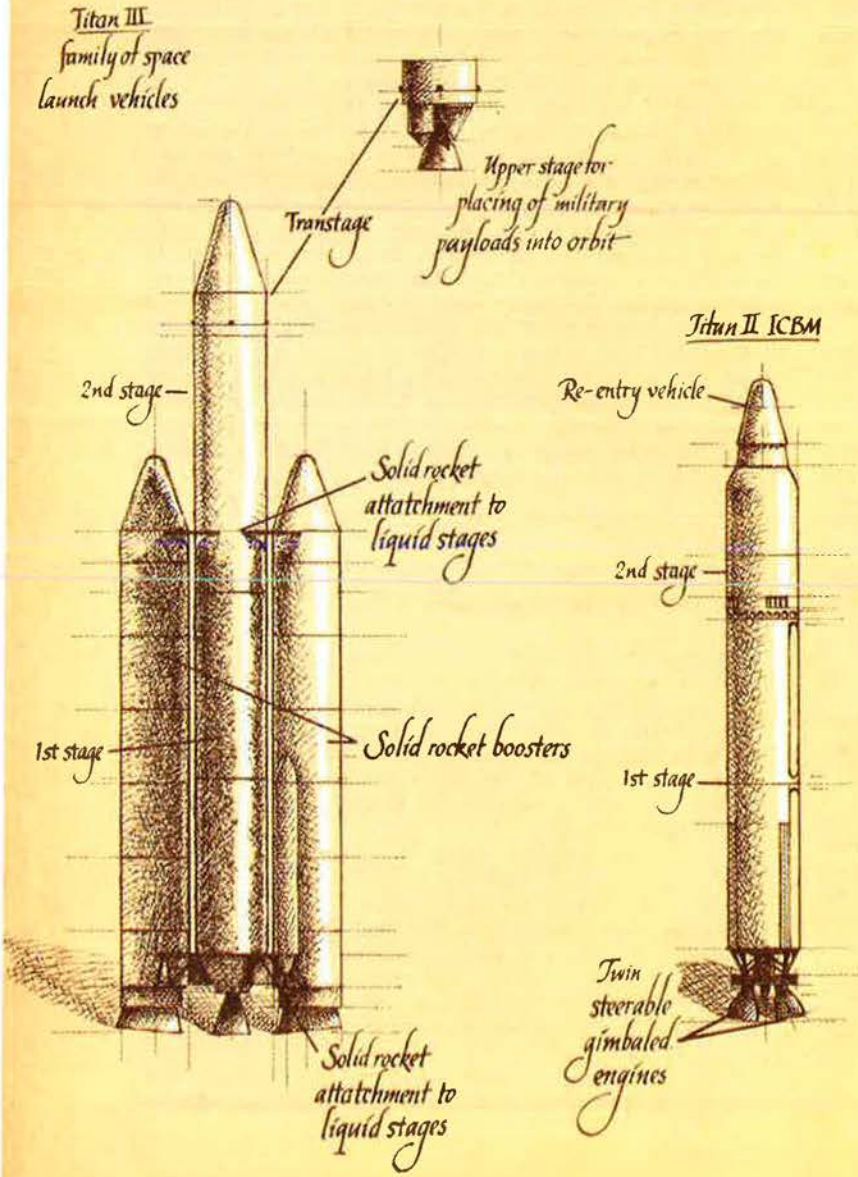
Put your experience to work.



We've been building successful missile systems since 1946, using the knowledge and experience gained with each successive system in the design, development and delivery of the next system. That's our system for developing systems.

It's the way we've produced the ground-mobile Pershings, the canister-launched Patriots, and the silo-stored Sprints and Titans. In all, this philosophy has worked on 26 missile systems, and for over 1200 test and operational flights.

Take the Titan, for example. It is still part of our basic defense system, well into the second decade since we designed, developed, tested, and delivered it to the Air Force. At the time, we activated the underground facilities, provided the logistic support and supplied the technical data for operating and maintaining the full launch system.

Today, this basic Titan has evolved into our nation's workhorse launch vehicle known as the Titan III. It's used for both military space missions and planetary exploration by the United States.

While no one has yet developed the next generation of strategic ICBMs, Martin Marietta Aerospace, with more than 31 years of experience and success in developing all types of tactical and strategic systems, has the preeminent credentials to join in an active partnership on the MX program.

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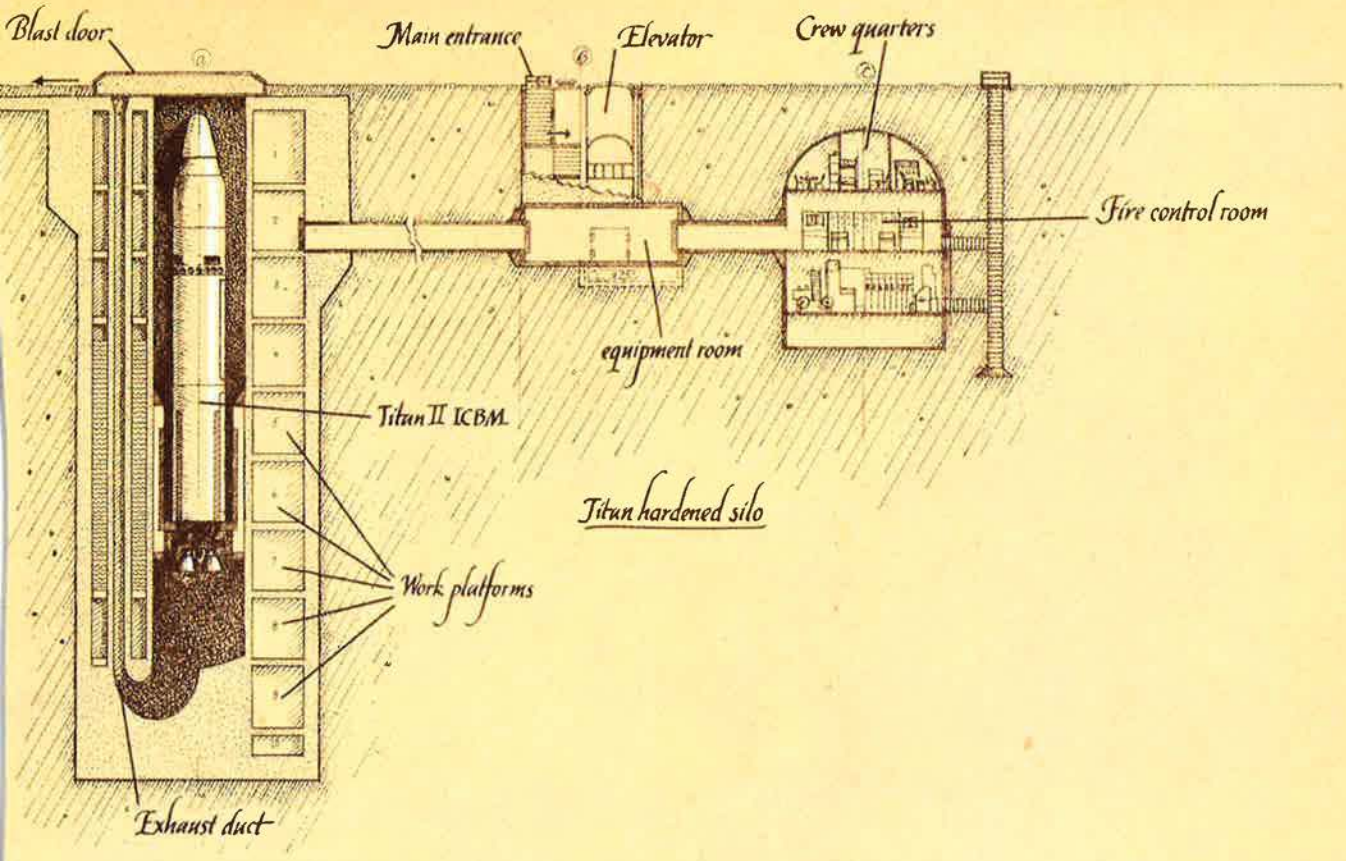
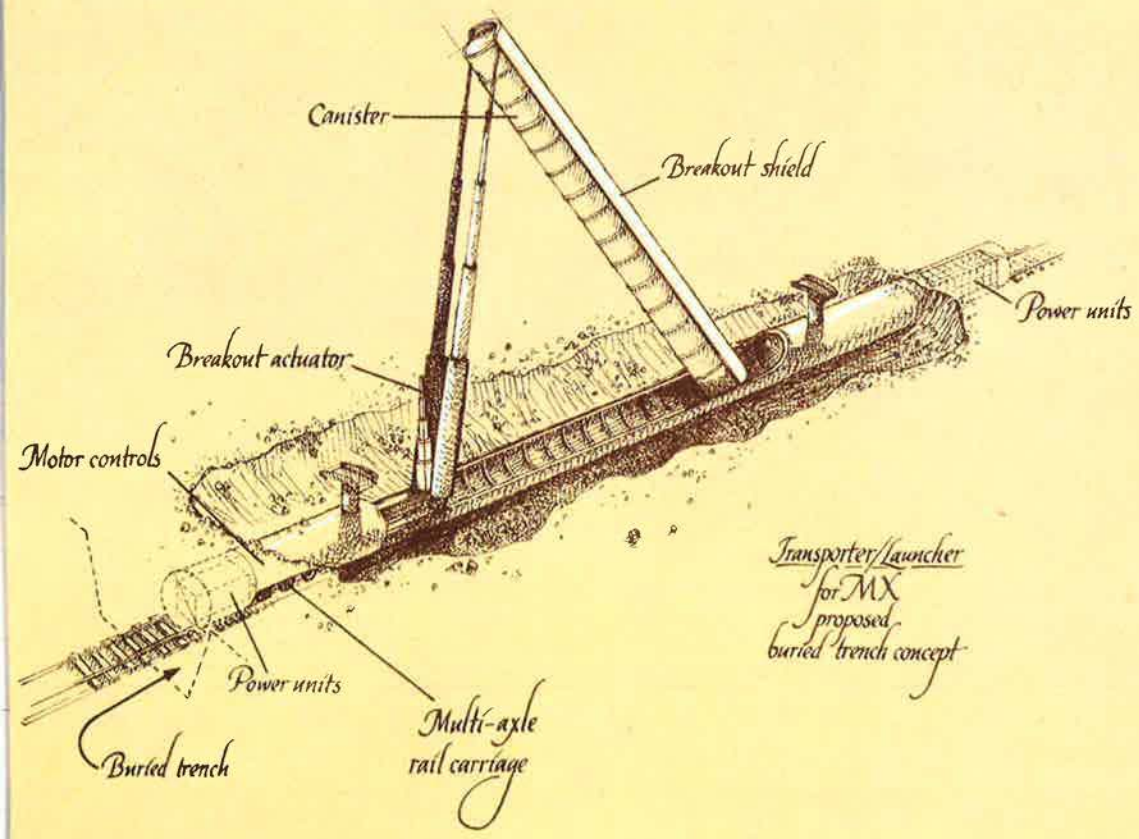
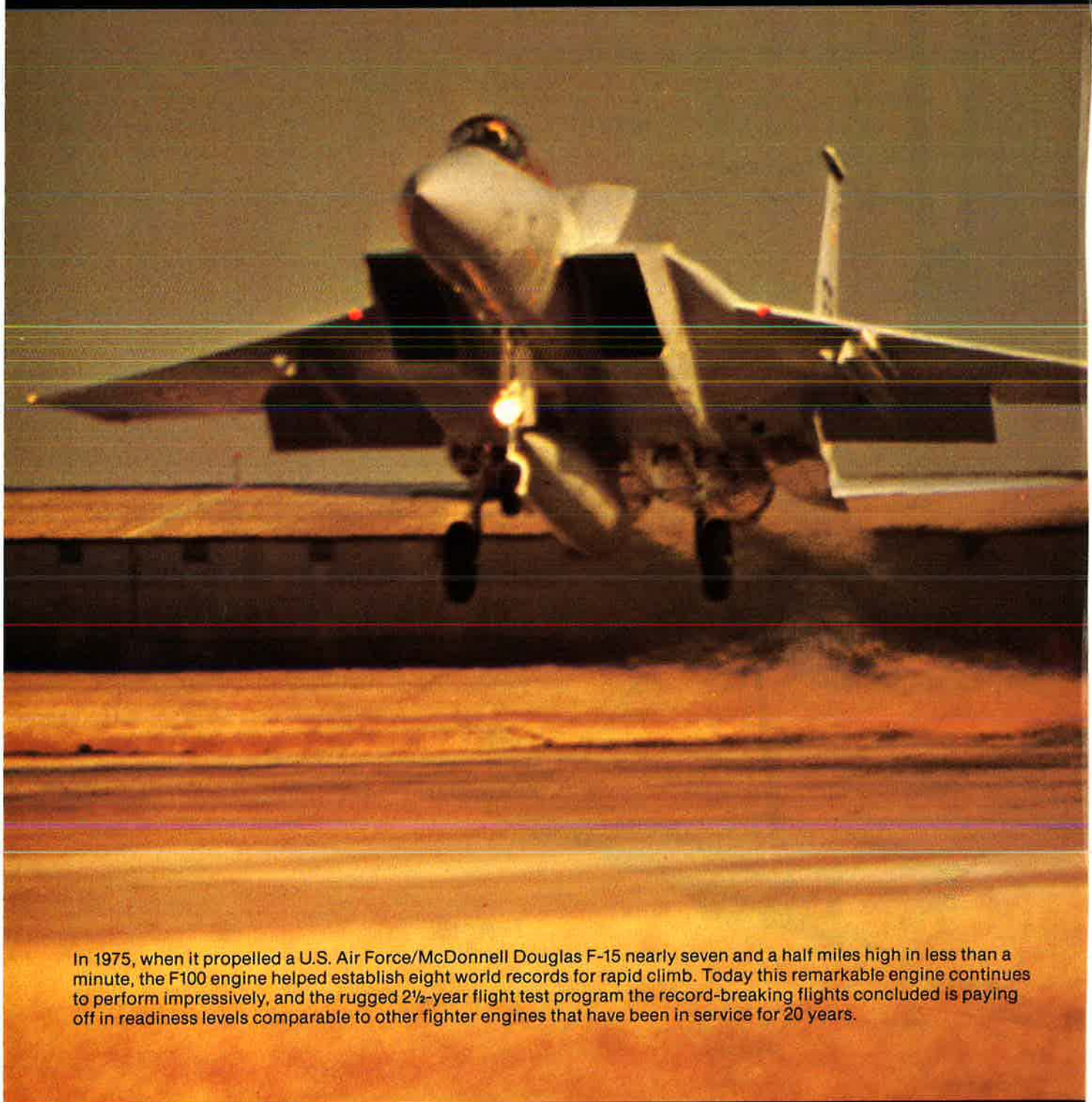


Titan hardened silo



Transporter/Launcher for MX proposed buried trench concept

The F100 engine.
It's just at the beginning of its life cycle.
But it has already set 8 world records.



In 1975, when it propelled a U.S. Air Force/McDonnell Douglas F-15 nearly seven and a half miles high in less than a minute, the F100 engine helped establish eight world records for rapid climb. Today this remarkable engine continues to perform impressively, and the rugged 2½-year flight test program the record-breaking flights concluded is paying off in readiness levels comparable to other fighter engines that have been in service for 20 years.

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UNITED TECHNOLOGIES ®

'Hell, Let's Try It!'

A Tribute to Gen. George C. Kenney 1889-1977

"HELL, let's try it!"

Regardless of what epitaph may formally mark the grave of Gen. George Churchill Kenney, these four short words, his personal motto, sum up his philosophy and describe his life style. They are the essence of the intensely personal kind of leadership that has become rare enough to qualify as an endangered species.

It is typical that Kenney danced at his own eighty-eighth birthday party only three days before his death, which took place on August 9, in Bay Harbour Island, Fla., near Miami. He had a great zest for life, which he generously shared.

Born in Nova Scotia, where his family was vacationing, he grew up in Brookline, Mass., attended the Massachusetts Institute of Technology, and in 1917, as an aviation cadet, began a three-decade-plus military career. He marked up two aerial victories in France and was shot down once himself.

Love of flying kept Kenney on duty during the lean days between the wars. In May 1942, he went to the Pacific as Commanding General, Allied Air Forces—in effect air deputy to General MacArthur, with whom he worked effectively in the tough island-hopping campaigns. He was a technical and tactical innovator, made to order for a theater where "make-do" was the name of the game. By war's end he was wearing four stars.

In 1946, he became first Commanding General of the new Strategic Air Command, later commanded the Air University. After retirement in 1951, he served ten years as president of the Arthritis and Rheumatism Foundation, taking time in 1953–55 to serve terms first as President, then as Chairman of the Board, of the Air Force Association—one of the most effective and popular leaders in the history of AFA.

This writer remembers him best for the trenchant "Kenneyisms" that laced his conversation. A man who hated to get up even more than he hated to go to bed, he used to say that "nothing important in history ever happened before 11:00 a.m." Asked about the early morning attack on Pearl Harbor, he retorted, "They lost the war, didn't they?" Discussing a script for an AFA occasion—"I can ad lib a lot better if you write it all out for me." Or "Running an Air Force is like playing poker. The guy with the best hand takes the money and the others don't count."

George Kenney enriched every life he ever touched. A great leader, an innovative thinker, a warm friend. We miss him.

—JOHN F. LOOSBROCK

As General MacArthur's top air officer in the Southwest Pacific, General Kenney directed the air war against the Japanese in the long haul from Australia to the Philippines.

General Kenney was a popular AFA President and Board Chairman in 1953–55. Here he presents an award to MSgt. A. J. Downey at the 1955 Convention in San Francisco.

the western world's ONL
proven all-weather defenc
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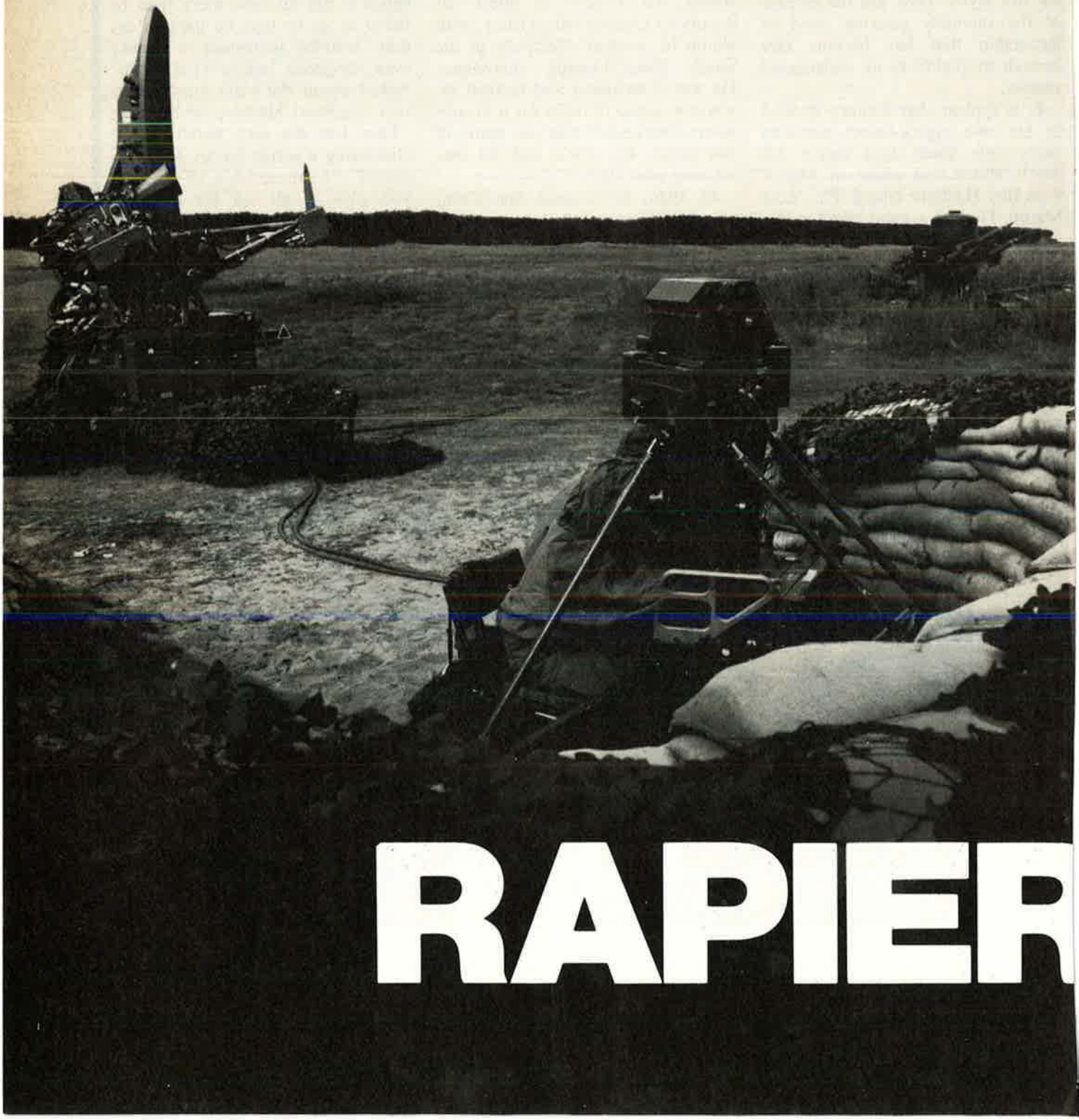

RAPIER

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Alone among NATO Forces, British Forces under NATO command in Europe are already at combat readiness with a proven, low-level missile defense system, effective against even supersonic attackers – RAPIER – and will go "all-weather" in 1978.

RAPIER was declared **operational** by the Supreme Allied Commander, Europe, in 1975.

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RAPIER is designed and manufactured by
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Shown on left operationally deployed at a NATO air base in Europe. Also in production in addition to this all-weather system is Tracked Rapier, shown right, installed on the American RCM748 armoured vehicle.

British Aircraft Corporation, a
BRITISH AEROSPACE *company*

AIR FORCE

OCTOBER 1977

The growing sophistication and complexity of modern military systems—and in many cases their location in remote, inhospitable environments—magnify the need for a better understanding of nature's strange laws that can be more lethal than enemy action.

AFGL Battles the Elements

BY EDGAR ULSAMER, SENIOR EDITOR

EVEN the mightiest weapons spawned by modern technology can be thwarted at times by nature's slightest quirks. Charged particle beam weapons may be a generation away from feasibility, but nature's charged particles can, and do, put military spacecraft out of business without even trying. Electronic jamming has been developed into a fine art, yet it is humbled by even a routine case of "Northern Lights." And such everyday occurrences as earth tides or heavy precipitation can foul up the otherwise superb accuracy of ballistic missiles. Understanding the natural environment and putting it to work *for* rather than *against* US weapon systems is the job of the Air Force Geophysics Laboratory at Hanscom AFB, Mass.

AFGL is commanded by Col. Bernard S. Morgan, Jr., and staffed by 629 Air Force military and civilian personnel—including eighty-three Ph.Ds. An element of the Air Force Systems Command's Directorate of Science and Technology, it serves mainly as the scientific pathfinder of AFSC's Space and Missile Systems Organization (SAMSO), but also works closely with other USAF and Defense Department agencies, including the Air Weather Service, Defense Advanced Research Projects Agency (DARPA), the Defense Nuclear Agency (DNA), and the Defense Mapping Agency (DMA).

AFGL uses Defense Meteorological Satellites, shown above, to plot paths of charged particles, to measure auroral effects, and to take IR photographs of clouds.

Spacecraft Charging

Solar flares, nuclear phenomena that catapult vast amounts of energy from the sun's surface into space, can produce catastrophic communications breakdowns and inflict fatal damage to military satellites. The charged particle flux generated by solar flares, as the Air Force learned several years ago with a DSCS (Defense Satellite Communications System) satellite, can strike spacecraft and induce voltage differentials of 10,000 volts or higher between the exposed and averted sides. This can cause the spacecraft's thermal insulation to break down. The result, Colonel Morgan told AIR FORCE Magazine, is a lightning-like discharge that, depending on its severity, can induce the attitude control systems to go haywire momentarily or, when vital circuits are affected, lead to destruction of the satellite. Satellites in high, especially geosynchronous, orbits are most likely to be damaged by radiation from these trapped high-energy electrons and other particles.

SAMSO, in conjunction with AFGL and other organizations, is developing a special SCATHA (for Spacecraft Charging at High Altitude) satellite, scheduled for launch next year. Its sole purpose is to explore and define ways to solve this problem. One of AFGL's tasks

is to come up with an "atlas" of the orbital environment in terms of the electron and proton count at various points as a step toward design techniques to ease or eliminate damage. At present, no comprehensive solution is in hand but increased shielding appears to have reduced the problem on recently launched DSCS satellites, according to Colonel Morgan. The likely long-term solution may be the emission of positive ions from the satellite to equalize the charge differential. This technique will be tested by SCATHA.

AFGL's job, in addition, is to make extensive predictions of solar flares, determine how the resultant charged particles ejected by the sun travel to earth, and describe what happens as they interact with the earth's magnetic field that traps them and channels them into the ionosphere above the earth's polar regions. Detailed measurements of the paths of charged particles are being taken by Defense Meteorological Satellites, Colonel Morgan said.

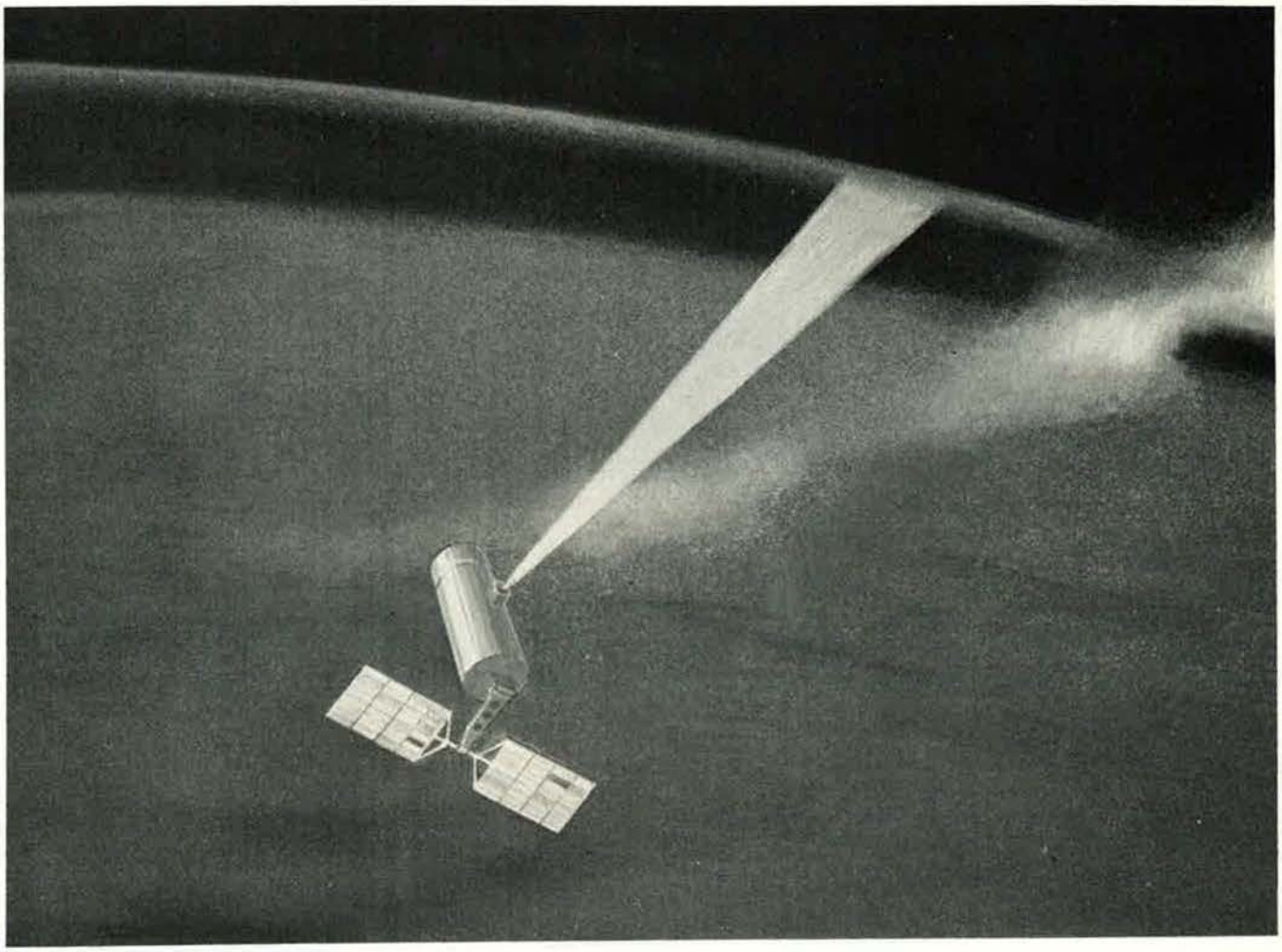
Spacecraft Scintillation Tests

The disruptive and destructive effects of the sun's electron and proton emissions are not confined to spacecraft. They also raise havoc with space communications, including those from such sophisticated and otherwise imperturbable spacecraft as LES-8/9. Vital communications in the UHF bands (chosen because they counteract jamming and nuclear effects) between spacecraft and aircraft can be seriously impaired by ionospheric anomalies. The ionospheric anomalies cause scintillation, or unpredictable deviations in signal strengths, strong one moment and fading the next. AFGL's flying laboratory, a specially equipped KC-135 (an NKC-135), is measuring and mapping ionospherically induced scintillations above the earth's equatorial, auroral, and polar cap regions. This study is being augmented through ground-based measurements at various latitudes, also under AFGL's auspices.

Solar Flares and Upper Atmosphere Density

The Lab's Aeronomy (upper atmosphere studies) Division long ago learned that solar irregularities have a pronounced effect on our atmosphere, and this in turn can affect Air Force systems operating in or through the atmosphere, such as aircraft, reentry vehicles, and surveillance and detection systems.

Solar effects and solar activities also play a significant role in the longevity of low-orbit satellites and the behavior of ballistic missiles because they cause variations in the density of the rarified atmosphere that extends



One of AFGL's key programs centers on measuring and modeling infrared emissions in the upper atmosphere to assist in the detection and tracking of man-made objects.

out to altitudes of more than 200 kilometers (124 miles). AFGL is working on special sensors that Defense Mapping and Defense Meteorological satellites will use to obtain better, more predictable information about drag factors that cause satellite acceleration and positional inaccuracies as well as anomalies in the trajectory of reentry vehicles. A key step here is detailed satellite mapping of inaccessible atmospheric regions.

Of special interest are auroral disruptions of command control and communications systems, including the OTH-B (Over-the-Horizon Backscatter) radar system. That system, essential for rapid warning of aircraft and cruise missile threats to the US mainland, is undergoing critical review, mainly because of concern over its ability to function during periods of auroral activity. Better understanding of these phenomena should lead to an easing of the problem. Frequency management,

The Lab's specially equipped KC-135 is used to measure and map ionospherically induced scintillations that can produce serious disruptions of military communications.

meaning shifts to ranges in the frequency spectrum least affected by a specific disturbance, probably could reduce or eliminate auroral disruptions of OTH-B and other systems.

Target Detection

AFGL's Optical Physics Division is supporting DARPA's TEAL RUBY program with an experimental activity to measure aircraft in-flight "signature" characteristics. According to DARPA, the AFGL program is establishing a detailed inventory of aircraft in-flight signatures involving very high spectral and spatial resolutions. One of the underlying techniques is multiplex spectroscopy that permits the simultaneous measurement of all wavelengths that enter the spectrometer, and cataloging aircraft signatures in terms of engine emissions as well as fuselage and sun glints.

Two basic programs are being pursued. One is the measurement and cataloging of aircraft signatures in terms of engine emissions and other aircraft characteristics and the other is measurement of infrared background signatures against which these aircraft must be detected.

The Division has developed OPTIR, a program that computes and predicts optical and IR emissions in the upper atmosphere from knowledge of the fundamental energy levels of its molecules. These emissions or "backgrounds" limit the detection and identification of targets. The Lab is taking extensive measurements, both from aircraft and balloons, to determine the geographic, seasonal, and altitude variations of the optical properties of these "backgrounds" as well as such terrestrial backgrounds as water surfaces and snowfields.

Other widely used codes or "tools" developed by this Division are the LOWTRAN and HITRAN atmosphere transmission codes to determine the propagation of laser energy and, of equal interest, the propagation of radiation from missile plumes and aircraft.

AFGL, on behalf of the Defense Department, has joined six European NATO countries and Canada in setting up a network of instrumented stations in Western Europe to find out "when and where we can or can't use electro-optical weapons. We are coming up with detailed information about how close to a given target we have to come under specific conditions and when it is better to use guided and iron bombs," according to the AFGL Commander. The effect of weather and other environmental factors on IR and laser guidance is being cataloged, and statistics on the probabilities of various weather conditions are being computed and compiled under the Optical Atmo-

sphere Quantities in Europe (OPAQUE) program.

AFGL's NKC-135 infrared flying laboratory, as well as balloons and rockets, probe and measure the nature and characteristics of auroral phenomena for a number of other purposes. Short of testing nuclear weapons in space—prohibited by the Limited Test Ban Treaty—the next best way to establish nuclear effects on the atmosphere is to study auroral behavior—nature's nuclear effects simulator—according to Colonel Morgan. The Defense Nuclear Agency, for that reason, is funding some of the Lab's auroral research, including the design of infrared sensors to measure eventually these disturbances of the upper atmosphere from aboard the Space Shuttle.

Improved ICBM Accuracies

Understanding and compensating for environmental factors that can degrade ICBM accuracies is one of the jobs of AFGL's Terrestrial Sciences Division. Prelaunch concerns are precise gravity measurements and compensation for a range of earth motions that can affect the guidance system's azimuth alignment. Two types of earth motions and ground effects belie the notion of a stable earth crust and are of special interest to missileers. Disturbances from earthquakes, explosions, storms at sea, wind, and certain industrial activities propagate outward from the source in the form of seismic waves. Ocean tides, atmospheric pressures on the earth's surface, the buildup of strain along fault lines in its crust, or even variations in ground water tables can lead to surface tilts that don't cause seismic waves. By measuring the effects of these geological and topographic anomalies, and their effects on ICBM silo suspension and guidance systems, the Lab contributes to techniques that minimize the adverse influences of these environmental factors on missile alignment.

Gravity obviously has direct impact on ballistic missile trajectories, with the effect most pronounced when the missile is traveling at the slowest rate—near the launch pad. AFGL is developing special sensors, called absolute gravity meters, "that can give us very precise gravity values, as references for a missile wing, for example. This enables the Air Force to insert the correct gravity value into each missile's computer, along with data about the gravity fields the missile will encounter en route to its target," Colonel Morgan told AIR FORCE Magazine.

AFGL calculates launch region and global gravity factors through data from satellites, laser measurements of the distance from the earth to the moon, and from surface gravity measurements. The lunar laser measurements also contribute to improved knowledge of the earth's rotation and of the wobble of its axis that also affect missile accuracy in an indirect way.

Lastly, determinations about the earth's precise shape help determine distances between pairs of points and their precise location, which is of critical importance to the Joint Strategic Target Planning Staff.

Weather-Induced ICBM Problems

Even the most sophisticated nose-cone design techniques—such as the carbon/carbon heat shield material of the MK 12A reentry vehicle aided by high spin rates (to even out heating and erosion)—are vulnerable to environmental conditions in the target area. The Defense Meteorological Satellites provide worldwide near real time weather information but as yet can't establish the liquid water content of clouds. This is the weather factor that contributes significantly to nose-cone erosion, and thus to inaccuracy. AFGL has come up with a method for estimating the "environmental severity index" from currently available satellite data. This index measures the erosion potential of weather. Such information could be used to delay launch of an ICBM until more favorable conditions prevail or to assign RVs optimized for reentry conditions against targets where severe conditions prevail.

The Laboratory also deals with the development of fully automated techniques for weather observing and forecasting. A demonstration model of an advanced

Aurora disruptions of critical command control and communications systems, such as USAF's nascent OTH-B radar warning system, are being measured and analyzed by AFGL in order to permit corrective frequency management.

Modular Automated Weather System (MAWS) has been installed at Scott AFB, Ill. MAWS automatically acquires, processes, and displays observations of visibility, cloud-base height, wind, temperature, and humidity from several remote stations on the airfield. It also automatically processes station data to prepare and display short-range probability forecasts of runway visual range and cloud-base height that are updated each minute along with the observations. "MAWS provides accurate and timely local weather information at less cost than present manual observation methods," Colonel Morgan said.

One of the Laboratory's programs does more than talk about the weather. It modifies it by dissipating stratus clouds as well as fog. Holes are punched in supercooled clouds by means of silver iodine seeding. A system for dispersing warm fog will soon be tested at Otis AFB, Mass. It is symbolic of the job AFGL has been doing for almost twenty-eight years, creating a benign environment for the Air Force in space, in the air, and on the ground through a better understanding, and occasional "bending" of nature's myriad laws. ■

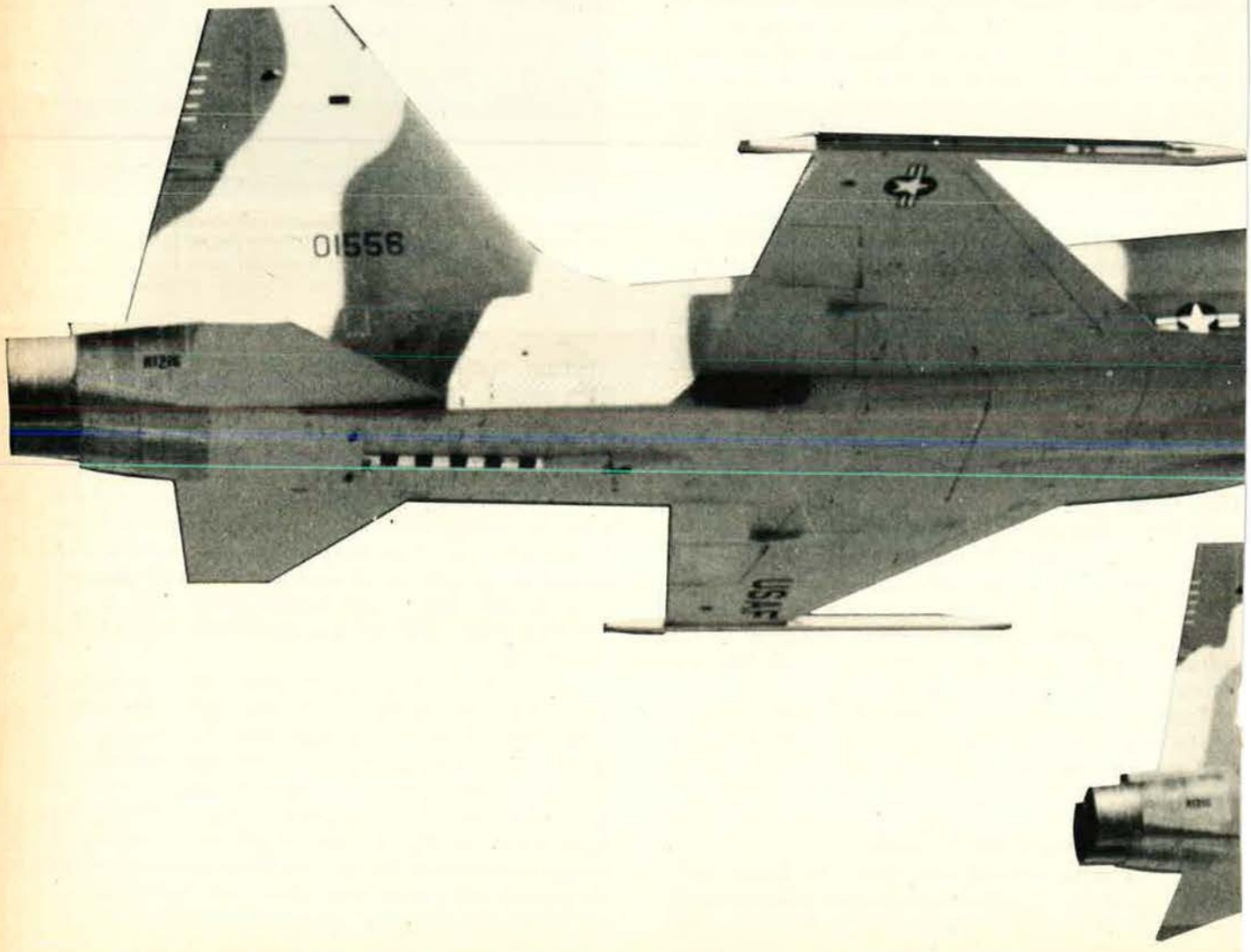
Air combat tactics are changing, and the big reason is technology. Long-range identification and kill capabilities are reaching the stage of development where tomorrow's jet ace no longer will have to see an enemy aircraft to destroy it. New launch-and-leave missiles, coupled with better means of target identification, will become more important than the air combat maneuvers themselves.

I had the opportunity to visit Nellis AFB, Nev., for a firsthand look at the Air Intercept Missile Evaluation (AIMVAL) exercise conducted there at the air combat maneuvering range, and I came away more convinced than ever that we must push these emerging new technologies for our tactical air forces of the 1980s and 1990s.

AIMVAL, which was completed in June, will provide data to define a new short-range (under five miles) air-to-air missile that could be used by both the Air Force and Navy. A second phase, Air Combat Evaluation (ACEVAL), is intended to refine combat maneuvers, and it will run through October. Frankly, though, I think the people conducting ACEVAL will find that what you fly and how you fly it isn't as important as what kind of missile you use and how you use it. What these exercises will prove is that either you fly with long-range kill capability, or you are going to operate at an unacceptable disadvantage—and that is a strange lesson to be learned from an evaluation of short-range missiles.

I taught air combat tactics at Nellis from 1952 to 1956 after putting in two tours in Korea. We stressed, then, that maneuvering the aircraft into firing position behind the enemy was about eighty-five percent of the kill, and that failing to do so would invariably let the enemy escape. That was true as recently as Vietnam, where, because of the requirement to identify a target visually, we used our aircraft like long-range guns, which meant we were using bullet tactics to fire missiles.

Missiles have always promised to change aerial tactics dramatically, but it has been only recently that their performance and reliability have been good enough to actually do so. Now, since missiles can be fired head-on, or even at an angle to the target, pilots will find that maneuvering is less important than it used to be. That means visual identification before engagement no longer can be considered an acceptable risk. To identify an aircraft as small as a MiG-21, for example, you have to get within two to three miles range—too close, if his missiles are as good as yours. That became obvious



An authority in air-to-air combat tactics tells how technology is forcing the first real change in fighter tactics since World War I. Aircraft performance, he believes, no longer will be the determining factor in the air battle.

THE CHANGING WORLD OF AIR COMBAT

BY MAJ. GEN. FREDERICK C. "BOOTS" BLESSE, USAF (RET.)

at AIMVAL, where attacking and defending aircraft were shooting down each other in the same encounter with painful regularity.

AIMVAL Ground Rules

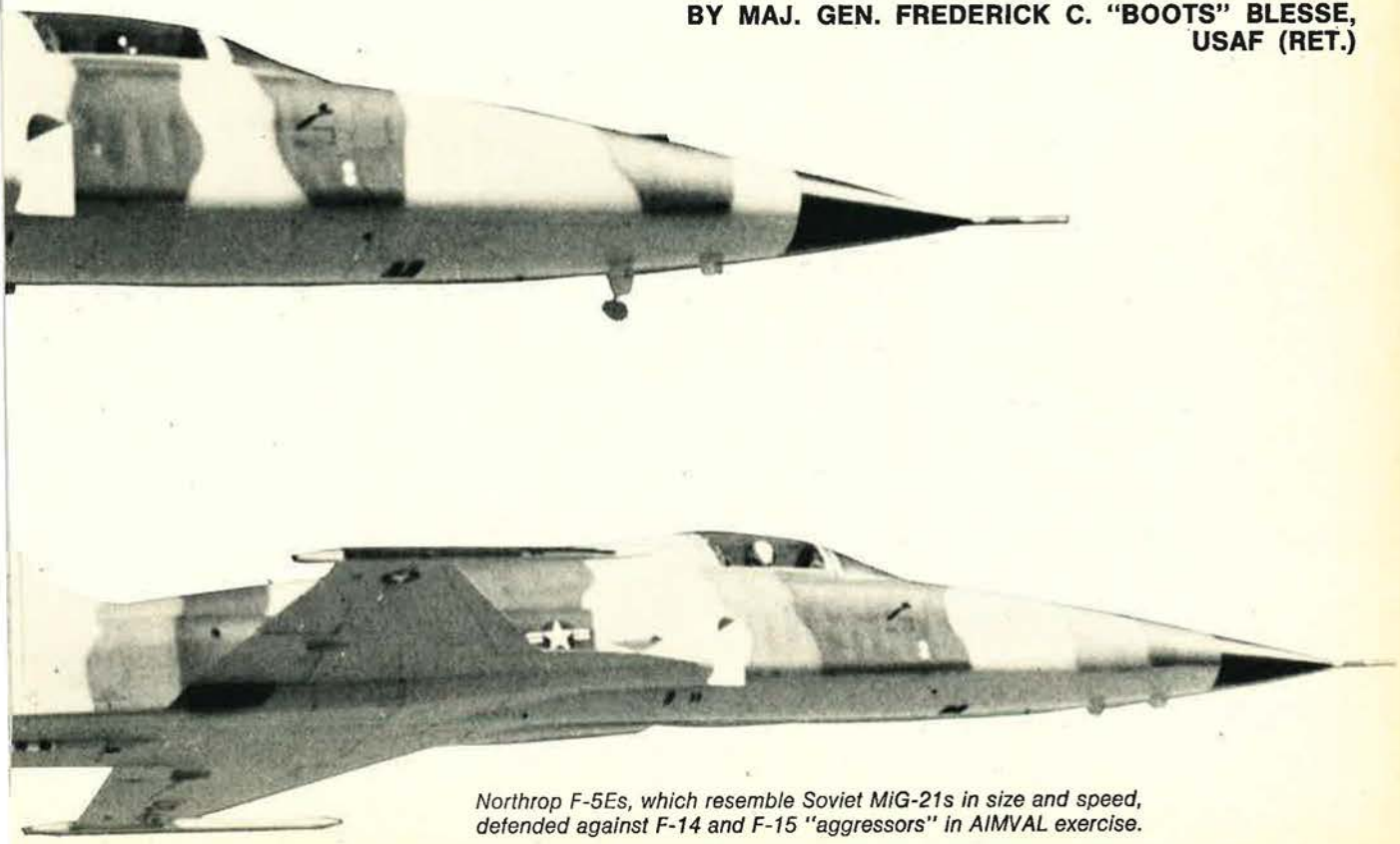
Let's look at a typical AIMVAL mission, and I'll show you what I mean about the changing nature of air combat.

The aggressor aircraft were the Navy's carrier-based interceptor, the Grumman F-14 Tomcat, and the Air Force's new front-line tactical fighter, the McDonnell Douglas F-15 Eagle. The defenders were Northrop F-5Es, which resemble the Soviet MiG-21 in size and speed. The resemblance is heightened by camouflage paint and bold red identification numbers exactly like those on Soviet aircraft.

The combat engagement area was a thirty-mile-diameter circle at the 7,500,000-acre Nellis range. The maximum ceiling was 50,000 feet. The aircraft didn't actually use live missiles. All firings were electronic and were recorded on the ground by huge banks of sophisticated instruments. The missions, including electronic "kills," were monitored on real-time display screens by ground controllers, and tapes were made for analyses later.

Two Raytheon missiles, the AIM-9L Sidewinder and the AIM-7F Sparrow, were tested against the capabilities of two "on-paper" missiles. Sidewinder is a launch-and-leave infrared homing missile with an effective tail-chase range of two to three miles. Sparrow has about ten times the Sidewinder's range, but the advantage is a dubious one, in that the missile has to be guided all the way to a target by its host aircraft's radar system. The two other missiles, the Ford Aerospace SS-1 and the Hughes SS-2, exist only in design specifications, but through electronic simulation their combination of capabilities permitted operational evaluation of attacks from thirty to seventy degrees off bore sight (straight ahead) with guidance sensitivity up to five times that of the AIM-9L Sidewinder.

The ground rules gave the F-5E aircraft certain advantages. They always took off last, because of fuel restrictions, which meant they knew ahead of time how many and which type of aircraft they'd encounter in the thirty-mile combat circle. And because they were defending their own territory, they were permitted to patrol the edge of the circle, but the F-14 and F-15 aggressor aircraft had to proceed immediately to the center. Finally, like their MiG-21 counterparts in Vietnam, the F-5Es received radar homing and warning vectors from ground controllers as the aggressor aircraft penetrated the combat zone (the thirty-mile circle).



Northrop F-5Es, which resemble Soviet MiG-21s in size and speed, defended against F-14 and F-15 "aggressors" in AIMVAL exercise.

The F-14s and F-15s, however, were on their own.

The F-5Es were armed with the AIM-9L Sidewinder, while the F-14 and F-15 used combinations of the four test missiles. The F-14's standard armament, the Hughes AIM-54 Phoenix, was ruled out because of its long range. AIMVAL was a test of short-range missiles.

Visual identification was a strict requirement, and the F-14 used a new Northrop Television Sighting Unit (TVSU) to get seventy percent of their positive F-5E identifications at ranges of ten to twelve miles. The Air Force has a version it calls Target Identification System-Electro-Optical (TISEO), which was installed in the F-4E but was never funded for the F-15.

The TVSU is a gyro-stabilized, closed-circuit television system with a precision optical telescope that acquires and tracks a target. The pilot sees the target on a small TV screen. The unit and the F-14's AWG-9 fire control radar are slaved to each other, which allows the radar to quickly reacquire a target in the event the radar lock is broken. The system is in two black boxes that, together, weigh only ninety-four pounds. Reliability was so high that only six minutes of maintenance were required for every flight hour.

Once inside an enemy fighter's missile envelope, even a highly maneuverable aircraft like the F-15 Eagle is "not likely to escape."

AIMVAL/ACEVAL Lessons

Almost eighty percent of all AIMVAL encounters were head-on. With the TVSU, the F-14 crew could get a clear television picture of a bogey F-5E safely outside the range of the F-5E's Sidewinder missiles, but well within the range of the F-14's Sparrows. The Tomcat crew would launch a Sparrow, but could not break off, because the missile must be guided to impact by the aircraft's radar. That takes about twenty-five seconds from ten miles and, in that time, the F-14 crew puts itself inside the missile range of its adversary.

At ten or twelve miles, the F-5E pilot has not sighted the F-14, and he may not know he's being chased by a missile. But after eighteen or nineteen seconds, the separation distance narrows to the point where visual identification is possible. The pilot sights the F-14 and uses one of his launch-and-leave Sidewinders, which can be fired up to thirty degrees off heading with high accuracy. In another second or two, the F-5E is destroyed by the F-14's Sparrow, but moments later, the F-14, itself, is destroyed by the F-5E's Sidewinder.

Too many encounters at AIMVAL ended in that kind of standoff. F-15s fared no better. With no long-range visual identification capability, their pilots could not fire until they could see their target and, by that time, they were inside the visual identification range of the F-5E pilots and, worse, inside the range of their missiles as well. The point here is that it doesn't make much difference how fast your airplane is or how high it will fly. Once you get inside your enemy's missile envelope, you're not likely to escape.

Long-range identification is an absolute necessity and, to that end, the Navy has funded development of a target identification system by Hughes. The contract calls for long-range identification by engine signa-

ture in the early 1980s. Radar identification by "skin paint" will follow, whereby fighter pilots will be able to identify and track enemy aircraft that are electronically silent; that is, they've shut off any electronic system such as search radar and IFF that might help give away their position. By the mid-'80s, Hughes will provide the capability of multiple correlation of engine signatures, skin paint, and other characteristics. Then our fighter pilots no longer should be required to identify a target visually before attacking.

Long-range identification, combined with a mix of long- and short-range launch-and-leave missiles, will produce the first real change in aerial tactics since World War I. We might even be able to eliminate the wingman, thus doubling our offensive capability without doubling cost. Some additional requirements would be necessary, like a weapon that fires to the rear as a protection against pursuing aircraft. I can envision air strike forces of single aircraft, each on its own, when the aerial battle begins. Improved radar and data link, new missile capabilities that promise quick changes of direction in flight, advances in identification, and—always important—the rapidly escalating prices for our war machines, all dictate some consideration for such an idea that, at first glance, might appear to be unorthodox.

Maj. Gen. Frederick C. "Boots" Blesse, USAF (Ret.), has logged nearly 7,000 hours in jet fighters, shot down ten enemy aircraft during two tours in Korea, and flown 156 combat missions in Southeast Asia, 108 of them over North Vietnam. He is the author of No Guts, No Glory, *the basic textbook on fighter tactics. Since his retirement in 1975, he has been a special assistant to the Board Chairman and President of Grumman Aerospace.*

In the meantime, we must begin to apply the lessons of AIMVAL/ACEVAL, which should be clear to any serious student of air warfare. All of our fighters should be equipped with TVSU, or a system like it, to identify targets beyond visual range. Our fighters need a missile with a kill range of at least fifty miles and a launch-and-leave capability that keeps them outside enemy IR missile range. Finally, we need a short-range, launch-and-leave missile that can be fired at targets not directly in front of the aircraft. The AIMVAL exercise should provide us with data for that.

If we provide those capabilities, aircraft performance no longer will be the determining factor in aerial battle. I, myself, would not like to try to become a jet ace again without those capabilities. If we don't provide them, we will force our pilots to operate at an unacceptable disadvantage. ■

Long-range identification with systems similar to this F-14's TVSU, and new launch-and-leave missiles, are changing tactics.

SO
CIVIL DEF
US STR

BY THOMAS H. ETZO

The author raises some often-ignored questions about the purpose of the USSR's civil defense program; examines its possible implications for US strategy; and suggests a range of practical, doctrinal, and political responses.

RECENTLY, Soviet civil defense and war survival programs have seemed fundamentally to threaten the strategies intended to ensure the security of the United States. Mutual assured destruction and associated ideas about the "sufficiency" of strategic nuclear forces in an era of parity have depended on the idea that, without terminal defenses against ballistic trajectory weapons, the citizens of the United States and the Soviet Union would be hostages, a situation that would enhance mutual deterrence. Yet, Russian developments in civil defense, as outlined in the February '77 issue of AIR FORCE Magazine, have raised the disturbing possibility that soon only Western populations may be sufficiently vulnerable to deter their governments from effective political-military pursuit of national interests.

Indeed, Russian war survival measures have assumed impressive dimensions. The Soviet government has begun civil defense training for much of the population, and it has continued to train and equip troops for nuclear, biological, and chemical warfare. There are special "civil defense troops" and a civil defense academy in the Soviet military. The Russians are dispersing industry and hardening industrial and military sites including command, communications, and missile installations; they are storing grain; and they are endeavoring to protect high government officials and significant numbers of workers through a program of shelter building and city evacuation planning.

In the context of the Russian civil defense effort, three questions require attention. There is first the question of what problems Russian civil defense may raise for American strategy. Second, there is the deceptively difficult question of just what these programs may mean. And, finally, there is the immediate question of how the US should respond to Soviet activities in this field.

The Problems for American Strategy

Most commentators on Soviet civil defense have concentrated on the problems it may pose for Western strategy. Three types of difficulties are evident. One relates to general nuclear war, a second to limited strategic options, and a third to ordinary political intercourse, sometimes known as diplomacy.

The implications of Soviet civil defense have been

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ROFESSOR OF STRATEGY, US NAVAL WAR COLLEGE

most alarming to observers who consider the possibility of full-scale nuclear war. Analysts cited in this magazine in February concluded that, as a result of civil defense measures, only about four percent of the Soviet population would perish from blast, fire, and initial radiation, vs. forty percent or more in the West. Similarly, these analysts estimated that the Soviet Union might be able to recover from nuclear war in two to four years, or three to six times faster than the US. They have reasoned that the United States is losing the ability to destroy the percentages of Soviet population and industry long thought necessary to deter Soviet leaders from initiating nuclear war or other major aggression. Coupled with the widespread misgivings about détente and trends in the overall strategic arms relationship, Soviet war survival measures have seemed palpably to menace American security.

However, the reasons for anxiety about Soviet civil defense in relation to a strategic nuclear exchange should be offset to some extent by several factors. One little-known fact bearing on the problem is that in recent years plans for employing American strategic nuclear forces have not envisioned the kind of one-time strike usually used as the basis for calculating casualties and damage. As Gen. Maxwell Taylor has noted in his book, *Precarious Security* (W. W. Norton, New York, N. Y., 1976), in recent US strategy, assured destruction capability has meant the ability to kill X percent of the Soviet population and destroy X percent of Soviet industry *X times at intervals*. If general nuclear war should come, the Soviet Union would have to expect to be attacked on an assured destruction scale several times and at intervals varying from a few weeks to several months.

In succeeding strikes, due to reduced warning and political direction, depletion of emergency stocks, and damage to transportation and other facilities, the consequences of follow-on strikes would be severe. The more the Soviets concentrated population to begin reconstruction in the aftermath of a first or second phase of attack, the more effective further attacks would be. The more they dispersed to avoid such consequences, the slower recovery would go forward. In addition to the effects of concussion, firestorm, and radiation, there would be the incalculable tolls of disease, infirmity, and disruption of complex communal life. There might also be unexpected consequences from the selfishness and violence that the initial survivors of holocaust could be expected to display.

In short, estimates of Soviet casualties and damage have been based on inadequate appreciation of American targeting doctrine and its implications. Understand-

ably, Secretary of Defense Harold Brown has expressed confidence that Soviet civil defense efforts are insufficient to blunt significantly the effects of general nuclear attack by the United States.

The second strategic problem facing the US in connection with Soviet civil defense programs grows out of contemporary scenarios concerning crisis bargaining, coercion, and the attractiveness of possessing, perhaps using, limited strategic options. In the Nixon-Schlesinger years, officials argued that the absence of limited strike options eroded the credibility of American strategic deterrence, because it left a too-wide gap between all-out war and doing nothing in the face of limited attack or provocation.

Those concerned over the effects of Soviet civil defense have suggested that because the Soviets have dispersed and hardened industrial and military targets as well as increased the numbers of launchers and associated facilities, the effects of a limited strike would be trivial, and, therefore, acceptable to the Soviet Union. But, because of the collocation of American military installations and cities, and due to the lack of hardening and population protection measures, similar limited attacks on the United States would produce results by no means trivial or acceptable.

Further, in this view, the growing Soviet capability to evacuate and/or shelter the populations of major cities strengthens Russian immunity to the threat of a limited strike, say, against one or two cities. To trade New York for Moscow, or St. Louis for Leningrad, never seemed a happy prospect. Now, so the argument goes, in addition to being a catastrophe it may be a bad trade.

In the case of limited option strategy, as in that of general nuclear war, there are countervailing considerations. One is that the effects of using nuclear weapons have always been presumed to be both psychological and physical. There is a correlation between the two, to be sure; but it is probably not an exact correlation. This point is important because the leadership of the Soviet Union is uniquely sensitive—even vulnerable—to internal disruptions. It fears challenges to authority and potential losses of control even in the most minor contexts, as the interesting and pronounced reaction to recent explosions in the Moscow subway demonstrated. The detonation of a nuclear device on or over Soviet territory would pose an enormous hazard to the political stability of Soviet leadership, and is, therefore, something they would want to avoid.

Even more important in keeping limited options open, however, are such easily available technological alternatives as dedicating a specific, small portion of US strategic forces to limited strike operations and fitting them with dirty warheads, or perhaps employing groundburst weapons in limited strike situations. Indeed, there are many alternatives available to ensure that the consequences even of limited strike will not seem trivial to Soviet leaders.

The third category of strategic problem, that of ordinary political intercourse, may seem both out of place in this discussion of strategy and relatively minor by comparison with the foregoing two topics. But it is neither mislocated nor of small concern. Both general nuclear war and limited strike operations remain remote, though unpleasantly real, possibilities. In contrast, the difficulty of pursuing national interests in more or less peaceful competition with the Soviet Union is a daily problem, and it is a problem of strategy as well as of diplomacy. For the weight of a state's views has always depended in large measure on its ability to compel agreement. It may be true that, as the great diplomat François de Callieres wrote nearly 400 years ago, "Every Christian prince must take as his chief maxim not to employ arms to support or vindicate his rights until he has employed and exhausted the way of reason and of persuasion." It is no less true, in George Kennan's words, that "You have no idea how much it contributes to the general politeness and pleasantness of diplomacy when you have a little quiet armed force in the background."

The argument with regard to ongoing political relations is that if the Soviets believe they possess genuine capability to survive nuclear war, and if correspondingly they feel less than deterred, they may become politically more assertive, more willing to run risks. The result might then be many more of those individually marginal but cumulatively costly Soviet gains so typical of the cold war in the 1950s and 1960s. Of this possibility, more later.

Dr. Thomas H. Etzold joined the faculty of the US Naval War College in 1971, having taught previously at Yale and at Miami University (Ohio). He is the author or coauthor of several books and has had some twenty articles published in US and European journals. He was named Professor of Strategy at the Naval War College in 1977.

What the Russian Programs May Mean

The purpose of introducing this category of questions is to raise doubts, not to provide answers. As noted above, most American comment on Soviet civil defense programs has—perhaps rightly—focused on the problems of strategy. However, the unfortunate side effect of this focus has been the emergence of an unproven but widening conviction that the Soviets intend principally to affect the East-West strategic relationship, to bring opportunities and direct gains to themselves, and that, therefore, Russian civil defense immediately threatens the West.

As a result of the conviction mentioned above, too few questions about the Soviet effort are coming up for discussion. Many of the undiscussed issues are of pressing relevance to strategic circumstances. Is, for instance, the Soviet civil defense effort in fact an indication of Russian intention to "go to the brink" from time to time, and so to intimidate the West into concession? Or are war survival programs evidence of Russian pessimism regarding the ability of the powers to avoid nuclear war sometime in the future, no matter how hard they may try to do so? Is it a sign of concern over Western intentions, or over Chinese? To what extent

is it related to Russian perception of the hazards of nuclear proliferation?

There is another extremely important set of questions. Is it possible that the Russian civil defense programs are more internal than external in their origins and implications? Could they be the result of bureaucratic politicking, as are many of our most costly and visible programs? Could they be designed to give the leadership enhanced control over the population, or the population increased dependence on and confidence in the leadership? Is the dispersal of industry a sign of Russian determination to complicate Western targeting, or is it merely a normal accompaniment to the development of Russia's still-primitive internal transportation system? Are grain stockpiles accumulated to anticipate holocaust, or are they a way of explaining perennial agricultural shortages and, possibly, hedging against price fluctuations in world commodities markets?

So far, the foregoing questions have received inadequate public attention. All of them, however, deserve careful analysis before one reaches conclusions on the meaning, implications, and requirements of Soviet civil defense for the West.

How the United States Should Respond

With the issues of strategy and the possible meaning —or meanings—of Russian civil defense efforts clearly in view, what should the United States do in response to Soviet programs? An answer here must comprise three elements: one practical, one doctrinal, and one political, and in that order of importance.

First the practical element. As the editors of this magazine suggested in February, the US should immediately augment its present meager efforts in civil defense. It is evident that the United States is not going to devote resources to such programs in amounts anything like those the Soviet Union has spent in recent years, and that the US cannot really expect to attain equivalency in this area soon, if ever. Indeed, there is no reason to believe that equivalency in such measures is necessary either to stable deterrence or to adequate freedom of decision in political matters. There is, however, reason to think that both friends and enemies would consider increased attention to civil defense an indication that this country was determined to hold its own in working out inevitable conflicts of interest with the Soviet Union.

It is possible that, with further study, the US could determine how to derive the most immediate benefits from moderate increases in civil defense spending. In practice, this would probably mean that protection of high government leaders, military communications and command facilities, and some additional strike forces or other military installations would take precedence over civilian shelter plans. In the short run, to be sure, this would be impressive to enemies, and, if adequately explained, tolerable to the American people.

Second, the doctrinal element. It is essential here to keep in mind that definitions of strategic sufficiency have always been arbitrary. There is no magic attached to such figures as the traditional requirement of killing twenty-five percent of Soviet population and destroying fifty percent of Soviet industry to achieve mutual assured destruction and thereby deter the Russians. Such figures were originally the result of "flat of the curve" reasoning; that is, they were the figures at which force planners of the early 1960s ran out of targets substantial enough to result in significant additional increments of damage. Forces then were sized to achieve redundancy for the sake of reliability as well as for the phased-attack plans mentioned above.

There is no evidence that the leaders of the Soviet Union are willing to risk casualties and damage in a nuclear exchange, even at much lower levels than the twenty-five to fifty percent formula. On the contrary, they give every evidence of fearing nuclear war and desiring to avoid it. As the New York *Times* noted in May 1977, the present Administration believes that the goals of mutual assured destruction, even as modified during the tenure of James Schlesinger as Secretary of Defense, were not only abstract and arbitrary, but imprecise.

Deterrence does not depend on equal security for each side, but on unacceptable insecurity for both. Increasingly, recent studies have pointed to the low level of nuclear damage either side may be willing to tolerate rather than to the high level of risk and sacrifice each may accept.

Finally, the political element, the most important of all. Here I return to the difficulties of the third category of strategic problem, that occurring in the context of ordinary political intercourse and relating to the Soviets' potential as aggressive risk-takers.

It is essential to recognize that the more the US makes of Soviet civil defense, the more political advantage it forfeits. By exaggerating the real threats and strategic challenges posed by these developments, Americans run the risk of talking themselves into weakness of will, and in that sense of doing the Soviets' work for them. As argued here, Russian civil defense is virtually without strategic meaning in terms of the actual difficulties raised in the event of general nuclear war; and the difficulties of the limited strategic options scenarios are relatively simple to overcome. But Russian efforts are politically meaningful if the United States scares itself and its friends to the point that it shows political timidity or weakness in bargaining.

The immediate response required of the US by Russian civil defense and war survival measures is not to scurry about in frantic or futile attempts to redress the balance of capabilities, even if some gestures toward improved civil defense should be made for psychological reasons. Instead, the immediate requirement is to affirm that deterrence works. This country possesses adequate strategic systems today. The United States government and the American people ought, therefore, to behave with the confidence that, for the present, the Russians are fully as deterred as we are. They ought also to keep in mind that the continuation of mutual deterrence will depend on the coherence of the relationship between strategic systems and strategic doctrine. Both will require improvement in the coming years. ■

The antecedents of today's ALCM and Tomahawk go back to World War I experiments with "aerial torpedoes" developed by Elmer and Lawrence Sperry, Glenn Curtiss, Orville Wright, and Charles F. Kettering. Too late—and too unreliable—for combat service, they were, nevertheless . . .

—US NAVY BUREAU OF ORDNANCE PHOTO

THE WORLD'S FIRST CRUISE MISSILES

BY LT. COL. H. F. "RED" SMITH, USAF (RET.)

THE current Cinderella of the US military is the cruise missile, an adaptation of a small, unmanned aircraft that can be air-, ground-, or sea-launched, and that can carry a conventional or nuclear warhead from several hundred to 2,000 miles, depending on launch configuration. Modern technology in unjammable inertial navigation, terrain correlation, solid-state electronics, and fuel-efficient turbofan engines have made possible this capability in aircraft but little larger than a standard torpedo. In fact, the Navy version can be launched from submarine torpedo tubes.

Two US contractors are developing cruise missiles: Boeing for the USAF with its Air-Launched Cruise Missile (ALCM), and General Dynamics for the Navy with the Tomahawk. Both have systems flying.

The potential impact of today's cruise missiles lies in their incredibly low cost of less than a million dollars each. The USSR, in recent SALT negotiations, has amply demonstrated its dislike for the cruise missile which, through the large numbers made possible by its low cost, could impose a vastly disproportionate burden on the Soviet Union in deploying defenses against the earth-hugging, 500-mile-an-hour flying bombs.

Early Beginnings

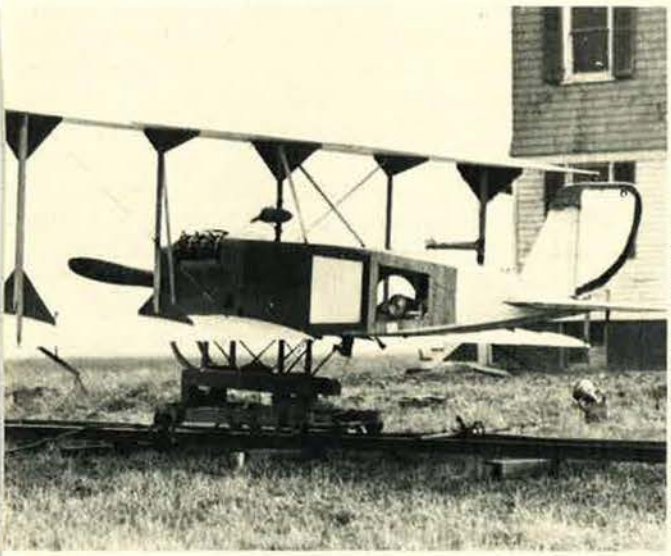
The idea of the flying bomb or "aerial torpedo" is not new. It goes back to 1915, and to Dr. Elmer A. Sperry, who developed a workable gyro stabilization unit for aircraft. The gyro-stabilizer is the heart of an aircraft autopilot, which as early as 1914 was used to demonstrate hands-off flight. It was the seminal invention leading to unmanned flying machines.

On April 14, 1917, the Naval Consulting Board "Resolved that the Secretary of the Navy be requested to apportion from such funds at his disposal the sum of $50,000 to carry on experimental work on the subject aerial torpedoes in the nature of automatically controlled aeroplanes or aerial machines carrying high explosives capable of being initially directed and thereafter automatically managed."

Early efforts centered on equipping US Navy N-9 Curtiss seaplanes for automatic flight, under the direction of Lawrence B. Sperry, Elmer Sperry's son. Automatic stabilizing, steering, and distance gear were installed in the N-9s with pilots making the takeoffs, then activating the automatic systems. Two trials were conducted on September 5, 1917. One N-9 made the test run accurately on course, but failed the range test with a twelve-and-a-half percent error by the "distance gear."

These early Navy efforts aroused the Army's interest. Maj. Gen. George O. Squier, the senior Army Signal Corps officer, witnessed an N-9 flight at Amityville, N. Y., on November 21, 1917. On his advice, the Army began an aerial torpedo project that resulted in development of the Kettering "Bug," under the supervision of Charles F. Kettering at Dayton, Ohio.

he Curtiss N-9 Seaplane was the rst test-bed aircraft for Sperry's Flying omb directional gyro and control quipment. Test flights were flown in eptember 1915 at Amityville, N. Y.



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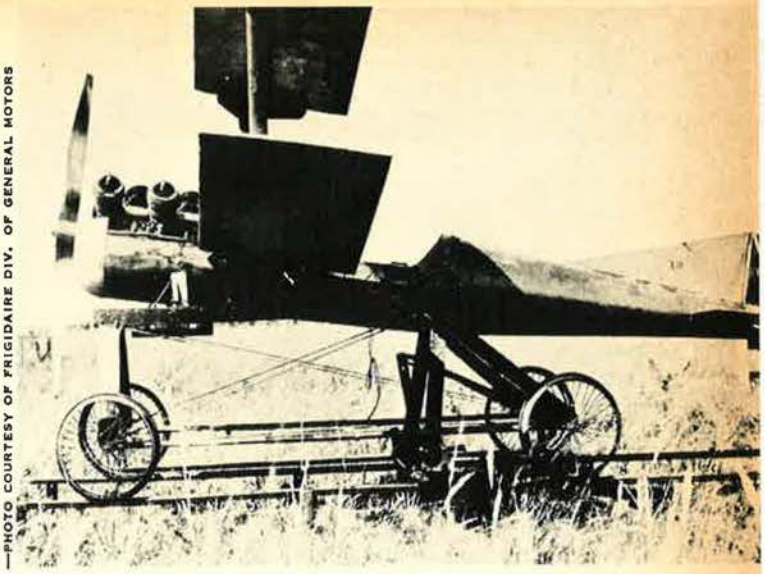


—PHOTO COURTESY OF FRIGIDAIRE DIV. OF GENERAL MOTORS

Left: Curtiss Flying Bomb had a directional gyro for automatically controlled flight. It made its first successful flight on March 6, 1918. Above: The Kettering Bug, or Aerial Torpedo, was the Army Air Service's secret weapon. Nicknamed "Liberty Eagle," it was designed and manufactured by Charles F. Kettering's Dayton Metal Products Co.

The Navy also launched a program, with the Glenn Curtiss Co., to develop a flying bomb that ". . . must carry 1,000 pounds of explosive, weigh 500 pounds empty, be catapult launched, have a top speed of 90 mph, carry fuel for a fifty-mile range, provide for special control equipment, and the engine should be as light as compatible with its duties." Successes were sporadic, with Lawrence Sperry risking his life early in 1918 to fly a cockpit-equipped version of the flying bomb. But on March 6, 1918, a Curtiss flying bomb was successfully launched and flew a prescribed short course of 1,000 yards—the first successful flight of an automatic unmanned aircraft.

Meanwhile, in Dayton, Boss Ket, as Charles Kettering was affectionately known to his people, outlined a simple, reliable, unmanned aircraft that would be cheap to build; easy to ship, assemble, and launch in the field; and that stressed load-carrying capacity and accuracy. The Dayton-Wright Co. was the primary contractor under Mr. Kettering's supervision, with Orville Wright as aeronautical consultant and C. H. Vills of the Ford Motor Co. as the engine consultant. The engine was manufactured by DePalma Manufacturing of Detroit. Final design was a conventional biplane with a modified DH-4 airfoil, fifteen-foot wingspan, gross weight of 530 pounds including an eighty-five-pound warhead, a four-cylinder, two-cycle, air-cooled engine of thirty-seven horsepower, and a speed of fifty-five mph.

Army Air Service flight tests of the Kettering Bug began in September 1918, just one year after the Navy first tested the concept. That same month, the Navy ended a difficult year with a flight-test failure that marked the end of the Curtiss design. The first Kettering Bug flight, on October 2, 1918, also was a failure. The second, on October 4, 1918, was more memorable, as reported by the Dayton-Wright Co.:

"The machine left the track and went directly into a stall; but the thrust was so strong that the stall resulted in a helicopter effect and the ship hung almost stationary for a perceptible length of time on its propeller without gaining or losing altitude, slowly turning over on its back, in which position it was almost certain that the control board became dislodged, throwing out of action all controlling elements. Gradually the attempted loop changed into an Immelmann turn, the machine diving out, recovering before striking the ground, going into a normal climb, clearing a hill of about a 250-foot elevation in less than a thousand yards; and flying perfectly, the ship left the area.

"The effect of the propeller-torque immediately became noticeable, causing the ship to fly in large circles. As it gained altitude . . . it gradually drifted eastward. The speed was beyond our expectations and the inherent stability was a little short of marvelous. . . . Several parties immediately left the aviation field in automobiles in pursuit. . . . The automobiles immediately lost sight of the ship, but after following the general direction of the wind drift and cross-questioning various farmers, they picked up its trail. . . . On the estimation of those who remained behind and watched it until out of sight, it is believed that an altitude of 11,000 to 12,000 feet was attained. Enough fuel was in the tank to maintain flight for about one hour and taking into account the wind-drift velocity as observed, it is certain that sustained flight was maintained until the motor ran out of fuel; the ship covered in this time certainly not less than 100 to 110 actual air miles. It is very likely that, after the motor stopped, the ship went into a nose dive, gaining sufficient velocity to shake off some part of the control surfaces, and that, from this

Retired Lt. Col. H. F. "Red" Smith is a cofounder and Past President of the National Association for Remotely Piloted Vehicles, and currently one of the Association's trustees. Prior to his retirement from the Air Force, he was associated with the development of several drone/RPV systems, leading to his final assignment as Director of Operational Services at Air Force Systems Command's RPV Systems Program Office, Wright-Patterson AFB, Ohio. He is now President of Eglen Hovercraft Co., Terre Haute, Ind.

time on, the country people observed the flight. Such expressions as, 'I don't see how any pilot that wasn't crazy or drunk could have done such stunts,' were met on every hand."

The third flight was a failure, but on October 22, 1918, the fourth test was a complete success. Quoting again from the Dayton-Wright Co. report: "The ship rose from the car in a perfectly normal climb and continued in the direction of flight without the slightest deviation, the flight being so absolutely perfect, contrasted with the ordinary airplane taking the air, that it was almost startling. At the set distance, the controls stopped the motor, the ship went into a nose dive and crashed very forcibly, almost exactly on the target."

The Glacial Pace of Progress

Wayward unmanned drones falling on the populated countryside around Dayton caused the Air Service to look for a more isolated test area. Newspaper accounts were also disturbing to the program's leaders, since the "Liberty Eagle" was a classified program geared to bring a new and innovative weapon to the European war. But less than a month after the fourth flight, the war ended, and only a few advocates urged that the program be continued.

On August 29, 1919, further testing of the Bug was authorized at Carlstrom Field, Arcadia, Fla. Fourteen flights were attempted from September 26 through October 29 of that year. There were four successful launches, and one sortie was almost totally successful—enough to keep the military interested in an "aerial torpedo."

From 1919 through 1924, the Air Service worked on improving the aerial torpedo and even designed the M-1 Messenger, a subscale one-place biplane built by the Sperry Co. to test control mechanisms. It was in this type aircraft that Lawrence Sperry lost his life on a flight across the English Channel on December 13, 1923. Wright Field continued to experiment with radio-controlled versions of the M-1 and other commercial aircraft of the day. (Both the Kettering Bug and the M-1 Sperry Messenger are on display at the Air Force Museum, Wright-Patterson AFB, Ohio.)

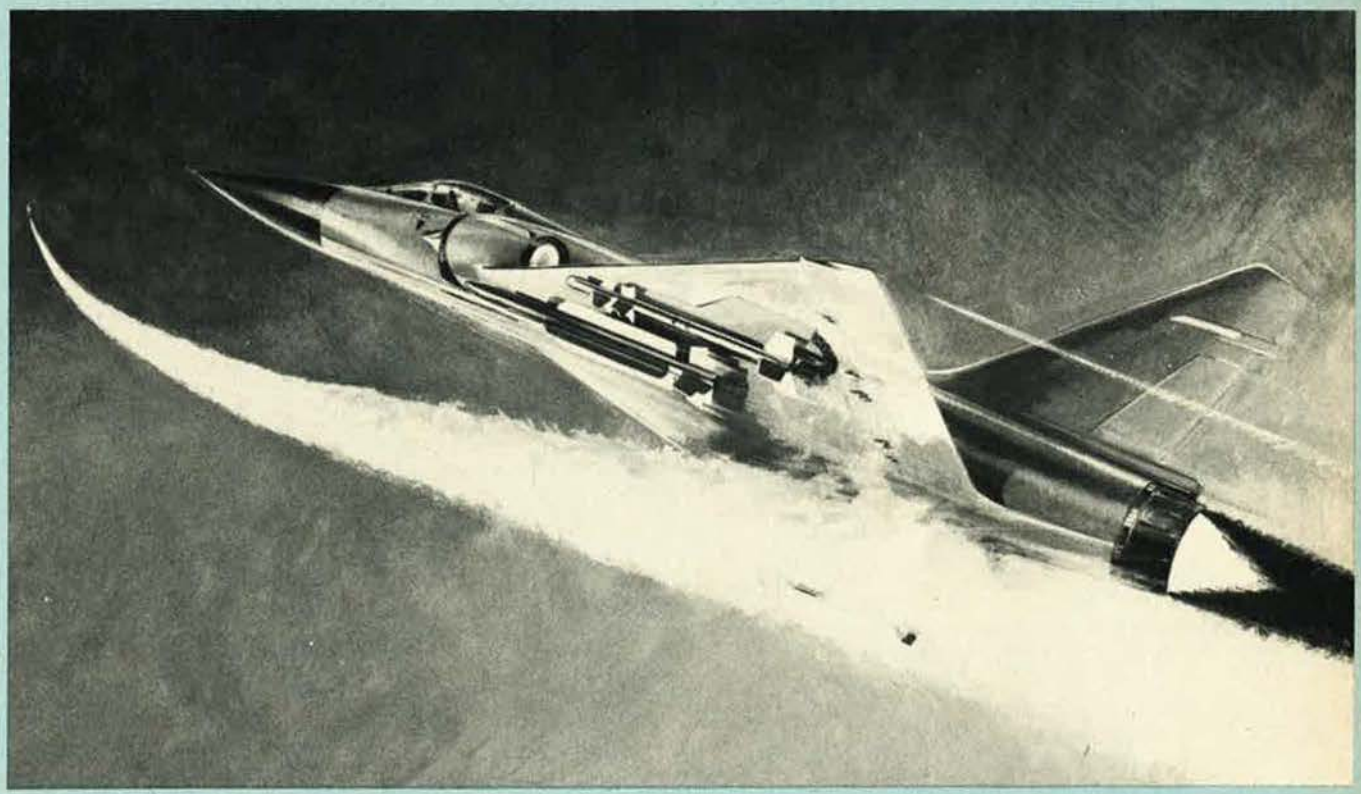
In the US, all aerial torpedo work ceased with the Great Depression of the early thirties. The aerial torpedo idea, however, was not lost. When World War II came, the German Air Force brought forth the V-1 buzz bomb designed on the very principles Lawrence Sperry had begun in 1915 with his flying bomb. Manufacturing the Fiesler-103 Vergeltungswaffe, or V-1 Retaliation Weapon, required only 736 man-hours per unit, most of it slave labor. It carried 1,870 pounds of high explosive and 10,500 sorties were launched against England from June 12, 1944, through March 30, 1945. Approximately seventy-three percent of those launched crossed the English Channel and 2,500 penetrated to targets, principally in London. The V-1 caused 14,665 casualties and untold psychological havoc.

With President Carter's termination of the B-1 program on July 1, 1977, we have come closer to the age of the unmanned weapon that Elmer Sperry envisioned in 1915. The cruise missile will give commanders the long range and accuracy that will be needed on the 1985 battlefield, without needless aircrew attrition. More costly manned aircraft can then be assigned to higher-priority tasks. Hence, the cruise missile will complement, but will not replace, manned aircraft. ■

The Sperry Messenger was designed in 1921 at Wright Field, Ohio, and put on contract by the Air Service for Sperry to manufacture. The name "Messenger" came about after Gen. Billy Mitchell used it to deliver dispatches during Army maneuvers. About fifty of these vehicles were produced. Wright Field used it as a manned test-bed to continue the "aerial torpedo" experiments that had begun during World War I.

JANE'S

ALL THE WORLD'S AIRCRAFT SUPPLEMENT



Artist's impression of the interceptor version of the Mirage 2000, armed with Matra Super 530 and 550 Magic air-to-air missiles

DASSAULT-BREGUET
AVIONS MARCEL DASSAULT/BREGUET AVIATION; Head Office: 27 rue du Professeur Victor Pauchet, 92420-Vaucresson, France

DASSAULT MIRAGE 2000

Following cancellation of the ACF (Avion de Combat Futur) programme, described briefly in the 1975–76 *Jane's*, the Mirage 2000 was selected as the primary combat aircraft of the French Air Force from the mid-eighties. Under French government contract, it is being developed initially as an interceptor and air superiority fighter, powered by a single SNECMA M53 turbofan engine. Dassault claims that its performance will be markedly superior to that of any current combat aircraft in these categories, and that the Mirage 2000 will be equally suitable for reconnaissance, close support, and low-altitude attack missions in areas to the rear of a battlefield.

Reversion to a Mirage III/5 type of delta-wing design, without horizontal tail surfaces, caused some surprise after Dassault's choice of a tailed sweptwing configuration for the later Mirage F1 and ACF. It resulted from considerable study of the requirements of a smaller and less ambitious aircraft than the ACF. Research left no doubt that a delta wing embodying the latest aerodynamic concepts offers an excellent compromise between structural simplicity, light weight, high speed characteristics, and the demands of rapid acceleration, high rate of climb, and manoeuvrability for an aeroplane of relatively modest size and installed power. In particular, a delta layout offers low drag over a wide range of angles of attack in flight, while providing the largest practicable wing area, with attendant benefits in terms of tight turning capability and high service ceiling.

Former shortcomings, such as higher land-

ing speed than a comparable sweptwing type, are overcome by the addition of automatic leading-edge slats which, used in conjunction with the elevons, constitute a variable-camber wing. At the same time, the adoption of fly-by-wire control for the wing surfaces and rudder, with artificial stability ensured by a central computer, permits acceptance of a far-aft centre of gravity without excessive loss of lift. This makes possible a much reduced landing speed for the Mirage 2000, and improves its manoeuvrability in aerial combat.

Having tested successfully a carbon-fibre rudder on a Mirage III, and boron horizontal tail surfaces on a Mirage F1 throughout the flight regime to Mach 2.2, Dassault decided to utilise both materials in the Mirage 2000, achieving weight saving of 15–20% in the components so constructed.

Wing area of the Mirage 2000 is some 15% greater than that of the Mirage III/5, enabling it to carry more internal fuel. The combined effect of all the technological advances was summarised by Général Maurice Saint-Cricq, Chief of Staff of the French Air Force, in the Spring of 1977. He said that the Mirage 2000 is intended to fly at Mach 2.2 at a height of 18,000 m (59,000 ft); to offer low-speed characteristics at least as good as those of the Mirage F1; a rate of climb twice that of the Mirage III, enabling it to attack a Mach 3 aircraft penetrating at high altitude approximately five minutes from brake release; and a 30% better range than that of the Mirage III, after take-off from a 1,200 m (3,940 ft) strip, enabling it to maintain coverage of a combat area for three times as long.

Five prototypes are being built, of which four are funded by the French Air Force and one by the manufacturers. The first is scheduled to undergo systems and vibration testing at Istres during the last quarter of 1977, and to make its first flight there in February 1978, only 26 months after programme launch in December 1975. The third prototype, to fly in early 1979, will be a two-seat trainer. The manufacturers' prototype will be used to develop equipment and other changes proposed for future variants and for export models of the Mirage 2000. Further airframes will be built for static and fatigue testing.

Initial production contracts, expected in 1979–80, will finance 130 single-seat and two-seat Mirage 2000s in 'air defence' configuration, with an eventual requirement for 200 aircraft in this role. The first will fly in 1981; deliveries to the French Air Force will begin in mid-1982, and operational capability should be achieved by 1983. A production rate of four aircraft a month is anticipated by 1984, plus any increase necessary to meet export orders. Dassault believes that a further 200 Mirage 2000s will be required for reconnaissance and strike duties. A single basic type would then make up a high proportion of the French Air Force's planned first-line strength of 450 combat aircraft by the second half of the 'eighties.

The projected strike version of the Mirage 2000 would carry 5 metric tonnes of external stores

The following description applies to the initial single-seat air defence version of the Mirage 2000:

TYPE: Single-seat interceptor and air superiority fighter.

WINGS: Cantilever low-wing monoplane of delta planform, with cambered profile. Large-radius root fairings. Full-span automatic leading-edge flaps operate in conjunction with two-section elevons which form entire trailing-edge of each wing, to provide variable camber in combat and during landing approach. Leading-edge flaps are retracted during all phases of acceleration and low-altitude cruise, to reduce drag. Fly-by-wire control system for elevons and flaps, with surfaces actuated by hydraulic servo-units. No tabs.

FUSELAGE: Conventional all-metal semi-monocoque structure, 'waisted' in accordance with area rule.

TAIL UNIT: Cantilever fin and inset rudder only; latter actuated by fly-by-wire control system via hydraulic servo-units. No tab. Small fixed strake, with marked dihedral, near leading-edge of each air intake trunk.

LANDING GEAR: Retractable tricycle type by Messier-Hispano, with twin nosewheels, and single wheel on each main unit. Hydraulic retraction, nosewheels rearward, main units inward. Oleo-pneumatic shock-absorbers. Electro-hydraulic nosewheel steering, through ±45°. Manual disconnect permits nosewheel unit to castor through 360° for ground towing. Light alloy wheels and tubeless tyres, size 360 x 135-6 on nosewheels, 750 x 230-15 on main wheels. Messier-Hispano hydraulically-actuated graphite composite disc brakes on main wheels, with anti-skid units. Runway arrester gear standard.

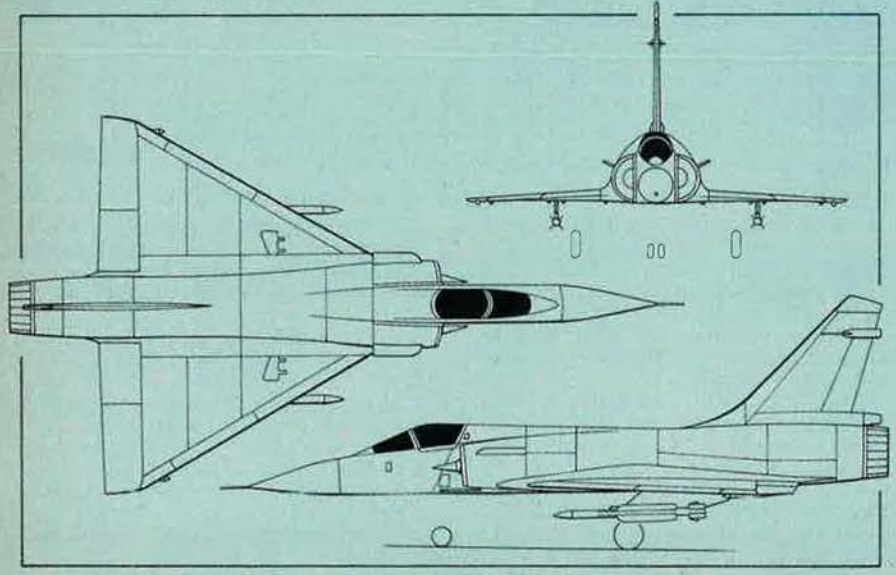
POWER PLANT: One SNECMA M53-2 turbofan engine, rated at 83.4 kN (18,740 lb st) with afterburning, in each prototype; M53-5, rated at 88.3 kN (19,840 lb st) with afterburning, specified for production aircraft. Movable half-cone centrebody in each air intake. Internal fuel capacity (estimated) 4,300 litres (945 Imp gallons). Provision for a jettisonable fuel tank of up to 1,700 litres (374 Imp gallons) capacity under each wing. Provision for flight refuelling probe forward of cockpit on starboard side.

ACCOMMODATION: Pilot only, under transparent canopy.

SYSTEMS: Two independent hydraulic systems, pressure 280 bars (4,000 lb/sq in), to actuate flying control servo-units, landing gear, and brakes.

ELECTRONICS AND EQUIPMENT: Digital pulse-Doppler radar, developed and produced by Thomson-CSF in collaboration with Electronique Marcel Dassault, with reported range of 54 nm (100 km; 62 miles), capability of detecting targets at all alti-

Dassault Mirage 2000 single-seat interceptor/air superiority fighter (Michael A. Badrocke)



tudes, and good ECCM characteristics. SAGEM-Kearfott inertial platform. EMD central digital computer. Thomson-CSF head-up and head-down displays. SFENA automatic pilot. Thomson-CSF ECM, including passive radar warning.

ARMAMENT: Two 30 mm DEFA cannon, and nine attachments for external stores, five under fuselage and two under each wing. Typical interception weapons comprise two Matra Super 530 missiles (inboard) and two Matra 550 Magic missiles (outboard) under wings. (Projected strike version would carry up to 5,000 kg; 11,025 lb of external stores, including nuclear weapons.)

DIMENSIONS, EXTERNAL (estimated):
Wing span 9.00 m (29 ft 6 in)
Length overall 15.33 m (50 ft 3½ in)

WEIGHTS (estimated):
Max T-O weight:
interceptor 9,000 kg (19,840 lb)
strike 15,000 kg (33,070 lb)

PERFORMANCE (estimated):
Max level speed over Mach. 2.3
Max continuous speed Max 2.2
Approach speed
150 knots (278 km/h; 173 mph)
Time to 15,250 m (50,000 ft) and Mach 2 less than 4 min
Service ceiling
above 18,280 m (60,000 ft)
Combat radius with two 1,700 litre (374 Imp gallon) external tanks and four air-to-air missiles
378 nm (700 km; 435 miles)

SOCATA

SOCIÉTÉ DE CONSTRUCTION D'AVIONS DE TOURISME ET D'AFFAIRES (Subsidiary of Aérospatiale); Head Office and Works: Aéroport de Tarbes-Ossun-Lourdes, BP 38, 65001-Tarbes, France

Examples of two new versions of the Rallye light aircraft were displayed for the first time at the 1977 Paris Air Show, as follows:

SOCATA RALLYE 235 G

This military version of the Rallye is generally similar to the high-performance Rallye 235 E four-seat light aircraft, with a 175 kW (235 hp) Lycoming O-540-B4B5 engine, but has four Alkan 663 underwing stores pylons which enable it to be used for a variety of armed and support missions. The pylons are attached under each wing between ribs 8 and 9, and ribs 15 and 16, and are connected to a weapon selection box installed centrally on the radio panel in the cockpit.

Stores that can be carried on these pylons include Matra F2 rocket launchers, each containing six 68 mm rockets; Type AA 52 pods, each containing two 7.62 mm machine-guns with 500 rds/gun, and large enough to retain all spent cartridge cases and links after firing; 50 kg operational or practice bombs; rescue packs for airdropping over water, desert, jungle, or polar regions; flares for use during operational or rescue missions by night; a surveillance pack containing a TV camera and transmitter to send images to a ground station. The camera is fitted with a zoom lens, and can scan to 45° on each side of the aircraft, with a vertical scan of 110°. The pilot has a control box (normal and zoom), and a monitor on which to check precisely the images the camera is viewing. All underwing loads can be jettisoned in an emergency.

The cockpit of the Rallye 235 G contains two side-by-side seats, with dual controls, enabling the aircraft to be used for both basic and operational training, as well as combat missions. A rear bench seat can be installed to permit the carriage of two passengers and a quantity of baggage or freight. Structure of the aircraft is basically unchanged, except for some reinforcement, notably to the wings in the vicinity of the weapon pylons.

SOCATA Rallye 235 G in ground support configuration with underwing armament of two rocket packs and two gun pods

PERFORMANCE:
Range/endurance:
Armed reconnaissance with 2 gun pods at 70% power, 30 min fuel reserves 5 hr or 556 nm (1,030 km; 640 miles)
Armed reconnaissance with 4 rocket launchers at 70% power, 30 min fuel reserves 2 hr 40 min or 286 nm (530 km; 329 miles)
Ground support with 2 gun pods at 75% power at 915 m (3,000 ft), 30 min fuel reserves, 10 min over target 243 nm (450 km; 280 miles)
Ground support with 4 rocket launchers at 75% power at 915 m (3,000 ft), 30 min fuel reserves, 10 min over target 130 nm (240 km; 149 miles)
Ground support with 2 rocket launchers and 2 gun pods at 75% power at 915 m (3,000 ft), 15 min fuel reserves, 10 min over target 43 nm (80 km; 50 miles)
Unarmed reconnaissance with TV pod at 70% power, 30 min fuel reserves 545 nm (1,010 km; 627 miles)

SOCATA RALLYE AGRICOLE

The high-lift and safety characteristics inherent in the basic Rallye well suit it for agricultural operations. It has been possible to purchase standard models adapted for spraying/dusting for some years. The Agricole represents a more specialised development, with a tailwheel-type landing gear instead of the normal tricycle type; a faired-in rear cabin to house a 580 litre (127.5 Imp gallon) chemical tank; reinforced structure, with anti-corrosive treatment on metal surfaces; and a propeller specially designed for heavy duty at low speeds. The airframe is basically similar to that of the Rallye 235 E, and the latter's 175 kW (235 hp) Lycoming O-540-B4B5 engine is retained.

The cockpit is equipped normally with a single seat, on the port side, with entrance via an upward opening canopy/door hinged on the centreline. The forward portion of the chemical tank projects into the starboard side of the cockpit, alongside the pilot. If desired, it can be removed, and replaced by a cover plate and second seat. The aircraft can then be used as a dual-control agricultural pilot trainer, with tank capacity reduced to 500 litres (110 Imp gallons).

Between the seasons for agricultural flying, the Agricole's cockpit canopy, cabin fairing, chemical tank, spraybars, and other specialised equipment can be removed and replaced by conventional Rallye seats and sliding canopy, converting the aircraft into a four-seat touring aircraft or light freighter.

A variety of dispersal equipment is available for the Agricole, including four Micronair units, two above each wing trailing-edge; a Sorensen underfuselage pump with a capacity of 2 to 40 litres/hectare (1 to 22 Imp gallons/acre) and spraybars with 24 or 32 nozzles; or a Transland spreader for solids. Steel wire-cutters are fitted on the front of each main landing gear leg and on the windscreen centreline, with a steel cable from the latter to the tip of the fin.

Max take-off weight of the Agricole is 1,300 kg (2,865 lb).

VFW-FOKKER/WESTLAND

VEREINIGTE FLUGTECHNISCHE WERKE-FOKKER GmbH; Head Office: Hünefeldstrasse 1-5, 2800 Bremen 1 (Postfach 1206), German Federal Republic
WESTLAND HELICOPTERS LTD; Head Office: Yeovil, Somerset BA20 2YB, England

VFW-FOKKER/WESTLAND P 277

To meet the Federal German Army's PAH-II requirement for a medium-weight helicopter to replace the interim BO 105 PAH-I anti-tank helicopter in the mid to late 'eighties, VFW-Fokker and Westland have produced a joint project study which has the designation P 277. A full-scale mockup of the aircraft has been built at Bremen, following tests of 700 different configurations in 75 hours of wind tunnel research.

To reduce development time and costs to a minimum, the P 277 would utilise major assemblies already in production for the Westland/Aérospatiale Lynx, including the latter's hingeless rotor, low-profile rotor/transmission assembly, power plant, duplex hydraulic/electric systems, and automatic flight control system, which offers stabilisation in pitch, roll, and yaw, with heading, radar height, and bar and height holds.

The primary mission of the PAH-II heli-

copter, for which a joint MBB/Aérospatiale design has also been proposed, would be anti-tank operation in support of ground forces. Complementary roles include ground attack of supporting enemy armoured units and supply vehicles, and armed escort of large transport helicopters. The aircraft must have all-weather operational capability by day and night, and be highly manoeuvrable for nap-of-the-earth deployment, easy to maintain, and able to provide firepower adequate to deal with any type of target currently envisaged.

Available details of the P 277 are as follows:

TYPE: Medium-weight anti-tank helicopter.

ROTOR SYSTEM: Single four-blade semi-rigid main rotor and four-blade tail rotor, both generally similar to those of the Westland/Aérospatiale Lynx.

ROTOR DRIVE: Shallow-profile damage-tolerant main gearbox, with tail rotor drive transmitted through large-diameter shafts, via intermediate and tail rotor gearboxes; generally as for the Lynx.

FUSELAGE AND TAIL UNIT: Semi-monocoque ballistic-tolerant light alloy structure. Tail unit comprises a ventral fin, and a dorsal fin/tail rotor pylon with a half-tailplane near the tip on the starboard side. Bullet fairing over tail rotor gearbox.

LANDING GEAR: Hydraulically-retractable main units; non-retractable tailwheel mounted at base of ventral fin. Main units have oleo-pneumatic shock-absorbers, and retract aft into sponsons on each side of fuselage.

POWER PLANT: Two Rolls-Royce Gem 4 turboshaft engines, each with max continuous rating of 645 kW (865 shp), and (2.5 min) max contingency rating of 783 kW (1,050 shp). Internal fuel capacity of 740 kg (1,631 lb).

ACCOMMODATION: Pilot and co-pilot/gunner in tandem beneath flat-plate transparent canopy. Crew seats and critical components protected by armour. Dual controls standard.

SYSTEMS: Two independent hydraulic systems power main rotor tandem servo control units. Simple automatic collective unit; duplicated stability augmentation and autopilot systems. Electrical power supplied by two 15kW three-phase transmission-driven alternators, and two 6kW engine-driven starter/generators. Engine infra-red suppression system.

ELECTRONICS AND EQUIPMENT: UHF, VHF, and HF com; secure speech; intercom; Doppler nav; radar altimeter; UHF homing; Tacan; IFF/SIF. Dual-magnification optical target sighting, with infra-red tracker, compatible with FLIR or laser tracker sensors, laser rangefinder, laser weapon training simulator, helmet sighting system, and pilot's night vision/sighting system.

ARMAMENT: Anti-tank weapons include eight Hot or TOW air-to-surface guided missiles, in four-round packs attached to tips of sponsons, and 20/30 mm cannon with 250 rds in underbelly turret. Ground attack weapons include 38 x 2.75 in rockets in two launch packs, and the underbelly 20/30 mm cannon. Armed escort weapons include two Matra 550 Magic air-to-air missiles, eight Redeye/Stinger infra-red missiles, and a 7.62 mm machine-gun with 2,000 rds in the underbelly turret.

DIMENSIONS, EXTERNAL:

Diameter of main rotor	12.80 m (42 ft 0 in)
Diameter of tail rotor	2.20 m (7 ft 2½ in)
Length of fuselage	13.10 m (42 ft 11¾ in)
Width of fuselage	1.10 m (3 ft 7¼ in)
Height of fuselage	2.50 m (8 ft 2½ in)
Height overall	3.50 m (11 ft 5¾ in)

AREAS:

Main rotor disc	128.67 m² (1,385 sq ft)
Tail rotor disc	3.79 m² (40.8 sq ft)

WEIGHTS (estimated):

Weight empty	2,464 kg (5,432 lb)
Max mission T-O weight	4,309 kg (9,500 lb)
Max permissible T-O weight	4,763 kg (10,500 lb)

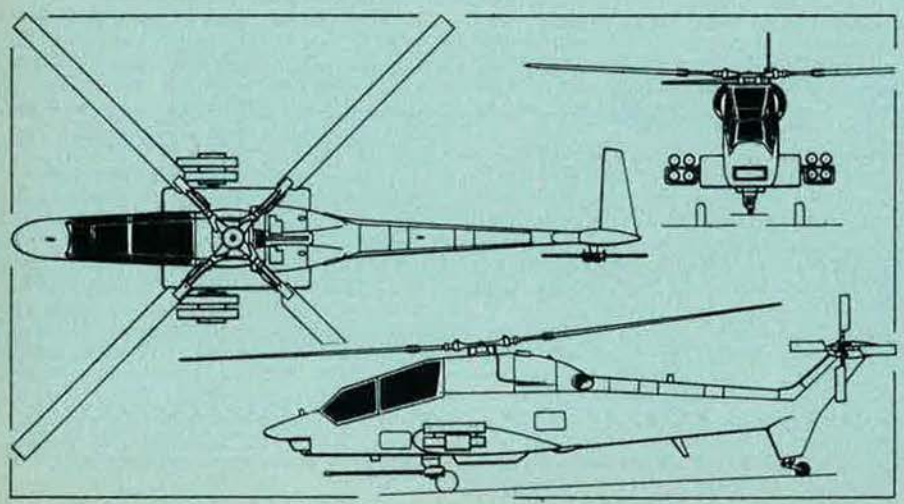
PERFORMANCE (estimated at mission T-O weight, outside air temperature of 10°C; 50°F):

Max cruising speed	155 knots (287 km/h; 178 mph)
*Max vertical rate of climb at S/L	808 m (2,650 ft)/min
Max rate of climb at S/L	792 m (2,600 ft)/min
Single-engine max rate of climb at S/L	305 m (1,000 ft)/min

Typical anti-tank mission profile, with 8 Hot and 20 mm gun, ISA+15°C: 5 min ground idle; 0.5 min hover T-O; 30 nm (55 km; 34 miles) at 150 knots (278 km/h; 172 mph); 8 nm (15 km; 9.3 miles) nap-of-earth at 70 knots (130 km/h; 80 mph) to target; 40 min hover/20 min loiter and attack; 8 nm return nap-of-earth at 70 knots; 30 nm at 150 knots; 0.5 min hover; land, plus 15 min reserves

** 5 min T-O rating*

VFW-Fokker/Westland P 277 anti-tank helicopter, intended to meet a German Army requirement (Pilot Press)



WSK-PZL-MIELEC

WYTWÓRNIA SPRZETU KOMUNIKACYJNEGO-PZL-MIELEC (Transport Equipment Manufacturing Centre, Mielec); Head Office and Works: ul. Ludowego Wojska Polskiego 3, 39-300 Mielec, Poland

WSK-PZL-MIELEC M-18 DROMADER (DROMEDARY)

Although superficially similar to the CNPSL-PZL-Warszawa PZL-106A Kruk, the M-18 Dromader is an entirely different and much larger agricultural aircraft. Designed to meet the requirements of FAR Pt 23, it has been developed with the co-operation of Rockwell International of the USA and utilises the outer wing panels of that company's Thrush Commander. Particular attention has been paid in the design to pilot safety, and all parts of the structure exposed to contact with chemicals are treated with polyurethane or epoxy enamels, or manufactured from stainless steel.

The M-18 made its public debut at the *Salon de l'Aéronautique et de l'Espace* in Paris in May/June 1977, the aircraft exhibited being one of three prototypes said to have been built up to that time.

TYPE: Single-seat agricultural aircraft.

WINGS: Cantilever all-metal low-wing monoplane, of constant chord, with 5° dihedral on outer panels. Steel-capped wing spars. Hydraulically-actuated two-section trailing-edge flaps. Aerodynamically balanced ailerons, actuated by pushrods. No tabs.

FUSELAGE: All-metal structure. Main frame, of helium-arc welded 4130N chrome-molybdenum steel tube, oiled internally against corrosion. Side panels detachable for airframe inspection and cleaning.

TAIL UNIT: All-metal structure, with braced tailplane. Aerodynamically balanced rudder and elevators. Trim tab in each elevator, actuated by pushrods.

LANDING GEAR: Non-retractable tailwheel type. Main units have low-pressure tyres size 720 x 320 mm, and are fitted with hydraulic disc brakes, parking brake, and wire cutters. Fully-castoring tailwheel, lockable for take-off and landing, with size 318 x 114 mm tyre.

POWER PLANT: One 746 kW (1,000 hp) PZL-Kalisz (Shvetsov) ASz-62IR nine-cylinder radial aircooled engine, driving a CNPSL-PZL-Warszawa SP.00 four-blade constant-speed aluminium propeller. Fuel tank in each outer wing panel, combined usable capacity 400 litres (88 Imp gallons; 105.7 US gallons). Gravity-feed header tank in fuselage.

ACCOMMODATION: Single adjustable seat in fully enclosed, sealed, and ventilated cockpit which is stressed to withstand 40*g* impact. Adjustable shoulder-type safety harness. Adjustable rudder pedals. Baggage compartment aft of seat. Quick-opening door on each side.

SYSTEM: 27V 100A electrical system, with 24V heavy duty battery and overvoltage protection relay.

EQUIPMENT: Communications transceiver and navigation receiver. Navigation lights, cockpit light, instrument panel lights, night

M-18 Dromader photographed during its flying demonstration at this year's Paris Air Show (J. M. G. Gradidge)

working lights, taxying light, and two rotating beacons. Built-in jacking and tie-down points in wings and aft fuselage; towing lugs on main landing gear. Cockpit fire extinguisher and first aid kit.

AGRICULTURAL EQUIPMENT: Glassfibre epoxy hopper, with stainless steel tube bracing, forward of cockpit; capacity 2,500 litres (550 Imp gallons; 660 US gallons) of liquid or 1,500 kg (3,306 lb) of dry chemical. Deflector cable from cabin roof to fin. Transland gatebox, control valve, and strainer, Root pump, and 48-96 nozzle spraybooms for spraying; Transland gatebox, control valve, and high output spreader for dusting with dry chemical; or eight AU 3000 atomisers for fine spraying. Aircraft can also be fitted with Rockwell International water bombing installation for fire suppression.

DIMENSIONS, EXTERNAL:

Wing span	17.70 m (58 ft 0¾ in)
Length overall (flying attitude)	9.465 m (31 ft 0¾ in)
Height overall (flying attitude)	4.60 m (15 ft 1 in)
Wheel track	3.575 m (11 ft 8¾ in)
Propeller diameter	3.30 m (10 ft 10 in)
Propeller ground clearance (tail up)	0.23 m (9 in)

AREA:

Wings, gross	40.00 m² (430.56 sq ft)

WEIGHTS:

Weight empty	2,470 kg (5,445 lb)
Payload:	
FAR 23	1,500 kg (3,306 lb)
CAM 8	2,600 kg (5,732 lb)
Max T-O weight:	
FAR 23	4,200 kg (9,259 lb)
CAM 8	5,300 kg (11,684 lb)

PERFORMANCE (at 4,200 kg; 9,259 lb max T-O weight, ISA. A: without agricultural equipment; B: with spreader equipment):

Max level speed:	
A	138 knots (256 km/h; 159 mph)
B	128 knots (237 km/h; 147 mph)
Cruising speed:	
A	110 knots (205 km/h; 127 mph)
B	102 knots (190 km/h; 118 mph)
Operating speed:	
A, B	92–110 knots (170–185 km/h; 106–115 mph)
Stalling speed, power off, flaps up:	
A, B	68 knots (125 km/h; 78 mph)
Stalling speed, power off, flaps down:	
A, B	59 knots (109 km/h; 68 mph)
Max rate of climb at S/L:	
A	348 m (1,141 ft)/min
B	318 m (1,043 ft)/min
Service ceiling:	
A	6,500 m (21,325 ft)
T-O run:	
A	275 m (903 ft)
B	280 m (919 ft)
Landing run:	
A	330 m (1,083 ft)
B	320 m (1,050 ft)
Max range, no reserves:	
A	280 nm (520 km; 323 miles)

AERO L-39

The L-39 basic and advanced jet trainer was developed in the Aero works at Vodochody by a team led by the chief designer, Dipl Ing Jan Vlcek. Two prototype airframes had been completed by 4 November 1968 when the 02 aircraft flew for the first time. The 01 airframe was utilised for structural testing. By the end of 1970, five flying prototypes and two for ground testing had been completed. Slightly larger and longer air intake trunks were fitted after preliminary flight tests.

A pre-production batch of 10 aircraft began to join the flight test programme in 1971, and series production started in late 1972, following official selection of the L-39 to succeed the L-29 (1974–75 *Jane's*) as the standard jet trainer of all Warsaw Pact countries except Poland. Service acceptance trials, in Czechoslovakia and the USSR, took place in 1973, and by the Spring of 1974 the L-39 had begun to enter service with the Czech Air Force. By the Summer of 1977, when the L-39 made its first appearance in the West, at the Paris *Salon de l'Aéronautique et de l'Espace*, approximately 1,000 L-39s had been ordered. Of these, some 400–500 were then in service with the air forces of Bulgaria, Czechoslovakia, the German Democratic Republic, Hungary, Iraq, and the USSR.

The L-39 forms part of a comprehensive training system which includes a specially designed pilot training flight simulator (TL-39), a pilot ejection ground training simulator (NKTL-29/39), and vehicle-mounted mobile automatic test equipment (KL-39). The aircraft is capable of operation from unpaved or unprepared runways.

The following description applies to the current production version, except where indicated:

In the static park at the recent Paris Air Show, the Aero L-39 was shown for the first time with underwing stores (Brian M. Service)

AERO

AERO VODOCHODY NARODNI PODNIK (Aero Vodochody National Corporation); Address: Vodochody, p. Odelená Voda, near Prague, Czechoslovakia
PROJECT ENGINEER, L-39: Ing Vlastimil Havelka

Aero's major product from 1963–74 was the L-29 Delfin jet basic and advanced trainer (NATO reporting name *Maya*), of which more than 3,000 were built for the air forces of the USSR, Czechoslovakia, and other countries. The L-29 has been superseded in production by the L-39.

TYPE: Two-seat basic and advanced jet trainer.

WINGS: Cantilever low-wing monoplane, with 2° 30′ dihedral from roots. Wing section NACA 64A012 mod. 5. Incidence 2°. Sweepback at quarter-chord 1° 45′. One-piece all-metal stressed-skin structure, with all-metal hydraulically-operated double-slotted trailing-edge flaps. Small fence above and below each trailing-edge between flap and aileron. Electrically-operated trim tab in each aileron. Control surfaces actuated by pushrods. Flaps deflect 25° for take-off, 44° for landing; ailerons deflect 17° up or down; airbrakes deflect

Aero L-39 basic and advanced jet trainer photographed during display at the 1977 Paris Air Show (J. M. G. Gradidge)

55° downward. Non-jettisonable wingtip fuel tanks, incorporating aircraft landing lights.

FUSELAGE: Metal semi-monocoque structure, built in two portions. Front portion consists of three sections, the first of which is a laminated glassfibre nosecone housing electrical and radio equipment and the nose landing gear. Next comes the pressurised compartment for the crew. The third section contains fuel tanks and the engine bay. The rear fuselage, carrying the tail unit, can be removed quickly to provide access for engine servicing. Two airbrakes side by side under fuselage, just forward of wing leading-edge.

TAIL UNIT: Conventional all-metal cantilever structure, with sweepback on vertical surfaces. Variable-incidence tailplane. Control surfaces actuated by pushrods. Electrically-operated trim tab in each elevator.

LANDING GEAR: Retractable tricycle type, with single wheel and oleo-pneumatic shock-absorber on each unit. Hydraulic retraction, main wheels inward into wings (with automatic braking during retraction) nosewheel forward into fuselage. Pneumatic ram-air system for emergency extension. K24 main wheels, fitted with Barum tubeless tyres size 610 x 215 mm (610 x 185 mm on early production aircraft), pressure 5.88 bars (85.34 lb/sq in). Nosewheel fitted with Barum tubeless tyre size 450 x 165 mm (430 x 150 mm on early production aircraft), pressure 3.92 bars (56.89 lb/sq in). Hydraulic disc brakes and anti-skid units on main wheels.

POWER PLANT: One 16.87 kN (3,792 lb st) Walter Titan (Motorlet-built Ivchenko AI-25-TL) turbofan engine mounted in rear fuselage, with semi-circular lateral air intake, fitted with splitter plate, on each side of fuselage above wing centre-section. Fuel in five rubber bag-type main tanks aft of cockpit, with combined capacity of 1,055 litres (232 Imp gallons), and two 100 litre (22 Imp gallon) non-jettisonable wingtip tanks. Total internal fuel capacity 1,255 litres (276 Imp gallons). Provision for two 350 litre (77 Imp gallon) underwing drop-tanks, increasing total overall fuel capacity to 1,955 litres (430 Imp gallons).

ACCOMMODATION: Crew of two in tandem, on VSI-BRI rocket-assisted ejection seats, operable at zero height and at speeds down to 81 knots (150 km/h; 94 mph), beneath individual transparent canopies which hinge sideways to starboard. Dual controls standard.

SYSTEMS: Cabin pressurised (differential 0.27 bars; 3.92 lb/sq in) and air-conditioned. Air-conditioning system provides automatic temperature control from 10°–28°C at ambient air temperatures from −55°C to +45°C. Two interconnected hydraulic systems, each with variable pressure pump and operating at 147 bars (2,133 lb/sq in) pressure. Main system actuates landing gear, flaps, airbrakes, ram-air turbine, and wheel brakes. Emergency system incorporates three accumulators using a 50–50 mixture of hydraulic fluid and nitrogen. Mechanical standby for actuation of landing gear, flaps, and airbrakes in the event of total hydraulic failure. Pneumatic canopy seals. 27/28V DC electrical system, powered by a 9kW VG 7500JA engine-driven generator, with two 800VA static inverters (one 1000VA on early aircraft) for 115V single-phase AC power at 400Hz and one 50VA static inverter for 36V three-phase AC, also at 400Hz. If primary generator fails, a V 910 ram-air turbine is extended automatically into the airstream and generates up to 3kW of emergency power for essential services. 12V SAM 28 battery for standby power. Sapphire 5 compressed air generator and SV-35 turbine for engine starting and to power fuel flow system. Air intakes and windscreen anti-iced by engine bleed air; normally, anti-icing is sensor-activated automatically, but a manual standby system is also provided. Oxygen system for crew.

ELECTRONICS AND EQUIPMENT: Standard electronics include Tesla RTL-11 air-to-ground VHF com (100-150MHz) and crew intercom, with separate intercom backup; a Soviet-built R-832 two-band VHF/UHF; RKL-41 ADF (150-1,800KHz); RV-5 radio altimeter; MRP-56P/S marker beacon receiver; and IFF. VOR/ILS optional. Landing light in forward end of each tip-tank.

ARMAMENT: Four underwing hardpoints, the inboard pair each stressed for loads of up to 500 kg (1,102 lb) and the outer pair for loads of up to 250 kg (551 lb) each; max external stores load 1,100 kg (2,425 lb). Typical underwing stores can include various combinations of bombs up to 500 kg in size; launching pods, containing up to sixteen 57 mm air-to-surface rockets; air-to-air missiles; gun pods; a five-camera reconnaissance pod; or (on inboard stations only) two 150 or 350 litre (33 or 77 Imp gallon) drop-tanks. Electrically-controlled ASP-3-NMU-39 gunsight and FKP-2-2 gun camera standard.

DIMENSIONS, EXTERNAL:

Wing span	9.46 m (31 ft 0½ in)
Wing chord (mean)	2.15 m (7 ft 0½ in)
Wing aspect ratio (geometric)	4.4
Length overall	12.32 m (40 ft 5 in)
Height overall	4.72 m (15 ft 5½ in)
Tailplane span	4.40 m (14 ft 5 in)
Wheel track	2.44 m (8 ft 0 in)
Wheelbase	4.39 m (14 ft 4¾ in)

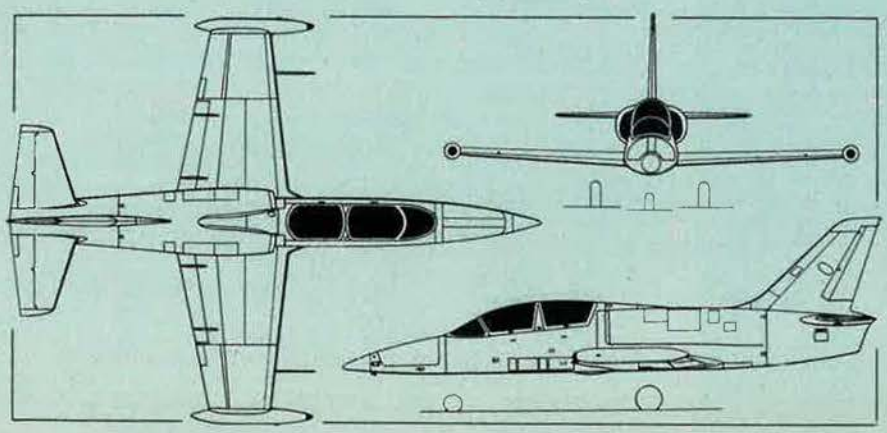
AREAS:

Wings, gross	18.80 m² (202.36 sq ft)
Ailerons (total)	1.23 m² (13.26 sq ft)
Trailing-edge flaps (total)	2.68 m² (28.89 sq ft)
Airbrakes (total)	0.50 m² (5.38 sq ft)
Fin	2.77 m² (29.78 sq ft)
Rudder	0.71 m² (7.68 sq ft)
Tailplane	3.93 m² (42.30 sq ft)
Elevators, incl tabs	1.14 m² (12.27 sq ft)

WEIGHTS AND LOADINGS:

Weight empty	3,330 kg (7,341 lb)
Fuel load:	
fuselage tanks	824 kg (1,816 lb)
wingtip tanks	156 kg (344 lb)
underwing tanks (optional)	545 kg (1,201 lb)
Max external weapon load	1,100 kg (2,425 lb)
Max T-O weight:	
'clean', with 824 kg (1,816 lb) fuel and tip-tanks empty	4,570 kg (10,075 lb)
with full internal fuel and four underwing rocket pods	(980 kg; 2,160 lb) 5,270 kg (11,618 lb)
Max landing weight	4,500 kg (9,920 lb)
Wing loading 'clean'	243 kg/m² (49.77 lb/sq ft)
Power loading 'clean'	270.9 kg/kN (2.65 lb/lb st)

Aero L-39 two-seat basic and advanced jet trainer (Pilot Press)



PERFORMANCE (A: at 'clean' AUW of 4,570 kg; 10,075 lb with tip-tanks empty; B: at AUW of 5,270 kg; 11,618 lb with full internal fuel and four underwing rocket pods; C: at AUW of 4,300 kg; 9,480 lb, except where indicated):

*Max limiting Mach number (VNE) 0.82

Max permitted diving speed (VD)
491 knots (910 km/h; 565 mph)

Max level speed at S/L:
C 378 knots (700 km/h; 435 mph)

Max level speed at altitude:
A at 6,000 m (19,685 ft)
421 knots (780 km/h; 485 mph)
B at 6,000 m (19,685 ft)
340 knots (630 km/h; 391 mph)
C at 5,000 m (16,400 ft)
405 knots (750 km/h; 466 mph)

Cruising speed at 5,000 m (16,400 ft):
C 367 knots (680 km/h; 423 mph)

Stalling speed:
C, flaps up
97 knots (180 km/h; 112 mph)
C, 25° flap
90 knots (165 km/h; 103 mph)
C, 44° flap
84 knots (155 km/h; 97 mph)

Touchdown speed:
A at 4,500 kg (9,920 lb) AUW
94.5 knots (175 km/h; 109 mph)
B at 4,600 kg (10,141 lb) AUW
98 knots (182 km/h; 113 mph)

Max rate of climb at S/L:
A 1,320 m (4,330 ft)/min
B 960 m (3,150 ft)/min

Optimum climbing speed:
C 210 knots (390 km/h; 242 mph)

Service ceiling:
A 11,500 m (37,730 ft)
B 9,000 m (29,525 ft)

T-O run, 25° flap, ISA:
at 4,300 kg (9,480 lb) AUW, concrete
480 m (1,575 ft)
at 4,300 kg (9,480 lb) AUW, grass
630 m (2,067 ft)
at 4,570 kg (10,075 lb) AUW
500 m (1,640 ft)
at 5,270 kg (11,618 lb) AUW
800 m (2,625 ft)

T-O to 25 m (82 ft):
at 4,300 kg (9,480 lb) AUW
630 m (2,067 ft)

Landing from 25 m (82 ft):
at 4,300 kg (9,480 lb) AUW
1,120 m (3,675 ft)

Landing run, 44° flap, ISA:
at 4,100 kg (9,039 lb) AUW
620 m (2,034 ft)
at 4,300 kg (9,480 lb) AUW
690 m (2,264 ft)

Max range on internal fuel, 5% reserves:
A 458 nm (850 km; 528 miles)
B 421 nm (780 km; 485 miles)

Max range with full internal fuel, two 350 litre drop-tanks, and no external weapons 863 nm (1,600 km; 994 miles)

Endurance at 5,000 m (16,400 ft), ISA:
with max internal fuel 2 hr 0 min
with max internal and external fuel
2 hr 30 min

g limits:
at 4,200 kg (9,259 lb) AUW +8; −4
at 4,400 kg (9,700 lb) AUW +7.5; −3.75
at 4,600 kg (10,141 lb) AUW +7; −3.5

** Has flown at Mach 0.85 (512 knots; 950 km/h; 590 mph) in test flights*

Mitsubishi F-1 single-seat close air support fighter, evolved from the T-2 supersonic jet trainer

MITSUBISHI

MITSUBISHI JUKOGYO KABUSHIKI KAISHA (Mitsubishi Heavy Industries Ltd); Head Office: 5-1, Marunouchi 2-Chome, Chiyoda-ku, Tokyo 100, Japan

MITSUBISHI F-1

Following the decision of the Japan Air Self-Defence Force to develop a single-seat close air support fighter from the Mitsubishi T-2 supersonic trainer (35 of which had been delivered by March 1977), detail design began in 1972. During the development period the fighter was provisionally designated FS-T2-Kai, as described in previous editions of *Jane's*.

The second and third production T-2 trainers (59-5106 and 59-5107) were converted as prototypes, in which form they made their first flights on 7 and 3 June 1975 respectively. These aircraft retained the rear cockpit and canopy of the T-2, but this area was occupied by the fire control system and test equipment instead of a second crew member. Externally, they differed from the T-2 by the presence of a tubular fairing at the top of the fin, housing a passive warning radar antenna.

These prototypes were delivered to the JASDF Air Proving Wing at Gifu in July and August 1975, and after a year of flight test and evaluation the aircraft was type approved in November 1976 and officially designated F-1.

Production orders were placed in March 1976 (for 18 F-1s) and March 1977 (for a further eight), of an anticipated total order for about 70. Deliveries were scheduled to begin in September 1977, following the roll-out of the first production F-1 (70-8201) on 25 February 1977; this aircraft made its first flight on 16 June 1977.

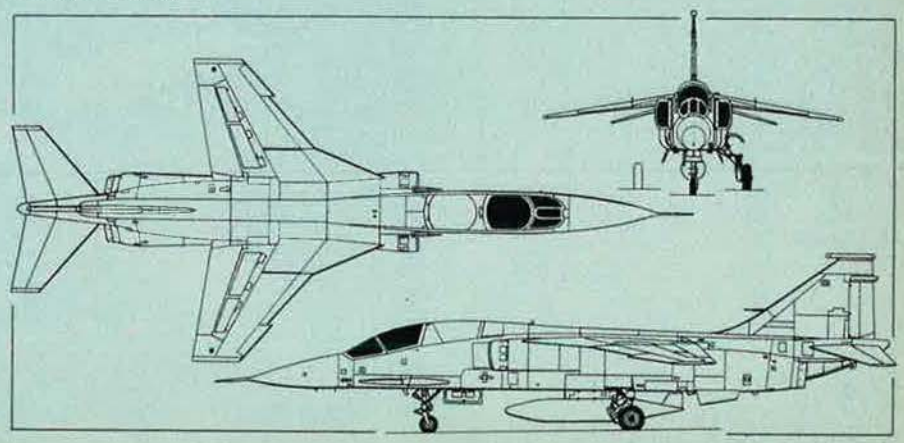
TYPE: Single-seat close air support fighter.

WINGS: Cantilever all-metal shoulder-wing monoplane. Wing section NACA 65 series (modified). Thickness/chord ratio 4.66%. Anhedral 9° from roots. Sweepback on leading-edges 68° at root, 42° inboard of outer extended-chord panels, and 36° on outer panels. Multi-spar torsion box machined from tapered thick panels and constructed mainly of 7075 and 7079 aluminium alloy. Electrically-actuated aluminium honeycomb leading-edge flaps, the outer portions of which have extended chord. Electrically-actuated all-metal single-slotted flaps, with aluminium honeycomb trailing-edges over 70% of each half-span. No conventional ailerons. Lateral control by hydraulically-actuated all-metal two-section slotted spoilers ahead of flaps.

FUSELAGE: Conventional all-metal semi-monocoque structure, mainly of 7075 and 7079 aluminium alloy. Approx 10% of structure, by weight, is of titanium, mostly around engine bays. Two hydraulically-actuated door-type airbrakes under rear fuselage, aft of main-wheel bays.

TAIL UNIT: Cantilever all-metal structure. One-piece hydraulically-actuated all-moving swept tailplane, with 15° anhedral. Inner leading-edges of titanium; outer leading-edges of aluminium. Trailing-edges of aluminium honeycomb construction. Small ventral fin under each side of fuse-

Mitsubishi F-1 equipped with centreline external fuel tank (Pilot Press)



lage at rear. Hydraulically-actuated rudder.

LANDING GEAR: Hydraulically-retractable tricycle type, with pneumatic backup for emergency extension. Main units retract forward into fuselage, nose unit rearward. Single wheel and oleo-pneumatic shock-absorber on each unit. Nosewheel steerable through 72°. Hydraulic brakes and Hydro-Aire anti-skid units. Runway arrester hook beneath rear fuselage. Brake parachute in tailcone.

POWER PLANT: Two Rolls-Royce/Turboméca Adour turbofan engines, each rated at 20.95 kN (4,710 lb st) dry and 31.45 kN (7,070 lb st) with afterburning, mounted side by side in centre of fuselage. (Engines licence-built by Ishikawajima-Harima, under designation TF40-IHI-801A.) Fixed-geometry air intake, with auxiliary 'blow-in' intake doors, on each side of fuselage aft of rear cockpit. Fuel in seven fuselage tanks with total capacity of 3,823 litres (841 Imp gallons; 1,010 US gallons). Pressure refuelling point in starboard side of fuselage, forward of main-wheel bay. Provision for carrying up to three 821 litre (180 Imp gallon; 217 US gallon) drop-tanks under wings and fuselage.

ACCOMMODATION: Pilot only, on Weber ES-7J zero-zero ejection seat is pressurised and air-conditioned cockpit. Manually-operated rearward-hinged jettisonable canopy. Liquid oxygen supply for pilot. Rear cockpit area of T-2 is modified as electronics compartment for bombing computer, inertial navigation system, and radar warning system, and has 'solid' fairing in place of second canopy.

SYSTEMS: Cockpit air-conditioning system. Two independent hydraulic systems, each of 207 bars (3,000 lb/sq in), for flight controls, landing gear, and utilities. Pneumatic bottle for landing gear emergency extension. Primary electrical power from two 12/15kVA AC generators.

ELECTRONICS AND EQUIPMENT: Dual Mitsubishi Electric J/ARC-51 UHF; Nippon Electric J/ARN-53 Tacan; Toyo Communication J/APX-101 IFF/SIF; Mitsubishi Electric nose-mounted air-to-air and air-to-ground radar and licence-built Thomson-CSF J/AWG-11 head-up display; Mitsubishi Electric bombing computer; Ferranti 6TNJ-F inertial navigation system; radio altimeter; air data computer; Lear 5010BL attitude and heading reference system; radar homing and warning system; and strike camera system.

ARMAMENT: One Vulcan JM-61 multi-barrel 20 mm cannon in lower fuselage, aft of cockpit on port side. Attachment point on underfuselage centreline and two under each wing, on which can be carried Mitsubishi ASM-1 air-to-ship missiles, rockets, or drop-tanks. Detachable multiple ejector racks on the underwing points permit the carriage of up to twelve 500 lb bombs. Wingtip attachments for two or four Sidewinder, Mitsubishi AAM-1, or similar air-to-air missiles.

DIMENSIONS, EXTERNAL:

Wing span	7.88 m (25 ft 10¼ in)
Wing aspect ratio	3
Wing taper ratio	3.7
Length overall	17.85 m (58 ft 6¾ in)
Height overall	4.39 m (14 ft 4¾ in)
Wheel track	2.82 m (9 ft 3 in)
Wheelbase	5.72 m (18 ft 9 in)

AREAS:

Wings, gross	21.18 m² (228.0 sq ft)
Vertical tail surfaces (total, excl ventral fins)	5.00 m² (53.82 sq ft)
Horizontal tail surfaces (total)	6.70 m² (72.12 sq ft)

WEIGHTS:

Operational weight empty	6,358 kg (14,017 lb)
Max T-O weight	13,674 kg (30,146 lb)

PERFORMANCE (T-2 at 'clean' max T-O weight of 9,805 kg; 21,616 lb. Performance of F-1 in 'clean' configuration generally similar except where indicated):

Max level speed at 11,000 m (36,000 ft)	Mach 1.6
Max rate of climb at S/L	10,670 m (35,000 ft)/min
Time to 11,000 m (36,000 ft) (F-1)	2 min
Service ceiling	15,240 m (50,000 ft)
T-O run (F-1)	1,280 m (4,200 ft)
Required field length (T-2)	1,525 m (5,000 ft)

Combat radius (F-1):

with four Sidewinders, internal fuel only, incl reserves
150 nm (278 km; 173 miles)

lo-lo-lo-hi with eight 500 lb bombs and external tanks
190 nm (351 km; 218 miles)

hi-lo-hi with two ASM-1s and one 821 litre external tank, incl reserves
300 nm (556 km; 346 miles)

Max ferry range (T-2) with three 833 litre (183 Imp gallon; 220 US gallon) external tanks
1,400 nm (2,593 km; 1,610 miles)

SAAB-SCANIA

SAAB-SCANIA AB; Aerospace Division
Head Office: S-581 88 Linköping, Sweden

SAAB-SCANIA B3LA

Swedish Air Force requirements for a new light combat aircraft and jet trainer for service in the mid-1980s have led to the evolution of the Saab-Scania B3LA, a multi-purpose aircraft optimised in the combat role for the support of land forces and for battlefield interdiction. Its primary task will be to replace the SK 60 (Saab 105) in the light attack and training roles, but it will also take over some tasks at present performed by the AJ 37 attack version of the Viggen. As a trainer, it will be capable of a full range of activity from basic flight training to advanced flying training, and weapon training.

Features of the B3LA, which was in the design definition stage in mid-1977, include survivability both in the air and on the ground, the ability to carry several tonnes of ordnance, and a low radar signature. It has been designed to have modular components (including a high percentage made from modern composite fibre materials) and modular electronics packages; built-in self-test capability; and automatic post-flight maintenance analysis. Operation in a combat environment would primarily be from dispersed, semi-prepared road bases; and would require a minimum of ground support, its low-pressure tyres enabling the aircraft to taxi off roads or runways along grass or gravel tracks.

Approval to proceed to prototype construction was expected before the end of 1977.

TYPE: Two-seat light attack aircraft, with secondary capability for basic or advanced training.

WINGS: Fail-safe cantilever shoulder-wing monoplane, having a supercritical wing section.

FUSELAGE: Conventional all-metal semi-monocoque fail-safe structure.

TAIL UNIT: Cantilever all-metal fail-safe structure, with sweepback on all surfaces.

LANDING GEAR: Retractable tricycle type, with single wheel on each unit. Nose unit retracts forward, main units inward into fuselage. Low-pressure tyres.

POWER PLANT: One non-afterburning version of the Turbo-Union RB.199 or General Electric F404-GE-400 turbofan engine, installed in rear fuselage. Lateral intake, with splitter plate, on each side of fuselage. Self-sealing fuel tanks.

ACCOMMODATION: Crew of two in tandem, on ejection seats, under individual canopies. Rear seat elevated.

ELECTRONICS: Redundant control systems, digital electronics systems, inertial navigation system, and APU.

ARMAMENT AND OPERATIONAL EQUIPMENT: Built-in cannon. Reconnaissance camera in nose. Hardpoint on fuselage centreline and two under each wing for wide range of external stores including rocket pods and air-to-surface missiles; attachment point at each wingtip for air-to-air missile. Forward-looking infra-red (FLIR) target acquisition, ECM equipment, and advanced signal processing.

A model of Saab's projected B3LA light attack/trainer for service with the Swedish Air Force in the 1980s

There is a move afoot to abandon Taiwan and establish full diplomatic relations with the People's Republic of China. Ethics aside, we should take a hard look at . . .

Taiwan and the US Posture in the Pacific

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

AS WE all know, there is a move afoot to establish full diplomatic relations with the People's Republic of China. But the PRC has intimated that first we should sever relations with the Republic of China on Taiwan, abrogate our defense treaty, and withdraw all US military personnel from the island.

Naturally enough, there also is a move afoot to meet these demands as a way of speeding the consumation of this new relationship. Prominent among the advocates of abandoning our old friends on Taiwan is Sen. Ted Kennedy of Massachusetts, along with various other people, in and out of government.

The rationale behind all this is simple. We will gain great stature, if not immediate friendship, with a nation of 800,000,000 people at the expense of a nation of only 17,000,000. We will also be enlisting this huge nation on our side against the USSR. Or, perhaps, it will be enlisting us. Seemingly, it will not matter in that joyous union of former enemies. As for Taiwan, well, we can give those Chinese some sort of reassurance. It will necessarily be well short of what we have given them in the past, but that is the way it goes.

When Chiang Kai-shek and the remnants of his army came ashore on Taiwan twenty-eight years ago, it was a bleak moment for him and for those who dreaded a Communist Asia. For all practical purposes, Marshal Chiang and his side were finished, and much of the Western world made that judgment. For a variety of reasons the US did not. As time passed the Nationalists on Taiwan became the military force they should have been on the mainland. Corruption was replaced with discipline and dedication. The Double Ten parades of the fifties and sixties, with the old Marshal reviewing his troops, were something unforgettable. Meanwhile, Taiwan began to prosper in a remarkable way, and the initial resentment of the native Taiwanese toward the mainlanders subsided with the realization that things had never been better.

The beautiful subtropical island of Taiwan has always been coveted by someone. The Dutch wanted it, and for nearly forty years of the 17th century, had it, shared during part of that time with the Spanish. It was the Dutch, in fact, who imported the Chinese from the mainland as a source of labor, the Taiwan aborigines being either incapable or intractable. It was a Chinese pirate who drove out the Dutch and brought in a more educated class of Chinese. Peking took control of the island for the first time at the end of the 17th century. The Japanese conquered Taiwan late in the 19th century and kept it until 1945. It has not, then, had an unbroken record as a Chinese province. However, that is beside the point. It is Chinese territory now, Nationalist Chinese territory, and if we concede that there is only one legitimate Chinese government, Taiwan goes along in the deal. That seems to be the position of Peking and the rapprochement advocates in this country.

Putting the matter of ethics and loyalty aside for the moment, consider what Taiwan means to the United States military posture in the Pacific. Presumably, we intend to remain faithful to our Korea and Japan defense obligations. Our bases in the Philippines are still basic to our ability to operate in the western and southwestern Pacific, and so the security of the Philippines is important to our own self-interest. A line drawn from Japan through Okinawa to the Philippines passes by Taiwan. It is scarcely logical not to include Taiwan in the line.

It has made sense in other ways over the past twenty-five years. The Chinese have been far more to us than mere base providers. As sophisticated and highly skilled people, they have been one of our best allies in the real sense of the word. During Vietnam much of our fighter overhaul was done in Taiwan. And while it is still not possible to detail their contributions, the Nationalist Chinese did some significant, and dangerous, jobs for us during that unhappy war.

Our strength in the Pacific is reaching the point of bare credibility, and will, with the Korean withdrawal, grow even more marginal. Giving up a strong ally makes no sense, and never mind the moral implications. When that ally has proved itself over the years to be faithful, as well as capable, it makes even less sense.

However, there is another consideration that does not come up for much discussion these days. Suppose the Nationalist Chinese refuse to roll over. It is a likely course for them to take, given their past record. Having taken that stand, and bereft of their old friends, where do they turn for arms and security? To the USSR, says Professor David Rowe of Yale, an Asian specialist, in an article in the July 22 *National Review*.

There is a certain logic in that prediction. After all, it would unite the two sworn enemies of Communist China. An unfriendly Taiwan would do very bad things to that western Pacific frontier of ours.

From what we know of them, the Chinese Communists are a pretty tough bunch. Sentiment seems to play a minor, or even nonexistent, role in their affairs. Thus, while it would appear that we, as the other world power, could capitalize on the present Soviet-Chinese enmity, we should do so with our eyes open. There is nothing in Communist China's past history, nor in Mao's little Red Book, to indicate we really can be good friends. They have more to gain, it would seem, than we, by a closer relationship. Why, then, should we sacrifice our friends, and a good deal of self-respect, by throwing Taiwan into the deal? ■

If you've wondered what it's like to be catapulted from zero to 170 knots in three seconds, or to set down an F-4 with a 300-foot landing roll, read on. The author, who did an exchange tour with the Marine Corps, much of it aboard the carrier *Nimitz*, tells about life at sea and . . .

Cat Shots and Traps With Trip Trey

BY CAPT. DAVID J. MEYER, USAF

YOU are the pilot of an F-4 Phantom on a moonless night over the Mediterranean, at least 100 miles from the nearest land. A little more than an hour ago you were launched from the deck of the Navy's newest nuclear-powered aircraft carrier, the USS *Nimitz,* now twenty-three miles away. Soon you expect to land on that deck again.

There is an 8,000-foot overcast blotting out the stars, and it is darker than you have ever seen it. No sky glow from nearby towns or villages, no lights from isolated farms, not one light anywhere, and not even a hint of a horizon. The dim red glow of your instrument lights is all you have to look at as you fly your holding (marshal) pattern waiting for your assigned approach time a few minutes away.

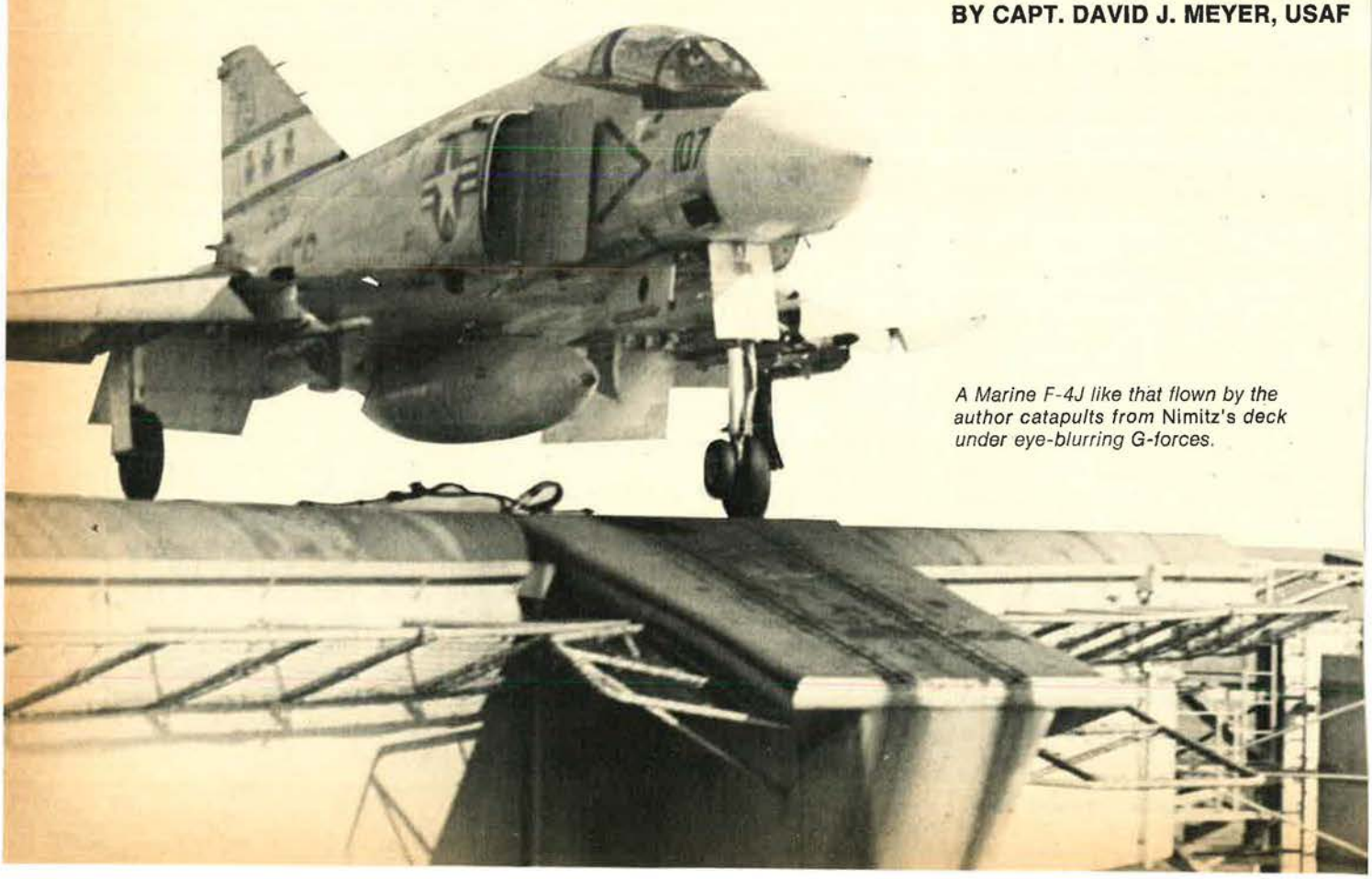
Ahead of you is the instrument approach that will take you from marshal to a point approximately one mile aft of the ship, where you can take over the approach visually. A successful landing can be made only by touching down approximately one-third of the distance up the 700-foot-long angled deck, and catching one of four steel cables (called wires) with your tailhook.

Sounds difficult? Well, 700 feet is a pretty small runway for a jet fighter like the Phantom, but Navy and Marine pilots land on them all the time . . . and a few Air Force pilots on exchange duty, such as myself.

• • •

My association with the US Marine Corps, and eventually the US Navy, began in June 1974 at Holloman AFB, N. M., when I received a call from the Exchange Officer Branch at the Air Force Military Personnel Center, Randolph AFB, Tex. Would I be interested in a Marine exchange assignment at Beaufort, S. C., flying F-4s? They had noticed that I was a volunteer for exchange duty on my Officer Career Objective Statement. After talking to a friend who had a Marine exchange tour at Beaufort a few years ago, I accepted the assignment.

On October 31, 1974, I checked into the Marine Corps Air Station at Beaufort, and the next day was assigned to VMFA-451, one of four F-4J Phantom squadrons there. After a few days of ground school, I was flying the F-4J, which is the same aircraft the Navy flies. It is similar in looks to the Air Force F-4D but has wings and landing gear that have



A Marine F-4J like that flown by the author catapults from Nimitz's *deck under eye-blurring G-forces.*

been stressed for carrier operations.

In May 1975, VMFA-333, another F-4 squadron at Beaufort, began preparing to deploy aboard the USS *Nimitz*. Marine squadrons had not been used aboard carriers very often in the past few years. VMFA-333 was an exception, having put in a Western Pacific and Mediterranean cruise in 1972–73 aboard the USS *America*. They had also just completed a two-week carrier qualification (CQ) period on the USS *Independence*. On May 5, I was transferred to VMFA-333, or "Trip Trey" as it is known, and immediately began to practice for carrier landings.

Meatball, Lineup, AOA

At this point I should say a few words about the visual landing aids aboard the carrier. The primary landing aid is the Fresnel Lens Optical Landing System, which consists of five Fresnel Lenses or cells arranged vertically. A row of green datum lights extends horizontally on each side of the center cell. The top four cells project an amber beam of light behind the ship. The center cell shows the desired glide path that is sixty-four feet wide at two miles, narrowing to less than a foot at the desired touchdown point. As you look from aft the ship at the lens, mounted at the left edge of the angled deck, there appears to be a circular blob of light called the "meatball" or "ball" between the datum lights. If you are on glide path, the ball is centered between the datums. If you are high, the ball is above the datums, and if you are low, it is, of course, below them. If you are so low that you see the bottom cell, you will be seeing a flashing red ball, for obvious reasons.

The pilot attempts to keep the ball centered all the way to touchdown. If he is successful, the aircraft tailhook will catch the third wire up the deck from the aft end of the ship. The first wire is about 170 feet from the "threshold" (called the ramp) of the ship's runway, with each of the other wires approximately forty feet further forward.

The next most important consideration is lineup. A dashed white and yellow line, lighted at night, is painted down the center of the landing area. It is very important to land as close to centerline as possible. The landing area is only about 100 feet wide with aircraft parked right to the edge on both sides.

The third consideration is Angle of Attack (AOA). The aircraft must be flown at "on speed" AOA throughout the approach. The AOA system automatically compensates for different aircraft weight caused by varying amounts of fuel or ordnance, giving the pilot a visual display of the correct landing speed.

Every pilot tries to maintain the three variables—meatball, lineup, and AOA—as close to perfect as he can throughout each pass at the carrier deck. He is supervised, assisted, and graded on each pass by several Landing Signal Officers (LSO). An LSO is a qualified pilot who has had special training. He is ultimately responsible for the safe recovery of the carrier air wing's aircraft, being in radio contact with each aircraft and in control of the Fresnel Landing System, deck lighting, etc. He grades each landing and debriefs each aircrew on any problems he may have observed.

The carrier environment is duplicated at Navy and Marine air stations ashore by a "carrier box" the size of a typical aircraft carrier landing area, painted on the left side of each runway with a Fresnel Lens system next to it. VMFA-333 practiced night and day for a little more than a month for the coming deployment to the USS *Nimitz*. In that month I flew thirty-two sorties and logged 230 practice carrier landings under the watchful eye of the squadron's LSOs standing next to the runway. Each sortie would consist of

A Trip Trey Phantom readies for 300-foot launch from one of two steam-driven catapults on Nimitz's *bow.*

Descending about 750 feet per minute, a Phantom "traps" one of four steel cables located a third of the distance up one of Nimitz's *two 700-foot decks. The "very violent" hookup halts the jet within three seconds.*

six to eight touch-and-go landings and little else. For a month we flew nothing but landing patterns, rarely climbing higher than 800 feet or even raising our landing gear. This practice was accompanied by intensive ground training in carrier operations and deck procedures.

The Moment of Truth

At last the long awaited day arrived. The morning of June 19, 1975, saw the USS *Nimitz* operating 100 miles off Norfolk, Va. A few days before we had flown our aircraft to NAS Oceana, near Norfolk, and we would operate from there during the next few weeks of carrier qualifications. Each pilot needed ten day carrier landings and six night landings to be a fully qualified carrier aviator.

We started quite early that morning. Our overhead time at the ship was 0800. At the prelaunch briefing you could see how keyed up and apprehensive everyone was. More than half of the squadron had never landed on a carrier before. Some had gone through Air Force pilot training a few years back and had not had carrier qualification then, as do pilots who graduate from Navy flight school.

My biggest fear was of the two touch-and-go landings we were required to do before we lowered our tailhook for our first arrested landing, or "trap" as it is known. At Beaufort, during field practice, I never could get airborne before reaching the end of the carrier box on touch-and-go landings. I was sure that the same thing would happen at the ship, but no one else seemed worried about that so I resigned myself to giving it a try.

The ship looked very small from several thousand feet overhead as we orbited, waiting our turn. In my back seat was a Radar Intercept Officer (RIO) from our squadron. Unlike Air Force Phantoms, there are no controls in the rear cockpit, so instructor pilots rarely ride there.

At last our flight of four went down for the break. During the day in good weather the landing pattern is entered from a standard Air Force style "overhead 360." I was number four in the four-ship flight so I watched as the first three F-4s broke from the formation to downwind seventeen seconds apart. Then my seventeen seconds were up and I turned to downwind, slowing to gear-lowering speed. Gear down, flaps down, slow to about 150 knots or on speed AOA. I watched the Phantoms ahead as one by one they reached the 180-degree position and turned final to intercept the glide path and centerline aft of the ship for their first touch-and-go.

As we approached the 180-degree position, which is one and a half miles abeam the aft end of the ship, we could see the boiling wake stretching out behind as the ship created thirty knots of wind down the angled deck by steaming into the wind. Now the turn to final, watching altitude, rate of descent, AOA, and playing the bank angle to arrive three-quarters of a mile aft of the ship with the ball centered and on centerline—"in the groove," as it is called. Now the moment of truth. The ball goes a little high so I reduce power a bit, but it stays there. Oh well, that's better than a low ball. Lineup's not too bad. Then the touchdown. Jam the throttles to full military power and as the end of the ship goes under the nose we are airborne and climbing back to pattern altitude. I didn't fall in the water, and so after that first touch-and-go, much of the anxiety left me and I began to enjoy the experience.

My first trap, a few minutes later, was really something! Before that, however, came my first bolter. A bolter is an inadvertent touch-and-go. It happens when you have your hook down with intentions of landing but you land too far down the deck to catch a wire. That is no problem, however, because you always go to full power at the instant of touchdown just in case, and so you just take off again.

A trap is very violent. The touchdown is normally at 750 feet a minute rate of descent. It can be much higher and is quite a jolt. I have often seen the main landing gear of a Phantom bounce a couple of feet off the deck on rollout. Then the wire your tailhook grabbed hauls you to a stop in a bit less than three seconds while allowing you to roll about 300 feet down the deck.

We immediately taxied to one of the bow catapults to be launched back into pattern. The *Nimitz* has four 300-foot-long catapults. The two on the bow may launch aircraft while others are landing on the angled deck. The catapults consist mainly of a large piston just under the deck that is moved by steam pressure. This piston is attached to a shuttle on top of the deck through a small slot. The aircraft are connected to the shuttle with a cable. The aircraft is run up to full power, the pilot salutes to show that he is ready, and the catapult is fired. The shuttle hurtles down the track, dragging the aircraft behind it. In about three seconds you are accelerated from zero to 170 knots. It is some ride! The G-forces are so strong that your eyeballs are slightly deformed so your vision is blurred during the catapult stroke!

That first day I got eight traps and,

of course, only seven cat shots; the extra trap because we stayed aboard that night.

VMFA-333 remained aboard the newly commissioned *Nimitz* until September 23, 1975. She was due some scheduled maintenance that fall before the upcoming Mediterranean cruise in the summer of 1976. While Trip Trey and the rest of the air wing became fully qualified in carrier operations, the *Nimitz* trained her crew in all the drills and procedures to make her a combat-ready ship. For the first part of this period, we operated off the east coast near Norfolk, Va., the *Nimitz's* home port. Soon, however, we steamed down to Guantanamo Bay Naval Base, Cuba, where the Navy trains and tests its new ships and crews.

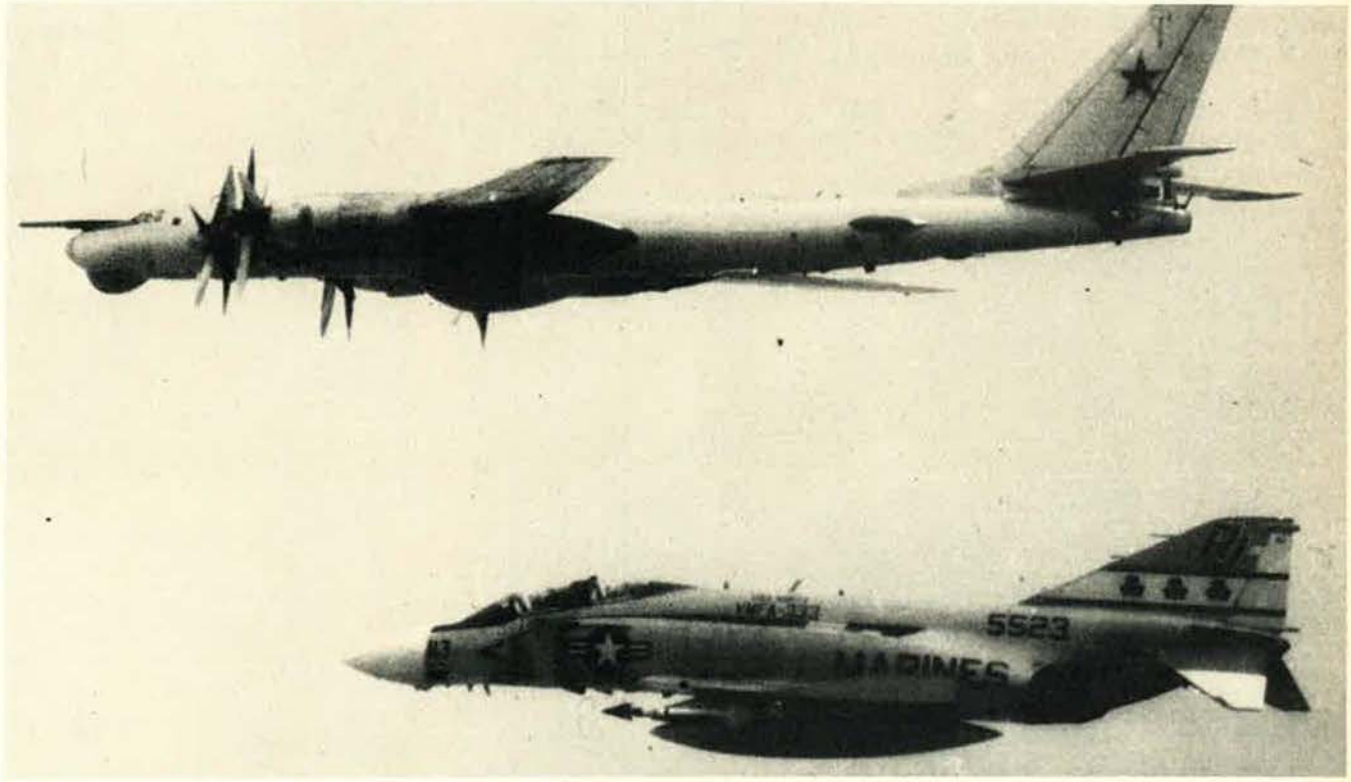
We operated south of Cuba for several weeks during which we got our first taste of night operations. Trip Trey was at last settling into the routine of carrier life, so new and different to most of us.

Life Aboard a Carrier

The *Nimitz* is a small city of almost 6,000 inhabitants. Most of them, of course, are Navy personnel, but about three hundred are the Marines of Trip Trey and the Marine detachment that is aboard every large Navy ship.

The ship has a library, gym, sauna, basketball court, chapel, barber shops, laundry, dry cleaners, PX, snack bars, clothing stores, post office, and enlisted and officer dining facilities. A different movie is provided for each squadron every night in addition to closed-circuit television, which is broadcast to all ready rooms and enlisted living areas.

The officers of Carrier Air Wing Eight's squadrons spend much of their time, while not flying, in their squadrons' large, comfortably furnished ready rooms. It is the heart of the squadron aboard ship, the center of operations, connected to the rest of the ship by two intercoms, a tele-



Soviet reconnaissance planes like the Tu-95 Bear watched Nimitz *operations in Northern European waters, including the Phantom squadron's fleet defense training exercises consisting of practice bombing runs and multiplane simulated strikes.*

phone, sound-powered circuit, and three closed-circuit TVs. During flight operations, aircrews are briefed there on TV by the ship's weather and intelligence people before the flight leaders' briefing. It is the place you leave from to go fly and the place you come back to after landing to fill out paperwork, watch your takeoff and landing on the closed-circuit TVs, and joke with the LSO and your friends about the grade you got for your landing. At other times it is where training is held, or where the paperwork needed to keep a squadron operating is done.

During off-duty times you may watch TV, chat with your friends, read your mail or magazines, and almost every day, in port or out, watch the squadron's movie for that day.

But on board ship there is really no off-duty time except when you are in port and go ashore. You may be called for some squadron task or duty at any time. You are always in uniform and always available aboard ship.

An officer may also spend a lot of time in his stateroom. Staterooms range from the roomy quarters of the captain of the ship to the four- or six-man rooms for warrant officers. Most are, however, two-man rooms like mine. My stateroom was approximately twenty feet by ten feet, with two bunk beds at one end, two desks and chairs, and many storage drawers. Each stateroom also has a sink and mirror. Restrooms (heads, in Navy lingo) are located everywhere, it seems, since only the staterooms of squadron commanders and above have showers and toilets.

All eight squadron ready rooms and most air wing officers' staterooms are located on the deck just under the flight deck. Consequently, the noise level during flight operations is very high. The roar of jet engines and the catapults as aircraft are launched; the tremendous crash as aircraft slam down on the deck and are brought to a stop by the wires; the hiss and roar of water, steam, and hydraulic fluid in the pipes and lines that operate the equipment—all have to be endured. After a while you can even sleep through some of the noise.

The Marine F-4J Phantom, identical to the Navy model, resembles the USAF F-4D but has wings and landing gear stressed for carrier operations.

The Navy and the Marine Corps, unlike the Air Force, have many duties, or watches, for their officers to stand when flight operations are not under way. Most of these are stood by junior officers, and they vary in length. Each squadron has a duty officer at all times. He handles all the business of the squadron during his twenty-four-hour watch, including implementing the flight schedule if flight operations are being conducted.

The four-hour integrity watch is stood by air wing officers with the help of eight enlisted men, whenever flight operations are not going on. It is the responsibility of the integrity watch to ensure that all aircraft are securely chocked and chained to the deck, that there are no fires, leaks, or other hazards on the flight deck or hangar deck.

In port, an officer may be called upon to guide visitors, act as shore patrol officer or boat officer. The shore patrol is stood by officers and enlisted men. You may walk the streets of a foreign city as an unofficial policeman, or sit in an office compiling reports.

Boat officer is by far the most unlikely duty for an Air Force officer. The *Nimitz* is too large to tie up at the piers of most ports, so she is anchored anywhere from one-half to three miles from shore. Small forty- or fifty-foot) motor boats, stored on the hangar deck, are used to transport the men to and from the shore. At night, regulations require that an officer be aboard to supervise the boat crew and the runs. I have stood this duty five or six times, including one ten-hour period in Tangier, Morocco, when the seas were high and everyone got completely soaked.

There are, of course, many officers attached to the ship other than the air

Capt. David J. Meyer is a 1968 graduate of the University of Nebraska, where he earned his commission through AFROTC. After pilot training at Williams AFB, Ariz., and F-4 training at MacDill AFB, Fla., he flew a combat tour in Vietnam as an F-4 Weapons Systems Officer. Subsequently, he upgraded to the front seat of the F-4 at Holloman AFB, N. M., and participated in several overseas deployments. Since completion of his tour with the Marine Corps, he has been assigned to the 56th TFW at MacDill AFB.

wing officers. They are in various departments that operate the ship and all its equipment and they have their duties to stand also.

Stalking the Bear

Flight operations during carrier qualification consists mainly of traffic patterns with one landing after another. After the CQ phase is completed, flight ops are run in a series of cycles, known as cyclic operations. The first of the day typically is sometime in the morning, with the last recovery shortly before midnight. For the first cycle, one to four aircraft from each squadron are launched on their missions in a five- to seven-minute period. An hour and a half later the second cycle is launched and the first cycle is recovered, and so on through the day. In this system you cannot come back and land when you run low on fuel. You must ensure that you do not run low until recovery time. With the Phantom, that is sometimes a problem because of its high rate of fuel consumption in relation to its fuel capacity.

Phantoms are usually scheduled to take on an additional 1,500 to 2,000 pounds of fuel on each mission by air refueling from an air wing A-6 or A-7 configured for tanking. Adding to the problem is the F-4J airframe restriction allowing a maximum of only 5,800 pounds of fuel on landing. We try to arrive at recovery time with maximum trap fuel of 5,800 pounds, especially at night in case of a couple of bolters (not that uncommon on a dark night). When you are burning 100–120 pounds every minute, you do not have much reserve for a lot of extra tries at landing.

It's on those dark nights that your RIO in the back seat is worth his weight in gold. I have flown with the same RIO, 1st Lt. Bob (Cowboy) Calhoun for the whole cruise. Cowboy saved us from difficulty in many tight situations by his constant attention to what is going on. The F-4 is a two-man aircraft and the RIO's duties are as important as the pilot's.

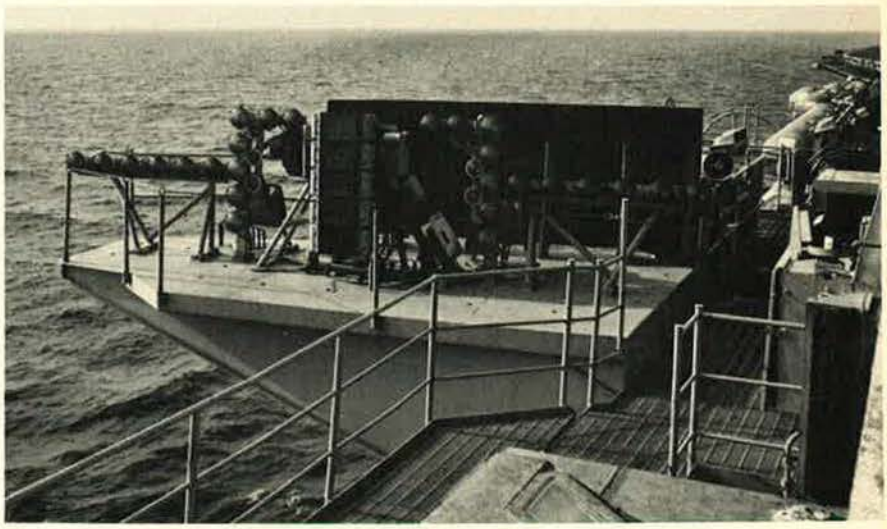
Our squadron's primary mission is fleet defense and most of our training missions reflect this. We fly mostly fighter intercept missions with air combat maneuvering against other air wing aircraft thrown in as much as possible. We also fly practice bombing missions, low levels, and participate in large, multiplane simulated strikes. The most interesting missions, perhaps, are to intercept and escort Soviet Tu-95 Bear reconnaissance aircraft.

The *Nimitz* sailed for Northern Europe in August 1975 after completing her training south of Cuba. Just off Newfoundland we intercepted the first Soviet Bear sent out to look us over. During the remainder of that short cruise we usually had a Soviet ship or aircraft in our vicinity.

In January 1976, Trip Trey and the rest of Carrier Air Wing Eight were again aboard the *Nimitz* for several months of CQ and other training in preparation for the upcoming Med cruise. This training was done off Virginia, Florida, Puerto Rico, and Cuba.

On July 7, we left Norfolk for the Mediterranean. Now, six months later, the cruise is nearly over. I have had a total of 200 traps on the *Nimitz*. It has been an interesting cruise, sometimes tedious, sometimes exciting (often too exciting), but very worthwhile.

Trip Trey is one of the best squadrons I have ever been in. I highly recommend an exchange tour with the Marine Corps or the Navy. Learning how the other services operate is an important part of an officer's professional education. But although I enjoyed the flying, the varied operational experience, and the unique environment of an aircraft carrier, I'm happy to be going back to the Air Force. ■



The "meatball"—center light on the Fresnel Lens Optical Landing System on port side of deck—shows pilot his approach position in relation to the desired glide path from two miles prior to touchdown.

In its continuing efforts to make an Air Force career more attractive, USAF is pioneering a program of "job enrichment," built on techniques that were tested at Ellsworth AFB, S. D. Aimed not at pay, promotion, and security issues, but rather at enhancing job satisfaction, it reflects USAF's understanding that man lives . . .

Not by Bread Alone

BY ED GATES
CONTRIBUTING EDITOR

THE US Air Force, pacemaker among the armed services in improving the quality of life in uniform, is quietly laying on separate but related programs designed to make military members happier with their jobs. USAF managers are removing irritants, reducing needless extra duties, changing procedures, granting more on-the-job authority, increasing responsibility, and showing people how their positions are important.

The new effort, backed by Chief of Staff Gen. David C. Jones and quarterbacked by a small group of young Air Staff officers, is called "job enrichment." That's unfortunate, for the program is far more exciting than the turn-you-off title suggests. But that could prove inconsequential if the results from expansion of the plan are as encouraging as are the findings to date. The project could provide the Air Force a large payoff at little dollar cost.

Instead of being bored stiff with their jobs, many blue-suiters should perk up at work. Instead of going through the motions, they'll display more interest and enthusiasm, USAF authorities believe.

These officials expect to apply new techniques for improving job satisfaction to a wide variety of enlisted and officer positions throughout the service. So far, the job-improvement project has been limited to a handful of units in SAC, TAC, MAC, and the Air Reserve Personnel Center.

An early job enrichment plan actually surfaced in 1974 at Hill AFB, Utah, among civilian employees with the Ogden Air Logistics Center. Since then, USAF and Air Force Logistics Command (AFLC) authorities report that worker productivity has increased and turnover has plunged. AFLC, on the basis of the Hill results, is expanding the program to all its bases (*see accompanying box, p. 63).*

On the military side, in early 1976 a handful of Hq. USAF officers from the newly formed Leadership and Motivation Division in DCS/Personnel, led by Maj. Paul Murphy and assisted by representatives from SAC, the Air University, and the Air Force Academy, met to choose a test base, zero in on specific jobs, and construct an overall game plan to apply Job Enrichment techniques in operational Air Force units.

Tough Test Bed

They picked a tough one—SAC's security police, generally regarded "as the least desirable duty" in the command, if not Air Force-wide. The test would take place at Ellsworth AFB, S. D., a frosty northern-tier site not likely to win any climate popularity contests. The test subjects were 811X0 security policemen who number about 19,000 Air Force-wide, 9,000 of them in SAC, including those at Ellsworth. Not to be confused with USAF law enforcement specialists who number about 10,000, the 811X0s guard the bombers, tankers, and ICBMs. Theirs is a vital function, and they know it. The Ellsworth SPs "were well aware of the importance of their work," Major Murphy told AIR FORCE Magazine.

"But there was little motivation from the job—after all, there is generally held to be only one way to guard a B-52. Job satisfaction was

exceedingly low, while discipline rates were high," Major Murphy noted.

His team worked with Ellsworth officials and Air Force Institute of Technology (AFIT) students there who were enrolled in the base's Minuteman Education Program and who served as research assistants, earnings five hours of graduate degree credit in the process. The investigators went directly to the security policemen, first with a specially constructed "job diagnostic" survey to learn how the positions were affecting the people and to see if the task could be better designed to improve job satisfaction. The survey asks such questions as "To what extent does your job permit you to decide how to go about doing it?" and "Do managers let you know how well you are doing?"

Next, the probers asked the local security specialists what was wrong with their jobs and what Air Force could do to improve them. They responded with a shower of ideas, more than 2,500 in all. These were culled down to nearly 100 and applied to members of one SP test flight. Their responses to the changes were compared day to day with other SPs who continued to perform under the old procedures.

Here are typical changes laid on the test group:

• Earlier, security specialists could not automatically ticket vehicle speeders on the flight line. Instead, they had to call the law enforcement specialists to request assistance. Now they issue tickets on their own. "Their job was broadened, they enjoy more authority. The new thrust means 'let a cop be a full cop,' " Major Murphy said.

Policemen like A1C Michael Semik of Ellsworth AFB, S. D., provide vital security to alert aircraft as they walk their lonely posts (above). Below, Flight Supervisor TSgt. Larry Silvis (left) gets a report on conditions around the B-52 alert area from Airman Semik. Findings from recent exercises conducted at Ellsworth, designed to make the sentry jobs more satisfying, are being applied at other SAC bases.

• Previously, when SPs went off duty, a supervisor had to be present to "clear" the weapons (to see that no rounds remained in the M-16's chamber). Not surprisingly, the SPs, all fully qualified with the weapon, didn't take kindly to the rule. The change now finds them certifying their own clearance via a two-man team management. They reportedly appreciate the added responsibility.

• First-line SP supervisors previously had to phone their superiors to determine when their troops could do this or that, such as go to chow. Now they decide themselves; the supervisors exercise more control over their people.

• There had been a SAC procedure for deciding when an SP walking his post in cold weather could warm up inside a flight-line guard shack. "The guys had always been ticked off by it. Someone else was deciding whether they were cold," Major Murphy said. "But with the change, if an SP felt cold, he called his supervisor. The latter replied, 'OK, but wait a minute while I ask how the other guys feel.'

"Surprisingly, as a group they usually elected to stay outside. Yet this boosted morale of the SPs in the test flight because they, not their supervisors, were making the decision," Major Murphy reported.

After weeks and months of observing and recording reactions of the test flight to the changes, Major Murphy and his associates reported to their three-star boss, the Hq. USAF Deputy Chief of Staff for Personnel (then Lt. Gen. Kenneth L. Tallman, now Lt. Gen. B. L. Davis). Their findings held that job performance had improved slightly, job satisfaction was "much improved," absenteeism (*e.g.*, for sickness) was way down, and attitudes and discipline were improved.

Positive reports also came from others involved in the experiment, such as Col. Ralph J. Astrella, Commander of the 44th Security Police Group at Ellsworth during the test.

Enrichment Team Leaders

Maj. Paul Murphy, thirty-seven, who heads the Hq. USAF job enrichment program, formerly was a missile launch control officer at Whiteman AFB, Mo., where he earned an M.B.A. via the Minuteman Education Program. More recently, he acquired, with help from AFIT, a Ph.D. from Syracuse University. His associates, mostly M.A. degree holders, also work out of the Headquarters' Leadership and Motivation Division and under the Deputy Chief of Staff for Personnel. They are Majs. Ron Lynde, Mike Mahler, and Robert White, and Capt. Bob Gregory. They received their initial job enrichment training at Logistics Command. All are in their early or mid-thirties.

The Murphy team has been assisted by faculty members from the Air Force Academy, the Air Force Institute of Technology, and Air University's Leadership and Management Development Center. They include Maj. James Metsala, formerly an Academy instructor and now a TAC RF-4C pilot, and Maj. Dorvan Crooch of AU's LMDC.

All data processing was performed by Maj. Val Tierman of the Academy. Currently involved are Maj. William Rosenbach of the Academy and Lt. Col. Denis Umstot of AFIT, both experts in the job-enrichment field.

He is now head of security police for the Fifteenth Air Force, March AFB, Calif. He told AIR FORCE Magazine recently that the security police area "provided a very fertile field for making job improvements. While there are many features of security police work that, by their very nature, cannot be changed, the SPs recognized that we were trying to help them.

"This—the fact that Air Force was showing concern for these members—had a dramatic effect on them. The Ellsworth program was highly successful, and we're in the process of laying it on throughout the Fifteenth Air Force," Colonel Astrella said.

An unofficial, but generally held-to-be-accurate assessment of the job enrichment activity at Ellsworth comes out like this: "Walking around B-52s for hours in lousy weather is still a lousy job, but the Air Force is making it better."

Cautious Expansion

With the enrichment concept firmly established, expansion is definitely under way. But it's a necessarily cautious expansion, because few people at Hq. USAF or in the field are qualified to carry the ball. Here, by command, is what is happening:

• **SAC.** Command officials "are looking" at everything in the security police area that has worked at Ellsworth and plan to lay on much or all of it, as appropriate, at all the other SAC locations.

• **TAC.** Authorities late last year surveyed Seymour-Johnson AFB, S. C., and found a "high enrichment potential" within the vehicle operation and maintenance areas of the base transportation squadron. The job diagnostic survey found many persons wanted more challenge injected into their jobs. Accordingly, job enrichment workshops followed. Improvement ideas, solicited from persons holding these jobs, are now being tested. Outcome of the Seymour-Johnson exercise should be determined sometime this fall.

• **Air Reserve Personnel Center,** Denver, Colo. Job monotony has been a problem at ARPC as in most organizations charged with record keeping. A job enrichment study requested by the ARPC commander has been conducted and changes in work procedures are being staffed and implemented.

Job Enrichment for Air Force Civilian Employees

Conditions that lead to job dissatisfaction include company policies, administration of policies, supervision, working conditions, interpersonal relations, money, status, and security. Those leading to job satisfaction are achievement recognition, work itself, responsibility, growth, and advancement opportunity.

So found the Ogden Air Logistics Center, Hill AFB, Utah, in 1973 when, to make its shrinking resources go farther, it fashioned an Orthodox Job Enrichment (OJE) program for its thousands of civilian employees.

Ogden management, in testing the idea, redesigned jobs to create more of the satisfaction elements and reduce the problems linked with dissatisfaction factors. The results, according to the Air Force, include big dollar savings, more production, improved employee attitudes, reduced sick leave and personnel turnover, fewer errors and rework, a more flexible work force, and management that deals with real issues and not "BandAids."

According to Ogden's former Commander, Maj. Gen. Edmund A. Rafalko, who retired in August, the program is based "on the employee's desire to do the work right from the start. Therefore, work is structured to satisfy this desire, commensurate with his or her skill capability. OJE provides the worker with responsibility, accountability, direct feedback, and direct communication."

It must be working. It's being laid on throughout Air Force Logistics Command.

Not all Air Force jobs are held to be enrichable or need enrichment, of course. For example, at the request of the Air Force Surgeon General, medical registrars at five bases were surveyed last winter. But the probe proved that the job was a good one, officials concluding there was "no significant job enrichment potential." So the idea was dropped.

Some thought had been given to enrichment testing among MAC C-141 pilots, but no decision had been reached at press time. Retention of StarLifter pilots has been a problem, officials said.

A Budgetary Bargain

These actions barely touch the surface of the enrichable job areas. Authorities hope to proceed into numerous others, but staffing problems must first be resolved. "We haven't enough people to enrich the entire Air Force, but we've got enough to prove it can work," Major Murphy says. He believes that more than seventy-five percent of all Air Force jobs could be enriched, but it's a question of which ones need it most and training new manpower to run the tests. Supply, maintenance, and administrative areas—tens of thousands serve in these fields—are particularly ripe for the enrichment treatment, he said.

The apparent route is to build more in-house expertise to supplement the handful of officers presently held qualified to operate enrichment projects. The present job enrichment "force," in addition to the quintet at Hq. USAF (*see box, p. 62*), includes a sprinkling of experts at Air University, AFIT, the Air Force Academy, and several others from AFLC who participated in the civilian program at Hill.

The Hq. USAF team is working with the Air University's Leadership and Management Development Center to determine the potential for expanding the effort.

The LMDC has experienced officer-NCO teams working out of its Maxwell AFB, Ala., headquarters that visit bases where they help solve a wide range of local problems. Like all efforts, the expansion of job enrichment will take resources. Finding and training those resources is an important initial step in the expansion process.

The other services, meanwhile, as they generally do when Air Force trots out an innovative personnel project, are keeping a close eye on USAF's progress with job enrichment. Major Murphy reports that Navy representatives monitored the Seymour-Johnson tests. "They're very interested," he said.

And, at the Army's request, Air Force recently produced a videotape of the Ellsworth experiment for use by the older service's security specialists.

Behind USAF's job enrichment drive is the feeling among the leadership that most management actions have focused on the extrinsics of the job—pay, security, working conditions. The result: most workers have not really been dissatisfied with these factors. However, most management actions have also ignored the intrinsics—the opportunity for achievement, growth, and recognition. The result: most personnel are not really satisfied either.

The new effort aims to end that paradox by making jobs genuinely satisfying.

Air Force's approach to the job enrichment plan avoids new funding. If a particular career field is riddled with problems that only a new bonus or special incentive with a big price tag might correct, that's someone else's department. Enrichment officers steer clear of it.

Indeed, the almost negligible costs of the program to date enhance its attractiveness. Not counting the regular pay of the main participants in the Ellsworth exercise, the effort cost only about $2,000, according to Major Murphy. That seems like a bargain price to pay for "turning people on about their jobs." ■

The US Army, now at half its peak Vietnam strength, is, man for man, the best in our history. But its ability to fight a sustained war is impaired by looming recruitment problems, a moribund Selective Service System, war reserve shortages, and inadequate strategic mobility.

US ARMY 1977

BY MAJ. GEN. ROBERT F. COCKLIN, USAR

Most knowledgeable military leaders would argue that today's Army is the most lethal, the highest quality, and the most ready of any in our history. We should all hope so; the mission for which the Army trains is to fight—outnumbered—and win.

Despite this rosy assessment, there are problems. Not the least of these would be the real concern about sustainability—both in manpower and materiel—and the ability to get to the fight before the issue is decided.

Impact of the All-Volunteer Concept

The strength of the active Army has been essentially stable over recent years, with an end strength goal for this year of 790,000. At the end of last year, the actual end strength was 778,325, which may well reflect seasonal recruiting fluctuations. The Army's Officer Corps, at 98,000, is at its lowest level since 1950.

While the active Army has so far been able to maintain its required strength under the all-volunteer concept, the Army's Reserve components have not. As of June 30, 1977, the Army National Guard's strength was 350,400, which is 39,600 below the authorized strength of 390,000. The Army Reserve strength was 186,800, against an authorized figure of 212,400. The total shortfall for both is the equivalent in manpower of more than three divisions. Unless the Congress enacts requested enlistment and reenlistment incentives, it is not likely that these shortages will be made up without some drastic lowering of quality standards. Even with the incentives, maintaining needed Reserve strength will be a significant challenge.

As a matter of fact, given the propensity of the Congress to continue to hack away at the monies needed to support recruiting and enlistment incentives, the active Army may also have trouble keeping its ranks filled with quality people. The Army now needs to recruit one out of every sixteen eligible males in the seventeen- to twenty-one-year age group if the strength requirements are to be met.

The quality goals in the all-volunteer concept together with longer enlistment periods have resulted in better discipline and less turbulence, and have provided soldiers who are more trainable. The concept is more cost-effective too, since the quality recruit—the one with a high-school diploma—is about twice as likely to complete his enlistment as is his nongraduate contemporary. Incidentally, the active Army is shooting for forty-five percent careerists in the enlisted ranks. It's about forty-three percent now.

The Army has made great strides in its ability to get round pegs in round holes—what is now called "skill match." This gets the right man to the right job at the right time. One of the most intriguing aspects of this effort is the adaptation of the recruiting effort to a refined system of management by weekly objectives. This new system is a computerized Army network similar to airline reservation systems. Manpower training planners and personnel managers "marry up" manpower requirements and weekly training center capabilities to display skill vacancies throughout the system. Specific numbers of spaces in a given mix of skills constitute a weekly objective, and the Recruiting Command achieves its mission only after filling all spaces available each week.

The role of women in the Army continues to expand. There are now 4,800 women officers and 44,000 enlisted women in the Army. Of the Army's 401 military occupational specialties, 371 are now available to women.

Mobilization Problems

There are presently significant manpower problems affecting the Army's ability to mobilize and sustain itself in extended fighting. Since 1973, the active Army has converted some 50,000 support and overhead spaces to fifty-six new combat battalions. Thirty-three of these new battalions are being used to form three new divisions. Upon completion, the Army will have sixteen active divisions plus eight National Guard divisions. The conversion of these active Army spaces has thrown a greater responsibility for support on the Reserve components. Sixty-seven percent of the Army's twenty-four-division tactical support requirement is presently assigned to the Reserve components. Thus, the current strength problems of the Reserve components take on a greater urgency, and impact heavily on contingency plans.

At the same time, the Army's Individual Ready Reserve (IRR)—the pool of trained individuals used

The Army's Hughes attack helicopter (left), an all-weather tank destroyer, will carry the Hellfire missile with laser homing. The mechanized infantry combat vehicle (MICV), under development for a decade, should be operational in the 1980s.

Chrysler Corp. has been named prime contractor for the new XM-1 tank, shown here in prototype. It is scheduled to enter the inventory in 1980. The XM-1 is only 92.5 inches high and has antitank-missile-repelling armor.

to fill up units and to replace combat losses in time of emergency—is in deep trouble and sinking fast. Unless drastic corrective action is taken, the IRR by FY '82 will be about 360,000 short of mobilization requirements for trained personnel to flesh out and sustain Army units until revived draft machinery and an expanded training base can assume that responsibility.

Yet the Selective Service System has been lowered to "deep standby" status and so weakened that it cannot supply inductees for training until four months after mobilization starts (M-Day). The result is that trained draftees cannot be shipped to NATO as replacements for combat losses until M-plus-seven-months.

It's clear the Army's ability to meet primary wartime commitments is degraded by these problems.

Equipment Modernization

There has been recent progress in getting new major Army weapon systems closer to the inventory.

Hughes Helicopters was selected in November as the prime contractor for the Army's attack helicopter. This all-weather tank destroyer will include in its armament the Hellfire missile system, which utilizes laser terminal homing. Extensive testing that preceded source selection gave this stable firing platform high marks for ruggedness, ease of maintenance, and flexibility. Despite less-than-avid support from the new DoD leadership and budget-cutting efforts on the Hill, adequate funding is expected for full engineering development, including the integration of the weapon and target acquisition. It has a projected inventory entry date of 1983.

Another decision made at year's end was to name Chrysler Corp. as the prime contractor for the new XM-1 tank. The new tank fea-

The Roland short-range missile system is effective against low-flying aircraft. Along with other organic SAM systems, it will beef up Army's air defenses.

Maj. Gen. Robert F. Cocklin, USAR, served during World War II as an artillery commander in the Pacific theater. He is the Executive Vice President of the Association of the United States Army. General Cocklin's mobilization assignment is Special Assistant for Information to the Secretary of the Army. He is the author of several books and many articles on defense affairs.

tures advanced armored technology, unique compartmentalization design, an integrated fire-control system, and a high-performance 1,500-hp. turbine engine. There will be a significant degree of major parts interchangeability with those of the German Leopard tank. Scheduled inventory entry date for XM-1 is 1980.

One of the major systems development success stories has been that of the Army's Utility Tactical Transport Aircraft System (UTTAS), to be built by Sikorsky. After four years of contractor development and nine months of government testing, development for more than a decade, but so far it has been the victim of engineering problems, changed weaponry, and the inability of a lot of people to decide just what really is needed and wanted. In any event, the latest decision, approved by the Department of the Army, is a mechanized vehicle that will accommodate a nine-man squad; it will be armed with the TOW antitank missile and the Bushmaster 25-mm gun, and will have a two-man armored turret. Barring future committee efforts, it should go to the inventory in the 1980s.

In other areas new items include: the Copperhead Cannon-Launched Guided Projectile, which is compatible with the Army's 155-mm howitzer; and, finally, a helicopter-borne Standoff Target Acquisition system to detect targets at ranges well beyond the ground line of sight.

War Reserve Shortages

Greater efforts are being made by the Army to obtain funding for rebuilding war stocks across a broad range of items. Army planners have been influenced in their thinking by the evidence developed in the Mideast war of 1973. This "sand-table" insight into the violence of warfare on the modern battlefield showed an extraordinary expenditure of military equipment, well beyond any previous planning figures. In eighteen days, the Arabs lost sixty percent of their tanks and the Israelis lost forty-three percent of their armored personnel carriers. While the open spaces of the desert environment contributed substantially to these high losses, it provided jolting evidence of what can be expected on future battlefields from accurate and lethal weapons in the hands of highly trained soldiers. This suggests to the Army planners that

Components of the medium- and high-altitude Patriot surface-to-air missile system that should be in the hands of Army field forces by the early 1980s.

it is going into production. The first birds are expected in the inventory next year. The UTTAS uses the same engine as the attack helicopter and is the first helicopter to carry a full squad with their equipment.

One of the items of equipment sorely needed by combat troops is a mechanized infantry combat vehicle (MICV). One has been under

Other systems that are approaching fruition include the Patriot surface-to-air missile for medium and high altitude (early 1980s); the Stinger, a light, shoulder-fired missile for low-altitude antiair; the Roland all-weather, short-range missile system for low-altitude, high-speed aircraft; and LOFAADS, an all-weather, short-range antiair gun.

larger initial stocks of weapons, vehicles, and ammunition are required to be physically available at the outset, since future battles of great intensity must be won or lost with the weapons and equipment on hand at the beginning of the fight.

FY '78 Department of Defense Budget Financial Summary

(Total Obligational Authority in Millions of Dollars)

DoD Component	FY '76	FY '77	FY '78
Department of the Army	$23,966	$26,928	$28,767
Department of the Navy	31,480	36,449	39,358
Department of the Air Force	28,443	32,257	34,079
Defense Agencies. OSD. Defense-Wide	4,855	5,169	5,656
Retired Military Personnel	7,326	8,238	9,036
Defense Civil Preparedness Agency	86	83	90
Military Assistance Program	1,355	1,066	1,028
Undistributed *	—	—	2,359
Total Direct Program (TOA)	$97,511	$110,190	$120,373

* Includes Pay Raise Contingencies

The Army's present procurement funding in these areas will not permit any rapid improvement in war reserves, which were too meager to begin with and have been seriously depleted by our military assistance efforts to other countries.

There have been marked improvements in both training and readiness of individual soldiers and units in the past couple of years. Training is largely performance-oriented. The Army Training and Evaluation Program (ARTEP) began in 1975 to provide a realistic method for evaluating performance standards that all units must meet. It is used as well to evaluate Reserve component units so that one measure of readiness is applicable to all. REALTRAIN has provided a technique for conducting realistic two-sided field exercises, and in arousing a high element of competitiveness. Computer assistance is being used to teach commanders, at brigade and battalion levels, the dynamics of battle and the effectiveness of battle control.

The Army Training and Doctrine Command has been completely redoing the Army's training manuals. The new Field Manual 100-5, "Operations," was an immediate best seller as a most innovative presentation of tactical doctrine. More detailed "How to Fight" manuals will be offshoots of this unusual document.

These improved training techniques, improving equipment levels, and other new training initiatives have all impacted on greater readiness. The active Army is in a highly ready posture—perhaps as high as in any peacetime year. The Reserve components fare less well, largely because of personnel shortages and in some cases shortages of equipment. However, Reserve component training has improved substantially, and if the personnel problems can be overcome, there seems little doubt that they will be capable as well in carrying out their missions—and it is obviously essential that this goal be reached.

The Strategic Lift Issue

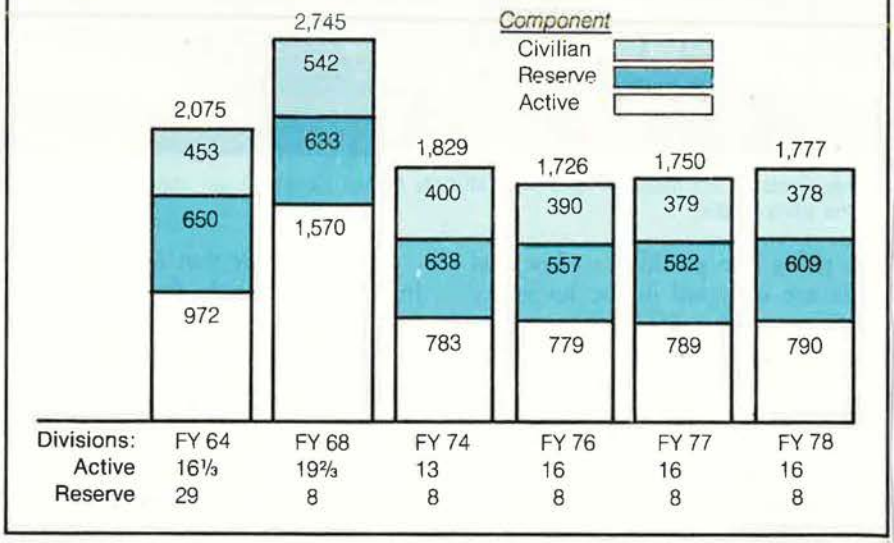
In the face of glaring inadequacies in strategic lift—both air and sea—a serious problem exists in ensuring that adequate land forces can be at hand fast enough to meet any serious contingencies that arise. Since most US scenarios envision first the possibility of a confrontation in Europe, this is where the greatest effort is made. At the moment, the Army has in NATO Europe four divisions, three brigades, and two armored cavalry regiments, plus the special brigade in Berlin.

To augment these US NATO units, other divisions in the US are assigned for prompt deployment to Europe in the event of an emergency. As a partial hedge against the lack of sufficient air and sealift to move these units promptly, much of the equipment they would need is already prepositioned in Europe to be picked up by the troops that presumably would be flown over on the Civil Reserve Air Fleet or Air Force aircraft. These prepositioned stocks (POMCUS) are inadequate in many instances, and it will be a time before a strained Army budget will permit their fill. No substantial improvement in either air or sealift is included in approved budgets.

The situation in Korea, much in the news in recent months, will be altered drastically if the President's plan for withdrawing Army troops is carried out. The most serious impact would be the removal of the stabilizing linchpin of deterrence that the division provides. These US soldiers on the ground have had the major role in holding back Kim Il Sung's oft-stated goal of subjugating the South. They have done it for twenty-four years. We have to think

Army Manpower FY 1964-78

(End Strength in Thousands)



twice before discarding this important safeguard for peace.

For Want of a Nail . . .

Several areas that impact heavily on the Army's ability to carry out its full role in our contingency plans need further effort. These were described as specific goals in the Ford Administration budget and endorsed in the Carter budget:

- Continue modernization of ground and air forces by procuring new aircraft, tanks, helicopters, and antitank missiles.
- Raise inventory levels of munitions and other equipment needed to sustain high-intensity combat.

The Army has 4,800 women officers and 44,000 enlisted women, with ninety percent of occupational specialties open to them.

- Increase training, prepositioning of equipment, and in-theater force mobility to improve US readiness to respond to the outbreak of a European conflict with normal or little warning.

These are essential goals and most who bear the responsibility for training and leading the Army forces see them as overly austere in the quantities being considered. The great strides that the Army has made in increasing and improving its combat organization without an increase in end strength, for example, can be negated to a large degree if the Reserve components do not receive the assistance they need to bring their manpower up to an effective level. Their role in the total Army capability is essential.

Similarly, across the board, weapons, equipment, and munitions are needed in larger numbers and on earlier timetables than are now contemplated. With all that has been accomplished to raise the lethality, quality, and readiness of Army forces, it is foolish to withhold the resources that the Army needs to do its job. ■

A Perspective on Army Aviation

Army Aviation is currently operating 9,195 rotary and fixed-wing aircraft assigned to regular and National Guard units. [In FY '77, the regular Air Force had 7,199 aircraft and helicopters, the Air National Guard 1,567, and the Reserve 480, for a total of 9,246.] For FY '77, some 1,500,000 flying hours were budgeted, sufficient to meet the Army's longstanding minimum training requirement of eighty hours per year per aviator but not adequate to maintain a combat-ready force. So in FY '78 the Army will switch to an event-oriented-type program geared to improving training time by recognizing the differences in assigned missions and aircraft.

Army aviators are selected from within the force or through recruiting. The bulk of the Army's aviation requirements are met by the career warrant officer aviator. Commissioned aviators are selected from within the force from among qualified applicants, and attend basically the same aviation courses as warrant officers.

Selected primarily from in-service applicants, an aspirant must be at least a high school graduate, with two years of college preferred. Upon successful completion of a flight physical, flight aptitude selection test, and an interview by a field-grade officer, and final screening by MILPERCEN, the warrant officer candidate attends a forty-four-week course. On successful completion of the course, he is appointed a warrant officer in the Army.

The remainder of the aviation warrant officer's career is designed to increase his exposure to and experience in all aspects of aviation. However, the primary job of the aviator is to fly, and the majority of his career is dedicated to that.

All aviators initially receive instruction in rotary-wing aircraft. The initial entry rotary-wing course at Fort Rucker, Ala., is currently under revision, and the new version will feature 175 hours of contact flying and forty hours of flight-simulator training. The entire course is self-paced instruction, which provides potential for more efficiency and economy. In addition, the new course will feature a significant increase in night flying and in aviation combat skills.

Based on the requirements of the force, selected graduates of the rotary-wing course will transition into fixed-wing aircraft. While the number may vary for each class, approximately five percent of the aviation warrant officer force is in fixed-wing assignments.

Army aviation missions cover the gamut of surveillance (OV-1 and RV-21 fixed wing); attack (AH-1 Cobra); observation (OH-58, UH-1, OV-1); command and control (U-21, UH-1, OH-58); combat assault (UH-1); cargo movement (CH-47 and CH-54); administrative (all); and air ambulance (UH-1). In addition, the Army has a requirement to operate its aircraft, day and night, under instrument conditions as well as in good weather; hence the requirement for all Army aviators to attain and maintain an instrument qualification.

Simulators are growing in use in Army aviation training. There are six UH-1 flight simulators at Fort Rucker used for instrument flight training. The undergraduate helicopter pilot receives forty hours of simulator training. The UH-1FS has been integrated into five graduate-level, rotary-wing courses and all Euro/NATO-related flight training. The UH-1FS is also used to satisfy individual aviator combat readiness flying requirements, research and development related studies, and research component affiliation training programs.

Currently, a CH-47 flight simulator and an AH-1 flight simulator are undergoing final testing. These simulators are full fidelity simulators with visual systems. As such, they are capable of simulating all phases of flight.

Airman's Bookshelf

The Military Imbalance

Arms, Men, and Military Budgets: Issues for Fiscal Year 1978, edited by Francis P. Hoeber and William Schneider, Jr. Crane, Russak & Co., Inc., New York, N. Y., 1977. 354 pages. $5.95 paperback.

This National Strategy Information Center study reviews in considerable detail the growing strategic and tactical imbalance between US and Soviet forces, contrasted military doctrines, manpower issues, and US intelligence performance. Chapter authors include the two editors, David Kassing, Stephen Lukasik, Steven Canby, William Lee, and Donald Brennan.

In his Foreword, Eugene Rostow notes that "The number, scale and importance of international aggressions have increased dramatically since 1969 or 1970—aggressions supported in each case by the Soviet Union. . . . We can no longer accept a situation in which we live by the rules of the [UN] Charter governing the international use of force while the Soviet Union and its proxies, satellites and allies violate those rules on a scale which becomes larger, more pervasive and more dangerous with every passing year."

Of particular interest is William Schneider's discussion of Soviet development of the German blitzkrieg doctrine, with a focus on surprise and preemption. Soviet weapons modernization and deployments in Eastern Europe and the western USSR are designed to support such a doctrine.

Stephen Lukasik notes that Soviet military R&D programs are aimed at preparations to fight and survive a broader range of conflicts than are those of the US. He urges expansion of the US technology base at a rate of two percent a year, with emphasis on high technology areas where the US excels.

Former CIA analyst William Lee concludes that the share of the Soviet GNP allocated to military purposes has climbed from ten to twelve percent in 1970, to fifteen percent in 1975, with a projected increase to eighteen percent by 1980.

The overall conclusion of the authors is that a US increase in constant dollar outlays of ten percent a year for the next three years and five percent for seven years thereafter would redress the dangerous military imbalance between the US and the USSR.

Eugene Rostow warns that "History . . . makes no allowance for nations, however civilized they may be, if they refuse to recognize the prevalence of predators and to protect themselves against attack." He concludes that "to stand by while our adversaries build their strength to substitute coercion for law would be to abandon our interests, and the law, as surely by indolence and fear as through military defeat."

—Reviewed by John Frisbee, Executive Editor.

New Books in Brief

Don't Miss Out: The Ambitious Student's Guide to Scholarships and Loans, by Robert Leider. Retired Col. Robert Leider has put together a complete guide for securing educational financial aid. One chapter details financial sources available to people according to military status, nationality, religion, and career objective. Octameron Associates, P. O. Box 3437, Alexandria, Va. 22302, 1977. 32 pages. $1.50.

Flying Safely, by Richard L. Collins. Fifteen years of analyzing accident reports proved to the author, who is editor of *Flying* Magazine, that most accidents are a result of pilots trying to get more out of an airplane than it can give, or operating beyond their own skill. This book provides a step-by-step safety program to eliminate these errors. Delacorte Press/Eleanor Friede, New York, N. Y., 1977. 276 pages. $8.95.

Jane's World Armoured Fighting Vehicles, by Christopher F. Foss. Here is a comprehensive look at the world's armored vehicles, organized into seven sections for easy reference. Each vehicle has a full list of user countries, manufacturer, current status, dimensions, speed, and armor, plus a development history and a list of variants of the basic vehicle. Photos. St. Martin's Press, New York, N. Y., 1977. 437 pages. $25.

Legacy of Flight: The Guggenheim Contribution to American Aviation, by Richard P. Hallion. The book examines the impact of Guggenheim philanthropy on American aviation, presenting a detailed account of the evolution of American aeronautics during the 1920s and 1930s. The author is Curator of Science and Technology at the National Air and Space Museum. Bibliography, index, notes. University of Washington Press, Seattle, Wash. 98105, 1977. 292 pages. $15.

P-47 Thunderbolt at War, by William N. Hess. The big, heavy, single-engine fighter played a major role in establishing Allied air superiority over Europe and in supporting the ground forces. The author, a well-known American aviation writer, reveals in text and photos what it was like to fly the Thunderbolt in war. Doubleday & Co., Inc., Garden City, N. Y., 1977. 160 pages. $10.95.

These recently published Adelphi Papers will interest students of military/political affairs: *American Security Policy in Asia,* by Leslie H. Brown, 36 pages. *The Diffusion of Power: Proliferation of Force,* Foreword by Christoph Bertram, 41 pages. Copies may be ordered from The International Institute for Strategic Studies, 18 Adam St., London WC2N 6AL, England. $1.50 postpaid. *—Reviewed by Robin Whittle*

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What They're Saying...

Carthaginian Example

From an address by Lt. Gen. Ira C. Eaker, USAF (Ret.), to the Awards Banquet of the 1977 Texas AFA Convention, San Antonio, Tex., in July 1977:

All in all, US defenses have eroded more rapidly in the past six months than during any equivalent period since the Korean War. If this continues, by 1980, we shall be a second-rate military power, and our leaders will have to submit to any demands the Kremlin leaders make.

There are many signs that we are now following what I call the Carthaginian example.

Twenty-two centuries ago, on the North African shores of the Mediterranean, near Tunis, lived the Carthaginians, a prosperous, secure people, a million strong. . . .

[Their] merchant ships were protected by armed galleons. The city's walls were manned by an adequate, dedicated army supported by a thriving economy.

About this time the rulers of Carthage decided to do away with the galleons protecting their sea trade and the soldiers guarding the city. They reasoned that without this costly burden their profits from commerce would be greatly increased. They followed this policy of disarmament long after a Roman senator, Cato, was ending all his speeches with the inflammatory admonition, "Carthage must be destroyed."

As time passed, Rome became more aggressive, seizing Carthaginian ships and even threatening Carthage with armed invasion.

In this extremity, the Carthaginian legislature . . . decided it would be cheaper to pay tribute for security rather than to rebuild their army and navy and revive their dismantled weapons-making industry.

But the powerful, confident Romans callously increased the tribute price year by year. Eventually, the burden became unbearable. Carthage hastily recalled her army generals, feverishly trained recruits, and revived her weapons industry. It was too late. The Romans had already crossed the sea unopposed and were besieging the walls of the city. Carthage fell and was destroyed. . . .

Today, the US appears to be following the Carthaginian example. We have been engaged in unilateral disarmament for several years. Presently, we see the first offers of tribute, gifts of technology and favorable trade in return for détente.

The third stage may come before the end of this century. Over the hot line from Moscow may come an order, "Furnish us 10,000,000 metric tons of wheat, without compensation. Of course, you will comply promptly, since your own Chiefs of Staff will tell you that we now have overwhelming military superiority." The US President will comply, he will have no other option. . . .

Russia—Beyond Brezhnev

From an article by Walter Laqueur, in the August 1977 Commentary *Magazine.*

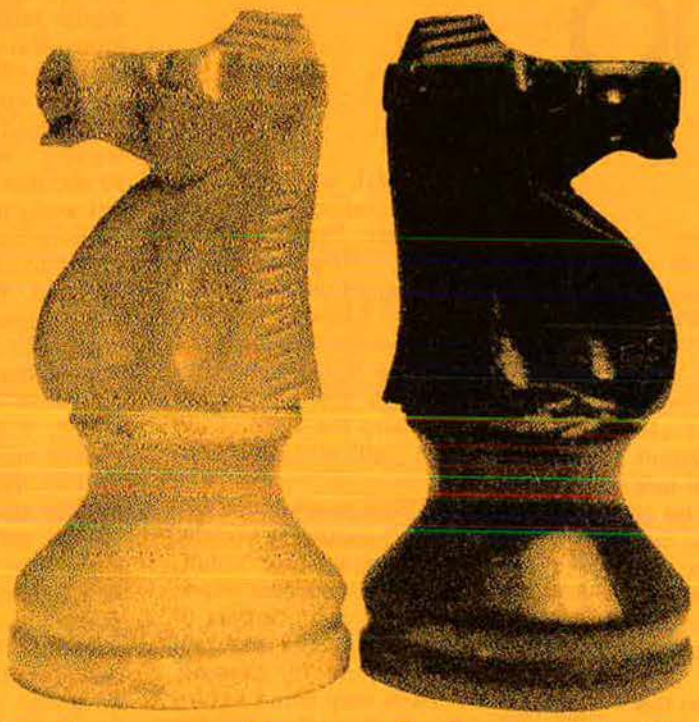
What will the future leadership of the Soviet Union look like? In the near future, after Brezhnev goes, it seems likely that there will be a reshuffle among members of the old guard. But any such arrangement would be provisional; effective power sooner or later will pass into the hands of the younger members of the Politburo and the Secretariat. The transition may be smooth, for Brezhnev has placed his protégés in strategically important positions in the party and state apparatus, but it is equally possible that a struggle for power will break out, as happened after Stalin's death. . . .

The generation that will succeed Brezhnev, Suslov, and Kosygin knows little about the outside world. This is not to say that the new leaders will be "Russia firsters." The fact that the Soviet Union is a superpower has a logic of its own, and Soviet leaders are drawn into foreign affairs as irresistibly as are American Presidents. In this respect there is bound to be continuity with the immediate past, since the new leaders will certainly want to strengthen the Soviet military potential and make the most of Western weaknesses without causing a breakdown in détente. . . . In addition, the fact that Soviet domestic problems are so difficult to deal with, not to say intractable, may in itself contribute to a strong emphasis being placed on foreign policy, a field where striking successes may appear more likely. . . .

Thus, the new leaders are unlikely to give up on the traditional ideological ambitions of the Soviet regime. The notion, in any case, that any Soviet leaders—whether those currently in place or those who will succeed them—no longer wish to see Communists coming to power in certain other countries, because this is bound to cause tension and conflict within the Communist world, is based on a profound misunderstanding of Soviet psychology and policy. The Soviet Union is, after all, still the leader of the Communist camp; if it were not to press for the victory of communism on a global scale, it would lose all credibility.

Nor, finally, are the Soviet leaders of the next generation likely to cut back on their military forces. The Soviet Union is a superpower, but not by virtue of its economic performance or the irresistible attraction of its official ideology. It has achieved the status of a superpower through its military strength. No Soviet leader is unaware of this fact, or can afford to disregard it. And the maintenance of a large military establishment carries with it the additional advantage of justifying economic shortcomings and political dictatorship—all said to be necessary to protect the achievements of "socialism" from powerful enemies even at a time of détente. ■

In December, AIR FORCE MAGAZINE proudly presents . . .



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MILITARY BALANCE 1977/78

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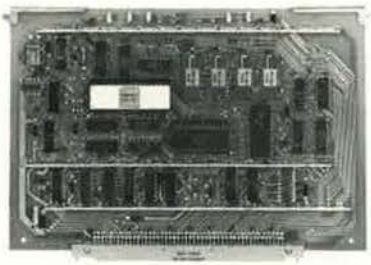

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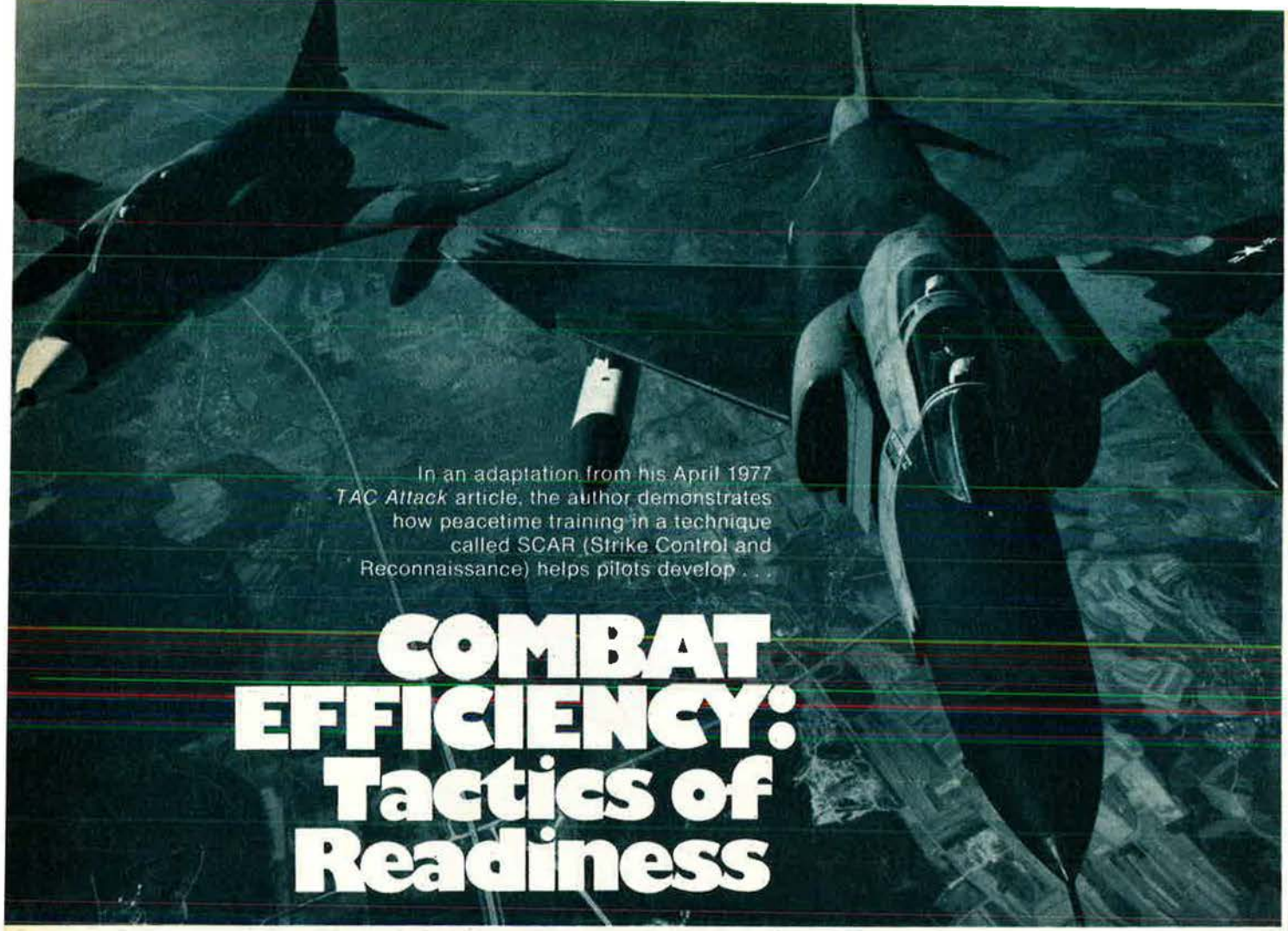


In an adaptation from his April 1977 *TAC Attack* article, the author demonstrates how peacetime training in a technique called SCAR (Strike Control and Reconnaissance) helps pilots develop . . .

COMBAT EFFICIENCY: Tactics of Readiness

BY MAJ. STEPHEN R. ELM, USAF

"SAFETY is the conservation of combat capability." How many times has that been said? And how many times has it been thought of as only the latest in a long series of empty slogans meant to take the fun out of flying and further restrict "real" training? But looking at this slogan from the standpoint of innovative tactics and training may give a new tune to the old song. Conservation of combat capability applies not only to safety in daily peacetime training, but also to developing tactics that use our resources efficiently in combat. A concept for more effective use of our limited number of attack aircraft is Strike Control and Reconnaissance (SCAR).

A Persistent Challenge

Officially, SCAR is defined as acquiring and reporting air interdiction targets, and controlling air strikes against them. SCAR techniques, flown in a variety of aircraft and under a variety of names, have been used in every US air war. This persistence is a reflection of the continuing challenge SCAR seeks to meet: locating mobile targets in high-threat environments and destroying them, without incurring unacceptable losses, before they engage our own ground forces. In future conflicts, the timely detection, identification, and location of mobile targets will continue to be a problem until advanced technology provides decision-makers with continuous, all-weather, real-time surveillance of the entire theater of operations.

Unfortunately, institutional memory is short. Too often there has been little carrying-over of hard-bought combat knowledge from one conflict to the next. Each new conflict has had its zero-based learning curve, and the wheel frequently has been reinvented. Inventing wheels while the bad guys are shooting real bullets is costly in terms of men and aircraft. While combat tactics must be dynamic to stay ahead of situational changes, wartime is not the most opportune time to be experimenting with basic tactics.

Tactics Development and Evaluation

In January 1976, Tactical Air Command directed that tactics development and evaluation (TD&E) be carried out to determine the value of SCAR as an option for the tactical forces commander. By May of that year, the 49th Tactical Fighter Wing, Holloman AFB, N. M., and the 67th Tactical Reconnaissance Wing, Bergstrom AFB, Tex., with the aid of the 41st Fighter Weapons Squadron at Nellis AFB, Nev., had developed tactics and procedures for the employment of the RF-4C in the SCAR role.

Tac fighters or attack aircraft such as these A-10s that are on five-minute alert can be launched after the SCAR crew has reported a target. The result can be near real-time information and attack.

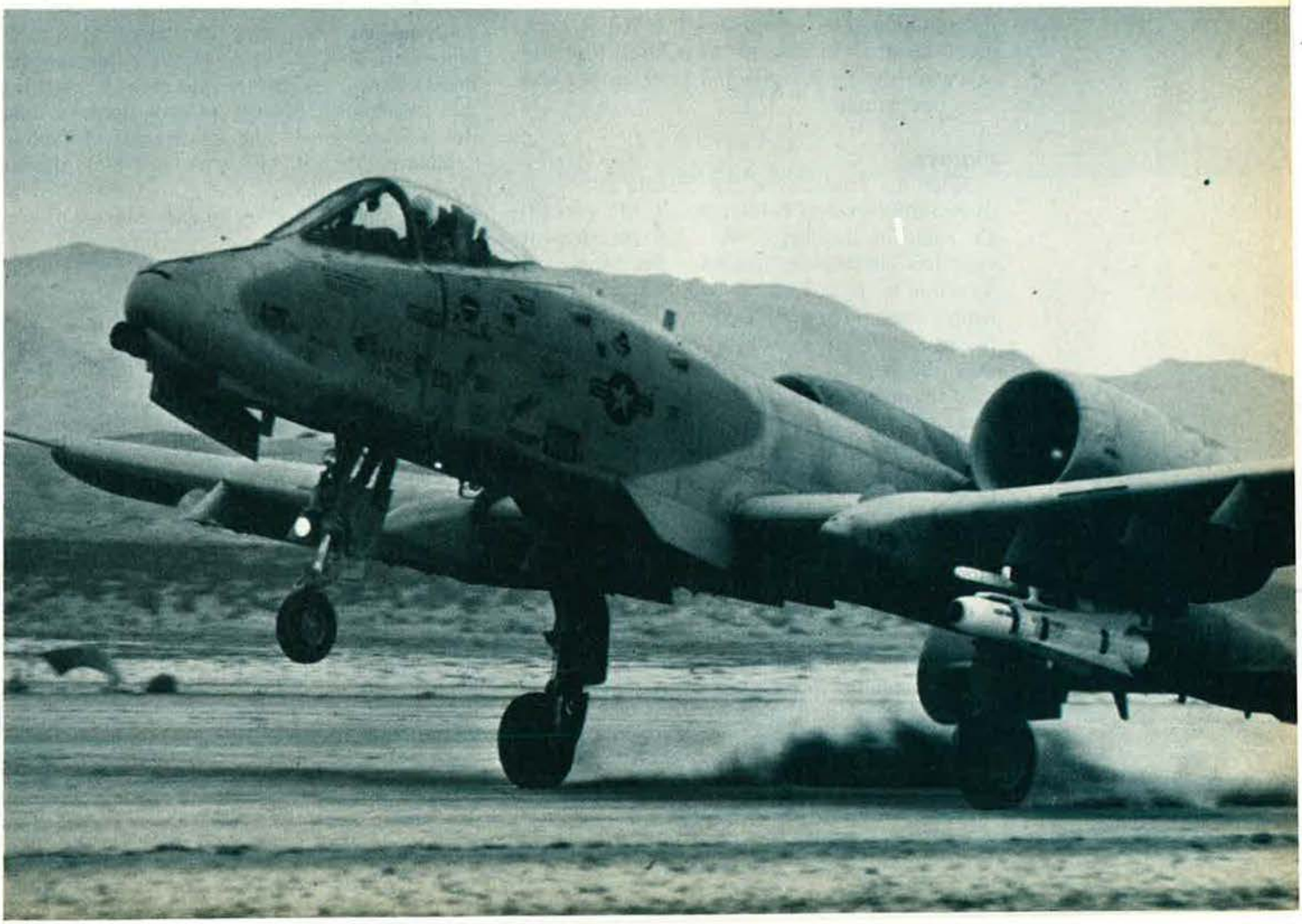
Why the RF-4C? Two reasons: established reconnaissance aircrew training is particularly well suited for crossover to the SCAR role, and the number of attack aircraft may be so limited in the next conflict that all aircraft capable of dropping bombs will have to be used in that role. Both the employment concept and specific tactics continue to be tested and modified in Red Flag and Blue Flag exercises.

SCAR can be employed in both direct and indirect strike control modes. The best way to explain direct strike control is to describe a typical mission profile. Although SCAR has been flown at medium and low altitudes, the very-low-altitude missions are the most demanding and, therefore, best illustrate the principles involved. The SCAR indirect strike control mission has six main elements: target development, rendezvous, ingress, strike control, damage assessment, and egress.

Target Development

Normally each SCAR aircrew becomes totally familiar with its assigned area through concentrated study of all available intelligence data. Just prior to launch they receive the latest update on enemy activity within their area and the current list of target priorities as established by the tactical forces commander. The SCAR crew then launches before the fighters to visually re-

In another SCAR direct control mode, the attack flight will take off after the SCAR crew and rendezvous at a predetermined point and time.



connoiter the area, pinpoint positions, and confirm the direction in which targets are moving. Based on the priority list, they next determine which targets are most lucrative and validate those to be attacked first. Exercising this on-the-scene selectivity prior to committing fighters ensures that attack aircraft are not exposed to enemy fire needlessly, and that only the most lucrative targets are struck. Using terrain masking at very low altitude and high airspeed, the SCAR crew exits the target area and reports the targets they discovered while proceeding to a preplanned rendezvous point.

Rendezvous

Aircraft that will attack the target under SCAR control can be allocated to the SCAR aircrew in one of three ways: fighters on five-minute alert can be launched after the SCAR crew has reported targets, those already airborne can be diverted from targets of lesser priority, or the attack flight can rendezvous with the SCAR aircraft at the predetermined point and at a specified time. In the last case, the fighters are assigned backup targets. If the rendezvous is not successful, they still can execute an effective mission.

The rendezvous point is a relatively safe reference point that can be found easily by both the SCAR and fighter aircrews. It may be located on either side of the forward edge of the battle area where terrain will provide shielding from enemy radar and communications jamming. During the rendezvous the SCAR crew gives the strike briefing to the fighters. Properly executed, the rendezvous and briefing take less than one minute.

Ingress

After the rendezvous, the fighters take one- to two-mile spacing behind the SCAR aircraft. En route to the target, the formation flies at very low altitude to minimize the chance of detection by enemy radar, with the SCAR and fighter crews giving each other mutual support. Because they are thoroughly familiar with the area, the SCAR crew can better avoid defenses, take the navigational load off the fighter flight lead, and provide additional ECM and chaff support. The fighters, freed of the responsibility for navigation, can devote more time to visual lookout, protecting themselves as well as the SCAR aircraft by providing an offensive capability against threats

Strike Control

The actual attack phase of the mission begins at a point called the attack reference point (ARP), which is located along the ingress route at a predetermined distance from the target. The SCAR crew marks the ARP, normally by firing two photoflash cartridges that give a flash of light and leave a small dense cloud of gray-white smoke in the air. As the fighter crews start their timing to begin the pop-up maneuver, the SCAR crew continues to the target and marks it with photoflash cartridges or 2.75-inch white phosphorus rockets. Marking both the ARP and the target reduces exposure to enemy fire. The ARP lets the fighter crews know exactly the distance and direction to the target, and makes the pop-up a very precise maneuver. This precludes popping early with a "float" to the target, or popping late which may require a reattack. If the target is difficult to see, marking it solves the target-acquisition problem, further reducing exposure time.

These tactics minimize the most vulnerable time for the fighters when they face the full range of enemy threats, when they've lost airspeed in the pop-up climb, when they're heavily loaded with bombs, and when the crews are concentrating on hitting the target. Responsibilities are divided so that mutual support never breaks down. As the SCAR crew is marking the target, the fighters provide lookout and threat warning. As the fighters are delivering ordnance, the SCAR crew provides similar cover for the fighters, and simultaneously maneuvers into position to conduct damage assessment.

Damage Assessment

Damage assessment can be done visually and relayed immediately, or photographically with a side-looking camera while standing off three to five miles from the target. Obtaining damage assessment from a standoff position beyond the range of point defenses in the immediate target area allows the SCAR crew to look under the smoke and debris to determine whether the target was destroyed.

Egress

After the fighters have delivered their ordnance, they rejoin the SCAR aircraft to exit the area. Since the SCAR crew has the fighters in sight during ordnance delivery, the SCAR pilot maneuvers as necessary to facilitate rejoining in a mutual support formation. Once out of the target area, the formation either proceeds to another target or back to friendly

An air tactics specialist, Maj. Stephen R. Elm has headed tactical reconnaissance programs at Southeast Asia and US bases, most recently Bergstrom AFB, Tex., as Chief of the 67th Tactical Reconnaissance Wing Weapons and Tactics Division. He also formerly served in the Hq. USAF Directorate of Doctrine, Concepts and Objectives. The 2,100-hour veteran (650 combat) of the RF-4C Phantom II holds an M.S. from the University of Southern California and presently is attending the Army Command and General Staff College, Fort Leavenworth, Kan.

territory. The same mutual support techniques that were used coming in to the target area are used going out.

Indirect Strike Control

Indirect strike control, exercised by the SCAR aircrew while not actually in the target area, can be used only under certain conditions. Since the target will not be marked, it must be one that can be readily identified by the fighters. An enemy staging area, for example, is a more suitable target for indirect strike control than is a camouflaged radar van.

Another prerequisite is a common reference point, such as a geographic feature, known by both the SCAR and the fighter crews. With a reference point and identifiable target, the SCAR crew can give the fighters a bearing and distance from the reference point to the target, or provide offsets for the fighters' weapons release computer set. The fighters can attack the target while the SCAR crew simultaneously conducts other strikes or returns to base.

If indirect strike control can be used, the survivability and efficiency of the SCAR crew are enhanced because they can control simultaneous strikes against different targets without having to reenter the high-threat area. Yet, because visual reconnaissance was conducted, the advantages of target validation and selectivity prior to committing attack are still retained with indirect strike control.

Theater Employment

The requirement for timely intelligence and responsive strike is always important, but would be critical if our next conflict were to find us in a position of numerical inferiority. Obviously, if we are not numerically superior we cannot engage in one-on-one attrition. We must achieve maximum disruption and destruction with limited resources. Soviet tactical doctrine bases offensive operations on combat momentum—obtaining a "shock-effect" with large numbers of men, mobile equipment, and massed firepower on the move. If combat momentum is destroyed, the Soviet offensive can be defeated.

Timing is critical in maintaining momentum because proper elements must come together within a specified time to be effective. The key to decisive disruption is destroying certain elements within the short period that is critical to the offensive. If we can achieve decisive disruption, there is a multiplier effect. To respond within a particular time frame, our forces must be able to react quickly to the latest intelligence data. SCAR provides that capability by matching near real-time information with near real-time attack.

Today, SCAR is increasing our operational readiness at nominal cost. It has the flexibility to adapt to any number of scenarios, the responsiveness to destroy mobile targets, and it enables the tactical forces commander to operate more effectively in an intense communications jamming environment or under adverse weather. The subtle significance of the SCAR concept lies in the fact that it is a capability gained, not with exotic equipment or expensive modifications, but solely through training—training that complements rather than substitutes for normal fighter and recce training. ■

This RF-4C stands ready for an early morning mission. Just prior to launch, its SCAR crew will be briefed on enemy activity in its assigned area. The SCAR crew then will decide which targets to attack first.

The Bulletin Board

By James A. McDonnell, Jr., MILITARY RELATIONS EDITOR

Benefits Report: "Status Quo"

Hq. USAF has sized up, in a recent detailed report to the field, this year's congressional actions affecting military pay, benefits, and entitlements. It reached this conclusion:

"There have been some gains and some losses, [but] in the majority of cases we have maintained the *status quo.*" The report repeatedly noted that numerous headline-getting plans first advanced by congressional committees—plans that would trim certain well-established benefits—were withdrawn following "reclamas" from Air Force and the Defense Department.

Examples included Appropriations Committees' plans to phase out the commissary subsidy and sharply increase CHAMPUS hospital costs for dependents. After the Pentagon protests, the lawmakers changed their minds.

Also defeated, at least in part by an Air Force reclama, was a Senate plan to convert 14,000 military spaces in nonappropriated fund (NAF) activities to civilian positions. Conferees weighing the FY '78 military appropriations bill restored funding to all but 1,750 full-time and 250 part-time military NAF spaces. This, USAF said, averted "any serious impact" on morale and welfare programs.

Congress, the Air Force report continued, also rejected plans advanced by both Appropriations Committees that would have prevented most military retirees hired by the federal government after September 30, 1977, from receiving their retired pay. However, that battle continues under a "double-dipping" probe conducted by the House Post Office and Civil Service Committee. Informed sources do not expect it to crack down very hard because at least thirty-three members of Congress are drawing both pay and pensions from Uncle Sam. The Committee is expected to recommend some changes, such as removing the dual compensation exemption now enjoyed by numerous high-ranking retired Regular officers serving as executives in federal agencies.

The only solid setback for the troops this year—Air Force calls it a "benefits reduction"—is the recent Space-A travel change. The lawmakers laid on a $10 charge for each air terminal transited by Space-A travelers. Air Force officials, who hope to talk Congress into reversing itself next year, charged that the adverse action grew out of inaccurate and erroneous assessment and costing studies conducted by the General Accounting Office.

In other actions that maintain the *status quo,* Congress extended for a year, to September 30, 1978, authority to pay selective enlistment and reenlistment bonuses; and, at press time, was in the process of extending, for the same period, the authority to continue paying military doctors and dentists their various special pays. The latter measure includes $100 per month extra pay for military veterinarians and optometrists.

USAF's report also noted that an improved survivor benefits bill is pending in the House.

There were these other developments on the benefits front:

- Dependency Indemnity Compensation. The House has passed and the Senate at press time was on the verge of approving a six-plus percent increase in DIC (for survivors of service members and other veterans who die from service-connected causes). Typical increases: widow of an E-5, from $300 per month to $318; O-4, from $384 to $407.
- GI Education Benefits. The House Veterans' Affairs Committee approved a 6.6 percent increase. It will mean a monthly raise for in-service veterans of up to $18 per month.
- Reserve Drill Pay. The lawmakers rejected a House plan to end drill pay for Reservists in legal, chaplain, public affairs, civil affairs, and R&D billets. This amounts to another successful stand against an attempted erosion of benefits.

The Air Force, meanwhile, is urging Congress to approve Administration proposals that would give:

- Mobile home owners monetary relief. The measure would remove the seventy-four cents per mile limit on moving a trailer (Defense says the average cost is $1.55 per mile) and permit payment of a dislocation allowance to trailerites.
- Junior enlisted families a $30-per-month allowance when they are separated. The payment currently is limited to E-4s with more than four years' service and higher grades.

AFA has supported most of the achievements cited above.

Some possible changes in benefits and entitlements are being held up pending the report of the President's Blue Ribbon Commission. Retirement changes are one of these. Also in this category, a high Pentagon official said, are Defense's plans to put government housing on a fair rental system and charge stiff rental fees for on-base trailer spaces. Both would hit members adversely in the pocketbook. If the Blue Ribbon Commission should oppose them, however, they might be dropped from further consideration.

Signals Change on Women Strengths

The Air Force has agreed to increase its female force substantially, from 39,000 now to 74,700 by FY '82. That latter figure will represent thirteen percent of USAF's entire uniformed force. As recently as 1972, the 16,000 WAF and medical women then on duty comprised a mere 2.3 percent of the force.

USAF's previous FY '82 goal was 56,800 women. Earlier this year, as reported in the August "Bulletin Board," the services had resisted

Defense Department pressure for large-scale distaff expansion. The services said they wanted to digest recent modest gains and "further explore" problem areas, such as lack of single women's facilities and joint-spouse assignments.

But the Air Force more recently reversed itself, and stepped-up female recruiting is already under way. Its FY '78 recruiting goal for women is a whopping 13,120; during five of the next twelve months 1,600 women will be recruited. By next September 30, the end of FY '78, USAF expects to have 47,000 distaff members.

The Air Force has wanted to assign women heavily in nontraditional skills and not concentrate them too heavily in administration and other traditional female jobs. But earlier this year, Headquarters officials told Defense that not enough female recruits were entering nontraditional billets and that a large distaff expansion would compound the problem.

Nevertheless, the Recruiting Service says that 7,000, or more than half of the FY '78 women recruits, will be in nontraditional jobs. Women may volunteer for enlistment in all specialties except seven combat-related jobs.

Retirement Battle Continues

Despite coming under increasing fire, the military's twenty-year retirement privilege has made it unscathed through another year. But the most prominent critics of the system, Rep. Les Aspin (D-Wis.), Adm. Hyman G. Rickover, and the Senate Appropriations Committee, undoubtedly will be heard from again.

They hold that requiring longer service and delaying retired pay several years not only would save large sums, but is justified. The Appropriations Committee notes that, according to Defense Department figures, if age forty-five were the earliest service people could begin collecting retirement pay, annual savings would hit $1.2 billion.

Mr. Aspin has been calling for delays in giving a service member retirement pay—for future retirees only—for a long time. Admiral Rickover, in a recent, highly publicized appearance, urged Congress to "move to thirty-year retirements" for future service retirees.

Interestingly, at the same time critics of the present retirement system were garnering headlines, the Air Force was reminding personnel offices in the field that no member is "entitled" to nondisability retirement at twenty years.

The service's general policy allows most volunteers to retire at twenty years. But a recent internal pamphlet, circulated by the Military Personnel Center, makes clear that the rules could change quickly.

"The Air Force has never inferred nor implied that regulations or policies relative to retirement would remain unchanged or in ef-

AFA Believes . . .

Star of the Show

It's not often—in fact it's darn seldom—that Washington newspaper readers get a balancing view of the erosion of military benefits. So we're happy to note a recent lead editorial in the Washington *Star* that said, quite eloquently, some things that can't be said too often.

The Washington Star
WEDNESDAY, AUGUST 3, 1977

Protect military benefits

The Senate Armed Services Committee has completed hearings on bills that would prohibit members of the armed services from joining labor unions. Perhaps it will not be long before this legislation becomes law.

Until lately, the thought of labor unions in the military was so far-fetched that legislation hardly seemed necessary. But with some unions ready to mount organizing efforts on military installations the need for laws banning such activity has become obvious.

Yet Congress should not think that banning union membership will eliminate the climate that has led unions to view the military as a "fertile field" for organizing efforts.

A major element in producing this "fertile field" has been the constant criticism lately — and some actual erosion — of benefits to military personnel. Vietnam brought the military into disrepute in some quarters, making it a convenient whipping boy for politicians and a target for cost-cutters on Capitol Hill and elsewhere in government.

Every year, for example, military commissaries come under attack in congressional appropriations committees for making groceries available at discount prices. One would think from the criticism that the taxpayers are being ripped off to the tune of about $300 million a year by well-heeled generals and admirals loading up on cheap foodstuffs, when in fact the vast majority of commissary customers are families of enlisted personnel, some of whose income is near or below the poverty level, and of lower-ranking officers, who are hardly getting rich in the military.

If the government can provide about $80 million a year in subsidies for a few thousand tobacco farmers to grow a substance demonstrably bad for health, what's wrong with subsidizing commissary operations by $300 million a year to benefit about 2 million members of the armed services who are on call 24 hours a day to defend the country?

There's also been a hullabaloo lately about "double dippers" — retired military people who work for the government and draw civilian pay while continuing to collect military pensions. The fact is that most of these "double dippers" are enlisted retirees whose average retirement pay is around $5,000 a year and whose civilian jobs are in the lower echelons of the civil service; but the critics focus on the 10 retired admirals and generals whose combined military pension and pay for top-level civilian jobs put their total compensation above that of Cabinet officers.

The "double dipper" controversy has triggered criticism of the entire military retirement system, which allows personnel to receive partial retirement pay after 20 years service and full retirement benefits after 30 years. Critics have suggested that early retirement be ended, that no retirement be paid before a certain age, that service personnel be required to contribute a portion of their active duty salaries toward retirement pay.

Nor are educational and medical benefits for the military what they used to be. And promotions come slower nowadays.

Add in the frequent long hours — there's no overtime pay in the military — the regular uprooting of homes, the frequent family separations, and the possibility of risking life in defense of the United States or an ally. It takes some dedication, if not rose-colored glasses, to see military service as a really attractive life.

The retirement benefits, the medical services, the commissary privileges and the rest were offered to induce men and women to join and make a career of the military. The fewer benefits, the less attractive it becomes; already the military is having difficulty filling quotas for the all-volunteer services, and there is talk of returning to the draft.

Yes, Congress should ban unions from the armed forces. But Congress also ought not chip away at military benefits and contribute to a climate that fosters unionism. Congress is, in effect, the shop steward to which military men and women look for protection of their rights, privileges and a decent livelihood.

The Bulletin Board

fect for an indefinite period of time. Rather, they are subject to change whenever the needs of the Air Force so demand," the pamphlet says.

This declaration is not seen as the start of a withdrawal from the "early-retire-keep-the-force-young" philosophy USAF has supported for years. The service also continues to champion the up-or-out statutes that help keep the force youthful.

But as the outlays for military retirement increase further—they are pegged at $9.1 billion in FY '78—the opposition to the twenty-year practice could intensify. More individual military officers seemingly are acknowledging that twenty-year retirement with immediate retirement pay is getting "harder to justify."

Meanwhile, the President's Blue Ribbon Commission, which was to convene last month, has retired pay high on its agenda. This in all probability means that no actual changes to the system will surface for at least a year.

Any recommendations for adverse changes by the Commission are expected to exclude present retirees. Commission Chairman Charles Zwick has indicated as much, as have Administration and congressional leaders.

AFA's manpower policy position urges that any personnel legislation enacted not apply to those currently serving.

Senior EM Advisors Confer

A new directive, AFR 39-20, which formally establishes the Senior Enlisted Advisor program, was a high point of interest last month at the first AFA-sponsored Senior Enlisted Advisor conference attended by many of those advisors. The conclave was held in conjunction with the Association's annual convention in the nation's capital. Advisors to the commanders of major commands and separate operating agencies attended.

USAF's Senior Enlisted Advisor program is actually ten years old, but there has been no central directive covering it until now. Besides spelling out overall policy, the new reg covers the advisors' roles and duties, qualifications, reporting identifier (99907), and much more. AFR 39-20 is now in distribution. Senior advisors, authorized at wing and higher level, number about 270 Air Force-wide.

JAG Pay Bill

The number of bills introduced in the House should easily pass the 10,000-mark when the first session of the Ninty-fifth Congress ends this fall. By the end of July the figure topped 8,600, helped along by a flurry of new military and veterans measures.

Included is H. R. 8199, containing a large JAG pay-raise plan. Sponsored by Rep. Mendel J. Davis (D-S. C.), it would give most military JAGs up to $250 a month in "special pay." In addition, JAGs who agreed to stay aboard at least three years would receive an extra two months' basic pay for each such year of service.

Similar lawyer measures, introduced periodically over the past two decades, have failed for lack of Administration support. This one isn't given much chance either. Other new House bills of interest include:

- H. R. 8406 (Rep. Don H. Clausen, R-Calif.), providing VA benefits for WW II Women's Airforce Service Pilots. Nothing has happened to a similar bill sponsored in the Senate by Sen. Barry Goldwater (R-Ariz.), which AFA strongly supports (*see April '77 issue*). But the House Veterans' Affairs Committee reportedly may soon take a look at the Clausen bill.
- H. Rs. 8551, 8552, and 8553 (Rep. Jack Brinkley, D-Ga.), would require that retirees, their dependents, and active-duty dependents be given medical and dental care on the same basis as service members.
- H. R. 8248 (Rep. William G. Whitehurst, R-Va.) would extend military medical and dental care to unmarried former spouses of military members, if such former spouses had been married to the member or former member at least twenty years.
- H. R. 8472 (Rep. Philip E. Ruppe, R-Mich.) would funnel ten percent of the savings realized from a base closure or realignment back to the local community for economic recovery.
- H. R. 8213 (Rep. Glen M. Anderson, D-Calif.) would give $150-per-month pensions to veterans of WW I and the surviving spouses and children of such veterans.
- H. R. 7847 (Rep. Bob Traxler, D-Mich.) would provide that military Reservists shall not be denied employment because of membership in one of the Reserve components.

CCAF Graduates 432 More

The Community College of the Air Force awarded 432 more Associate in Applied Science degrees this past summer to airmen at 120 locations worldwide. The event marked the second large-scale award of degrees since CCAF won degree-granting authority early this year. Details of the first graduation, for 272 airmen, were reported in the August issue. Degrees will be awarded each quarter.

The group of 432 recipients included 135 from Air Training Command bases, the parent command of CCAF. The largest local ceremony was held at Sheppard AFB, Tex., where sixty-six airmen were honored. Air Force-wide, degrees were awarded in a variety of programs ranging from administrative assistant to work center management.

There were fifteen chief master sergeants on the degree list, and three airmen first class: Mario Fernandez, Alan D. Brown, and Norma A. Webster. The lone Senior Airman, a new title created by the new "three tier" enlisted structure, was Craig Clemons.

VA Home Loans Up

The GI home loan program is brisk, according to the Veterans Administration. For July, the agency said, both home loans and appraisal requests were up sharply over the same month last year. During the first ten months of FY '77, VA received 368,000 loan applications. The home loan program, established in 1944, helps finance purchase of what VA calls a "reasonably priced home at a favorable rate of interest and with little or no down payment."

Short Bursts

Only **forty-one** of the 1,502 cadets

in the new class at the Air Force Academy dropped out during the six-week summer basic training for the newcomers. Usually, it's much higher than that. Officials attribute the improvement to the manner in which the **new Cadet Wing Commander, Edward A. Rice, Jr.,** has directed the "positive motivation" training now given new cadets.

Traditional harassment is out, and newcomers "now receive a mixture of praise and constructive criticism," according to the Academy. Cadet Rice, incidentally, is the first black to hold the top student post. He's been on the Superintendent's List (academic and military achievement) **for six semesters,** sporting a lofty 3.41 grade point average. His dad is a **retired Air Force major** who lives in Yellow Springs, Ohio.

At about the same time the

Ed Gates . . . Speaking of People

OER System: Battered and Bruised

Three years ago the Air Force unveiled a bold new program governing officer effectiveness reports (OERs). No longer could raters give nearly all their subordinates top marks, as had become SOP throughout the service. No longer would rating inflation, with all its misleading and unfortunate aspects, be the norm.

Instead, under the "controlled" system invoked in the fall of 1974, only twenty-two percent of the officers in each grade could receive a "top-block" or 1 rating. Furthermore, no more than fifty percent could receive a top- or second-block (1 or 2) rating. Finally—and here's where the trouble began—all other officers were to receive third-, fourth-, fifth-, or sixth-block (3, 4, 5, or 6) ratings. Since the final three were seldom awarded, third blocks have been going to virtually half of the nearly 100,000-member force ever since.

Air Force leaders had hoped that officers would regard 3s as "competitive" for promotion purposes. "A third-block rating is a good rating," authorities declared during the early days of the controlled project.

Unfortunately, most officers, of high and low station alike, didn't see it that way. As several rating-promotion cycles came and went, a multitude came to regard 3s as a kiss of death. Particularly unhappy have been officers assigned to the Hq. USAF Air Staff and other special activities where the jobs traditionally have been advertised as solely the province of superior officers.

The incumbents saw absolutely no equity in being labeled outstanding on the one hand and receiving a 3 on the other. And they have sounded off about it loud and long.

The review process under the controlled OER system has also drawn boos. Reviewing officers, to assure that the 22-50-100 formula was complied with, frequently had to reduce a 1 given by a rating officer to a 2 or even a 3. The reviewers were pretty much locked in and enjoyed little flexibility. They've been tabbed the "bad guys" frequently.

Charges that 1s are being reserved for this or that special group continue to surface. Gripes about the OER program, in short, never really stopped when the controlled plan was introduced. And since then they have increased.

Six weeks ago the Air Force responded—by lifting the controls on all but top-block ratings. Only twenty-two percent of the force now may continue to receive 1s; all the rest can be 2s, or lower, or some combination, depending on how local officials feel about the people they're rating and reviewing.

This change, of course, immediately raises the specter of a return to inflation—by seventy-eight percent of the force (all but the twenty-two percent top blocks) receiving 2s. But officials have an ace in the hole they feel will deter such inflation: a new rule requiring reviewers to state the number of ratings they award in each rating block.

Accordingly, if a reviewer of 100 officers hands out seventy-eight 2s, he's going to stand out like a sore thumb. And the leadership won't like it.

"The reviewer," Headquarters says, "is the key to the revised control system and must not abandon reasoned, objective distribution of ratings. It is his or her rating in evaluation of potential . . . that is controlled."

Reviewers, Headquarters continued, "must exercise their responsibility and flexibility to award ratings as described . . . (in a revised regulation) with care and restraint." Under the revisions, top-block or 1 ratings should go to officers with the "highest potential"; 2s go to "very effective officers who clearly have potential for expanded or more diverse responsibility"; and 3s are for officers "who are performing well in current duties, but have not yet clearly demonstrated potential for expanded or more diverse responsibility."

The message is clear: Reviewing officers who abuse the spirit of these instructions by going all or most of the way with second blocks are asking for trouble.

OERs prepared after the official lifting of the second- and third-block controls (September 1, 1977) will be clearly identified so that promotion boards can distinguish between them and ratings given earlier, Air Force said.

Not altered was the "closed" form introduced in 1974 that provides extra information for promotion boards weighing lieutenant colonels for full colonel. Described by officials as helpful in providing data for those panels, the form remains in operation.

Hq. USAF authorities declined to label the removal of second- and third-block controls "major" or "significant," but called them a "modification" of the system. The changes, they said, "retain . . . the key element of the OER system, the controlled rating concept."

They credited these controls with breaking the inflationary trend (ninety-five percent top ratings) that limited the value of the previous OER. They said the controlled ratings were also giving supervisors and commanders a "more direct voice in the management process and providing more feedback to individual officers."

The office of DCS/Personnel stressed that the change allows reviewers to exercise more flexibility in awarding ratings. Officials there said the OER system has matured to the point where it is time to give reviewers added responsibility in distributing ratings among "the solid performers who constitute the majority of the officer corps."

That quote puts the finger on what may be the crux of USAF's OER dilemma—that the officer corps, acquiring more talent, degrees, and expertise each year, is now bursting with quality and there have been too few high-scoring OER blocks established to properly identify it. So, maybe the expected boost in second-block ratings will reduce pressures and ease the overall problem. Some quarters, of course, will insist that this isn't enough relief, that considering the overall lofty caliber of the officer corps a lot more than twenty-two percent should receive 1s. But that road could lead back to wholesale inflation.

So, perhaps it's time to withdraw the attacks on the battered and bruised OER system, at least for awhile, and digest the new changes. They seem reasonable enough. ■

The Bulletin Board

Senate Armed Services Committee was reporting S. 274, **a measure barring military unions,** to the full Senate, the Defense Department published, in the Federal Register, its proposed directive **forbidding service members from joining unions.** The latter was scheduled to go into effect in mid-September. Just what happens to S. 274 was not immediately clear.

That service-wide test of **energy usage in family quarters** is slated to begin early next year, following installation this fall of utility meters in 10,000 sets of family quarters. **Five USAF bases** were being considered as test participants. Even if the families involved in the test use too much electricity, gas, or oil, they won't be charged for it. But later—probably not before 1980, after the tests have been evaluated **—meters could be installed** in all 155,000 USAF family housing units, and heavy users charged.

"Military courts **do not provide certain safeguards** found in civilian federal courts," says the General Accounting Office in a recent report. GAO urged Congress **to replace military court members** and select jurors from the overall military population on a random basis.

In separate reports, the GAO, the government's watchdog on federal spending, asked the lawmakers to **replace the military pay-allowance system** with a straight salary arrangement, and to **establish a single overall federal retirement policy** to replace the various retirement systems now operating (military, civil service, judges, etc.).

By law, junior enlisted service members are allowed to move only 225 pounds of household goods courtesy of the government at PCS time. But the Air Force is reminding them that there's a way to get around this restriction: **use the do-it-yourself move plan,** which began last year. For example, E-3s who moved their own averaged almost 1,200 pounds actual weight moved and still pocketed an average $72 as their share of the government's savings. During USAF's first ten months of do-it-yourself, **5,894 airmen and 1,090 officers participated.** Their average "incentive payment" was $200.

The **Air Force Aid Society** has eased some of its tough loan and grant policies. For example, the $500 loan ceiling for straightening dependents' teeth has been removed. AFAS, which received more than $900,000 from the Air Force 1977 Assistance Fund Campaign, **has come under steady fire for being stingy** in shelling out money. Its loans remain interest free.

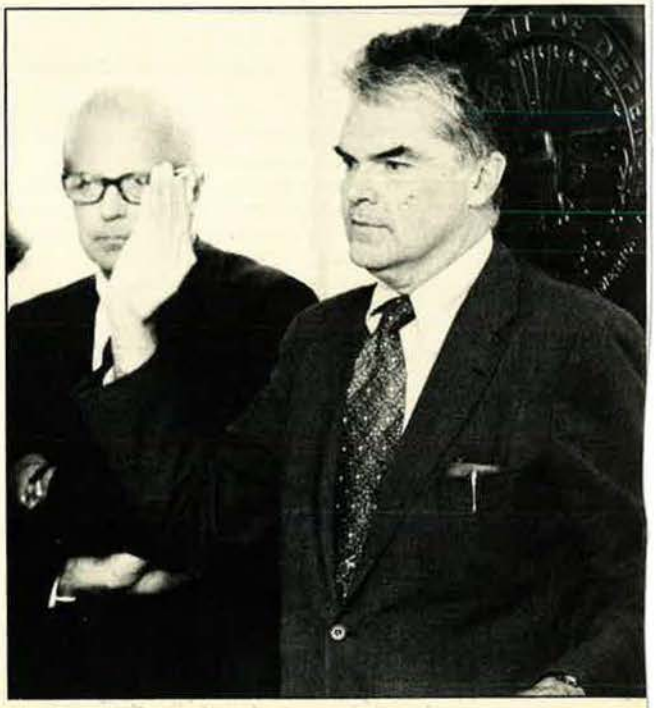
Senior Staff Changes

EXTENSION: Gen. Daniel James, Jr., as CINC, NORAD and ADCOM, Peterson AFB, Colo., until May 1, 1978.

RETIREMENTS: B/G Michael E. **DeArmond;** M/G Robert L. **Edge.**

CHANGES: M/G Richard N. Cody, from DCS/Plans, Hq. SAC, Offutt AFB, Neb., to Dep. Dir., Ops. & Admin., DNA, Washington, D. C. . . . **B/G Robert T. Herres,** from Dep. for Security Assistance Programs, Hq. ESD, Hanscom AFB, Mass., to Asst. C/S for Comm. & Computer Resources, Hq. USAF, Washington, D. C., replacing retiring M/G Robert L. Edge . . . **M/G Abner B. Martin,** from B-1 System Program Director, Hq. ASD, Wright-Patterson AFB, Ohio, to Dir., Defense Mapping Agency, Washington, D. C. . . . **B/G Thomas C. Pinckney, Jr.,** from Spec. Asst. to C/S, Hq. USAF, Washington, D. C., to Dir., East Asia & Pacific Region, OSD (ISA), Washington, D. C.

SENIOR ENLISTED ADVISOR CHANGES: CMSgt. Philip A. Arvizo, from DoD Administrative Officer, American Embassy, Caracas, Venezuela, to Senior Enlisted Advisor, Hq. AFISC, Norton AFB, Calif., replacing CMSgt. Edward H. Johnston . . . **CMSgt. Posie W. Barker,** from NCOIC, Assignments, 1141st Special Activity Sqdn., Stuttgart, Germany, to Senior Enlisted Advisor, Hq. ARPC, Denver, Colo., replacing CMSgt. John W. Spencer . . . **CMSgt. Roland W. Douglas,** from Chief of Organizations and Requirements, Air Force Academy, Colo., to Senior Enlisted Advisor, the recently established Air Force Management Engineering Agency, Randolph AFB, Tex., replacing retiring CMSgt. William C. Toups . . . **CMSgt. Fred Dickinson,** from Chief of Military Personnel Div., AF Commissary Service, Kelly AFB, Tex., to Senior Enlisted Advisor in the newly established Air Force Engineering Service Agency, Kelly AFB, Tex. . . . **CMSgt. Edward A. Henges,** from Senior Enlisted Advisor, Hq. Twenty-first Air Force, McGuire AFB, N. J., to Senior Enlisted Advisor, Hq. MAC, Scott AFB, Ill., replacing retiring CMSgt. Otto H. Lensch III. ■



Dr. Hans M. Mark is sworn in as Under Secretary of the Air Force as John C. Stetson, Air Force Secretary, looks on during the Pentagon ceremony. Dr. Mark, who was born in Germany, came to the US in 1940 and became a US citizen five years later. He earned his Ph.D. from Massachusetts Institute of Technology and served in a number of research and academic positions before coming to the Air Force.

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AFA News

By Don Steele, AFA AFFAIRS EDITOR

Unit of the Month

THE NORTH GEORGIA CHAPTER . . . cited for consistent and effective programming in support of the missions of the Air Force and AFA, most recently exemplified by its Boy Scout Merit Badge Workshop at Dobbins AFB.

AFA's North Georgia Chapter and the Air Force Reserve's 94th Tactical Airlift Wing recently cosponsored a day-long merit badge workshop at Dobbins AFB for some 190 Boy Scouts and adult leaders representing twenty-six Atlanta Area Council Boy Scout troops. They spent the day with personnel of the 94th and Chapter leaders being briefed at five program stations—flight theory, aircraft walk-through, propulsion, navigation and weather, and aviation history—and earning their aviation merit badge in the process. The sponsors started the annual program last fall with Girl Scouts and plan to make the workshops annual events in Atlanta's Scouting program. In the photo, TSgt. David Lokey gives the scouts an aircraft propulsion briefing in the Dobbins maintenance hangar. In recognition of the Chapter's outstanding community relations efforts and its work with youth, AFA President George M. Douglas names the North Georgia Chapter as the "Unit of the Month" for October.

Robins AFB Queen Darlene Leid, an employee in the Directorate of Materiel Management at the central Georgia base, was the center of attraction for the North Georgia Chapter's "Salute to Airpower" float in Atlanta's "Salute to America" Fourth of July parade. Waiting for the parade to start are Chapter members, from left, Carol Lovoring, A1C Ginger Salazar, CMSgt. Buzz Sawyer, Chapter President Bill Copeland, and, standing on the float, Miss Leid.

The New York State AFA's Thirtieth Annual Convention was held in Tonkonkoma. Principals in its Thirtieth Anniversary Dinner program were, from left, AFA Board Chairman Gerald V. Hasler, who introduced the guest of honor and recipient of the State AFA's Bernt Balchen Award; Edwin A. Link, recipient of the Bernt Balchen Award; and Lt. Gen. Bennie L. Davis, Deputy Chief of Staff/Personnel, the guest speaker. AFA President George M. Douglas was the luncheon speaker and, during the business session, incumbent State President Ken Thayer was reelected.

The Oklahoma State AFA's 1977 Convention was held at Altus AFB and was hosted by the Altus Chapter. Participants included, from left, State President David Blankenship, who was reelected during the convention; Maj. Gen. Charles C. Blanton, Director of Legislative Liaison, Office of the Secretary of the Air Force; Vic Kregel, Vice President for AFA's Southwest Region; and Altus Chapter President Aaron Burleson.

chapter and state photo gallery

The California State AFA's 1977 Convention was hosted by the General Curtis E. LeMay-Orange County Chapter at the Marriott Hotel in Newport Beach, Calif. Shown reviewing the convention schedule are, from left, Past State President John Lee; Charles Cleminshaw, Parker-Hannifin Corp. Vice President, the luncheon master of ceremonies; Convention General Chairman Robert J. Eichenberg, President of the host Chapter; Robert Clifford, Air California President, the banquet master of ceremonies; and Richard Spooner, the luncheon program chairman. Los Angeles Police Chief Ed Davis was the luncheon speaker; Lt. Gen. Daniel O. Graham, USA (Ret.), former Director of the Defense Intelligence Agency, and Dr. Milorad Drachkovitch, head archivist of the Hoover Institute at Stanford University, were the banquet speakers. Delegates reelected incumbent State President Dwight Ewing.

A highlight of the Texas State AFA's Convention Awards Banquet was the presentation of a plaque to Earle North Parker, right, naming him a Jimmy Doolittle Fellow of AFA's Aerospace Education Foundation. The $1,000 fellowship was sponsored for Mr. Parker, a former AFA National Director and the major contributor to the State AFA's scholarship fund, by the Texas State AFA and was presented by State President E. F. "Sandy" Faust, left.

Robert J. Puglisi, immediate Past President of AFA's Mid-Ohio Chapter, was named the Ohio State AFA's "Man of the Year" at its recent convention in Columbus. Mr. Puglisi, left, is shown receiving the award from State President Ed Nett. During the business session, delegates reelected Mr. Nett, and elected Mr. Puglisi as Executive Vice President of the State AFA.

COMING EVENTS

AFA's 31st Annual National Convention, Sheraton-Park Hotel, Washington, D. C., September 18–21 . . . **AFA's Aerospace Development Briefings and Displays,** Sheraton-Park Hotel, Washington, D. C., September 20–22 . . . **AFA Symposium entitled "Theater Deterrence for the 80s,"** Hyatt House Hotel, at the Los Angeles International Airport, Los Angeles, Calif., October 27–28 . . . **Sixth Annual Air Force Ball,** Century Plaza Hotel, Los Angeles, Calif., October 28.

Participants in the Texas State AFA's 1977 Convention in San Antonio included, from left, AFA Board Chairman Gerald V. Hasler, who assisted in the presentation of awards at the convention luncheon; retired Lt. Gen. Ira C. Eaker, the guest speaker at the Awards Banquet; State AFA President E. F. "Sandy" Faust; and William W. Roth, Immediate Past President of the Alamo Chapter, the host Chapter for the convention. At the business session, delegates reelected Mr. Faust for a second term.

AFA News

PHOTO BY WALTER KYDD

In conjunction with a visit to McGuire AFB, N. J., by Gen. William G. Moore, Jr., Commander in Chief, Military Airlift Command, the Thomas B. McGuire, Jr., Chapter sponsored a picnic for its members with General Moore as the guest of honor. During the program, New Jersey State AFA President Leonard Schiff announced that the McGuire Chapter had been selected as AFA's Unit of the Year for 1977. Shown following the announcement are, from left, Col. James L. Gardner, Jr., Commander, 438th Military Airlift Wing; Maj. Gen. Alden G. Glauch, Commander, Twenty-first Air Force; AFA National Director James Grazioso, in front of General Glauch; Mr. Schiff; Chapter President William Demas, and General Moore.

INTERESTED IN JOINING A LOCAL CHAPTER?

For information on AFA Chapters in your area, write:
Assistant Executive Director/Field Operations
Air Force Association
1750 Pennsylvania Ave., N. W.
Washington, D. C. 20006

The California State AFA's "Military Woman of the Year," Air Force Capt. Sally L. Davidson, center, protocol officer at the Air Force Space and Missile Systems Organization (SAMSO) in Los Angeles, could not attend the State AFA's Convention in Newport Beach, but did receive her award at ceremonies in the office of Lt. Gen. Thomas W. Morgan, right, SAMSO Commander. Greater Los Angeles Airpower Chapter President Richard C. Doom, left, presented the award on behalf of State AFA President Dwight Ewing.

The Hon. Jim Wright, House Majority Leader, a long-time member and supporter of the Air Force Association, recently became a Life Member of AFA. During a visit with Congressman Wright, AFA National President George M. Douglas, left, presented him a Life Member Certificate, card, and lapel pin.

During an aloha party for Gen. Louis L. Wilson, Jr., Commander in Chief, Pacific Air Forces, prior to his recent retirement, AFA's Hawaii Chapter President Jim Dowling, right, on behalf of AFA President George M. Douglas and the Air Force Association, presented General Wilson a personalized plaque chronicling his thirty-nine years of military service.

chapter and state photo gallery

Lt. Gen. George H. Sylvester, center, Commander, Aeronautical Systems Division (ASD), Wright-Patterson AFB, Ohio, and N. C. "Dutch" Heilman, left, AFA's Wright Memorial Chapter President, recently presented a check for $2,500 to Col. Richard Uppstrom, right, Director of the Air Force Museum. The money was donated by participants in the seventh "Stewart Open" golf tournament, cosponsored annually by ASD and the AFA Chapter. In the past seven years, the tournament has donated almost $20,000 to the Museum and $3,500 to AFA's Aerospace Education Foundation.

Sen. Jake Garn (R-Utah), left, was the guest of honor and speaker at a recent dinner meeting sponsored by the Utah State AFA at the Hill AFB Officers' Club. In the photo, Senator Garn, left, congratulates newly elected Utah State AFA President Leigh Hunt.

AFA's Silver and Gold Chapter recently honored the Central Bank of Denver and the Space Age Federal Credit Union as Community Partners. Shown after presentation of the Community Partner Certificates are, from left, Chapter President Stephen L. Brantley; Space Age Federal Credit Union Manager Dennis Anderson; Shirley Cleland, then Colorado State AFA Secretary, now a Vice President; and State AFA President Edward C. Marriott.

Net proceeds from the Second Arizona Air Force Ball, a black-tie, fund-raising event sponsored annually by AFA's Phoenix Sky Harbor Chapter, benefited the Arizona Wheelchair Pilots Association (AWPA), an organization established in 1973 to pursue specific aviation goals for wheelchair-bound individuals. Robert Seitzberg, center, a Past President of the AFA Chapter, presented a check for $1,000 to AWPA President Jack Green, left, during AWPA's recent tour of the 26th NORAD Region blockhouse at Luke AFB. Bunny Gardner, AWPA coordinator, is at right.

AFA News

At the annual awards banquet of the Southern Wayne Senior High School AFJROTC unit in Goldsboro, N. C., Cadet Maj. Barbara Lee received AFA's AFJROTC Bronze Medal. Shown are, from left, retired Lt. Col. Earl Creyer, Aerospace Education Instructor at Southern Wayne; Scott Berkeley Chapter President Bill Bowden; Cadet Lee; Col. Lindy Gunderson, Commandant, Middle Atlantic Area, AFROTC; and Walter Fulcher, Southern Wayne principal, who received an AFA membership from the members of the AFJROTC unit.

—USAF PHOTO BY SSGT. ERICK CAMPBELL

During a luncheon sponsored recently by AFA's Thomas B. McGuire, Jr., Chapter in the McGuire AFB NCO Club, Col. James L. Gardner, Jr., left, Commander, 438th Military Airlift Wing, presented a Military Airlift Command "Distinguished Citizen Certificate" to Chapter President William J. Demas, center. AFA National President George M. Douglas, right, was the guest speaker. The award was "in appreciation for outstanding community service to the 438th Military Airlift Wing" at McGuire AFB.

During the Robert H. Goddard Chapter's Annual Summer Banquet at Vandenberg AFB, Calif., the Chapter's "Outstanding Women in the Medical Service" awards were presented. Brig. Gen. Don M. Hartung, Commander, Space and Missile Test Center at Vandenberg, congratulates three of the five recipients. They are, from left, Dr. Mary Carlson, MD, USAF Hospital at Vandenberg; Sister Donna Marie Swerdliger, Assistant Administrator, Marion Hospital, Santa Maria; and Dr. Gilda G. Hwang, DDS, USAF Hospital at Vandenberg.

—OFFICIAL USAF PHOTO

The Montgomery, Ala., Chapter's trophy and inscribed pen set for the outstanding research paper submitted to the Air Command and Staff College were recently presented to Maj. Daniel T. Adamson at ceremonies in the office of Maj. Gen. William L. Nicholson III, Commandant, Air Command and Staff College. Shown are, from left, General Nicholson, Major Adamson, Mrs. Adamson, and Immediate Past Chapter President Joseph W. Coyle.

LOOK AT TODAY'S SOARING HOSPITAL COSTS!

*Source: Mutual of Omaha Group Claims Research

Will *your* current hospitalization insurance cover all of today's gigantic hospital costs? Not likely! But Here's Immediate Help!

AFA HOSPITAL INDEMNITY INSURANCE

- ☐ **Benefits up to $80 Per Day**
- ☐ **Benefits for Hospital Out-patient Treatment**
- ☐ **ALL AFA Members and Families Are Eligible**

Check these and all other benefits on the next two pages, and apply now.

ENROLLMENT PERIOD WILL CLOSE NOVEMBER 18, 1977

CURRENT ENROLLMENT PERIO

APPLY NOW FOR AFA HOSP

Why Pay Money Out of Your Pocket When You Are Hospitalized?

Every family has extra expenses when a family member is hospitalized. But that doesn't mean you have to pay them if you're covered by AFA's Hospital Indemnity Insurance.

A Simple, Practical Plan

AFA Hospital Indemnity Insurance benefits—now available up to $80 per day—begin on the first day you are hospitalized—for covered sickness and accidents—and continue for as long as 365 days. No deductible. No waiting period. And benefits are payable in addition to all other insurance or government benefits you might receive. Benefits are paid directly to you unless you request payment to a hospital at the time you submit a claim.

How It Works

Under AFA's Program, you have three basic plans to choose from. You simply select the one which best meets your needs.

Individual plan . . . coverage for you; Limited family plan . . . coverage for you and your spouse; Full family plan . . . coverage for you, your spouse, and all of your dependent children.

Under each plan you have a choice of coverage . . . $20, $40, $60, or $80 per day. Depending on the plan you select, your spouse would receive 75% of your daily benefit and each child would receive 50% of your daily benefit. And, in all cases, benefit payments would be made for up to 365 days in the hospital for each covered illness or accident for each insured member of your family.

New Hospital Out-patient Benefits

If you require hospital out-patient treatment within 48 hours of a covered accident or other emergency sickness, this new AFA benefit will pay $20.00 for each out-patient visit. There is no limit to the number of times you or insured members of your family may receive benefits for out-patient treatment at the hospital for accidental injuries, but benefits for treatment for emergency sickness are limited to 5 visits per year ($100). Of course, no more than one payment, per insured person, may be made during any 24-hour period and, naturally, payments under the out-patient benefit plan will only be made if you are not confined in th hospital overnight.

The optional $20/day hospital out-patie benefit may be added to any of the basi plans.

Premium for Hospital Out-patient Benefit

Plan	Annual Cost	Semi-Annual Cost
INDIVIDUAL PLAN	$ 3.00	$1.50
LIMITED FAMILY PLAN	$ 6.00	3.00
FULL FAMILY PLAN	$11.50	5.75

Eligibility

All members of the Air Force Association who are citizens of the United States are eligible to become insured under this program. Members of their families are also eligible for coverage, under the Full Family Plan; dependent children will be insured between the ages of 14 days and 19 years (unmarried children between the ages of 19 and 23 are also eligible if they are wholly dependent upon the principal insured for support and are attending school or college on a full-time basis.)

Provision for Pre-Existing Conditions

Health conditions for which the insured has received medical treatment or advice o has taken prescribed drugs or medicin within 12 months prior to the effective dat of his insurance, are considered to be pr existing conditions. Coverage for such pr existing health conditions will begin after consecutive months during which time he covered under the policy and receives medical treatment or advice and takes such prescribed drugs or medicine.

Renewal Provision

As long as the Master Policy with AF remains in force, termination of your cove age can occur only if premiums for cove age are due and unpaid, or if you are longer an AFA member. Your certifica cannot be terminated because of the nu ber of times you receive benefits.

BENEFIT SCHEDULE

PREMIUM SCHEDULE

INDIVIDUAL PLAN

Member's Attained Age	Plan A-1 Member: $20 per day Annual	Plan A-1 Semi-Annual	Plan B-1 Member: $40 per day Annual	Plan B-1 Semi-Annual	Plan C-1 Member: $60 per day Annual	Plan C-1 Semi-Annual	Plan D-1 Member: $80 per day Annual	Plan D-1 Semi-Annual
Under 40	$ 31.00	$ 16.50	$ 57.00	$ 29.50	$ 84.00	$ 43.00	$110.00	$ 56.00
40-49	$ 39.00	$ 20.50	$ 72.00	$ 37.00	$105.00	$ 53.50	$138.00	$ 70.00
50-59	$ 56.00	$ 29.00	$106.00	$ 54.00	$156.00	$ 79.00	$206.00	$104.00
60-64	$ 81.00	$ 41.50	$156.00	$ 79.00	$231.00	$116.50	$306.00	$154.00
65 & over*	$ 59.00*	$ 30.50*	$ 65.00*	$ 33.50*	$ 72.00*	$ 37.00*	$ 79.00*	$ 40.50*

LIMITED FAMILY PLAN

Member's Attained Age	Plan A-2 Member: $20 per day Spouse: $15 per day Annual	Plan A-2 Semi-Annual	Plan B-2 Member: $40 per day Spouse: $30 per day Annual	Plan B-2 Semi-Annual	Plan C-2 Member: $60 per day Spouse: $45 per day Annual	Plan C-2 Semi-Annual	Plan D-2 Member: $80 per day Spouse: $60 per day Annual	Plan D-2 Semi-Annual
Under 40	$ 63.00	$ 32.50	$113.00	$ 57.50	$164.00	$ 83.00	$215.00	$108.50
40-49	$ 76.00	$ 39.00	$140.00	$ 71.00	$204.00	$103.00	$268.00	$135.00
50-59	$109.00	$ 55.50	$207.00	$104.50	$304.00	$153.00	$402.00	$202.00
60-64	$156.00	$ 79.00	$301.00	$151.50	$448.00	$224.00	$591.00	$296.50
65 & over*	COVERAGE ONLY AVAILABLE UNDER INDIVIDUAL PLAN							

FULL FAMILY PLAN

Member's Attained Age	Plan A-3 Member: $20 per day Spouse: $15 per day Children: $10 per day Annual	Plan A-3 Semi-Annual	Plan B-3 Member: $40 per day Spouse: $30 per day Children: $20 per day Annual	Plan B-3 Semi-Annual	Plan C-3 Member: $60 per day Spouse: $45 per day Children: $30 per day Annual	Plan C-3 Semi-Annual	Plan D-3 Member: $80 per day Spouse: $60 per day Children: $40 per day Annual	Plan D-3 Semi-Annual
Under 40	$ 78.00	$ 40.00	$142.00	$ 72.00	$206.00	$104.00	$270.00	$136.00
40-49	$ 91.00	$ 46.50	$169.00	$ 85.50	$246.00	$124.00	$323.00	$162.50
50-59	$125.00	$ 63.50	$235.00	$118.50	$346.00	$174.00	$457.00	$229.50
60-64	$172.00	$ 87.00	$331.00	$166.50	$490.00	$246.00	$646.00	$324.00
65 & over*	COVERAGE ONLY AVAILABLE UNDER INDIVIDUAL PLAN							

*Coverage for members age 65 and over is only provided through the AFA Senior Age Benefits Program (see details above) under the individual plan. In the event you become age 65 while insured under the basic program, your coverage will be transferred automatically to the AFA Senior Age Benefit Program on the first renewal date of the certificate following your 65th birthday.

NOTE: Your premium is automatically adjusted to the rate for your attained age on renewal.

UNDERWRITTEN BY: Mutual of Omaha Insurance Company, Home Office: Omaha, Nebraska

NDS NOVEMBER 18, 1977
AL INDEMNITY INSURANCE!

xceptions

Your Plan does not cover losses resulting om (1) hospital confinement commencing ior to the date the protected person or igible dependent becomes insured under is certificate; (2) declared or undeclared ar or act of war; (3) service in the Armed orces of any country, except the United tates; (4) acts of intentional self-destruc- on or attempted suicide while sane or in- ane; (5) pregnancy, including childbirth or sulting complications; (6) confinement in ny institution primarily operated as a clinic, onvalescent home, rest home, nursing ome, or home for the aged, drug addicts, alcoholics, or hospitalization involving ervous or mental disorders where no harge is made for confinement expense.

Senior Age Benefits • Payable in addition to the hospital benefits of Medicare

Members age 65 and over may qualify for coverage under the Federally sponsored Medicare program. The hospital benefits of Medicare currently provide coverage in excess of $104 during the first 60 days of hospitalization; during the following 30-day period, Medicare pays for eligible charges over $26 a day; for hospitalization in excess of 90 days, Medicare benefits are available only when you utilize the 60-day "lifetime reserve," and in this event, your costs become $52 a day.

In order to help cover those costs not paid by the hospital benefits of Medicare, AFA Senior Age Benefits are available to all members age 65 and over. It provides daily benefits for as long as 365 days. Benefits for the first 90-day period, during which Medicare coverage is available, are identical for all senior age policyowners—$10 a day for the first 60 days and $15 a day for the 61st through the 90th day of hospitalization. Daily benefits for coverage beyond the 90th day are available in different amounts ($20, $40, $60, or $80 a day) depending on your choice of plan.

MAIL THIS APPLICATION WITH YOUR FIRST PREMIUM PAYMENT TODAY!

APPLICATION FOR
AFA HOSPITAL INCOME INSURANCE

Mutual of Omaha

Group Policy GMG-6900
Mutual of Omaha Insurance Company
Home office: Omaha, Nebraska

Full name of member _____
Rank Last First Middle

Address _____
Number and Street City State ZIP Code

Date of birth _____ Height _____ Weight _____ Soc. Sec. No. _____
Month Day Year

PLAN OF INSURANCE (Check One)

Member Only	☐ A-1	☐ B-1	☐ C-1	☐ D-1
Member and Spouse	☐ A-2	☐ B-2	☐ C-2	☐ D-2
Full Family	☐ A-3	☐ B-3	☐ C-3	☐ D-3

HOSPITAL OUTPATIENT BENEFITS (Check One)
☐ Yes ☐ No

METHOD OF PAYMENT (Check One)
☐ Annual ☐ Semiannual
I enclose my initial premium in the amount of:
BASIC COVERAGE $_____
HOSPITAL OUTPATIENT COVERAGE $_____
TOTAL PAYMENT $_____

This insurance coverage may only be issued to AFA members. Please check the appropriate box below:
☐ I am currently an AFA member.
☐ I enclose $10 for annual AFA membership dues (includes subscription ($9) to AIR FORCE magazine).

If this application requests coverage for dependents (Limited Family Plan or Full Family Plan), please complete the following information and list only those persons for whom you are requesting coverage.

Names of Dependents To Be Insured	Relationship to Member	Date of Birth (Month-Day-Year)

In applying for this coverage, I understand and agree that (a) coverage shall become effective on the last day of the calendar month during which my application together with the proper premium amount is mailed to AFA, (b) only hospital confinements (both inpatient and outpatient) commencing after the effective date of insurance are covered, and (c) any conditions for which I or my eligible dependents received medical treatment or advice or have taken prescribed drugs or medicine within 12 months prior to the effective date of this insurance will not be covered until the expiration of 12 consecutive months of insurance coverage without medical treatment or advice or having taken prescribed drugs or medicine for such conditions.

Date _____, 19____ _____
Member's Signature

NOTE: Application must be accompanied by check or money order.
Send remittance to:
Insurance Division, AFA, 1750 Pennsylvania Ave., N.W., Washington, D. C. 20006. 3788GH App Rev. 10/77

CURRENT ENROLLMENT PERIOD ENDS NOVEMBER 18, 1977

Bob Stevens'

"There I was..."

THE FOLLOWING WAS WRITTEN BY A 5TH GRADE STUDENT OF JEFFERSON SCHOOL, BEAUFORT, S.C. IT WAS FIRST PUBLISHED IN THE SOUTH CAROLINA AVIATION NEWS. WE THINK IT'S A CLASSIC.

WHY I WANT TO BE A PILOT

WHEN I GROW UP I WANT TO BE A PILOT BECAUZE IT'S A FUN JOB AND EASY TO DO. THATS WHY THERE ARE SO MANY PILOTS FLYING AROUND THEZE DAYS.

PILOTS DONT NEED MUCH SCHOOL. THEY JUST HAVE TO LEARN TO READ NUMBERS SO THEY CAN READ THEIR INSTRUMENTS.

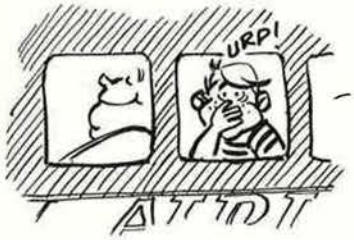
I GUESS THEY SHOULD BE ABLE TO READ A ROAD MAP, TOO...

PILOTS SHOULD BE BRAVE SO THEY WONT GET SCARED IF IT'S FOGGY AND THEY CAN'T SEE, OR IF A WING OR MOTOR FALLS OFF...

PILOTS HAVE TO HAVE GOOD EYES TO SEE THROUGH THE CLOUDS, AND THEY CANT BE AFRAID OF THUNDER OR LIGHTENING BECAUZE THEY ARE MUCH CLOSER TO THEM THAN WE ARE.

THE SALARY PILOTS MAKE IS ANOTHER THING I LIKE. THEY MAKE MORE MONEY THAN THEY KNOW WHAT TO DO WITH. THIS IS BECAUZE MOST PEOPLE THINK THAT FLYING A PLANE IS DANGEROUS, EXCEPT PILOTS DON'T BECAUZE THEY KNOW HOW EASY IT IS.

I HOPE I DONT GET AIR-SICK BE-CAUZE I GET CAR-SICK AND IF I GET AIR-SICK I COULDN'T BE A PILOT AND THEN I WOULD HAVE TO GO TO WORK.



Bob Stevens

What's our mild-mannered civilian turbofan engine doing in a tough bird like this?

Just proving a point, just proving a point.

The bird is the new CASA C-101 trainer/light attack aircraft.

The engine, Garrett's TFE 731 turbofan.

And the point is this:

Our TFE 731 has what it takes to perform as efficiently and reliably in the combat environment as it does in the world of the business jet.

The C-101, being developed by CASA (Construcciones Aeronauticas S.A.) for the Spanish Air Force, is a basic and advanced trainer, with an air-to-air and air-to-ground weapons delivery capability. Armed recon, ECM and photo recon missions are also planned because of the CASA's maneuverability and long endurance at low level.

Its Garrett engine will be essentially the same fuel-saving, low-pollution turbofan now used by four leading business jet builders—Dassault, Israel Aircraft Industries, Learjet and Lockheed. The TFE 731 is also the conversion engine for AiResearch Aviation's 731 JetStar.

The CASA 101. As the forerunner of a new breed of economical, virtually smokeless combat aircraft, it makes sense to power it with the turbofan that powers the economical clean-flying business jets.

GARRETT

The Garrett Corporation One of The Signal Companies

GARRETT'S TFE 731 TURBOFAN

The only one in its class

Northrop Corp. and Messerschmitt-Boelkow-Blohm (MBB) are partners in the development of the C-101.

F-15: Less maintenance means lower cost and more defense.

Defense budget manpower costs are higher than the combined cost of materials, supplies, operations and new airplanes. So a USAF fighter that requires less maintenance than its predecessors yields double value.

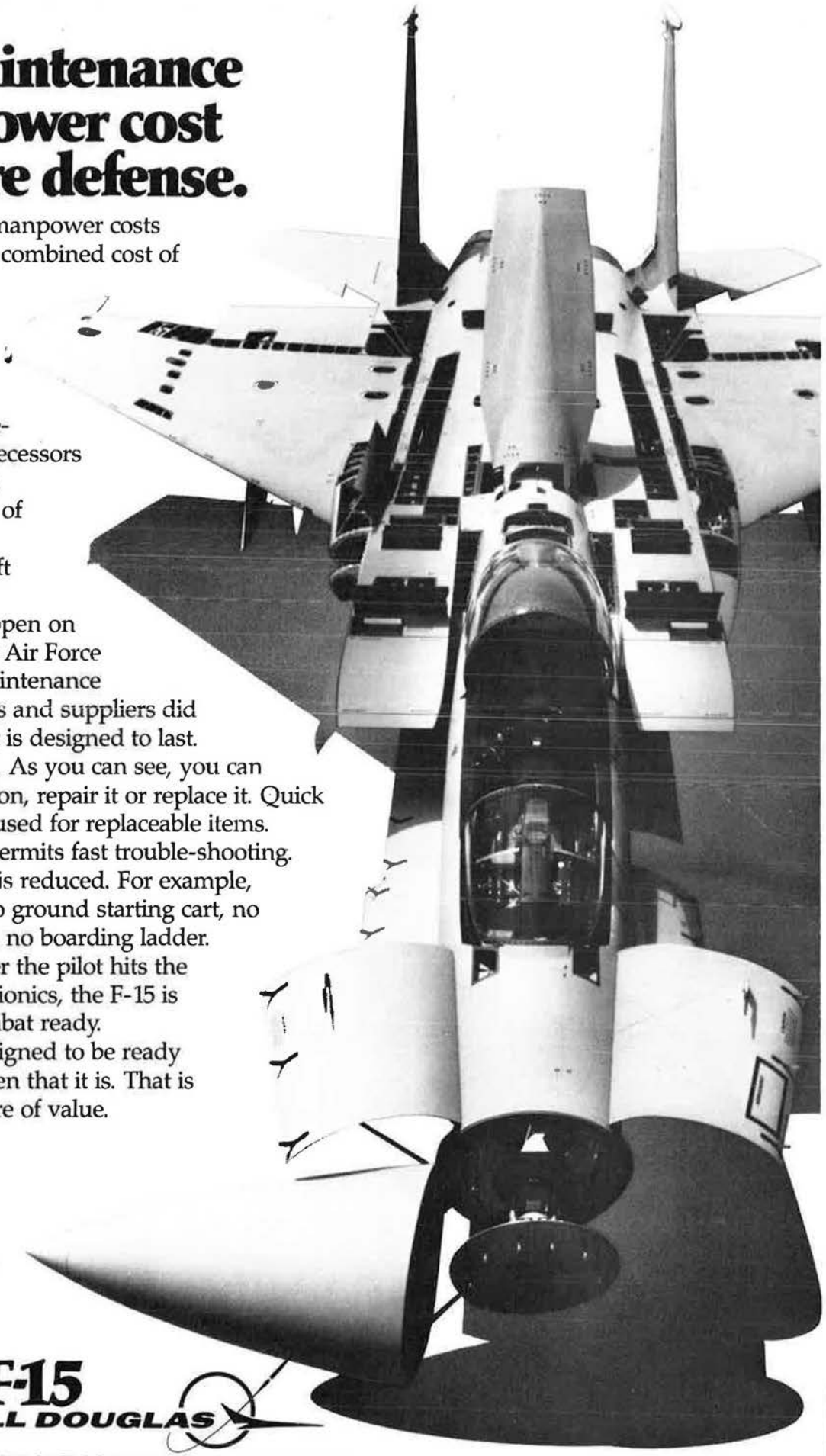
It lowers the cost of operation.

It increases aircraft readiness.

How did this happen on the F-15 Eagle? The Air Force specified it. Our maintenance engineers, designers and suppliers did the rest. Equipment is designed to last. Access is simplified. As you can see, you can get to the malfunction, repair it or replace it. Quick release devices are used for replaceable items. A self-test system permits fast trouble-shooting.

External support is reduced. For example, the F-15 requires no ground starting cart, no ground electric cart, no boarding ladder. Within minutes after the pilot hits the switches on cold avionics, the F-15 is off the ground, combat ready.

The F-15 was designed to be ready to fight. It has proven that it is. That is the ultimate measure of value.



The F-15
MCDONNELL DOUGLAS

EQUAL OPPORTUNITY IN PROFESSIONAL CAREERS. SEND RESUME: BOX 14526, ST. LOUIS, MO. 63178