

OCTOBER 1985/\$2

AIR FORCE

PUBLISHED BY THE AIR FORCE ASSOCIATION

MAGAZINE

Joint Operations

The Ups and Downs of Interservice Cooperation





The C-20A Gulfstream III: It's doing everything they asked it to do.

And more.

When the U.S. Air Force set out to select replacement aircraft for the C-140s, it established some very demanding criteria. And rightfully so. The transports operated by the 89th Military Airlift Wing play a vital role in the conduct of our nation's affairs at home and abroad.

The Air Force program standards called for specific levels of performance, mission readiness, supply and maintenance efficiency—not to mention tight schedules for outfitting, crew training and delivery of the first three aircraft to Andrews Air Force Base. What's more, two mission requirements—one long range, the other medium range—suggested that two aircraft types were needed to do all the work that has to be done.

In the end, the Air Force decided it could get everything it needed in *one* airplane: the Gulfstream III.

The first C-20A Gulfstream III went into service in September 1983, only three months after contract signing, on schedule, within budget. Now that three C-20A Gulfstream IIIs are on duty, they're living up to the long heritage of superior performance, dispatch reliability, systems dependability, low maintenance requirements and cost-effectiveness of Gulfstream executive jets in transporting key executive teams anywhere in the world.

For example, the Air Force said the new aircraft had to be fully mission capable 85% of

the time. The C-20A Gulfstream IIIs are currently working upwards from 95%.

The rate of non-mission capable supply—a measure of the inability to dispatch the aircraft because of a parts shortage—could be no more than 1.0%. With the C-20A Gulfstream IIIs, the rate is only 0.50%.

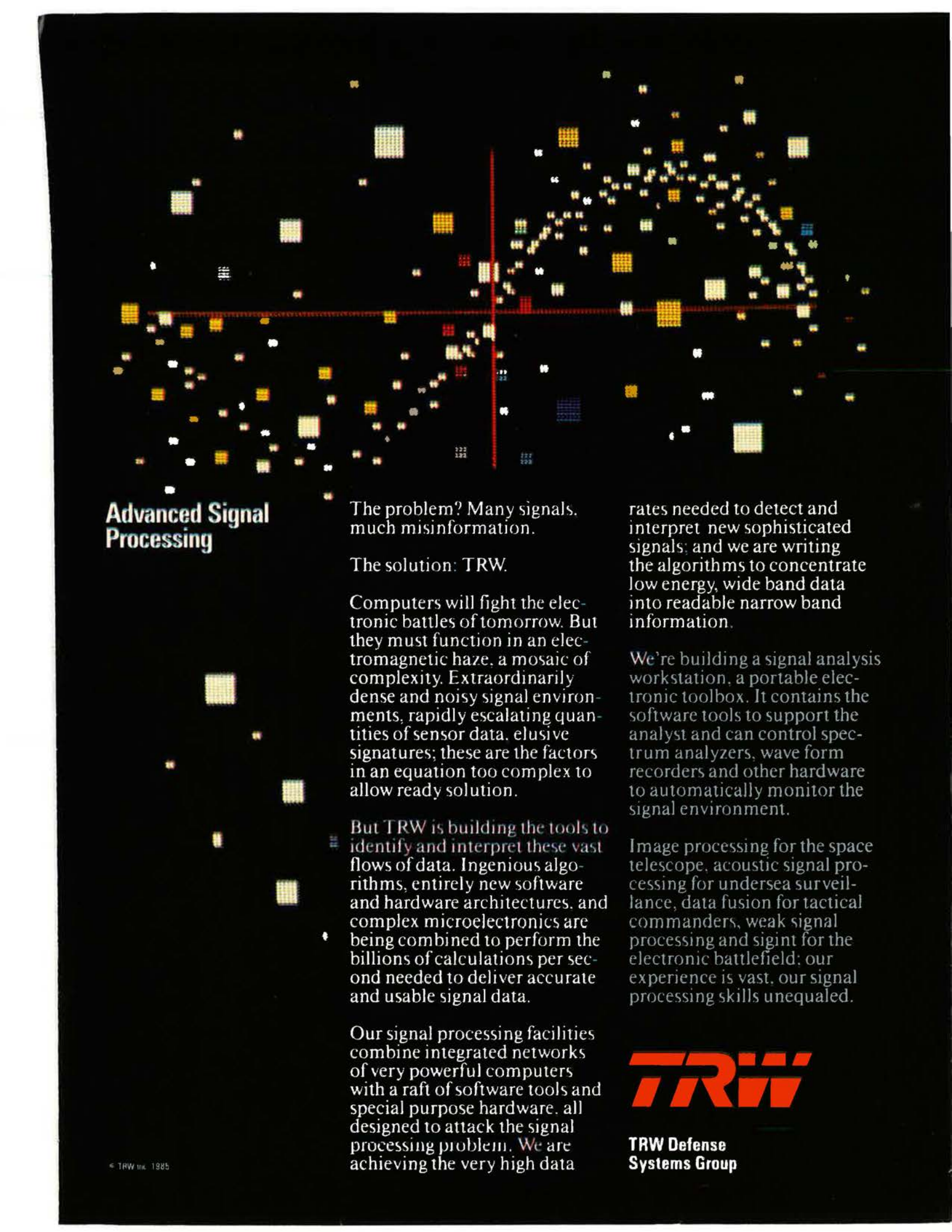
The Gulfstream III's performance not only meets the mission requirements of the C-140 program, it also fills many overseas travel demands for the Special Airlift Mission Fleet. This capability increases the flexibility and efficiency of the Air Force to meet high priority travel requests, yet the C-20As require only 7.5 maintenance man-hours per flight hour compared to 27 for the C-140s they replaced.

Finally, an example of the mission versatility and cost-effectiveness of the C-20A Gulfstream III in meeting the needs of the Special Airlift Mission Fleet:

One C-20A Gulfstream III departed Andrews AFB on a 13 day trip, logging 43 flight hours and traveling to locations in the Pacific. Upon its return to Andrews AFB, it was cleaned, refueled and put to work the next day flying missions in the United States. It required no maintenance for the entire period.

The U.S. Air Force demanded a lot in its new jet transports. By any measure, the C-20A Gulfstream IIIs are delivering everything it asked for.

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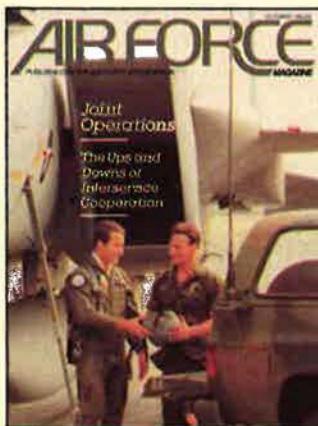
One of the Signal Companies 



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About the cover: A US Army soldier takes a firsthand look at an F-15 Eagle at Langley AFB, Va. A special section on "Joint Operations" begins on page 46 of this issue. (Photo by Eddie McCrossan)

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AIR FORCE Magazine (ISSN 0730-6784) October 1985 (Vol. 68, No. 10) is published monthly by the Air Force Association, 1501 Lee Highway, Arlington, Va. 22209-1198. Phone (703) 247-5800. Second-class postage paid at Arlington, Va., and additional mailing offices. **Membership Rate:** \$18 per year; \$42 for three-year membership. **Life Membership:** \$250. **Subscription rate:** \$18 per year; \$25 per year additional for postage to foreign addresses (except Canada and Mexico, which are \$8 per year additional). Regular issues \$2 each. Special issues (Soviet Aerospace Almanac, USAF Almanac issue, Anniversary issue, and "Military Balance" issue) \$5 each. **Change of address** requires four weeks' notice. Please include mailing label. **POSTMASTER:** Send change of address to Air Force Association, 1501 Lee Highway, Arlington, Va. 22209-1198. Publisher assumes no responsibility for unsolicited material. Trademark registered by Air Force Association. Copyright 1985 by Air Force Association. All rights reserved. Pan-American Copyright Convention.

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AN EDITORIAL

The All-Volunteer Bargain

By John T. Correll, EDITOR IN CHIEF

THE military draft was put on the shelf in 1973, and there it is likely to stay. The continuing requirement for eighteen-year-old men to register with Selective Service has met only moderate resistance. Resumption of draft calls, though, would almost certainly set off a firestorm of negative public reaction.

It would be a political impossibility to reactivate the draft except in the most dire and immediate national emergency. Furthermore, it would take months for the first draftees to be ready for action. Given an emergency dire and immediate enough to reactivate the draft, a drawn-out mobilization might not help much.

Barring an extended conventional conflict of the Vietnam variety, the nation had better count on fighting any future war with the troops it has when hostilities begin.

The composition of available forces has changed significantly in the all-volunteer era. A big difference is expanded reliance on reserve forces. From 1973 to 1985, for example, Air National Guard and Air Force Reserve manning grew by thirty-five percent while the active force declined by twelve percent. The Air Reserve Forces are projected to grow by another 13.6 percent over the next five years. They are now equipped with modern weapon systems and fully integrated into all major Air Force missions.

Another change has been the increasing percentage of women in the force. Whereas women in the Air Force were once limited to a short list of career fields, they are excluded today only from those specialties directly related to combat and closed to them by law.

Thus the best options for restructuring the force have already been exercised. From here on, it gets down to straight recruiting and retention, and that is about to become appreciably more difficult. By 1990, the military age population of the United States will be fifteen percent smaller than it was in 1980. Military recruiting and retention will have to compete even more fiercely with private sector employment.

Fifteen years ago, the American public welcomed the shift to an All-Volunteer Force with great relief and bold promises. Better military compensation was a cheap price to pay if that would spare the sons of middle America from the draft. Once that threat of conscription was removed, though, Mr. and Mrs. Middle America looked at the bargain with different eyes. They began to begrudge the new level of benefits going to those who joined and served voluntarily.

A lesson was learned—but apparently not remembered—in the late 1970s, when repeated pay caps led to recruiting shortfalls and devastating losses of mid-career veterans. A slow recovery began with restoration of benefits in the 1980s. It was slow because the services

have no provision for lateral entry. Seasoned middle-graders have to be raised from second lieutenants and airmen basic. When readiness is lost, it cannot be rebuilt overnight.

As with Pharaoh of the Bible, who was unable to learn from the series of punitive plagues visited upon him, the public is again clamoring for cutbacks in military compensation. Even more damaging than actual cuts has been the deepening fear among the troops that no benefit is secure and that the military retirement system, especially, might be swept away at any time.

Seen from a distance, the All-Volunteer Force is standing strong, but up close, the cracks are beginning to show. Air Force retention rates peaked three years ago and since then have been in gradual decline. Pilot retention is particularly troubling. The Air Force projects that it will have an aggregate pilot shortfall beginning in FY '87.

A good argument can be made that it was unwise to end the draft, but the time for that argument was in 1973. The issue now is how to recruit and retain a volunteer force. If military members lose confidence in the fairness of their compensation system, the probability of a military manpower crisis in the near future is roughly 100 percent. If that happens, Congress will bear the major responsibility—but can share the blame with a fickle public that wanted a volunteer force but didn't want to pay for it.

The military establishment itself must make sure it has done all it can do. The Defense Department cannot control compensation, but it is consulted on priorities. It must speak up for its people with sufficient volume. The individual services govern many factors that determine the overall quality of military life. They must be absolutely certain that people have as much say as possible in matters that affect them personally and that when people bump up against the "exigencies of the service," the resulting actions are indeed necessary and not merely convenient. It is good news that tour lengths are getting longer. Frequent reassignments—and the out-of-pocket expenses that go with them—have traditionally been among the worst of the aforementioned exigencies.

It might be worth remembering, too, that part of the all-volunteer frenzy in 1973 was a competition among the services to see which could outdo the others in reducing irritants, petty restrictions, and thoughtless inconveniences. The phrase then in vogue was "eliminating the Mickey Mouse." The services have done pretty well in this regard, but there are still some sightings of mouse tracks here and there.

Mickey Mouse, like the draft and draftee wages, belongs to another era. ■

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AIRMAIL

Pacific Perspective

I was pleased to read the special section on "Airpower in the Pacific" in the August 1985 edition of AIR FORCE Magazine. Whereas most publications concerned with national security issues tend to stress Europe more than the remainder of the world, it is refreshing to see a magazine that espouses a global perspective.

In peacetime, the public tends to ignore military matters in Asia, despite the growing economic and strategic importance of the region to US interests and regardless of the fact that two American states extend far into the Pacific. In our only global war, the Allied Powers' theme was "Europe first." Historically, the Pacific has been the second-priority theater; now, however, Americans are beginning to understand the importance to us of this vast and complex region.

If we are to maintain worldwide peace and security with our network of allies, we must ensure that our global orientation continues to be shared. We commend your editors for sharing the Pacific perspective.

Gen. Robert W. Bazley, USAF
Commander in Chief, PACAF
Hickam AFB, Hawaii

Keeping Informed

I have just returned from my vacation and have spent the last couple of days catching up on my reading. I especially appreciated the articles included in your June and August issues. I have been a member of AFA since I can remember, but I have never taken the time to write to you before, even though I have always enjoyed AIR FORCE Magazine and try to read it from cover to cover whenever I can. I have used it for reference on several occasions and have always found it to be most informative on the latest "happenings" in the Air Force.

I particularly enjoyed the June '85 article by James P. Coyne concerning USAF's electronic forces and capabilities (see "Electronics for the Shooting War," p. 72, June '85 issue). As a longtime EWO, I am pleased to see that proper recognition is finally being accorded to one of the most

important elements of the overall Air Force structure.

For years, ECM took the back seat in both funding and appreciation. During my flying days, EWOs were frequently treated as unnecessary crew appendages and considered to be productive only when picking up the parachutes and flight lunches. The war in Vietnam did much to demonstrate the true value of ECM and even converted some nonbelievers into active supporters. The excellent article in your authoritative magazine helps to convince the unknowing that ECM does indeed deserve priority funding and consideration for enhancement of USAF aerospace systems.

I also appreciated your coverage in the August '85 issue of the role of the Air Force in the Pacific theater. While eight years of assignments to Hq. USEUCOM and SHAPE kept me well informed on the European/NATO situation, activities in the Pacific theater were only vaguely known to me.

I have always thought that we (the US military community) tend to concentrate too heavily on the European aspect while neglecting the importance of the Air Force component in the Pacific area. Your articles provided information on the status of our forces in that area as well as some insight into the prevailing political environment and potential threat. More importantly, the articles show that PACAF is doing an outstanding job of meeting its awesome objectives with limited assets.

These recent issues of AIR FORCE Magazine have reinforced my opinion that it is an outstanding publication

Do you have a comment about a current issue? Write to "Airmail," AIR FORCE Magazine, 1501 Lee Highway, Arlington, Va. 22209-1198. Letters should be concise, timely, and legible (preferably typed). We reserve the right to condense letters as necessary. Unsigned letters are not acceptable, and photographs cannot be used or returned.

that presents a broad and comprehensive overview of today's USAF. It is one of the most informative and interesting military-oriented magazines going—I read it first.

Keep up the good work.

Col. John T. Johnson,
USAF (Ret.)
Burke, Va.

Wrong Ally

Today I received the August 1985 issue of AIR FORCE Magazine and, as usual, thoroughly enjoyed perusing it. I now look forward to a more detailed reading.

I don't make it a habit to write to editors about technical errors (and this is the first I have found in your magazine), but I felt compelled in this case.

The caption for the photo on the bottom right of page 45 is the case in point (see "PACAF's Global Perspective," August '85 issue). It says that airmen of the Royal Thai Air Force and USAF examine an F-4 wingtip. In fact, it should read, "Airmen of the Republic of Korea Air Force and the US Air Force examine the wingtip of an F-4."

The picture shows 6497th Consolidated Aircraft Maintenance Squadron personnel working on a 497th Tactical Fighter Squadron F-4E. The personnel and the aircraft are stationed at Taegu AB, Korea, where Republic of Korea Air Force personnel do the majority of the maintenance work on the assigned USAF aircraft. An important side note here is that these aircraft consistently achieve among the highest in-commission rates in the entire USAF F-4 fleet. They are frequently at the top of this comparison.

The 497th TFS and 6497th CAMS are portions of a geographically separated unit of the 51st TFW headquartered at Osan AB, Korea. I might not have been quite so sensitive to the error had I not recently served as Vice Commander and Commander of the 51st TFW.

Col. Marcus F. Cooper, Jr.,
USAF
Mililani, Hawaii

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AIRMAIL

Re: The caption for the photo on page 45 of the August 1985 issue.

Having recently returned from an assignment in Korea, I detected an error. The two USAF airmen are assigned to the 6497th Consolidated Aircraft Maintenance Squadron, as can be surmised by reading the words on the crew chief's cap. The 6497th CAMS is based at Taegu AB, Korea.

While the unit does participate periodically in Cope Thunder exercises and may on occasion work with the Royal Thai Air Force, the third individual in the photo is wearing the uniform of an NCO in the Republic of Korea Air Force, not the Royal Thai Air Force.

I'm sure the members of the 6497th CAMS and especially the members of the ROKAF would appreciate a correction.

Capt. Charles Renfro, USAF
USAF Academy, Colo.

● *Colonel Cooper and Captain Renfro are correct. (The photo came to us miscaptioned.) We appreciate the many letters from readers pointing out the error.*—THE EDITORS

Bouncing Broncos

I just finished reading the August '85 issue and enjoyed the articles on our Pacific air forces.

I noted a possible inaccuracy in James P. Coyne's lineup of aircraft at Osan AB, Korea (see "PACAF's Global Perspective," p. 42, August '85 issue). He included the OV-10 Bronco as the forward air control aircraft for USAF fighters at Osan. Isn't it true that the Broncos were sent to Hawaii to replace the O-2 aircraft there and that the OV-10s were in turn replaced in Korea by OA-37 Dragonflies that were drawn from the Air Force Reserve inventory? (See your Air Force Almanac issues for 1984 and 1985.)

Mark L. Bogosian
Cincinnati, Ohio

● *Reader Bogosian is correct, and so is Editor Coyne. There are OV-10s stationed at Osan AB, Korea, as well as at Wheeler AFB, Hawaii. OV-10s arrived at Osan AB in the spring of 1985, after the Almanac issue had gone to press. OV-10s did originally go to Hawaii from Osan and were replaced by OA-37s. When the OV-10s moved back to Korea, some OA-37s at Osan were*

transferred to USAF forces in the Panama Canal Zone and others were sold to foreign governments under the Foreign Military Sales program.—THE EDITORS

Acquisition Reform

As a taxpayer and an independent contractor trying to do business with the US government, I read your editorial "Legislating Competition" with great interest (*August '85 issue, p. 4*).

There is no question that our forces must be combat-ready. But that requirement cannot be used as a reason for acquisition regardless of cost. The public outrage of the 1980s over spare-parts overpricing is well founded and fully justified. And the demand for reform is strong because complacency—not common sense—prevailed on the part of DoD prior to the outrage.

Generally, the government makes mountains out of molehills during the acquisition phase of a project. One can easily receive 100 pages of general and special conditions and only one page of technical specifications for a project. Everybody has to get their oar in. Compliance with monumental irrelevancies adds tremendous cost. And that's the government's fault.

Since the military must award contracts to the lowest bidder, it is not surprising that quality is a problem. Don't forget—you only get what you pay for. Cheap is not always best. We frequently see ways a project or system can be improved, but for the most part such suggested improvements will be rejected as not "competitive" if such an improvement is suggested at bidding time.

With \$916 stool caps and \$7,622 coffee makers, the acquisition activity must be berserk. Anybody who paid or authorized payments of those prices should be fired. *Period.* But unlike private industry, they apparently cannot be fired. It seems as though a great portion of the responsibility for this kind of foolishness rests with the military itself. It is not surprising that F100 engine parts cannot be properly acquired if people cannot buy a coffee maker at a sensible price.

It looks as though the military has left itself wide open to all kinds of criticism because of the overpriced coffee makers and stool caps, \$600 Allen wrenches, \$300 hammers, and the like. The US citizen, private industry, and just plain common sense will not tolerate such foolishness. Maybe these sorts of things amount to "less than six percent of the spare-parts budget," but that's a lot of bucks and probably more than most small, hard-



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For further information contact Wesley R. Stout, Director, Technical Services, 1000 Woodbury Road, Woodbury, NY 11797. (516) 682-8500.

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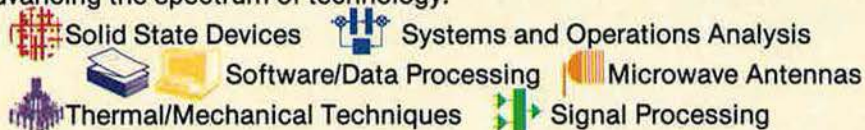
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From concept, design, production, test, and integration, RCA Systems Engineering is unique in its total approach. That's why RCA Missile and Surface Radar Division has been trusted to produce many of America's most sophisticated defense systems. Systems that stand the tests of time.

Protecting the free world against tomorrow's threat requires more than today's technology. It demands RCA Systems Engineering skills to focus the appropriate technologies into defense systems now and in the future.

To learn more about the technology challenges at RCA, contact our Director of Marketing. To become involved in the technology challenges at RCA, send your resume to our Manager of Employment. RCA Missile and Surface Radar Division, Moorestown, New Jersey 08057.



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working, taxpaying companies gross in one year.

Yes, the objective is sound defense acquisition, but in a sensible fashion and at a reasonable price. If common sense and reason can prevail, then we'll get a lot more bang for our bucks.

John F. Lewis
Norfolk, Conn.

Philippines Ferment

In the August 1985 issue, Gen. T. R. Milton, USAF (Ret.), wrote that "the Philippines are in trouble," but "not yet desperate trouble" (see "Our Thin Pacific Line," p. 49, August '85 issue). I hope our intelligence agencies do not hold the same opinion, because the situation in the Philippines may have reached the point where the Communist New People's Army may have already won the hearts and minds of the Filipinos.

The National Democratic Front has already stated that the two US bases in the Philippines would be removed. These sentiments are shared by a growing number of non-Communist Filipinos. Some have even reported that the NPA could achieve its goals in a few years.

As a Filipino-American whose grandfather fought and died for freedom in the Battle of Bataan, I find the situation disheartening. In 1972, President Marcos declared martial law, thus depriving the Filipino people of their freedom. Martial law also makes a mockery of the sacrifices of American and Filipino soldiers who suffered so much to keep the islands free.

Today, the only country in Southeast Asia with a growing Communist insurgency is the Philippines. Many policymakers in the US consider the Marcos regime an ally and the Armed Forces of the Philippines (AFP) a reliable partner. With friends like these, we don't need enemies.

The AFP is corrupt and hated by the population. It was recently reported that a Philippines Air Force (PAF) officer was punished because he refused to allow the wife of the Air Force Chief of Staff to use PAF gasoline to fill up her car. The Chief of Staff of the AFP is charged in the cover-up of the assassination of opposition Senator Benigno Aquino. . . . Exercises like Cope Thunder can be conducted anytime, but a corrupt and incompetent AFP will always remain the same.

The only solution to the problem is to throw out the Marcos regime and the current AFP. The second step is to assist competent non-Communist Filipinos in forming a new civilian government and military. If the situation

AIRMAIL

calls for drastic measures, then the US should organize Filipino-Americans into fighting units, as was done during World War II.

Enrico L. Montesa, Jr.
Woodside, N. Y.

• For more on the Philippines situation, see "The Questionable Future of the Philippines" on page 142 of the September '85 issue.—THE EDITORS

Wrong Colonels?

Re: The article "A Point of Honor" by John L. Frisbee on page 106 of the August 1985 issue.

It is a story of courageous and honorable airmen. Lt. Walter Truemper and Sgt. Archibald Mathies could have bailed out and abandoned the critically wounded pilot, but chose instead to attempt a landing. They were not successful in their attempt and lost their lives. They were awarded the Medal of Honor posthumously.

Your story was substantially correct, except for one point. Col. Robert W. Burns was not the other pilot who flew alongside the damaged bomber and tried to lead or talk them into a landing. It was Col. Eugene Romig and the undersigned, sitting in the copilot seat, who flew alongside the crippled bomber for nearly one hour trying to aid in guiding the bomber to a landing. Colonel Burns was in the control tower, giving whatever aid he could from that vantage point.

Col. Elzia Ledoux,
USAF (Ret.)
Clearwater, Fla.

The Danes Reply

In your June issue, Maj. Dan Sibbet, USAF (Ret.), relieves the Royal Danish Air Force (RDAF) of all capability and credibility (see "Airmail," p. 12, June '85 issue). I really wonder what his motives were in writing his letter. Whom or what does it benefit?

We live in free societies, and of course everybody is entitled to an opinion, but in a publication with as vast a distribution as AIR FORCE Magazine, it would be to everybody's advantage if statements and opinions were based on knowledge and the will to arrive at a balanced viewpoint.

I am not going to go into individual points, as the Major's mind is apparently made up, but I would like to add a few comments.

In the overall directive to the Danish armed forces, it says that in the event of an attack on Danish territory, it is the task of the Danish armed forces to counter such an attack immediately by facilitating deployment of allied reinforcements and to fight jointly with such reinforcing forces. Admittedly, we have a number of shortcomings (who doesn't?) that we try to rectify, but we feel confident that we can—and will—live up to the aforementioned task. Otherwise, we would not have established these reinforcement plans.

During the last few years, the Danish armed forces have been provided a number of modern weapon systems, and there are agreed-on plans and funds in hand for additional purchases—additional F-16s, additional Hawk squadrons, a naval shipbuilding program, advanced munitions and equipment, and so on.

For the Major's information, the Danish welfare state was decided on by Danes during years of democratic process. If the good Major doesn't like that, it's his problem, not ours!

(P.S.: Did you ever try relating the number of indigenous combat aircraft to the population sizes of individual NATO nations? Some people may be surprised!)

Col. S. O. Nielsen, RDAF
Vedbaek, Denmark

In the June 1985 edition of your magazine, Maj. Dan Sibbet, USAF (Ret.), expressed his opinion of the Danish armed forces.

I do not wish to comment on Major Sibbet's general idea of the composition of our armed forces or the political and economic aspects of this country's defense policy. However, Major Sibbet also said that "the Danish military—air force included—will not fight effectively if confronted by the Soviets because it is both unable and unwilling to do so."

I find it a quite profane accusation by anyone, but especially by a fellow allied air force officer, that we would be unwilling to fight. On what grounds is such a judgment of the morale of the Danish armed forces based?

With regard to the alleged "poor maintenance" and "faulty equipment," let me say that I feel every bit as safe in a Danish F-16 as I did in USAF F-16s when I converted to that aircraft, at Hill AFB, Utah. It is correct that we do not have a large number of aircraft, but if that has any bearing on the maintenance of these limited assets, it is one of positive value. We look after what we have, as compared with some other air forces.

Finally, the patronizing classification of the Ground Observer Corps probably stems from a lack of knowledge of the effectiveness of that particular part of the Danish air defense system. I think it is sufficient to say that there are times when I prefer the Ground Observer Corps to the AWACS.

Maj. J. F. Autzen, RDAF
Haderslev, Denmark

Central America

I am writing in reference to Alfred J. Hanlon's letter printed in the July 1985 issue of *AIR FORCE Magazine* (p. 12). As the J-5 Director at USSOUTHCOM from 1981 to 1984, I believe I can fill in some of the blanks in his rather cavalier position. Unfortunately, like too many in our society, Mr. Hanlon does not understand what is going on in Central America, what should be done about it, or—perhaps most disturbingly—when.

It is certainly not a game. Our neighbors to the south are involved in an insidious, multidimensional, low-intensity struggle against relentless Marxist-Leninist antagonists who are supported by the Soviet Union through a number of surrogates, most notably Cuba and Nicaragua in this hemisphere. It is warfare of an "under-the-table" nature, but warfare nonetheless.

Until the first part of 1983, the opposition was doing quite well. Since that time, increased US aid—security and economic assistance plus a tailored military presence—has brought clearly positive results, and the affected countries are holding their own militarily while making needed political and social reforms. Just recently, Radio Marti went on the air, and Congress approved new funding for the Contras. We appear to be doing it right this time, but we must continue the aid to our friends—socioeconomic repair takes a long time—as well as the pressure on Cuba and Nicaragua.

It is likewise not another Vietnam. Geographically, Central America lies in our strategic front yard. Our own national security and that of the free world are tied in many important ways to the security of this hemisphere. Our besieged neighbors in Central America do not expect us to fight their war for them—and we don't have to. Given adequate levels and kinds of security and economic assistance, they can and will prevail on their own. They do have great respect for the US and seek our friendship. Moreover, they have committed themselves to democracy and are moving dramatically in that direction.

AIRMAIL

These are big differences.

Again, we appear to be doing right this time. Thankfully, we began setting plans in motion several years ago. By the time "all those millions start pouring across our southern border," it would have been too late.

Col. Walter E. Hines III,
USAF
Maxwell AFB, Ala.

I read with interest and mostly agreed with the letter by Dom Ayala, Jr., in the August 1985 issue of *AIR FORCE Magazine* (p. 10). He is on sound ground in his evaluation of the gunboat diplomacy of the Reagan Administration in Central America.

The President's public statements with regard to various Central American nations are harmful to those nations and the standing of the United States worldwide. He has no constructive policies that could lead to peace or to economic and democratic progress in Central America.

It would help if the President would stop shouting, mining harbors, and promoting military action and would rather attack poverty and economic misery in the area.

Edward C. Welsh
Arlington, Va.

Support for Taiwan

I am writing to express my full agreement with the August 1985 "Airmail" letter from Maj. George R. Henry on the subject of Taiwan (p. 9).

I was among some 650 who attended the Fourteenth Air Force reunion on Taiwan in May of this year.

During World War II, I served for more than two years in west and northwest China, and I was also on temporary duty with the Twentieth Air Force on the Matterhorn project in the Chengtu area for some months. So I have seen China as it was then, and I can imagine how it is there now under Communist rule.

In Taiwan, we found the people to be very industrious, gracious, and kind. They have built a country that to my mind is second to none in the world today. We visited Kinmen (formerly Quemoy) and observed how the people away from the larger cities live.

To turn our allegiance to the People's Republic of China at the possible expense of the Republic of China is a course of action that must be, in my

estimation, reconsidered and reversed.

Capt. Richard J. Wright,
USAF (Ret.)
Flagstaff, Ariz.

Prime Contractor

Your checklist of major electronics projects (see "What's Happening in Electronics at ESD," p. 64, June '85 issue) erroneously lists Logicon, Inc., as the contractor for the Sentinel Bright program. Since October 1983, Engineering Research Associates (ERA) has been Phase I prime contractor on this program.

While ERA is a small business, we won the contract in an unrestricted competition. In recognition of our performance on the Sentinel Bright training system, the Air Force's Electronic Systems Division nominated ERA as the 1985 SBA Prime Contractor of the Year. Our company went on to win the SBA Region III and national awards.

Quoting from Sen. Paul Trible's letter informing us of this award: "Your company's performance on the Air Force's Sentinel Bright training system led to your selection as the national winner." We are proud of our accomplishments to date and look forward to demonstrating superior performance on future Air Force programs.

Paul Arnone
President, ERA
Vienna, Va.

Operation Vittles

At midnight, September 30, 1949, the Berlin Airlift ended—462 days after it began on June 26, 1948. During its operation, the Berlin Airlift delivered more than 2,300,000 tons of food and supplies totally by air in 277,264 flights. Seventy-nine American, British, French, and German participants died to keep a city alive.

The Berlin Airlift Memorial at Rhein-Main AB, Germany, is being developed as a lasting monument to Operation Vittles. Phase I of this memorial was dedicated on June 26, 1985, and it is an exact replica of the monument that now stands at Tempelhof Airport in the city of Berlin.

We are now in Phase II, during which we will obtain a C-54 and C-47 aircraft that flew in the airlift. These will be placed on static display at the base of the Rhein-Main monument. We are shooting for a dedication of the aircraft on June 26, 1986.

We have our eye on C-54G 45-629. We are still looking for a C-47. If anyone has any information on C-54G 45-629 (especially pictures), or if anyone knows where we can obtain a



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Joint venture program office
6380 Hollister Avenue
Goleta, CA 93117

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C-47 (preferably one that can fly to Rhein-Main) that flew in the Berlin Airlift, we would like to hear from you. We are interested in talking to anyone who knows anything about the Berlin Airlift and who might have any information that they would share with us—documents, pictures, or anything else that they could send to us. We want to hear from anyone who would like to be a part of this effort to remind folks of our Air Force heritage and the cost of freedom.

No one thought we could do it—especially the Soviets. It was an operation that was born in peace, lived in peace, and died in peace—and it kept peace in Europe at a most critical time. It's our heritage and a testimony to the spirit and positive attitude of our airlifters and their ground support personnel.

Anyone wishing to help out with this project is asked to contact the address below.

Carl Peirola
312 Chelsea Dr.
Warner Robins, Ga. 31088
Phone: (912) 953-3396

B-24 Film

I need help in locating World War II combat film of the B-24 Liberator bomber. It is almost unbelievable that abundant film and videocassettes of combat exist for most World War II aircraft, except for the B-24.

There were more military personnel involved with the B-24 than with any other aircraft in history, and yet these more than 20,000 military personnel can't relive the nostalgia of World War II history on film. At Willow Run in Michigan during World War II, Henry Ford demonstrated his manufacturing genius by producing a B-24 Liberator every fifty-five minutes. This incredible feat of mass-producing an aircraft had never been done before—and hasn't been matched since. More than 40,000 workers were involved in production. Mr. Ford engaged Charles Lindbergh as a consultant for two years to assure the flying performance of this bomber.

Today at Willow Run, 1,600 members of the Yankee Air Force are seeking combat film of the B-24, as are many veterans of B-24 groups and photo reconnaissance, submarine patrol, and training units from World War II.

As a veteran pilot of the 459th Bomb Group of Fifteenth Air Force, I am seeking any B-24 film to screen for our members at our group reunion in Tucson, Ariz., in October 1985. Any videotape or film—whether 8-mm, 16-mm, or 35-mm, with or without narration—would be most appreciated.

Can any readers help?

Frank S. Day
2700 E. 9 Mile Rd.
Warren, Mich. 48091

Air Force Firefighters

Along with a fellow firefighter, I am in the process of writing a book on the history and operations of US Air Force fire protection.

The objective of the book is to provide the complete story concerning training, operation, vehicles, fire prevention, personnel, and history. We hope to have enough information to tell the history from the beginning through the 1930s, World War II, the Korean War, and the Vietnam conflict.

Photographs will be assembled in a pictorial history of the Air Force firefighter, past and present, in training, day-to-day operations, and actual crash and structural fires.

We feel that any project of this magnitude should benefit from the input of our fellow firefighters. We ask any Air Force firefighters—active duty, Air Force Reserve, Air National Guard, civilian, or retired—who have any photographs or materials that they wish to contribute to this endeavor to contact us at the address below.

Any photographs or material sent will be carefully handled and returned as soon as possible. All contributions will be acknowledged.

Charles E. McCraney
P. O. Box 6171
Broadview, Ill. 60153

Phone: (312) 694-6034

German Propaganda

I am a British author at work on a book about German propaganda beamed into the UK during World War II, its effect on the home front, on British armed forces, and particularly on the US military personnel sent to the UK.

One particularly interesting period is the time in December 1944 and January 1945—before, during, and after the Battle of the Bulge, when even the most hardcore Nazi propagandists generally admitted to themselves that the war was lost.

Professional German military men had recognized this fact for a long time. The general effect on many of the propagandists was that they became increasingly hysterical in their broadcasts, accidentally revealing in-

teresting truths that might otherwise have not gotten out.

I am interested in hearing from US Army Air Forces veterans—both flight and ground crews—who might have listened to propaganda broadcasts in the UK or France or even as prisoners of war. I am particularly interested in hearing from anyone who listened to the "Axis Sally" broadcasts.

If these veterans will write, giving a brief background of where they served and any short recollections of how extensively they were exposed to this propaganda during the December-January period, I will get in touch with specific questions. No material will be used in the book without the respondent's permission.

I hope that readers can help me with this project. Contact me at the address below.

M. E. Happel
300 E. 75th St.
Apt. 22-L
New York, N. Y. 10021

B-17 Restoration

The Pima Air Museum, which is located out in Arizona just south of Tucson, has more than 130 military and civilian aircraft on display. The museum is open daily from 9:00 a.m. to 5:00 p.m., except Christmas. More than eighty years of aviation history can be reviewed at this museum.

The B-17 we have on display is named *I'll Be Around*, and it is missing some essential parts to make it appear "combat ready" again. The 390th Memorial Museum Foundation has undertaken the task of restoring this bird to its fully configured combat appearance. This fall, we will start construction of a building to provide a "hangar" for *I'll Be Around*.

We need help in locating these missing parts. Anyone having any knowledge of where B-17E parts may be found is asked to contact the address below.

John Quinn
390th Memorial Museum
Foundation
P. O. Box 15708
Tucson, Ariz. 85708

Phone: (602) 990-0925

68th TFS

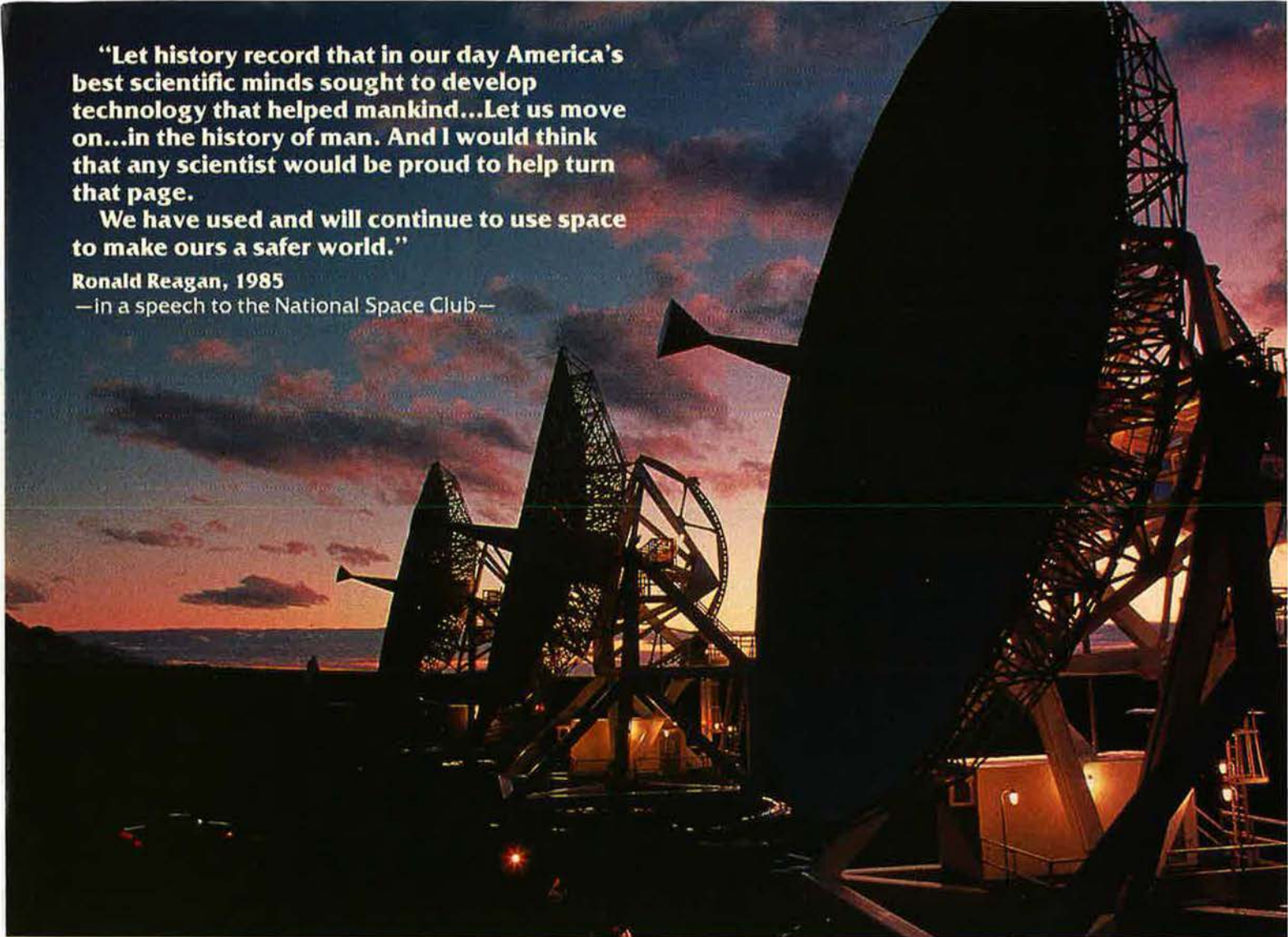
I am writing an article for *Aerospace Historian*, the subject of which is the deployment of the 68th Tactical Fighter Squadron from George AFB, Calif., to Southeast Asia in August 1965. However, the intervening twenty years have left a few gaps in my memory. I would, therefore, appreciate very much hearing from anyone who was a member of the 68th during that deployment.

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Ronald Reagan, 1985

—in a speech to the National Space Club—



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communications segment contract.

We're expanding our operations in Colorado Springs and developing other dynamic DoD markets.

We're making great progress in space and ground station communications technology, and the thrill of helping to make a safer world is still with us. Developing and using this technology to make ours a safer world is going to occupy us all for quite some time.

And we're seeking a few more of America's best minds to help us turn that page.

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I need specific information about combat missions as well as anecdotes relating to our four-month stay in SEA. Please contact me at the address below.

Col. H. Bruce Shawe, Jr.,
USAF (Ret.)
P. O. Box 124
Gardnerville, Nev. 89410

Ploesti Raids

I am attempting to locate old copies of two B-24 unit histories entitled *The 389th Bombardment Group: A Pictorial Review of Operations in the ETO* and *The Story of the 93d Bomb Group*. I wish to buy or borrow any copies of these books that can be located. They would be most useful as research materials for a book I am writing about the low-level bombing mission against Ploesti, Romania, on August 1, 1943.

All loaned materials will be protected and returned to the owner, and postage will be reimbursed. Please contact me at the address below.

Steven D. Nylén
404 Engel Ave.
Henderson, Nev. 89015
Phone: (702) 564-6352

History of Chaplains

I am presently compiling information for a book on the history of the chaplaincy. I am in desperate need of stories, anecdotes, photos, etc., covering all aspects of the chaplaincy from all the armed forces. Of particular interest is data on chaplains of other countries and on chapel managers (i.e., chaplain's assistants).

Anyone willing to correspond with me on this project would receive full credit, and any material sent will be handled carefully and returned after copying.

I am also looking for any photos of the chapel, chaplains, or chapel activities at Dover Field, Del., from 1941 to the present. These will be used for a historic display. Photos will be copied and returned.

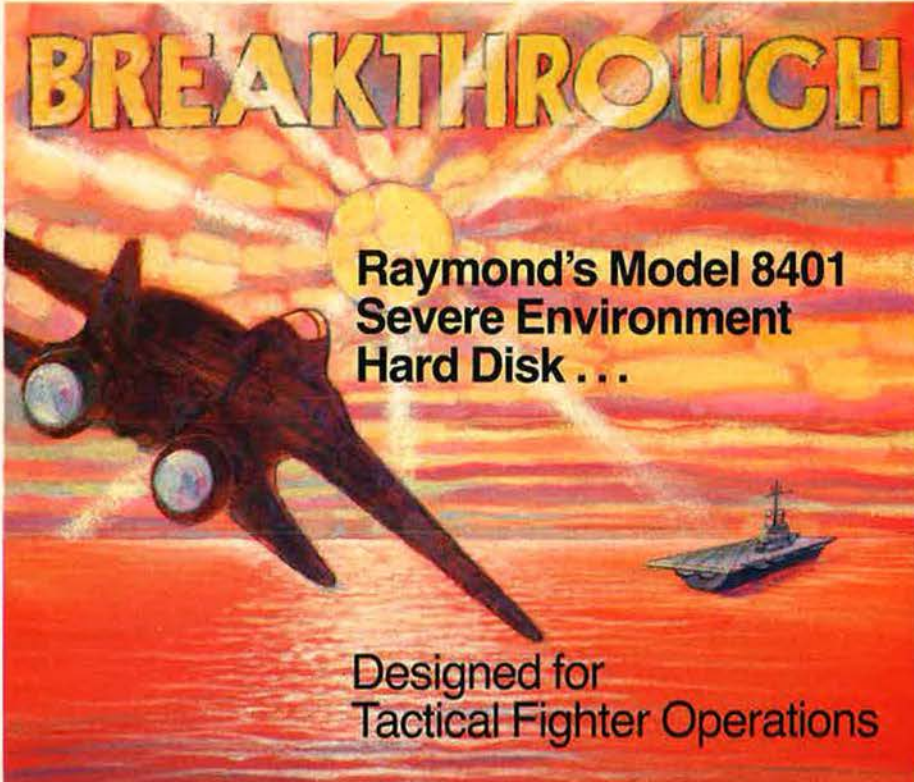
David E. Lilly
3104C Walnut St.
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Letters Home

I am compiling an anthology of letters written home by American soldiers from the fighting fronts of World

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War I and World War II. All material will be treated with care and returned (photocopies are acceptable).

I understand how personal these letters are, but I believe that the thoughts and feelings of men who have fought for their country have historical value and should be shared with others.

Please contact me at the address below.

Annette Tapert
10806 W. 2d St.
Fairfax, Va. 22030

WW II Flak Jacket

For use in a display on aviation medicine at the USAF Museum, we are seeking a USAAF World War II battle-damaged flak or armored suit or a section thereof. The artifact would be credited in the exhibit to the donor.

Anyone who has such an item to donate should contact:

Charles G. Worman
Chief, Research Division
USAF Museum
Wright-Patterson AFB,
Ohio 45433

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The U.S. Department of Defense has given two of its four top money-saving awards to Hughes Aircraft Company for proposals that will cut costs by nearly \$275 million. The Contractor Value Engineering Achievement Awards honor defense contractors for helping to trim defense costs during 1984. The Air Force cited Hughes for saving \$172.8 million on the Imaging Infrared Maverick air-to-surface missile over the life of the contract. The Navy honored the company for reducing projected costs on the UYQ-21 data display system by \$101.5 million. Hughes also contributed to the savings achieved by FMC Corporation, which won the Army award for cost-cutting efforts on the Bradley Fighting Vehicle System. The Value Engineering program was created to cut production costs without affecting performance, reliability, quality, maintainability, and safety standards. Last year the armed forces approved 34 Hughes VE proposals for total cost reduction exceeding \$296 million. Since 1964, Hughes military customers have approved 705 changes on 52 programs for total savings of \$887 million.

A new-generation mapping radar has two advanced features to help it spot military targets and create maps with resolution equal to that of infrared sensors. The Advanced Synthetic Aperture Radar System (ASARS-2), designed to complement electro-optic sensors, is flown on a U.S. Air Force TR-1 reconnaissance aircraft and provides real-time radar imagery to a ground station in all weather. ASARS-2 has a "squintable" antenna, which allows it to look around obstructions to make maps and classifications of targets on a single pass. The system also has a spotlight mode, which allows the antenna to look back or forward to focus on a suspected target and glean more detail. Hughes is producing the system for the Air Force under a development and production contract.

UK Royal Navy Sea Harriers will be able to fire Amraam missiles once equipped with new radars and new avionics. Modifications to the aircraft will result in a slightly larger radome, longer nose, and stretched fuselage. Overall length, however, will remain the same because the nose pitot tube will be eliminated. The Sea Harrier will be able to carry up to four Hughes AIM-120 advanced medium-range air-to-air missiles or a mixture of Amraam and Sidewinder missiles. In addition, the aircraft will be equipped with the Joint Tactical Information Distribution System (JTIDS) for secure voice and data links. Sea Harrier FRS.1 versions will be converted to FRS.2 versions beginning in 1989.

Computers monitor the work flow at a Hughes facility for making printed circuit boards for advanced missiles. Once planning instructions are entered into the network, planning route sheets and tool sheets are printed and follow the work order through the shop. Route sheets are printed with bar-code labels so work can be logged in after each operation. The bar codes also are used to log in quality inspections. The computer network allows management to immediately determine the status of any program or of any specific piece of hardware. The facility is located in Tucson, Arizona.

An advanced binocular system turns night into day for military pilots flying nap-of-the-earth missions in either helicopters or fixed-wing aircraft. The Aviator's Night Vision Imaging System (ANVIS) is a helmet-mounted binocular that intensifies nighttime scenes illuminated by faint moonlight or starlight. It uses advanced optics and mechanical components to offer high performance in a rugged lightweight package. The optical system incorporates precision injection-molded aspheric elements to provide high resolution and reduced complexity. Molded mechanical parts employ high-strength antifriction plastics for smooth mechanical operation. Hughes Optical Products, a Hughes subsidiary, builds ANVIS for the U.S. Army.

For more information write to: P.O. Box 45068, Dept. 74-3, Los Angeles, CA 90045-0068

Survivability and Sufficiency

By Edgar Ulsamer, SENIOR EDITOR (POLICY & TECHNOLOGY)

The Soviets are putting considerable effort into neutralizing US submarines, Secretary Weinberger says. Viability of the triad—including sufficient ICBM capability—must be preserved.

Washington, D. C., September 4



The Soviets are spending a "great deal of time and effort" developing techniques and technologies to detect submerged submarines "no matter how quiet [the US submarines]

are and . . . to neutralize and defeat them," according to Defense Secretary Caspar W. Weinberger. By stressing Soviet determination to negate the "quieting" of the US SSBNs, he seemingly alluded to Moscow's work on nonacoustic detection technologies reported previously in this space. While he acknowledged that the SLBM component of the strategic triad is the "most survivable [element] for the moment," he insisted that redundancy must be preserved. The reason is that "we can't afford to be wrong" in maintaining the tools that are essential for the prevention of nuclear war.

In a meeting with a group of Pentagon correspondents, he suggested that the nature and orientation of the US strategic deterrent forces over the long term might eventually undergo fundamental change if thoroughly reliable strategic defenses can be developed. Such a defensive system—possibly germinated by the Strategic Defense Initiative (SDI) research program—"could bring about a number of different changes in our strategic thinking, but we don't have this yet," the Secretary said.

He stressed that relying solely on SLBMs—even on such advanced designs as the allegedly hard-kill-capable D-5—could create lengthy "gaps"

in the cohesion of the US deterrent. Such a circumstance might tempt the Soviets to consider a first strike on the assumption that the US lacked an adequate retaliatory capability. The consequence of abandoning the ICBM component of the triad, he warned, might well be that "deterrence is eroded or [even] lost."

Questioned by this writer concerning Administration reaction to congressional moves to confine the deployment of MX to fifty of these medium-size ICBMs, Secretary Weinberger asserted that "we need more than fifty MXs as part of our offensive deterrent capability." He explained that the credibility and effectiveness of the offensive strategic forces depend on their ability to cover an appropriate number of Soviet targets. The number of hardened Soviet targets is increasing, and "they have a lot more targets [of this type] than we do," the Secretary added.

Pointing out that this Administration, on taking over from its predecessor, halved the number of MX ICBMs to be deployed—from 200 to 100—he told this reporter that the US deterrence capability would be put in jeopardy if "we can't cover the targets that [we] need to cover" and as a result fail to demonstrate to the Soviets that after a first strike by them the US still has the means to counter Moscow's second- or third-strike capability. The MX ICBM, he stressed, is designed to cope with a Soviet restrike capability, but must be deployed in sufficient numbers to accommodate the multitude of warheads needed for this task. Secretary Weinberger pointed out that "we have said all along that the minimum number of MXs is 100."

The Defense Secretary contended that "Congress knows that fifty is not enough," adding that Congress, in the Administration's view, did not rule out the deployment of additional numbers of MX missiles beyond the initial fifty that were cleared by the Senate-House Conference Report for emplacement in Minuteman silos. He interpreted the intent of the Joint Conference Report, which has not yet been approved by the House, as al-

lowing for the eventual deployment of another fifty missiles provided "you . . . give us a basing mode that is more acceptable" than putting MX in Minuteman silos.

The Pentagon is working on a number of different basing modes to satisfy this congressional mandate, he explained. Advanced basing modes recommended previously by this Administration—such as the Closely Spaced Basing concept that capitalizes on the mutual interference of warheads detonating close to one another in terms of space and time—were scuttled by congressional opposition, he pointed out.

Rep. Les Aspin (D-Wis.), the Chairman of the House Armed Services Committee, took umbrage at Secretary Weinberger's statement in response to this reporter's question and threatened to hold up the defense conference report "until we can discuss these matters and reach some understanding." In complementary letters to President Reagan and Secretary Weinberger, the HASC Chairman asserted that "my view of the conference [report] is that the fifty-missile cap is permanent and the options for change placed in the legislation were put there in case some new basing system were found or there were some dramatic changes in the international situation." Alluding to the fact that Secretary Weinberger told the press that "substantial" increases in silo hardness, even though quite costly, have become possible, Representative Aspin commented with seeming pique that, "in my view, superhardening is not another basing mode, and the next budget cycle is not a change in the international situation."

The latter barb was apparently triggered by Secretary Weinberger's general comment—not linked to MX specifically—that the Administration has neither decided on whether or not it would seek supplemental funding in connection with the FY '86 defense bill nor completed formulation of its defense budget request for FY '87. He did say, however, that work under way to determine whether a "supplemen-

tal" would or would not be needed will be completed by November 15, 1985. By that time, the Pentagon is to report to the White House on whether or not the US should continue its compliance with the terms of SALT II and on what adjustments, if any, might be required in this country's strategic force modernization program because of that decision.

Turning to the proposed new small ICBM (SICBM or "Midgetman"), Secretary Weinberger said it "is not improper to point out that it is difficult" to deal with a missile designed by Congress: "That is what we have." Warning that limitations originally placed on the SICBM program by Congress could weaken its effectiveness, he said that "various committees and subcommittees have added various things to it, and this can complicate the design we are pursuing."

(Earlier this year, the Armed Services Committees requested the Defense Department to reexamine the SICBM's design "baseline" that had been prescribed largely by Congress last year. The Air Force, the Defense Science Board, and other elements of the Pentagon are in the midst of studies to determine the most militarily effective sizing and configuration of the new ICBM. Some of these studies will probe whether Midgetman should be able to carry more than one warhead. Other analyses will focus on the need for advanced penetration features, such as letting the warheads "skip" along the upper reaches of the atmosphere. The central concern of all studies involves survivable basing modes. Because of the uncertainties about the nature of the missile, it is now also known as the NICBM, with the "N" signifying "new.")

In spite of the constraints imposed on the small ICBM, "we are proceeding along the path laid out by Congress vigorously and, I think, effectively," Secretary Weinberger said. He added, however, that by confining the missile to a one-warhead configuration, it is going to be an "expensive missile." He declined to speculate on just how costly the system would be on grounds that the design was still evolving.

A recently completed General Accounting Office study, meanwhile, concluded that "preliminary data available on the small ICBM weapon system indicates that life-cycle costs, technical aspects, and operational effectiveness issues must be resolved before the success of the small ICBM and survivable basing proposals can be assured." With this caveat, the General Accounting Office ventured into some tentative cost estimates:

IN FOCUS...

"For example, for a force of 500 small ICBMs, the preliminary life-cycle cost estimate in 1982 dollars for basing in optimally superhardened silos is \$49 billion, the estimate for deploying on hard mobile launchers is \$44 billion, and the estimate for deploying on soft mobile launchers, which are designed to withstand a lower level of blast pressures and depend on wide dispersal for survivability, is \$43 billion."

The General Accounting Office's report concluded further that operating and maintaining a force of small ICBMs in "one or more basing modes" could require a large personnel force. In the case of a force of 500 deployed SICBMs, about 20,000 people would be needed if the basing mode involves randomly dispersed hard mobile launchers; if soft launchers dispersed over a wide area are used, the manpower requirement shoots up to about 34,000 people, according to the GAO analysis. Included in the 20,000 figure associated with hardened launcher deployment are about 4,000 ground mobile security personnel.

In an attempt to lower the personnel requirements for operating and maintaining these launchers, the Air Force is examining the possibility of using an airmobile security force, according to the General Accounting Office. On first blush, this step could lower the size of the security force to about 2,500 people.

Other measures under investigation by the Air Force include the use of advanced "delay and denial devices" on the hard mobile launchers as well as procedural adjustments to permit reductions in the number of people assigned to guard the nuclear warheads.

A circumstance that, according to the General Accounting Office, could drive up the size and, hence, the cost of the SICBM force in a fundamental fashion is a cut in the MX force level. Shortfalls in the ICBM warhead arsenal that would result from any cut in MX deployment might have to be made up by increasing the number of deployed small ICBMs.

The GAO study—which reportedly contains no major divergencies from relevant Pentagon views—singled out major technological and engineering challenges associated with the SICBM program, as presently struc-

ture. One of these stems from the current stricture against increasing the weight of the missile significantly beyond 30,000 pounds. This limit "strains today's missile technology." Another key challenge centers on the development of an affordable guidance and control system that can achieve high accuracy in a mobile environment. The Air Force, therefore, is exploring a number of alternate guidance systems in addition to a modified version of the advanced inertial reference sphere (AIRS) system of the MX.

A third area of concern involves the balance between the combined weight of the missile and its launcher, mobility, and hardness to achieve maximal survivability. Current estimates peg the weight of the loaded launcher at between 150,000 pounds and 180,000 pounds, with "an upper limit of 200,000 pounds," according to the GAO. This range is significantly higher than the initially forecast weight of about 120,000 pounds. This "weight gain" could curtail the weapon's mobility, according to the GAO analysis: "If road networks at potential deployment locations are not adequate to support hard mobile launcher operations or to provide the needed dispersal area, the hard mobile launcher concept may have to be modified."

Current plans call for deployment of a hard-mobile-based SICBM in land areas owned and controlled by the Departments of Defense and Energy. According to the Air Force's siting plan, each launcher requires about eight square miles of suitable land for daily operations and twice that for periods of increased alert. For a force of 500 missiles, that would translate to 4,000 square miles needed for routine use and 8,000 square miles for periods of increased alert. In the event of imminent attack, the GAO analysis reports, "the mobile launchers would dash at high speed off the military bases . . . to [the] adjacent countryside, expanding the dispersal area . . . to 28,000 square miles."

Another concern that results from the presently proposed design is how the SICBM's configuration will affect the selection of deployment areas. The SICBM is to carry a 1,000-pound payload as well as penetration aids, such as decoys that will thwart future Soviet ballistic missile defenses, over a distance of 6,000 nautical miles. But as the report points out, the design lacks the capacity at present to carry both a reentry vehicle and penetration aids "without a degradation in range. To maintain range while carrying both packages will require modifi-

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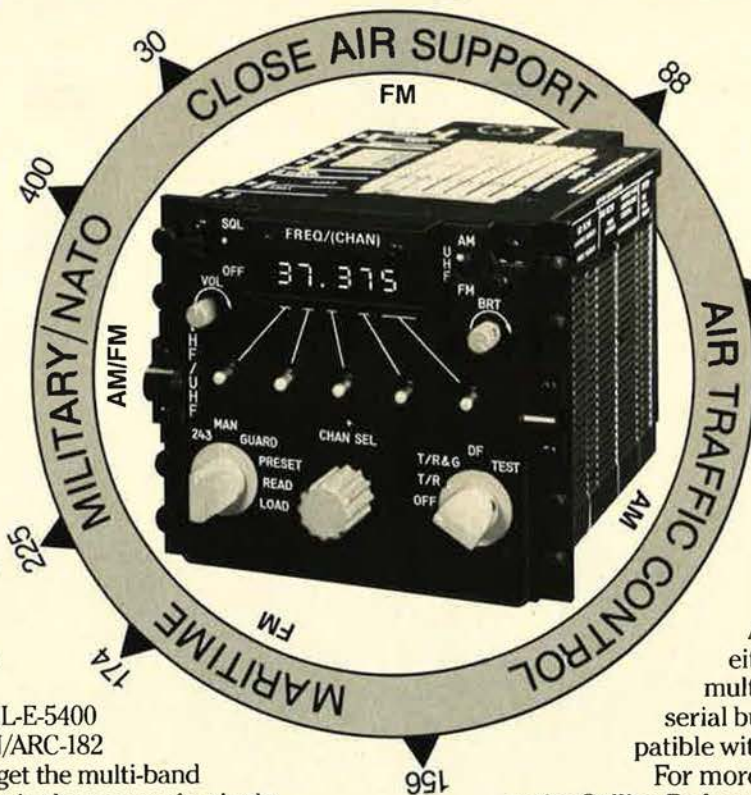
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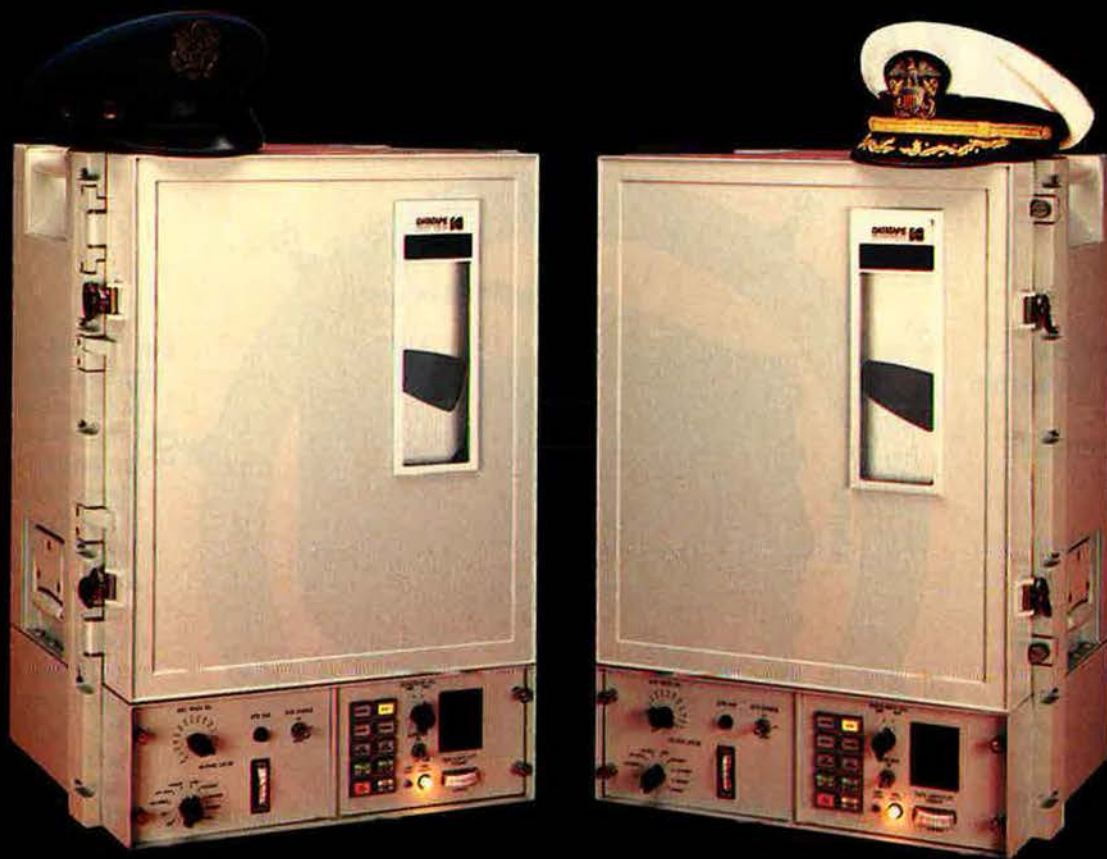
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cations to the missile or basing in northern locations."

Lastly, endurance and advance warning are of overriding importance to the effectiveness of the SICBM. Neither the hard- nor the soft-mobile-basing options, according to the GAO report, are likely to provide the Air Force with the required level of readiness, meaning the requisite number of missiles ready to fire at all times over a protracted period: "Achieving a relatively long period of endurance would require additional basing modes, such as hardened silos." The GAO analysis also finds that "to achieve survivability against an attack where the enemy is willing to expend a significant portion of [his] resources, a hard-mobile-based small ICBM force will require adequate warning time to allow dispersal of the missiles over a large area. This is more critical than in the past, since silos provided survivability that was independent of advance warning."

Secretary Weinberger stressed the importance of a mobile deployment option for the small ICBM, but at the same time seemed to leave the door open to other basing modes, presumably as a means for backstopping the former. He suggested that the Administration looks with a jaundiced eye on mobile basing concepts that rely largely on deception rather than full mobility.

The Reagan Administration, he explained, is perceived wrongly of opposing ICBM mobility: "It's not mobility that we killed, [only] the 'race track' concept [based on hiding] 200 missiles in 2,600 holes [that would be opened up for inspection by Soviet satellites to prove compliance with the terms of SALT II every] New Year's Day. . . . That system was mad in my opinion, and I thought so long before I [became Secretary of Defense]." The type of mobility sought by the Reagan Administration, he added, is exemplified by "what the Soviets have in some of their newest missiles." Mobility, Secretary Weinberger suggested, "is what the SS-20 [MIRVed intermediate range ballistic missile] has—you can fire it from a silo or from a TEL [on-road/off-road mobile Transporter-Erector-Launcher]."

Asked whether or not Congress would eventually support the fielding of the small ICBM, Secretary Weinberger answered that that could not be predicted at this time because "there is some doubt in Congress" about this weapons program.

DARPA's Aerospace Plane Program

The hypersonic flight regime—

IN FOCUS...

from the Mach-5 range all the way up to orbital escape velocity, the threshold of "aerospace planes"—is getting high-level attention in the White House, the Pentagon, and NASA. At least three areas of potential interest are being pursued: hypersonic flight for both military and commercial applications, an aerospace vehicle, and a classified national security mission of which not even the code name is known publicly.

The aerospace plane, also referred to as TAV, for transatmospheric vehicle, is a potential candidate for missions supporting the Strategic Defense Initiative and the US Space Station program. Initial indications are that an aerospace plane might cut the cost of delivering payloads into orbit in half compared to the Space Shuttle and complementary expendable launch vehicles (CELVs).

The Defense Advanced Research Projects Agency (DARPA) is spearheading the current renaissance of hypersonics technology, which has been largely a dormant field since the 1960s, when the Air Force, the Navy, and NASA invested heavily in R&D work on hydrogen-fueled scramjet engines. These efforts were halted because rocket technology appeared to offer a simpler approach to high-speed flight. DARPA recently proposed a "proof-of-concept" effort to determine the feasibility of hypersonics technology in a program that would absorb "several hundred million dollars over two or three years," DARPA's Deputy Director for Research Dr. Charles Buffalano told Congress.

A number of factors are boosting US interest in a coordinated long-term research effort to establish the feasibility and costs of manned and unmanned vehicles that can travel at speeds up to Mach 25, take off from conventional airport runways to reach any point on earth in about one hour, or serve as single-stage-to-orbit delivery platforms. Key here are significant advances in propulsion technology beyond the somewhat cumbersome and inflexible hydrogen-fueled supersonic combustion ramjet, or scramjet, concepts of the past.

DARPA is working on promising advanced concepts for combined-cycle engines—meaning propulsion plants that function efficiently from zero

speed to extreme hypersonic velocity—called "airturboramjets" and "cryojets." These engines could use a variety of fuels, including solid-rocket-type propellants, liquid hydrocarbon fuels, and methane and hydrogen fuels. Other advances in relevant "enabling" technologies associated with hypersonic flight include breakthroughs in computational fluid dynamics modeling in three dimensions, high-temperature lightweight structures, active cooling, hypersonic aerodynamics, and "intelligent" avionics.

Promising advances in the materials area include silica-based ceramics, rapid solidification rate (RSR) metals, and third-generation carbon-carbon composites. The latter material can withstand temperatures higher than those encountered on reentry by the carbon-carbon structures used on the leading edges of the Space Shuttle.

Through integration of the airframe and propulsion plant, the proposed new vehicle can accommodate three flight regimes, according to Dr. Buffalano: takeoff, hypersonic, and rocket. When operating as a scramjet, for instance, the forward vehicle underbody would account for a large part of the inlet compression and the vehicle afterbody shape would form the nozzle and produce half of the thrust at high speeds. The efficiency of such an integrated engine, expressed in terms of average specific impulse, is about three times greater than that of the hydrogen-oxygen engines of the Space Shuttle.

A long-term ancillary consideration that, theoretically at least, increases the appeal of hypersonic vehicles and aerospace planes is that they could be operated with hydrogen fuels. Since hydrogen can be extracted easily from water, it holds out the promise of achieving independence from limited petroleum resources. Also, because of its low specific gravity when it is kept in a liquid state, hydrogen fuel should lead to aircraft that have a lower gross weight and, by extension, relatively lower operating costs.

The payoffs in the national security sector from hypersonic vehicles that can either provide flexible access to space or result in aircraft that operate with the immediacy of ballistic missiles are self-evident. Whether these payoffs will ever materialize won't be known until DARPA can complete its proposed proof-of-concept project to show whether, when, and for how much hypersonic flight can be translated from drawing-board concept into hardware reality. ■

CAPITOL HILL

By Brian Green, AFA DIRECTOR OF LEGISLATIVE RESEARCH

Washington, D. C., August 30 Authorization Bill Controversy

The Senate on July 30 approved the compromise military authorization bill by a vote of 94-5. Because of the apparent discontent of many House members with some of its provisions, the House vote on the conference report was delayed until after the congressional summer recess. The House vote, still pending as of this writing, is expected to be close.

The calculus and timing of the House vote have been further complicated by an apparent disagreement between Chairman of the House Armed Services Committee Les Aspin (D-Wis.) and Secretary of Defense Caspar Weinberger over the correct interpretation of the conference compromise on the MX missile. The conference report concerning MX states that "the conference provision is explicit with regard to the limitation on further deployment (beyond fifty MX missiles) in existing Minuteman silos and is equally explicit with regard to the possibility of further MX deployments should the President propose and Congress approve a more survivable basing mode."

Secretary Weinberger is on record as saying that to deploy only fifty MX missiles would shortchange basic deterrence requirements and that the number of deployed weapons must be brought up to the full 100 requested by the Administration. He has further suggested that many in Congress understand that fifty missiles is inadequate, citing the provision concerning new basing modes.

Chairman Aspin took strong exception to Secretary Weinberger's contention. In a letter to the Secretary, he wrote, "My view of the conference is that the fifty-missile cap is permanent and that the new options for change placed in the legislation were put there in case some new basing system were found or there were dramatic changes in the international situation. In my view, superhardening is not another basing mode, and the next budget cycle is not a change in the international situation. . . . My personal view is that we need to get

some better understandings before we bring the defense conference report to the House floor. . . . If the cap is not going to be permanent, then I think it is pretty clear we have no deal."

Task Force to Study SICBM

Under Secretary of Defense for Research and Engineering Donald Hicks requested on August 20 that the Defense Science Board "form a task force to review the intercontinental ballistic missile modernization programs" that will focus on the "effectiveness, affordability, and schedule" of the small ICBM (SICBM, or Midgetman). The results concerning the SICBM will be submitted to the House and Senate Armed Services Committees prior to their consideration of the FY '87 defense budget. The report was requested by the committees in the FY '86 military authorization bill.

The Task Force will review projected threats, mission requirements, technical risk, cost, manpower requirements, safety, physical security, and the impact of congressionally mandated weight limits on the potential effectiveness of the SICBM. It will also recommend a basing concept for full-scale development.

Membership of the panel includes John Deutch, Provost at MIT, Chairman; Gen. Russell E. Dougherty, USAF (Ret.), Executive Director of the Air Force Association; Daniel Fink, private consultant; Dr. Harry Rowen, private consultant; Dr. Charles Townes, University of California at Berkeley; Robert Everett, President, The MITRE Corp.; Maj. Gen. Jasper Welch, USAF (Ret.), private consultant; Gen. Bernard Schriever, USAF (Ret.), former head of the 1983 Small Missile Independent Advisory Group; and R. James Woolsey, attorney with Shea and Gardiner. Dr. Deutch and Mr. Woolsey were members of the Scowcroft Commission, which originally recommended the SICBM.

Congress Receives ASAT Certification

On August 20, Congress received from President Reagan the certifica-

tion required prior to a test against an object in space of the US ASAT system being developed. In the certification, the President attests that:

- The US is attempting in good faith to negotiate "the strictest possible limitations" on ASAT weapons, consistent with US national security interests.

- The test is necessary to "avert clear and irrevocable harm to the national security."

- The test will not constitute an irreversible step that would gravely impair prospects for negotiations on ASAT weapons.

- The test is consistent with US obligations under the ABM Treaty.

The certification must be submitted to Congress at least fifteen days prior to the date of the test. The exact date of the test is classified, but will probably take place no later than early October.

Report on the Military Balance

John M. Collins, a highly respected senior defense specialist for the Library of Congress, has authored a comprehensive study of recent trends in the military balance that is entitled *U.S.-Soviet Military Balance 1980-1985*. In it, Mr. Collins makes four key points.

- The peacetime balance isn't as bad as some critics suggest, and deterrence is currently stable.

- The wartime balance, however, is not good.

- The Soviets are not likely to use their most threatening capabilities because of the costs, risks, and uncertainties inherent in their use.

- The US has a much greater need for a balanced force structure than the Soviets because of the geopolitical advantages enjoyed by the Soviet Union.

With respect to the Air Force, Mr. Collins states that USAF "fighter/attack squadrons are far stronger than in 1980." But he also states flatly that "Soviet gains between 1980 and 1984 . . . far outstripped the net US increase" and that the gross Soviet numerical superiority "leaves us disadvantaged." ■

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AEROSPACE WORLD

News, Views & Comments

Washington, D. C., September 6
★ The Air Force's first C-5B transport aircraft has rolled out of its assembly position at the Lockheed-Georgia Co. facility at Marietta, Ga.

The airlifter is an updated version of the C-5A Galaxy and includes many new and enhanced features, including state-of-the-art materials and avionics.

Secretary of the Air Force Verne Orr—who attended the July 12 rollout ceremonies along with other senior Air Force officials—says, "The C-5B program this aircraft represents will go a long way toward increasing

our nation's force-projection capability," according to Aeronautical Systems Division officials at Wright-Patterson AFB, Ohio. Following testing, the first B-model Galaxy is scheduled for delivery to Military Airlift Command by the end of this year.

ASD awarded a \$50 million preliminary production contract to Lockheed-Georgia in October 1982, with the option to purchase forty-nine additional aircraft for a total cost of \$7.8 billion.

"The first aircraft is scheduled to be delivered in December, with the fiftieth aircraft expected in mid-1989," say Air Force officials.

seats will be made from special flame-retardant materials and certified by the Federal Aviation Administration. The seats will also be thirty percent lighter than those in the A model, decreasing the weight of the aircraft by 725 pounds. This reduced weight will save about \$13 million in fuel costs over the life of the C-5B fleet, Air Force officials say.

The C-5B also has new carbon brakes that are more than 400 pounds lighter than the old systems, which will save about \$20 million over twenty years and double the life of the braking system.

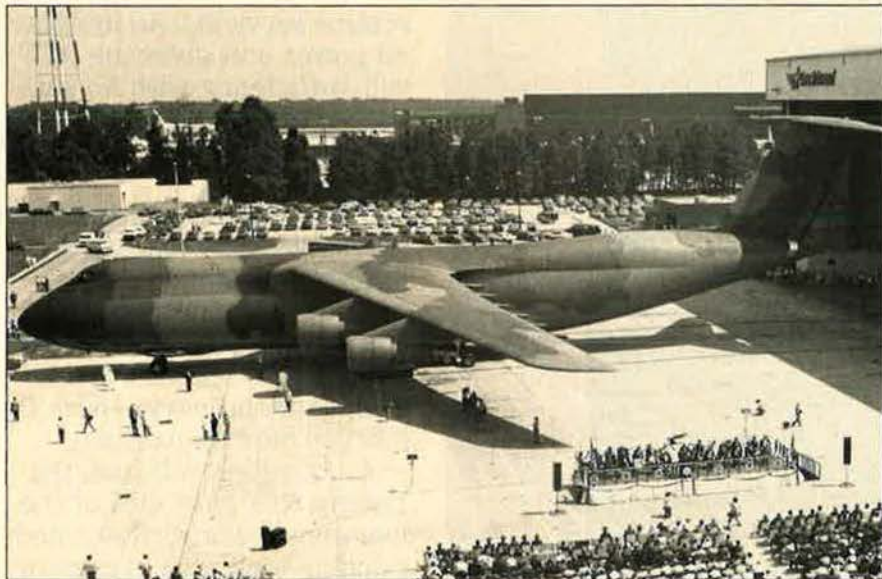
★ An AMRAAM missile bored through difficult radar "clutter" conditions in August to intercept a drone aircraft target successfully in the second guided launch in the full-scale development program, according to Air Force and Hughes Aircraft Co. officials.

"The test firing was the third consecutive successful launch of the Advanced Medium-Range Air-to-Air Missile, which is under development by Hughes Aircraft for the Air Force and Navy," say Air Force officials.

The instrumented AIM-120A missile found and tracked the QF-100 drone, which was skimming across the surface of the White Sands Missile Range at a speed of Mach 0.7 some 1,000 feet above the desert floor. An F-15 pilot from the 3246th Test Wing at Eglin AFB, Fla., launched the missile in a look-down/shoot-down tail-aspect attack from medium range while flying at Mach 0.9 at approximately 16,000 feet.

The AMRAAM flew the first part of its flight course under control of its on-board inertial reference unit, using target coordinates provided by the F-15's APG-63 radar. The missile then switched to a terminal mode, using an on-board active radar to guide it to the drone despite the high "clutter" environment produced by the missile's radar energy being reflected from the earth.

"This was the first F-15 launch in the current test series, and it verified AMRAAM's interface with that air-



The first of fifty C-5B Galaxy military transports rolls out of its final assembly position at the Lockheed-Georgia Co. in Marietta, Ga. Secretary of the Air Force Verne Orr welcomed the aircraft into the inventory.

our nation's force-projection capability. When completed, it will add 7,500,000-ton-miles per day of outsize airlift capability toward our goal of 66,000,000-ton-miles per day."

Gen. Lawrence A. Skantze, Commander of Air Force Systems Command, says the C-5B would help provide "the capability to project our forces to any point on the globe as is necessary."

Flight testing of the first production C-5B began in early September at Dobbins AFB, Ga., and includes a fifty-five-hour flight evaluation pro-

The C-5B is similar to the C-5A. Both are 247.8 feet long, have a wingspan of 222.8 feet, and feature a cargo hold nineteen feet wide, 13.5 feet high, and 144.6 feet long—large enough to airlift the Army's seventy-four-ton mobile scissors bridge, the Abrams M1 tank, or helicopters.

The C-5B is powered by four improved General Electric TF39 engines rated at 41,000 pounds of thrust each. It also has a new troop compartment with seats for seventy-three passengers and two loadmasters.

According to ASD officials, the new

craft's avionics," according to Hughes officials. This launch followed two launches from the F-16, the other Air Force aircraft for which AMRAAM is intended.

AMRAAM is also designed for use aboard the Navy's F-14 and F/A-18 aircraft and various models of combat aircraft of the United Kingdom and the Federal Republic of Germany, say company officials.

The missile used in the August test was the ninth delivered in the full-scale development program that started in December 1981.

★ Major US airlines are currently evaluating an airborne wind-shear detection system manufactured by Safe Flight Instrument Corp. of White Plains, N. Y.

"The tragic destruction of Delta Air Lines Flight 191 at Dallas-Fort Worth International Airport and the killing of 132 of its passengers prove that the wind-shear threat simply cannot any longer be ignored," says Samuel P. Saint, an American Airlines captain for thirty-one years and now a consultant to the Safe Flight Instrument Corp.

The Wind-Shear Warning/Recovery Guidance System, built by Safe Flight, is installed on both the Eastern

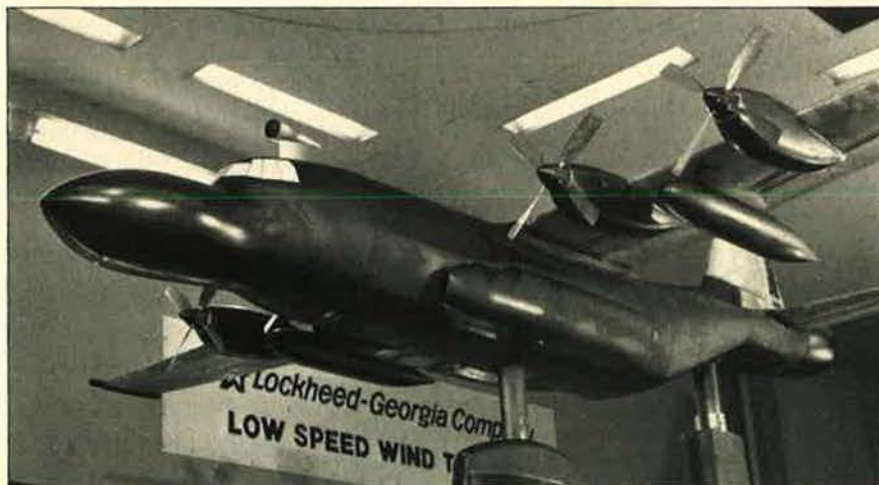
and the United Air Lines Boeing 727 simulator. The Boeing Aircraft Co. has also done a simulator evaluation in cooperation with Safe Flight.

In addition, United has flown the system on Boeing 727 and 747 aircraft, and other airlines have tested the system in similar in-flight service since it became available in 1976. The system has been flown under FAA Supplemental Type Certification on a

number of airline-type aircraft, including the DC-9, 727, and 747. It is also FAA-certificated on most types of corporate jet aircraft.

"Wind-shear warning is currently being used on the Air Force/Boeing C-135 Speckled Trout new technology test-bed aircraft," say Safe Flight officials.

The airborne computerized system features a simulated voice alert and



Wind-tunnel model testing has been completed on a proposed Airborne Early Warning (AEW) version of Lockheed's C-130 Hercules transport. If selected for production, it would be the fortieth version of the C-130 developed by Lockheed.



It's not a crystal ball, but an Infrared Search and Track (IRST) sensor that Hughes Radar Systems Group is proposing to "transplant" from deactivated Air Force F-101, F-102, and F-106 interceptors into Air National Guard F-4s. Giving the Air Guard this IR capability can be accomplished for one-tenth the cost of a new infrared system, Hughes says. (See item, p. 38.)

continuously computes the energy loss caused by a severe low-altitude wind-shear encounter or downburst. If a predetermined energy loss level is reached and the wind-shear warning is sounded, then the pitch command bars will display continuously computed pitch guidance that will produce the best possible climb profile for the escape maneuver.

The FAA ground airport wind-shear detection system is criticized by pilots who say it produces false alarms and cannot predict microbursts or other wind shears; it can only report their presence. A new technology detection system for airports, called Doppler Radar, is at least four years away, say airport safety observers.

★ The Air Force has awarded two contracts totaling \$447.6 million for the assembly, test, and systems support of the small intercontinental ballistic missile (SICBM) now under research and development.

Martin Marietta Aerospace Corp. of Denver won the contracts, which provide for missile handling, missile and component assembly, flight and ground testing, and system analysis for the small ICBM test program.

Research and development funding for the missile nose shroud and the test cannister for cold-launch of

the missile is also included in the contract, Department of Defense officials said.

The small ICBM is part of the strategic modernization program recommended in 1983 by the President's Commission on Strategic Forces. The missile will be about forty-six feet long, weigh 30,000 pounds, and be able to deliver a 1,000-pound warhead about 6,000 miles. Officials will decide in late 1986 whether or not the missile is to be based in mobile or fixed launchers. Initial deployment is scheduled for 1992.

★ McDonnell Douglas Corp. recently announced that it will implement expanded, no-questions-asked refund policies on sales of aerospace spare parts and support equipment to US

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government and foreign military sales customers and to commercial customers around the world.

The government can return any covered spare part or piece of support equipment "if there is any dissatisfaction with its cost—no questions asked," says Sanford N. McDonnell, Chairman and Chief Executive Officer of the corporation. He describes the refund policy as "the most comprehensive in the aerospace industry."

FAA Plans Airport Safety Upgrades

New Airport Radar Service Areas (ARSAs) designed to improve air safety are being proposed for thirty-six airports, including military installations, Secretary of Transportation Elizabeth Hanford Dole has announced.

According to Secretary Dole, "The new system will improve safety and operational efficiency by requiring that all pilots be in radio contact with the air traffic control facility. Having all aircraft in the service area communicate with air traffic controllers will reduce the risk of any midair or near midair collision."

At these locations at present, only aircraft planning to land at the airport are required to contact approach control. Because of this, some aircraft in the area of an airport are thus not known to air traffic controllers. Having all aircraft in the area report to controllers will give ATC people a more complete picture of traffic, according to Department of Transportation officials.

Secretary Dole notes that the proposal is part of a broader FAA program to increase safety margins at US airports. She says the agency expects to propose ARSAs at other sites this fall and to consider additional locations next year.

The first group of fourteen airports proposed to become operational with the new system in December includes Albany County Airport, N. Y.; Anchorage International Airport, Alaska; Bradley International Airport, Windsor Locks, Conn.; Capitol City Airport, Harrisburg, Pa.; Corpus Christi International Airport, Tex.; Harrisburg International Airport, Pa.; Long Island MacArthur Airport, Islip, N. Y.; Pensacola Naval Air Station, Fla.; Pensacola Regional Airport, Fla.; San Antonio International Airport, Tex.; Syracuse Hancock International Airport, N. Y.; Theodore Francis Green State Airport, Providence, R. I.; Tulsa International Airport, Okla.; and Whiting Naval Air Station, Fla.

Airport locations proposed for the ARSAs in early 1986 are Burbank-Glendale-Pasadena Airport, Calif.; El Toro Marine Corps Air Station, Santa Ana, Calif.; Greensboro-High Point-Winston-Salem Regional Airport, N. C.; James M. Cox Dayton International Airport, Ohio; Lubbock International Airport, Tex.; March AFB, Calif.; Norton AFB, Calif.; Ontario International Airport, Calif.; Portland International Airport, Ore.; Tinker AFB, Okla.; and Will Rogers World Airport, Oklahoma City, Okla.

Also included and proposed for ARSA operations in mid-March of 1986 are Daytona Beach Regional Airport, Fla.; Des Moines Municipal Airport, Iowa; El Paso International Airport, Tex.; Eppley Airfield, Omaha, Neb.; Fort Lauderdale-Hollywood International Airport, Fla.; Jacksonville International Airport, Fla.; Norfolk International Airport, Va.; Offutt AFB, Neb.; Orlando International Airport, Fla.; Palm Beach International Airport, Fla.; and Richard Evelyn Byrd International Airport, Richmond, Va.

The ARSA is a two-tiered block of airspace, generally circular in shape and with a radius of ten miles at the top. Pilots operating in the ARSA would have to establish communications with the airport radar approach control facility and comply with all clearances and instructions. This would give air traffic controllers information on all aircraft operating in these areas, thereby avoiding the kinds of airspace conflicts that can result when there is a mix of known and unknown traffic.

ARSAs were implemented in mid-March at three airports: Baltimore-Washington International Airport in Maryland; Robert Mueller Municipal Airport in Austin, Tex.; and Port Columbus International Airport, Columbus, Ohio.

FAA officials will hold local meetings around the country to discuss the proposal with pilots and other airspace users.

Mr. McDonnell, in a letter to Secretary of Defense Caspar W. Weinberger, said that "if the military feels it must retain the item in stock for operational readiness, their complaint will be addressed without concern for a time limit."

McDonnell Douglas has been working with the Defense Department since 1983 to encourage the purchase of spare parts and support equipment at the lowest possible price, according to Mr. McDonnell.

The new policy specifies that new and unused parts or equipment built by McDonnell Douglas and purchased from the company by the military under prime contracts may be returned for refund within six months of delivery if the customer is dissatisfied with the price.

The policy applies to prices to the government up to \$100,000. At that level, McDonnell Douglas furnishes cost data in advance of establishing a price.

In related news, Defense Secretary Caspar Weinberger announced in late July that Boeing and General Electric had instituted a refund program whereby any spare parts or support equipment considered by DoD to be unreasonably priced could be returned for credit.

★ A fully equipped prototype of the Air Force HH-60A Night Hawk search and rescue helicopter has been unveiled in a ceremony at International Business Machines Corp.'s Federal Systems Division facility in Owego, N. Y.

The ceremony marked the completion of the installation of the integrated avionics suite—navigation and communications equipment, sensors, and visual displays—into the helicopter.

The Night Hawk is the first new helicopter developed for the Air Force since the Vietnam era. "The Night Hawk was developed to perform combat missions in hostile territory," says Lt. Col. Joe Perez, chief of ASD's HH-60A division. "With the helicopter's state-of-the-art avionics and its proven airframe, the HH-60A will be able to complete combat rescue missions safely and undetected," he adds.

Avionics integrated into the HH-60A include 179 electronic units that will allow the helicopter to perform rescue missions at night and in limited adverse weather. The cockpit and integrated avionics of the Night Hawk were designed, according to Air Force officials, "to reduce the crew work load so [that the aircraft] can be operated by a pilot and a copilot,

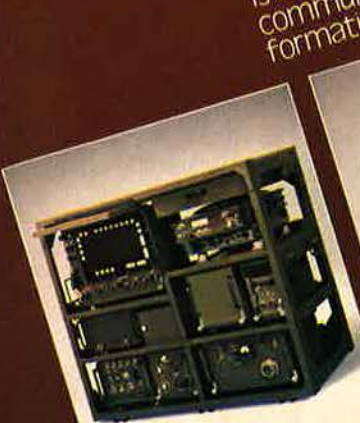
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innovative ways of improving test technology, and the IDSS is just one example. Harris Corporation, Government Support Systems Division, 6801 Jericho Turnpike, Syosset, Long Island, NY 11791. 516-364-0400.



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without the use of a flight engineer."

The entire HH-60A cockpit is compatible with night-vision goggles, which improve the pilot's ability to see during darkness. Using a new panel design that features four side-by-side video displays (two for each pilot), the cockpit has only fifteen instruments, eight of which are backup.

Control buttons located around each of the cockpit video screens are used to call up a variety of information that includes flight-control commands, attitude, altitude, ground speed, available power, and distances and times to preset destinations. Caution, warning, and advisory alerts are displayed automatically.

The new helicopter, which rolled out in January 1984 at Sikorsky Aircraft, Stratford, Conn., combines a modified Army UH-60A Black Hawk airframe with an upgraded powerplant and transmission and two jet-tisonable external fuel tanks. The added equipment and power will allow the HH-60A to perform rescue missions up to 250 nautical miles behind enemy lines without escort or refueling.

Current Air Force requirements call for delivery of ninety Night Hawks. Production contract costs are valued at more than \$200 million.

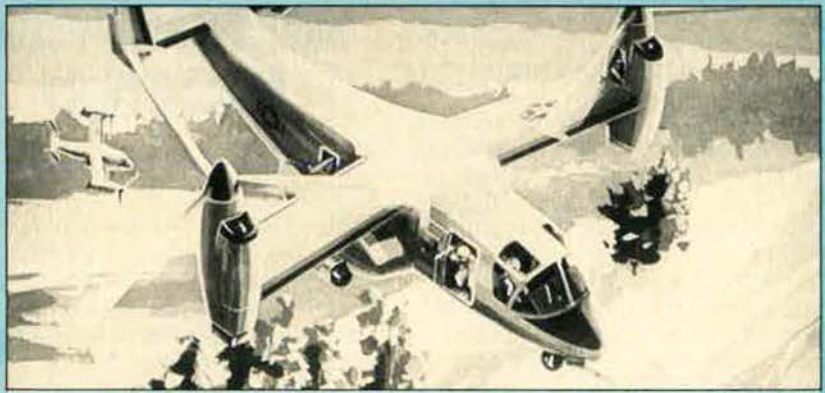
★ Goodyear Aerospace has won a \$55.9 million contract to supply 455 types of aircraft wheels, brakes, and related spare parts needed to keep Air Force planes in the air.

The parts range from wheel bearings to highly sophisticated carbon disk brakes and antiskid control systems for the majority of aircraft in the Air Force inventory.

The contract, which runs through December 1986, was awarded by the Ogden Air Logistics Center, Hill AFB, Utah, the Air Force's principal procurement center for aircraft wheels and brakes.

Aircraft to receive parts covered by the contract include the A-10, A-37, C-123, C-130, C-131, C-141, E-3A, F-4, F-5, F-15, F-16, FB-111, T-29, T-33, and T-39. The F-15 and F-16 use Goodyear carbon brakes, as does the B-1B bomber now being delivered to the Air Force.

The parts will be built in Goodyear facilities located in Akron, Ohio.



Combat search and rescue is one of the missions proposed for the CV-22 tilt-rotor aircraft now ready to enter full-scale development.

CV-22A Tilt-Rotor Program Progressing

Department of Defense observers say that Congress is expected to take a hard look this fall at the Defense Department's proposal to begin full-scale development on a new joint-service aircraft. The new airframe has, for the most part, received only limited attention from the media and has enjoyed relatively smooth sailing in Congress. Here is the background.

To the average person, the V-22A aircraft might look much like an ordinary fixed-wing airplane. But the V-22A is expected to have the remarkable ability to take off and land like a helicopter and then to convert from vertical to horizontal flight and back again while flying at cruising speeds.

A combined service effort of the Air Force, Navy, Marine Corps, and Army, the V-22A program involves Bell Helicopter Textron, Fort Worth, and Boeing-Vertol, Philadelphia, as contractors. A decision for V-22A full-scale development is anticipated this fall, say Defense Department officials.

At Aeronautical Systems Division at Wright-Patterson AFB, Ohio, work is in progress on the CV-22A, the Air Force version of the new craft. Air Force plans to acquire eighty CV-22s for MAC. The four services will procure a total of 913 and share the program cost for the tilt-rotor aircraft if Congress approves Defense Department plans.

In December 1982, the Navy was appointed as the executive service to oversee the V-22A program. The Navy version is designated HV-22A, with fifty aircraft to be procured. The Marine Corps plans to procure 552 models of its MV-22A version, and the Army will receive 231 aircraft.

While the V-22A might appear to be a new concept, scientists and engineers have actually been designing and building prototypes of a "convert-o-plane" since 1943. Over the years, the Air Force, Army, Navy, Marine Corps, and NASA have displayed interest in developing the tilt-rotor concept.

It wasn't until thirty years after McDonnell Douglas built the first military convert-o-plane (XV-1) in 1950, however, that DoD began work on developing a common vertical-lift airframe. The object of the tilt-rotor program is to give the four services a self-deployable, multimission airplane with vertical/short takeoff and landing (V/STOL) capability for the 1990s and beyond.

In the 1960s, a triservice program managed by ASD resulted in the design, development, and flight testing of three V/STOL prototypes. They were the X-19, built by Curtiss-Wright Corp., Caldwell, N. J.; the XC-142, developed by Ling-Temco-Vought Corp., Dallas, Tex.; and the Navy X-22, built by Bell Aerospace Systems, Buffalo, N. Y. None of the three aircraft went into production, but research in V/STOL technology continued over the years.

"The Air Force will use the CV-22A to complement the MC-130 Combat Talon aircraft on special operations missions," say ASD officials. "And the CV-22A will provide a vertical airlift aircraft needed for long-range operations, taking personnel in and out of an area and resupplying them as needed," officials add.

The V-22A acquisition strategy stresses development of a common airframe for all the services. By using mission kits and through minor modifications to the baseline configuration, the services will be able to tailor aircraft capability to meet specific mission requirements.

V-22A performance requirements include a 288-mph (250 knots) cruising speed, the ability to maintain a 15,000-foot altitude with only one engine operating while carrying twenty-four passengers, the capability to withstand minus-one to plus-four G loads during hard maneuvers, the ability to make 180-degree turns at low altitudes in fifteen seconds or less while traveling at cruising speed, the capability to deploy 2,100 nautical miles without refueling, and the ability to perform other evasive action and emergency landing maneuvers.

★ An infrared sensor "transplant" that would increase the air defense capabilities of Air National Guard F-4s has been proposed by Hughes Aircraft Co.

Hughes Radar Systems Group personnel can now transfer Infrared Search and Track (IRST) systems to the F-4 aircraft from deactivated Air Force F-101, F-102, and F-106 interceptors.

Hughes officials say that 300 IRST systems can be transferred to ANG Phantoms for about \$100,000 per aircraft. "This is one-tenth the cost of developing a new infrared system for the Guard aircraft and amounts to a savings of approximately \$270 million," says one Hughes official.

"The F-4s are equipped with an existing radar that needs to be supple-

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mented with an infrared system to be more effective against modern airborne threats," says Charles J. Steigleder, associate manager of avionics improvement programs for the Radar Systems Group.

"IRST will enable the pilot to fire infrared missiles when the F-4 radar cannot pick out targets because of clutter, countermeasures, or malfunctions," says Mr. Steigleder.

The IRST systems were originally

built by Hughes in the 1960s to provide low-altitude detection and countermeasures capabilities for the F-101, F-102, and F-106. The systems have undergone several upgrades, most recently in 1980 when a Hughes-developed thermoelectrically cooled infrared detector was added.

"This new detector makes it possible for F-4s to utilize IRST systems, which otherwise would probably be declared surplus," according to Steigleder.

Flight testing of the proposed cost-saving IRST is under way at the ANG's 119th Fighter Interceptor Group at Fargo, N. D., under an Air Force contract.

★ The Navy recently received its first production lot of Skipper II Laser-Guided Bombs for use in fleet operations in a move that should provide increased survivability for aircraft.

The Skipper II bombs are deployed to aircraft carriers of both the Atlantic and Pacific Fleets and will be primarily launched from the A-6 all-weather attack aircraft, say officials.

The Navy was able to save both time and money by using off-the-shelf components derived from Navy bombs currently in the inventory. "These components were combined to develop a weapon that enables low-level launch and greater standoff capability," say Navy officials.

The Skipper II, with a projected cost of \$22,500, is an inexpensive guided weapon. Unit cost has been reduced further by almost \$1,500 per weapon as a result of competition.

The Skipper II has a 1,000-pound warhead consisting of a Mk 83 general-purpose bomb. It is guided to its target by a modified laser-guidance and control section taken from the Paveway II, a laser-guided bomb with no motor. The target is illuminated by either an airborne or a ground-based laser designator.

Emerson Electric Co. of St. Louis, Mo., was awarded the FY '85 contract for the modification of 2,000 Paveway II laser-guidance and control and air-foil units for the Skipper II. Aerojet Tactical Systems Co. of Sacramento, Calif., which has been producing rocket motors for the Shrike missile, has been awarded the contract for building the Skipper II propulsion system.

The Skipper II was developed at the Naval Weapons Center, China Lake, Calif., in 1980.

★ **NEWS NOTES**—The Air Force has awarded Sabreliner Corp. a **\$4.8 million contract** for the upgrading and structural modification, weapon and

Flight to Freedom

Crew members of an Air Force C-141B from McGuire AFB, N. J., described themselves as being on edge and tense as they waited to transport thirty-nine former American hostages from Syria to West Germany last June 30.

The crew included members from three MAC units: the 438th Military Airlift Wing at McGuire, the 76th Military Airlift Squadron from Charleston AFB, S. C., and medical technicians from Rhein-Main AB, Germany.

They departed Rhein-Main AB on June 29 to pick up the Americans who had been held hostage by Shiite terrorists in Lebanon since June 14. The airlifter landed in Damascus about five hours after takeoff.

"We felt a little edgy, especially when the Syrians came out and surrounded us with weapons," said Capt. Richard S. Wharton, aircraft copilot.

"It was something we hadn't quite expected, and we weren't sure if they were good guys or bad guys. They turned out to be good guys and protected us very well," he said.

MAC officials at Scott AFB, Ill., said the original plan was to have the aircrew wait on the flight line, pick up the hostages, and return to Rhein-Main the evening of June 29. However, after an eight-hour wait, crew members learned that further demands by the Shiite captors were delaying the release of the hostages.

Officials said the crew was housed overnight in a hotel near the airport, which created more tension.

"We couldn't leave the hotel, and they had all those guys with guns around watching us," said SSgt. Dennis T. Oehmsen, a flight engineer from the 30th MAS.

The following morning, as crew members were busy checking the aircraft, which had been configured for aeromedical evacuation, they learned the hostages had crossed the border from Lebanon.

"They looked good," said Captain Wharton. "Of course, they were tired because of the stress they'd been under for more than sixteen days, but there weren't any who had to be helped. They were in control of themselves.

"They were happy to see us," the Captain continued. "They were really happy to see the American flag patches on our uniforms and very happy to be on an aircraft on the way home."

TSgt. Sheldon Jones, another flight engineer on the crew, said the crew faced another anxious moment when the hostages' baggage arrived. He explained, "We had to sanitize it—make sure there were no explosives planted in it. Some people came out from the US Embassy to tell us what to do," he said.

About thirty minutes after the safety checks, the C-141 was airborne. "The hostages cheered when we took off," said Captain Wharton. "They cheered when we left Syrian airspace, and they cheered when we landed at Frankfurt."

"We headed home, and we were all much higher than the aircraft at the time," added mission commander Maj. Leroy W. Edwards.

The C-141 arrived at Rhein-Main six hours later. The hostages were greeted by Vice President George Bush, checked by Air Force doctors at Wiesbaden, West Germany, and put on a commercial airliner to Andrews AFB, Md.

They arrived at Andrews on July 2 and were welcomed by President Reagan. The C-141 crew members returned to McGuire AFB the same day and were greeted by New Jersey Congressman H. James Saxton, then-MAC Commander in Chief Gen. Thomas M. Ryan, Jr., and other top Air Force officials.

—A1C DAN HELMICK, USAF



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avionics systems integration, and flight testing of **twenty-five T-33 jet aircraft** over the next thirty months. Work will take place at the Sabreliner facility located in Perryville, Mo.

The **French Air Force** has received its first of **eleven reengined C-135R aircraft**. The tanker, known as the KC-135R in the US Air Force, was modified by Boeing Military Airplane Co. to boost the airplane's performance, allowing it to take off with more fuel, to burn less fuel while in the air, and to reduce noise, smoke, and other pollutants.

A second **ANG unit has been selected to fly the F-15 Eagle**—the 116th Tactical Fighter Wing of the Georgia Air National Guard. The unit,

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based at Dobbins AFB, Ga., will receive the first of twenty-four F-15s in October 1986.

Production work for the Air Force on the first of **700 terrain-following radars** housed in the navigation pod of the **two-pod LANTIRN system** got a big boost recently with the award of a \$407 million contract to Texas Instruments Equipment Group. Produc-

tion of the 700 radar units will extend through 1992, according to TI officials.

For the first time in the US, **wake vortex flow visualization flight tests** are being conducted with a **commercial helicopter**, a Sikorsky S-76. The tests are being flown at the FAA Technical Center near Atlantic City, N. J.

Contracts have been awarded to two companies to develop competing preliminary designs for a **ground-based Terminal Imaging Radar (TIR)**. The TIR program is the second **major Strategic Defense Initiative sensor technology effort** that the Army has put under contract. Six-month contracts, valued at approximately \$5 million each, have been awarded to Raytheon Co., Wayland, Mass., and Westinghouse Electric Corp., Baltimore, Md. The TIR program will examine technology for a ground-based phased-array radar that can discriminate between reentry vehicles and the many other objects reentering the earth's atmosphere during an attack. The contracts include an option for a twelve-month second phase. If the option is exercised, the Army would select one or both of the contractors to refine their preliminary TIR design to assure that it can meet the technical requirements of the radar.

★ **AWARDS**—This month, three individuals will receive the newly created **National Air and Space Museum Trophy** for their achievements in the fields of **aerospace science and technology**. Two recipients—astronauts **Kathy Sullivan** and **Bruce McCandless**—will share an award for their contributions to the current Space Shuttle program. **Robert R. Gilruth**, the third honoree, was selected for his outstanding leadership in the space program in its early years. Sullivan was the first American woman to walk in space in October 1984 on Space Shuttle Mission 51-G. McCandless, who helped to develop the Manned Maneuvering Unit (MMU), was the first person to fly the MMU in space. Under Gilruth's leadership, the Mercury spacecraft was designed, developed, manufactured, and successfully tested.

The **Air Force Flight Test Center** at Edwards AFB, Calif., which is developing a revolutionary low-level, night, all-weather combat attack capability for single-seat aircraft in the **LANTIRN F-16 Combined Test Force** program, has received the **Air Force Systems Command Test and Evaluation Award**. The award, which covers the period from July 1983 through December 1984, is the top honor that can be given to an AFSC test unit.

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Richard D. Neumann and **James R. Hayes** of Aeronautical Systems Division's Flight Dynamics Laboratory have won the **1985 AFSC Test and Evaluation Award** for developing new techniques to evaluate wind-tunnel tests of hypersonic aerodynamic

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heating. The wind-tunnel tests produce data that is used to evaluate heating rates and effects on various airframes. The new techniques create more and more detailed data at significantly lower costs than previous procedures.



Capt. Randal E. Morger (standing) and Jeffrey P. Rhodes are new members of the **AIR FORCE Magazine** staff.

Morger and Rhodes Join Staff

Two new staff members joined **AIR FORCE Magazine** during the summer. Capt. Randal E. Morger, USAF, is a new Contributing Editor. He is working at the magazine for ten months under USAF's Education With Industry (EWI) program.

Captain Morger was commissioned through the AFROTC program at the University of Montana, Missoula, Mont., in 1974, where he majored in broadcast journalism. A major selectee, he was previously assigned to units in Air Training Command, Military Airlift Command, US Air Forces in Europe, and Tactical Air Command. Most recently, he was Chief of Public Affairs, 1st Tactical Fighter Wing, Langley AFB, Va.

He replaces Capt. Napoleon B. Byars, USAF, who has been reassigned to the Pentagon.

Jeffrey P. Rhodes came aboard in June as the new Staff Editor. He is responsible for a wide variety of tasks in both the editorial and production areas of the magazine.

Mr. Rhodes graduated from Clemson University, Clemson, S. C., with a degree in administrative management. In college, he worked in the school's Sports Information Office, where he gained writing, editing, and design experience. One of his feature articles was recognized by the College Sports Information Directors of America (CoSIDA) as the "Best in the District" for 1984. After graduation, he was Assistant Service Bureau Director for the Atlantic Coast Conference. At the same time, he served as the Public Information Officer for the Carolinas Wing of the Confederate Air Force.

He replaces Edward J. McBride, Jr., who has entered law school.

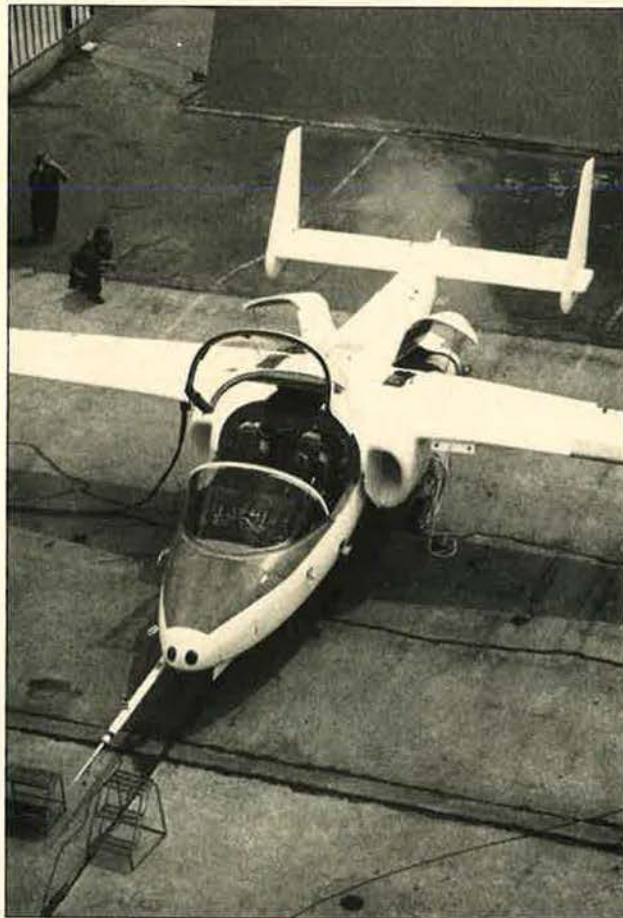
Combat: the



Capt. John Kelly, an aircraft commander with the 20th Special Operations Squadron, Hurlburt Field, Fla., has received the **Koren Kolligian, Jr., Trophy for 1984** for outstanding airmanship by an individual crew member in averting an aircraft accident or minimizing its seriousness. In November 1984, while flying an HH-53 helicopter with seven crew members and eight passengers on board, the tail rotor fell off while the aircraft was at only 800 feet of altitude. "His expert application of the controls slowed the aircraft's descent and kept it level and controlled," say Air Force officials. He prepared the crew for a crash and coaxed the aircraft toward a safe landing in a small clearing. This is the first known time that a helicopter has lost a tail rotor without causing fatalities, Air Force officials say.

MSgt. Gary Lemmonds of Offutt AFB, Neb., was awarded **\$6,000 recently for his 1983 suggestion** to replace old, uncomfortable, and worn and broken EC-135 interiors with those from Boeing 707 airliners in the Military Aircraft Storage and Disposition Center at Davis-Monthan AFB, Ariz. Offutt officials estimate that his suggestion has **saved the Air Force more than \$620,000** as of August 1985. ■

Engines are started for the first time on the Development, Test, and Evaluation aircraft No. 1 (DT&E 1) T-46A built by Fairchild Republic Co. at its Farmingdale, L. I., N. Y., plant. DT&E 1 has been shipped to Edwards AFB, Calif., for extensive ground and air testing before the new Air Force primary trainer, the first in thirty years, goes into production.



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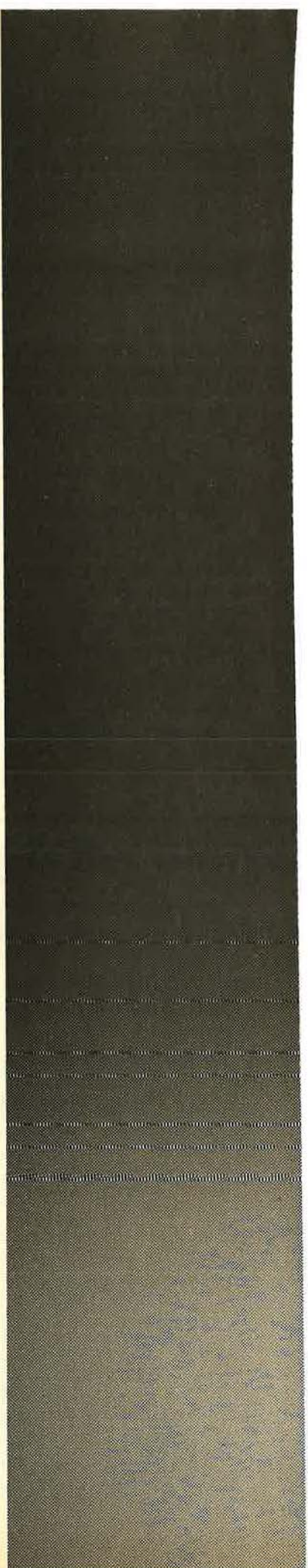
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Never before have the services shown such a spirit of cooperation. But that doesn't mean it's all sweetness and light.

The Ups and

A soldier from Fort Monroe, Va., headquarters of US Army's Training and Doctrine Command (TRADOC), gets a close-up briefing on USAF's F-15 fighter at neighboring Langley AFB, Va., headquarters of Tactical Air Command. The TRADOC-TAC team is spearheading and symbolizes the increasing cooperation between the two services. (Photo by Eddie McCrossan)



Downs of Jointness

BY JAMES W. CANAN, SENIOR EDITOR

WHEN James R. Schlesinger was Secretary of Defense in 1973, he addressed a state of affairs that has bedeviled all the civilians who have held that job before and since. "The tendency," he said, "[is for] each of the services to build into itself capabilities that will permit it to be independent of the other services."

"I don't think we can afford that," Dr. Schlesinger said. "I hope to get the services to look at the larger view more than they have. Each is obligated to think in terms of a common national defense rather than in terms of their separate interests."

Dr. Schlesinger made it clear that he was not advocating a totally purple-suit military force—far from it. The idea, he said, was to refine interservice relationships to "get the beneficial effects of interservice competition while avoiding the nefarious effects of interservice rivalries."

That is still the idea. It is now called jointness. Putting it into practice has a long way to go before the

utopia of thoroughgoing interservice cooperation in all appropriate spheres is realized, if ever.

In just the past few years, however, jointness has come into its own as a philosophy and as a practice that top US military leaders tend to swear by rather than shun.

Given the growing threat to the US and its allies and considering the increasing costs of military systems and operations, pooling resources for economical and effective firepower just makes good military sense.

The Joint Chiefs of Staff under Gen. John W. Vessey, Jr. (see "The Purple World," page 56 of this issue), and the Office of the Secretary of Defense are greatly responsible for the rise of jointness.

Examples of successful joint endeavors abound. They include spadework done by the JCS's Joint Planning Staff for Space for the smooth establishment of the Unified Space Command, the fast start of the Strategic Defense Initiative Organization (SDIO), the biservice



success of the Joint Cruise Missile Office, the great promise of the tri-service Very-High-Speed Integrated Circuits (VHSIC) program, and the solid progress of the Airborne Self-Protection Jammer (ASPJ) now in testing.

More joint efforts have probably been instituted in the arena of command control and communications (C³) than in any other—and with good reason. C³ commonality and interoperability are tough nuts to crack, but their taste can be very sweet.

The combined-arms Grenada operation in late 1983 stimulated much of the new interservice work on C³. It was a successful campaign, but it bared some disturbing problems of cross-service ground-air communications.

Within weeks after the Grenada campaign, the Joint Staff established its C³ Review Council of senior officers from all services to review and resolve urgent issues of C³ interoperability. That council comes under the Joint Staff's C³ System Directorate, as busy a shop as there is in the Pentagon.

Philosophies of Jointness

Jointness has become a byword in development, production, and testing of weapon systems and subsystems—even now of components—and in the doctrines, operations, and exercises of all the services.

Just over a year ago, the Joint Logistics Commanders (JLC) reported that fully one-fourth of all major acquisition programs involved two or more services. The JLC, made up of the commanders of Air Force Systems Command, Air Force Logistics Command, Army Materiel Command, and Naval Material Command, looked at eighty such programs and found them to be the wave of the future. It had this to say:

"Recent trends suggest that the future will bring a significant increase in joint-service development and procurement programs. These trends will require a fundamental change in the traditional single-service orientation of the services with respect to system acquisition."

The main reasons for this prognosis were listed by the JLC as follows:

- Increased doctrinal emphasis on joint warfighting and interoperability of forces.

- Deployment of emerging technologies that permit integration of multiservice C³I assets and force structures.

- Increased congressional demands for greater cost-effectiveness in military procurement.

More attention to joint programs will be necessary to offset critics' calls for military reform and, in that context, for an end to "alleged service parochialism," the JLC said.

Many such critics fail to acknowledge the substantial strides already made.

"There is as much attention to joint programs as I've ever seen," declares Dr. Thomas E. Cooper, Assistant Secretary of the Air Force for Research, Development, and Logistics.

Air Force Chief of Staff Gen. Charles A. Gabriel emphatically agrees.

"There is a spirit of cooperation and of working together in the Department of Defense that is unparalleled in my military experience," General Gabriel asserts.

Both men have had a great deal to do with bringing about the situation they describe.

Dr. Cooper was a prime mover behind the JLC study, together with Gen. Robert T. Marsh prior to the General's retirement last year as Commander of Air Force Systems Command.

General Gabriel and US Army Chief of Staff Gen. John A. Wickham, Jr., classmates at the US Military Academy in the 1950s, teamed up to promulgate a set of thirty-one Army-Air Force joint initiatives in developing and allocating weapons and other combat systems in accordance with the two services' mutual prosecution of the AirLand Battle doctrine.

A landmark document in its scope, spirit of give-and-take, and four-star luster, the Memorandum of Agreement embodying those joint initiatives may be the best thing that has happened to Air Force-Army relations since the first time a ground attack aircraft blasted an enemy tank off of an infantry company's back.

The MOA isn't just lying around on generals' desks looking im-

pressive, either. It is rapidly being expanded and put to work. At this writing, fourteen of the initiatives have been implemented, and several more have been added, some of them now involving the Navy and the Marine Corps as well.

The Changing Navy

Over the years, the Navy has been the military services' most reluctant partner. This has been evident not only in the acquisition and



GABRIEL: The spirit of cooperation is unparalleled in his military experience.

operational arenas, but also in the gimlet eye that the institutional Navy has cast on the Naval officers it has assigned to joint-program offices and even to the Joint Staff, supposedly the essence of jointness in the Pentagon.

By and large, Army and Air Force officers no longer fear, as once they did, that their pursuit of jointness in such purple-suit assignments as the Joint Staff will threaten, *ipso facto*, their green-suit and blue-suit careers. Not so the Navy officers, however.

This disparity was pointed out in a 1983 Defense Science Board report on joint acquisition programs. Among its five main recommendations for improving such programs, the DSB study panel, headed by Adm. Isaac C. Kidd, Jr., USN (Ret.), included "Navy career growth in joint-program offices."

"Testimony has been received," the DSB panel reported, "that, unlike other services, assignment to Joint Program Office duty by Navy personnel is viewed as limiting to [Navy] career growth."

There are ample signs, however, that this is changing from the top down.

Chief of Naval Operations Adm. James D. Watkins has come around to jointness, observers say. A year ago, for example, Admiral Watkins

Air and Sea Coordination

In 1982, General Gabriel and Admiral Watkins signed a Memorandum of Agreement that was nowhere near as extensive as the subsequent Air Force-Army MOA but that was, in its way, just as remarkable. Under it, the Air Force will help the Navy attack enemy ships and naval bases. USAF will operate AWACS aircraft in concert with Navy fighters and will use its fighters to cover Navy warships within

Navy. B-1B bombers with Harpoons would be even more formidable on antiship missions. They are built to carry Harpoons if it comes to that.

The Navy and the Air Force also have set up a joint training area in the Caribbean to integrate the procedures of their tactical air arms.

Both services are now concentrating on improving the commonality and interoperability of their C³ equipment and on school-



WATKINS: Under his leadership, the Navy is changing from a reluctant to willing partner.

played a major role at General Gabriel's Four-Star Commanders Conference, discussing maritime strategy and Air Force-Navy interoperability.

Moreover, nearly half of all major US joint military exercises now are maritime, with Air Force—and even Army—participation getting heavier all the time.

The Navy's past penchant for going its own way stemmed from its makeup and its mission. It has its own air arm and, in effect, its own army, the Marine Corps, for prosecuting war at sea and on littorals. The Army and the Air Force, on the other hand, must work together and are natural partners in land warfare. As General Wickham put it: "If we go to war, we go jointly."

Now it is far more likely that the Navy and the Air Force would go to war together, too.



LEHMAN: He has been a force for jointness and welcomes all the help the Navy can get.

range of Air Force land bases.

The idea is to have Air Force fighters out of Iceland, Greenland, the United Kingdom, and western Europe assist the Navy in covering the Soviet approaches to the North Atlantic. In southern Europe, the Air Force would help the Navy cover the Mediterranean. Air Force aircraft out of Okinawa, South Korea, and the Philippines would augment Naval coverage of the west Pacific.

Even with all its carrier battle groups optimally deployed, the Navy would be hard-pressed to cover all that territory by itself.

As part of the Navy-Air Force entente, the Air Force, which had long since performed ocean surveillance with B-52s, also clinched a ship-attack role for its strategic-range bombers. Two squadrons of B-52s are now equipped with Harpoon antiship missiles developed by the

ing Air Force AWACS and fighter crews in the procedures and tactics that Navy E-2C and fighter crews use in attacking ships and in defending carrier battle groups against attacks from the air.

For example, the Navy has a very precise set of tactics for approaching a hostile surface force. Air Force fighters can't just come on the scene and wing it. Also, Air Force AWACS and Navy E-2C aircraft use different conventions and references in vectoring their respective fighters.

All such warfighting wrinkles are being ironed out in fleet exercises that increasingly involve the Air Force. Air Force participation in the Navy's Fleetex '85 exercise in the Pacific was very extensive and involved AWACS aircraft, KC-135 tankers, F-15 fighters, F-4 defense-suppression Wild Weasel aircraft,

and B-52 bombers in mining and Harpoon-launching antiship roles.

According to General Gabriel, the Navy has become a "full-up participant" with the Air Force and the Army in the drive for a common combat Identification Friend or Foe (IFF) system and for closer cooperation in munitions research, development, testing, and evaluation. The Navy is also aboard on some Air Force avionics programs—for example, the Integrated Communication, Navigation, and Identification Avionics (ICNIA) program at AFSC's Aeronautical Systems Division at Wright-Patterson AFB, Ohio.

The ICNIA program is geared in great measure to USAF's Advanced Tactical Fighter (ATF) development program, aspiring to ATF deployment in the early 1990s. Now ICNIA is also becoming pertinent to the Navy's Advanced Tactical Aircraft (ATA) development as well.

Even though officials of both services anticipate that the ATF and the ATA will have different airframes and different engines, they believe their avionics will have much in common and may indeed be indistinguishable. "What you see coming more and more are baseline systems with modifications, making them, say, ninety percent common and ten percent unique," explains USAF's Dr. Cooper. "New technologies are making this possible."

Air Force and Navy fighters would have had a lot more in common a long time ago if the Navy had not dropped out of an important joint development program in the early 1970s. The Navy had teamed up with the Air Force to develop an engine for both the Air Force F-15 and the Navy F-14, but jumped ship. It turned to the TF30 engine, then in production, for its F-14.

The Air Force persisted in the engine development program, footing the bill and tackling the problems alone. The payoff was worth it. The program produced the F100 engine, which, with its superb thrust, was selected to power Air Force F-15s and, later on, F-16s as well.

Meanwhile, the TF30 engine kept the Navy F-14 from being all that it could be. The swingwing F-14 has never had enough thrust to enable it to perform as well as its superb aerodynamics would allow.

Having learned its lesson, the Navy subsequently teamed up with and stayed with the Air Force in the 1980s Alternate Fighter Engine program, which gave birth to the General Electric F110 engine and the Pratt & Whitney F100-PW-220 engine, an upgrade of the original F100.

The Navy will put F110 engines on future F-14s and retrofit them on existing F-14s, thus attaining a much greater degree of combat ef-

fectiveness and efficiency up, and to work more earnestly at melding their systems, doctrines, and missions to all those ends.

Secretary Weinberger specified that the Navy should take advantage of Air Force capabilities in maritime operations because "the combined assets of the Navy and the Marine Corps are insufficient to meet the threat in all areas."

He also addressed this point in a



WICKHAM: He teamed up with General Gabriel in the landmark Army-Air Force agreement.

fectiveness, thanks to jointness, over the oceans.

The Air Force too will benefit from the Alternate Fighter Engine program in a big way. It will buy many of both the F110 and F100-PW-220 engines, and the competition between the two manufacturers for annual sales to USAF is already keeping down the costs of both.

Growth of Joint Operations

Much of the impetus in Air Force-Navy cooperation (indeed, in all interservice cooperation) sprang from Secretary of Defense Caspar W. Weinberger's "Defense Guidance" to the services in 1982.

Widely ignored or scarcely mentioned by Weinberger critics who charge him with letting the services do and buy anything they want, that document signified just the opposite. It told the services to get

speech at the Naval War College, Newport, R. I., declaring:

"Neither the Navy nor any other service is ever going to go to war by itself. Military objectives can be achieved only by joint planning and operations that integrate all combat arms."

The Weinberger Defense Guidance also urged the Navy, with its carrier-based attack aircraft and long-range cruise missiles, to take a hand in a European mission long reserved for the Air Force—hitting tactical targets in support of inland Army campaigns. The Navy has been equipping some of its attack submarines with long-range, land-attack, nonnuclear Tomahawk cruise missiles to do just that.

Navy air has already demonstrated its capability for supporting ground combat operations, of course. Carrier-based fighter and

attack aircraft did yeoman work over Vietnam.

With varying intensity, all Secretaries of Defense have urged greater combat-capability jointness on the services. However, Secretary Weinberger's urging had the advantage of timing in getting the services' very sincere attention.

Dr. Richard D. DeLauer, Under Secretary of Defense for Research, Engineering, and Acquisition at the time, put it into perspective for Congress.

"What is different now," Dr. DeLauer testified, "is that vastly greater threats demand cooperation and efforts to achieve combined effectiveness.

"At the same time, technology and advances in management now offer opportunities which previously appeared to be beyond our grasp. These include chances for joint activities to help significantly in offsetting the dangerous superiorities which continue to confront us and our allies.

"Economy and efficiency are still cornerstones of any cooperative effort. But the bottom line must remain combat effectiveness. Achieving that goal at the lowest possible cost is our common purpose."

The Army-Air Force initiatives reflect a keen sense of all the above.

Planning to Work Together

The most fundamental and far-reaching of the initiatives is the one in which the two services now work together in crafting their respective Program Objective Memorandums (POMs) each year.

The POMs are the first step in the tortuous formulation of the annual defense budgets. By tackling them together, the Army and the Air Force establish a united front not only in dovetailing their requests for resources but also in defending those requests with double strength as the budget-drafting process goes forward in OSD.

These days, in a departure from past practice, the services' POMs also reflect the priorities of the Commanders in Chief of the Unified Commands, the CINCs. Thus, the POMs give bigger play to the war-fighting needs of the CINCs, and those needs are drawn together in Army-Air Force POM deliberations.

The Army-Air Force MOA also committed the services to realign some of their weapon systems and electronic systems and to winnow some duplicative missions and systems.

For example, the services got together on developing a common radar for deployment aboard Air Force C-18 aircraft rather than on the OV-1 aircraft that the Army had wanted in constituting the Joint Surveillance and Target Attack Radar



WEINBERGER: His Defense Guidance prodded the services to get together more earnestly.

System (JSTARS). The Air Force agreed to cancel its Comfy Challenge ground-based electronic warfare program and to let the Army come up with such an EW system for both services. The Army agreed to cancel its program for an airborne radar-jamming system, giving that task to the Air Force.

Both reaffirmed the Air Force's exclusive responsibility for providing close air support with fixed-wing aircraft (see "Coordinating the Air-Ground Battle," page 64).

The two services took a big step toward exchanging a couple of traditional missions. The Air Force proposed putting the Army in charge of providing helicopter support for Special Operations Forces (SOFs), and the Army agreed to lead a joint study of the feasibility of letting the Air Force take charge of area surface-to-air missiles.

The services also demonstrated that joint systems, for the sake of joint operational effectiveness, are not always the best way to go. They decided that each will be better off pursuing its own version of a Tactical Missile System, and so the two services took the "J" out of the JTACMS program.

The biservice agreement covered a lot more territory—ground defense of air bases, countering the threats of helicopters and tactical

missiles, suppressing enemy air defenses, conducting search-and-rescue operations and night combat, and training air liaison officers and air controllers, to name but several.

Working Out Differences

The job of fashioning joint doctrines and procedures in keeping with the landmark Army-Air Force agreement falls to USAF's Tactical Air Command (TAC) and to the US Army's Training and Doctrine Command (TRADOC), near neighbors at Langley AFB, Va., and at Fort Monroe, Va., respectively. Those commands' means of doing that job is the Army-Air Force AirLand Forces Application Agency (ALFA) at Langley.

ALFA originates the procedural and doctrinal documents that spell out for the combat units of both services how and why enemy air de-

fenses and rear echelons, for example, must be attacked in accordance with AirLand Battle.

The stuff of ALFA's work is to make Air Force ground-attack aircrews understand that they must make a special effort to take out those enemy air defenses so that, for instance, the JSTARS aircraft can fly where it has to fly to do its recon and targeting job.

By the same token, Army artillerymen, for example, are given to understand and that there are times when they too must take some unaccustomed and unwelcomed actions in the name of combat teamwork, such as diverting their tubes to shell enemy air defense units instead of directing those tubes at targets that the infantry wants them to hit closer to the Forward Line of Troops (FLOT).

"We know we have to help those F-16s get to their targets and come back to fight again," says an Army officer at ALFA.

ALFA has been in business since 1975 and has enjoyed the unstinting support of all the Army and Air Force four-stars who have commanded TRADOC and TAC through the years since. The agency got a tremendous shot of adrenalin, however, from last year's Army-Air Force compact, which came right down ALFA's alley from the lofty level of the Chiefs of Staff.

"The Chiefs can make things happen like no one else," says an ALFA Air Force officer.

Indeed, ALFA's work was instrumental in paving the way for and in bringing about the Army-Air Force MOA.

For example, ALFA wrote the manual on Joint Attack of the Second Echelon, called J-SAK, that sets forth the Army-Air Force command and control relationships and targeting procedures needed to attack enemy rear echelons. The manual was published in 1982 as a TAC-TRADOC-US Readiness Command (USREDCOM) document. It was briefed to major commands in the US, Europe, and the Pacific and to the Army and Air Staffs at the Pentagon. It is now ingrained as Army-Air Force doctrine.

ALFA's documents on joint concepts, procedures, and requirements range widely. Recent exam-

ples include those on Joint Suppression of Enemy Air Defenses (J-SEAD), Joint Counter-Air/Air Defense (J-CAAD), and Joint Command Control and Communications Countermeasures (J-C³CM). There are many others.

The five Air Force officers and five Army officers who make up ALFA, which is commanded by Army Col. Garry P. Hixson with Air Force Col. Ronald E. Henry as his deputy, are an enthusiastic lot. They know that they have something going that is getting bigger all the time.

Now the Navy is sending officers from its Atlantic Command headquarters in nearby Norfolk to observe and to begin taking part in ALFA's work.

Lingering Interservice Friction

Despite the ample evidence of increasing interaction among the services, all is far from sweetness and light. Resistance to jointness still runs high in some circles, and problems persist.

For example, the Air Force and the Navy continue to joust over the best means of making their tacair communications effectively interoperable through the Joint Tactical Information Distribution System (JTIDS).

And the Air Force-Army MOA has had rocky going (no one ever thought it would be completely a piece of cake) in some of its elements. Its provision that the Army would take command of what are now Air Force Special Operations Force (SOF) helicopter units caused some to raise Cain inside the Air Force and was put on hold by OSD. At this writing, moreover, it also seems that the MOA's suggested transfer of area SAMs from the Army to the Air Force will be more difficult than anticipated.

Some Navy attack submariners claim they have enough on their hands without taking on the land-attack mission with cruise missiles, too.

Some Air Force officials, taking note of the budget-crunch threat to USAF's planned buildup and modernization of tacair units for traditional Air Force missions, have mixed feelings about drawing on such units to help the Navy control the seas.

There is also concern in the Air Force that the Navy may pull out of the Air Force-Navy codevelopment program for the much-needed launch-and-leave Advanced Medium-Range Air-to-Air Missile (AMRAAM). The program is in deep trouble in Congress because of its cost. Congress is threatening to kill the AMRAAM program unless Secretary Weinberger, who has been down on it lately, certifies his renewed confidence in it no later than next March.

Meanwhile, Congress is moving to provide technology development funding for the AIM-7X, a next-generation, radar-guided, beyond-visual-range air-to-air missile conceived by the Navy.

Air Force officials say that the AMRAAM program is as good as dead if the Navy abandons AMRAAM in favor of the AIM-7X or signals Congress that it wouldn't mind doing so. Such officials insist that AMRAAM will be a much better and more cost-effective missile than the AIM-7X, if given adequate time to prove itself.

What is shaping up here is a situation wherein the Air Force may once again be compelled to turn to an air-to-air missile conceived and developed by the Navy, just as it did many years ago with the original AIM-7 Sparrow and the original AIM-9 heatseeking Sidewinder.

The Air Force is the lead service in developing AMRAAM, but the Navy would almost certainly be the lead service in developing the AIM-7X.

All the services tend to support joint programs much more heartily when they are the leaders, not the followers, in such programs. However, many civilian proponents of interservice collaboration don't care which service takes the lead just so long as the program is a joint one. This approach was reflected in a General Accounting Office report at the end of 1983 with the title: "Joint Major System Acquisition by the Military Services: An Elusive Strategy."

Addressing joint acquisition of air-to-air missiles and fighter aircraft, the GAO report said:

"Most military technologies and activities overlap or interrelate to one degree or another. A service may monitor another's system de-

velopment, exchange ideas, or buy another service's finished product. These are good ways to conserve development costs and avoid duplication.

"The Marine Corps, for example, often benefits from developments in other services.

"The Sparrow and Sidewinder air-to-air missile programs, although of single-service origin, have brought the Navy and the Air Force together for periodic missile updating and to share procurement. The Army also uses a Sidewinder variant in its Chaparral surface-to-air defense system.

"The collaboration appears satisfactory to all. Other examples include the use of the Army's Black Hawk helicopter airframe and engine in Navy (SH-60B) and Air Force (HH-60A) helicopter programs.

"A service may also buy another's end product, as the Air Force bought the Navy's A-7 and F-4 aircraft, and modify them to meet its needs. If subsequent customizing is moderate, this saves development money and reduces duplication."

This is all well and good. But it remains obvious to this day that the Air Force would have much preferred to have developed—or to have taken the lead in developing—its own air-to-air missiles and fighter and attack aircraft. It would almost certainly resist any move toward a repeat performance of the F-4, A-7, Sparrow, and Sidewinder sagas, and so, on the other side of the coin, would the Navy.

One thing is absolutely clear. Neither of the services would ever again acquiesce in the development of any aircraft intended to be all things to both of them. The nightmarish TFX/F-111 experience of the 1960s lingers painfully in their memories.

There seems to be little reason for such concern. These days, commonality is being approached with much more sophistication in deference to the services' singular requirements and begins very early in the ecumenical exploration of technologies.

Technology—The Tie That Binds

Jointness is rampant in technology base programs. A major reason

for this is the fast-rising importance to all the services of digital electronics and attendant technologies and of their great potential for common embodiment in such systems as fire controls and flight controls.

Joint technology programs in electronics just won't quit. This is also becoming the case in propulsion. Among especially notable examples are the VHSIC program, the Ada high-order computer language program, the Computer Software Initiative program, and various advanced propulsion technology programs.

In just the past few years, many management offices have been established by OSD to coordinate, if necessary, the services' complementary efforts in such technology endeavors. These include the Advisory Group on Electronic Devices, the Joint Army, Navy, Air Force, NASA Interagency Propulsion Committee, and the Joint Services Guidance and Control Committee.

Given the increasing accent on jointness at the exploratory level of technology development, the Defense Advanced Research Projects Agency (DARPA) is having a heyday.

At the other end of the development-deployment spectrum, joint testing and evaluation of systems and subsystems is also on the rise and is centered in OSD's Joint Test and Evaluation Program.

More than thirty joint testing programs have been initiated in that program. These involve hardware in such arenas as Identification Friend, Foe, or Neutral (IFFN), forward-area defense, logistics over the shore, and electro-optically guided weapons countermeasures, counter-countermeasures, and data-link vulnerability.

For the services, clasping hands on a program is one thing, but holding the handshake when the sweat starts to flow may be quite another. Some tough tradeoffs crop up.

The four-service JVX tilt-rotor aircraft program exemplifies these difficulties. All the services have agreed to develop the JVX in accordance with a common set of mission requirements. For the Air Force, that's the rub.

For its special purposes, USAF needs the troop-carrying JVX to fly faster and go farther than the other

services deem necessary. However, since the Air Force is looking to buy a relatively small portion of the total number of JVX aircraft now planned for eventual production, it is in no position to drive the design of the machine to meet its special requirements for bigger, tougher, and more costly engines and transmissions than the other services think they will need.

Thus, the Air Force has to scale down its requirements for the JVX and to come to terms on the absolute minimum performance it can abide as a continuing player in the JVX program.

The Thorn of C³

Harmonizing mission requirements is the first order of business in and the key to the successful design and development of all joint systems. This is why it is often difficult to reconcile the services' C³ hardware.

In combat, for example, the Army's communications are much more voluminous and diverse than those of the Air Force. Ditto those of the Marines in relation to the Navy. Also, Air Force fighter crews, in keeping with their tactics, rely heavily on voice transmissions. Navy fighter crews rely more on digital transmissions. This disparity is at the heart of the Air Force-Navy struggles over JTIDS voice and data links.

The JTIDS program is also an example of one in which development went so far forward to meet the requirements of one service, the Navy, that adjusting it to meet the requirements of the Air Force as well is difficult.

As one Pentagon official puts it: "That program needed to be walked back. Getting compatibility while going backward is always tough. When you allow a program to start and go forward under one service and then try to make a shotgun wedding with another service, it usually doesn't work very well.

"The services fly their flags in the development process, not in the production process," this official adds.

When mission requirements are more or less compatible to begin with, it is much easier to bring the services together in systems development programs. The Army-Air

Force JSTARS program comes to mind.

In a program called SOTAS—for Stand-Off Target Acquisition System—the Army was developing a radar to put aboard helicopters or propeller-driven aircraft (the OV-1) that would pick up moving ground targets not all that far behind the battle lines.

The Air Force, on the other hand, developed another radar in its Pave Mover program that would take a

swering all those basic and intertwined questions. They are the generals and admirals whose combined-arms forces use the systems to execute the doctrines in accomplishing the missions.

This is why the recent inclusion of the CINCs' say-so in the services' POMs is viewed as a major milestone in the forward march of jointness.

The CINCs' participation in the Defense Department's Planning,

Their "visibility is now very high throughout the PPBS process," Secretary Taft maintains.

In this vein, Mr. Taft contends that "the changes we have made in the past two to three years—enhancing the participation of the CINCs and the JCS, in particular the Chairman—have been consistent with the thrust of most of the proposals [for reform of OSD and the JCS] that I've seen. The changes have been helpful to Secretary Weinberger and to me, and there will be more. But I'm basically satisfied with where we are now," the Deputy Secretary of Defense declares.

He also cautions, "Jointness is not, in itself, always our objective. In preparing programs and budgets, it is always a point to be considered, but it should not be regarded as a virtue in the abstract."

Other officials—civilian and military—strike the same cautionary note about continuing to increase the clout of the CINCs in the resources-allocation process.

They worry that it could go too far. They point out that the CINCs, who may have to go to war at any time, naturally take a short-term view that in general assigns higher priority to funds for readiness than to funds for modernization.

"That could get out of hand," warns one military officer. "The JCS is responsible for the long look ahead, meaning modernization, and its influence could be eroded."

By and large, military reformers allege that the service Chiefs of Staff are too beholden to their respective services and often fail to put aside parochial considerations and get together in endorsing enlightened joint warfighting and acquisition requirements. Also, critics have charged that such parochialism results in JCS decisions born of compromise, not of boldness. This, in turn, prevents the Chairman from giving the best and most imaginative military advice to the National Command Authorities, the military reformers claim.

As a result, they insist, jointness in the US military establishment is more reactionary and indicative of the *status quo* than it is progressive and innovative.

Insiders take strong issue with such allegations. Even while con-



TAFT: Jointness should be considered in the PPBS process but isn't "a virtue in the abstract."

deeper look behind the lines from a fixed-wing jet, the TR-1 or the C-18.

The JSTARS program got off and running only after the Army agreed that a common radar aboard the C-18 would be the best way of meeting both services' depth-perception targeting requirements.

As in JSTARS, a crucial question that must be answered at the outset of all joint programs is whether or not they will support the military doctrines of the services involved. Another one is whether or not new technologies becoming available for joint systems will make it possible for the services to modify their doctrines into a happy marriage. Still a third is if the services see eye to eye on mission needs.

Dollars and Sense of Jointness

The CINCs come into play in a very big way when it comes to an-

Programming, Budgeting System (PPBS), which begins with the POMs and from which all funding eventually flows, now goes well beyond their inputs to the POMs. The CINCs also attend meetings of the Defense Resources Board (DRB), a panel of top-level civilian and military leaders in OSD and the services that perches atop the PPBS pyramid and that makes the final, collegial decisions on who gets how many dollars for what.

The DRB, now in its stretch drive of preparations for the Fiscal Year 1987 defense budget to be submitted to Congress next January, is scheduled to hear from the CINCs again this month.

Deputy Secretary of Defense William H. Taft IV, who is the chairman of the DRB and thus calls its shots, was responsible for interjecting the CINCs into DRB deliberations.

ceding that there is plenty of room for improvement, they claim that the latter-day advancement of jointness in OSD, in the JCS, and in the services themselves should be enough solid evidence to satisfy the reformers.

For example, General Gabriel, in a speech at the Air War College earlier this year, declared that "the criticisms [of the JCS] are wide of the mark.

"Sure there are flaps between the Chiefs," USAF's Chief of Staff continued, "but General Vessey has set the right tone and behavior. All the Chiefs are committed to maintain the confidence of the American people and to support increased joint-service exercises, training, and interoperability to get the most effective and affordable defense. We are cutting out duplication and filling the voids."

Secretary Weinberger had this to say:

"Organizational changes are sometimes desirable and necessary, and we've made some—in the acquisition area particularly. But I don't find that the way the Joint Chiefs are now working requires reorganization, and I don't think that the reorganizations proposed, in many cases, are going to improve the situation.

"What's needed is a very careful look at all the things we're doing in the form of acquisition, and we [OSD] and they [the JCS] are doing that."

Centralizing Control of Resources

Jointness has been the driver of a great many of those changes. One of the most important was OSD's creation last year of the heavy-hitting Joint Requirements and Management Board.

Comprising the Vice Chiefs of the four services and the Director of the Joint Staff, the JRMB is charged with overseeing and selecting joint programs across the board. Its establishment had been urged by the Defense Science Board and was subsequently hailed by the Joint Logistics Commanders in the 1984 JLC report on joint acquisition.

That report made it very clear that the joint-program scene badly needed a top-level management body like the JRMB. It said that the

services had "no formal policy or criteria for selecting joint programs," were "largely ineffective" in identifying joint-program opportunities, and were so wrapped up in their own requirements that their reviews of each others' requirements were "perfunctory, with little meaningful feedback."

No wonder, said the JLC, that "a significant number of joint programs have experienced severe problems [and] a high incidence of service withdrawals, particularly from OSD-initiated programs," which constituted "more than half of all joint programs."

Moreover, according to the JLC: "average cost and schedule growth rates for joint programs have been significantly higher than the growth rates for single-service programs."

The new JRMB stepped into this sloppy scene and right away started tidying it up. It reviewed the services' requirements for deep-attack weapons and cut their individual programs for such weapons from seven to three—two of them joint. The savings in life-cycle costs are estimated at about \$3 billion. The JRMB also restructured and shortened the demonstration and validation phase of the Army-Air Force-NATO Mark XV Combat Identification System.

At this writing, the four-star board is considering the opportunities for joint programs in some fairly cluttered arenas—remotely piloted vehicles (RPVs), electronic warfare, wide-area surveillance, and the Worldwide Military Command and Control Information System.

The JRMB reports directly to the JCS, which has put its Joint Staff to work on improving joint operational and acquisition capabilities.

The Policy Division of the Joint Staff's Plans and Policy Directorate (J-5) has been assigned central responsibility for the development of joint warfighting and interoperability plans.

Moreover, two powerful and relatively new Joint Staff agencies—the Strategic Plans and Resource Analysis Agency (SPRAA) and the Joint Special Operations Agency (JSOA)—are going full blast.

Not much can be said about the JSOA, but there is no secret about SPRAA. One of its main jobs is to make sure that the CINCs' priorities

find a home and are not lost in the shuffle in the JCS.

Joint Operations—Flawed But Working

The CINCs (and jointness in all its forms) owe a lot to General Vessey. On becoming Chairman of the Joint Chiefs of Staff, he had the Joint Staff and the Unified Commanders review all the nation's war plans.

General Vessey then invited the CINCs to brief the plans to the JCS. He followed up by directing the CINCs to develop "joint doctrine warfighting manuals."

This was a major step forward in operational jointness, and it primed the CINCs for their newly activist role in DoD's PPBS process.

It has also had exemplary results. At this writing, US European Command is nearing completion of a joint doctrine for theater counterair and is working up joint doctrine for Follow-On Forces Attack (FOFA)—a concept that squares with the AirLand Battle concept and that is espoused by Supreme Allied Commander Europe (SACEUR) Gen. Bernard W. Rogers for attacking Warsaw Pact second-echelon forces.

US Atlantic Command is forging joint doctrine for air maritime operations. USCINCLANT (Navy) has signed an MOA with USAF's TAC and the Army's TRADOC for developing joint operations concepts, tactics, and procedures. This explains why Navy officers are now more frequently in evidence at the TAC-TRADOC ALFA offices at Langley AFB, Va.

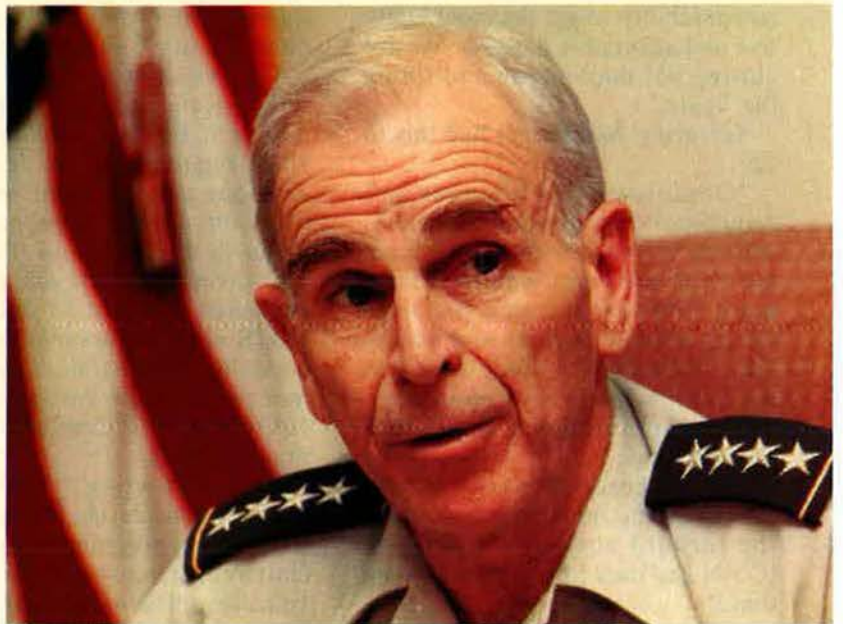
Even when critics of the military establishment acknowledge the overwhelming evidence of strong momentum in jointness, they claim that a great deal of it is "personality dependent," meaning that it stems from General Vessey's personal predilections to jointness and from, for example, the long-standing personal relationship of onetime West Point classmates Generals Gabriel and Wickham.

Even when personalities are put aside, though, it is apparent that jointness has come so far that there is no turning back. As one senior officer puts it:

"Jointness is an attitude more than it is anything else, and it has caught on." ■

As President Eisenhower told Congress in 1958, single-service operations are gone forever.

The Purple World



BY GEN. JOHN W. VESSEY, JR., USA
CHAIRMAN OF THE JOINT CHIEFS OF STAFF

WHEN AIR FORCE Magazine asked me for some words for this issue, I was happy to accept as a way of saying “thanks” to the men and women in the Air Force—active, Reserve, and Guard—for their great service to the nation in peace and in war and for the wonderful cooperation and support that I, personally, have had from the Air Force since it was formed.

I also accepted the invitation to write this article for a second reason. This special issue of AIR FORCE Magazine on jointness and interservice cooperation is especially well timed. The subject is vital to the defense of the nation, and there is a great story to be told. Today, there is more going on in equipment modernization, in training innovations, and in the development of tactical doctrine for joint operations and unified action of our armed forces and for combined operations with our allies than ever before in our history. Those of us charged with the responsibility to set the course for the future of our armed forces have tried to leave four tools for the future: good people, good equipment, good op-

erational concepts, and good training to tie the other three together. That work is never done, and the challenge for those who serve today and in the years ahead is big and exciting. Those of us who lead today have been able to build on the work of those who preceded us. Those who follow will build on our work.

A few years ago, Bobby Knight, our great Olympic basketball team coach, said, "Everyone has the will to win, but the problem is that not everyone has the will to prepare to win." Similarly, if the armed forces don't prepare for war, we will not deter war and we will surely not win the war should war occur. The challenge for the armed forces is to prepare now—in peacetime—for the way we will have to fight in the years ahead.

We don't want war; we want to prevent it. On the other hand, war is our business, and the better we are at it, the better our chances will be of preventing war. Certainly, we cannot be 100 percent accurate as we look into the future, but one of the things we know about future wars from looking at past wars is that President Eisenhower was absolutely right when he told Congress in 1958 that single-service operations are gone forever. The United States is blessed with four service Chiefs of broad strategic vision who recognize that reality and who are committed to ensuring effective unified action and joint operations of the armed forces under the direction of the Commanders in Chief of the Unified and Specified Commands.

Directing unified action and joint operations requires extraordinarily good command and staff work by commanders and staffs who understand the operational capabilities and limitations of the forces in all four services and who understand how to direct those forces to fight together. Those commanders and staff people are in joint and combined headquarters, and they're often affectionately and sometimes disparagingly called "purple-suit" people.

Purple People

Gelett Burgess once wrote:

I never saw a purple cow,
I never hope to see one;
But I can tell you, anyhow,
I'd rather see than be one.

The word "purple" first became associated with the "joint system" during World War II when the Joint Chiefs of Staff first began to function—some five years before they were first recognized in law. There are several different theories about the association of purple with joint military ventures. One is that the color purple symbolizes the intermingling of the whites, blues, greens, tans, reds, and gold and silver found in all the service uniforms and insignia. The theory would make purple the joint color and symbolize the motto of the Armed Forces Staff College: "That All May Labor as One." Another theory is that the purple designation comes from the color of the ink on the first duplicating machines of the JCS in the 1940s.

Whatever the theories about the connection of purple with the concept of joint operations, I sometimes find a lack of understanding of "jointness" in the armed forces. Some have the idea that joint operations means high

headquarters and paperwork, far from the action. I want to dispel that notion. Joint operations is the Navy coxswain of a landing craft putting Marines or Army troops ashore at the right place and time. Joint operations is an Air Force fighter pilot dropping bombs where an Army infantry company commander asks to have them. Joint operations is a Navy destroyer gun crew supporting Marine or Army infantry on the beach. Joint operations is Air Force bombers supporting a Naval task force. Joint operations is Army field artillery firing anti-aircraft suppression missions for Air Force fighters. Joint operations is when the unique combat capabilities of two or more of the services come together to make the whole greater than the sum of the parts in order to kick the tar out of the enemies of the United States.

Unified action of the armed forces comes from employing the forces of the components of the Unified Commands under the direction of a single commander to achieve the strategic objectives laid out for that com-

As Chairman of the Joint Chiefs of Staff, Gen. John W. Vessey, Jr., USA, inspects the guard at the Great Lakes Naval Training Center, Ill. A soldier's soldier with impressive combat credentials, General Vessey came to military preeminence up through the ranks.



mand. Of course, the ultimate in unified action is the national direction of the Unified and Specified Commands to carry out the nation's strategy. Hence springs the need for those commanders and staff—the "purple-suiters"—to direct the forces. It was in recognition of that fact that the 1947 National Security Act was amended in 1958 under President Eisenhower's guidance to provide for "a system of operational commands that are truly unified, each assigned a mission in full accord with our objectives."

As the reader can see from the few illustrative examples I cited, "jointness" cannot be confined to headquarters. If we are to carry out joint operations and unified action successfully, the capability and willingness to work together must permeate the armed forces from top to bottom.

Our global strategy is a coalition strategy. We have fought three major wars in the last forty-five years, all of which required close cooperation with allies. Should we have to fight again, we will do so in cooperation with our allies. We share with a number of nations common goals and objectives, and they have willingly joined us to

defend the freedom and values we cherish. Those nations have their own military heritages—some of them very compatible with ours and some not so compatible. Our languages and cultures may be different. The task for us is to build and maintain forces and to exercise and train them so that our forces can operate effectively as joint teams and with the forces of our allies in combined operations.

Preparing for Joint Action

There are two facets to the task. One is training the forces—those of our own services—to operate together; the other is building and training the staffs to help the commanders direct joint and combined operations.

Concerning the latter facet of the task, a variety of people have suggested that the right way to build those staffs is to construct a corps of staff officers whose Army, Navy, Marine Corps, and Air Force pigment has been washed away in purple. The officers would spend most of their time in joint assignments. Those who believe that idea to be incorrect, and I am one of them, cite either of two reasons.

The first reason, and the one most often cited, is that such an idea is contrary to the intent of Congress in drafting the 1958 Reorganization Act. It is correct that Title 50, Section 401, US Code, as amended, says the law is not intended “to establish an overall armed forces general staff.” Certainly, the law makes good sense, but the people on the other side of the argument can correctly point out that circumstances have changed. If they’ve changed enough to require an Armed Forces General Staff, then Congress can surely change the law.

The correct reason for not wanting joint staffs peopled by officers whose service connections have been washed away is that joint headquarters are operational headquarters. Those headquarters need operationally oriented staff officers who are current in the operational concepts of each of the services. The needed operational knowledge is best acquired by serving with the operational forces of the services. Yes, knowledge of the unique tools of the joint commands—the Joint Operational Planning System, the Joint Deployment System, the national intelligence systems, the joint and combined command and control systems, and the joint logistics and mobility systems—is important to the joint staff officer. But that can be learned. The service staff colleges, the Armed Forces Staff College, the War Colleges, and special staff training at joint headquarters can all help to pass on that knowledge. On the other hand, there is no way to compensate for a lack of current operational knowledge among the staff officers of joint and combined headquarters. The only system I know that will work well is having a steady exchange of top-notch officers and noncommissioned officers between the operational forces and the joint staffs.

If thorough expertise in his service skill is the most important ingredient an officer brings to joint staff duty, the next most important ingredient is skill as a staff officer to help the commander weld the forces of all services together as a unified fighting team. Some of the ingredients of that skill are mechanical and, as I pointed out, are easily dealt with through education and training. Other ingredients are attitudinal and come from intelligence, experience, and maturity. I am convinced that

serving under the right sort of leadership has much to do with shaping those attitudes.

In our system, service pride and loyalty are healthy attributes, even when serving in joint outfits. Our airmen are good, our soldiers are good, our Marines are good, and our sailors are good. I’d be very disappointed if they didn’t recognize and take pride in their own skill. On the other hand, none is more important than the others. All are essential. I’d also be very disappointed if each didn’t recognize and take pride in the skills of his comrades in the other services.

Service parochialism—attempts to advance the interests of one’s own service at the expense of the effectiveness of the joint team—has no place in joint assignments or joint operations. Since the only way we’re going to fight is jointly, I conclude that petty service parochialism has no place in our armed forces.

Leadership has to set the example and create the climate. The Secretary of Defense, the Joint Chiefs of

Chairmen of the Joint Chiefs of Staff

General of the Army

Omar N. Bradley, USA	8/16/49	8/14/53
Adm. Arthur W. Radford, USN	8/15/53	8/14/57
Gen. Nathan F. Twining, USAF	8/15/57	9/30/60
Gen. Lyman L. Lemnitzer, USA	10/1/60	9/30/62
Gen. Maxwell D. Taylor, USA	10/1/62	7/3/64
Gen. Earle G. Wheeler, USA	7/3/64	7/2/70
Adm. Thomas H. Moorer, USN	7/3/70	6/30/74
Gen. George S. Brown, USAF	7/1/74	6/20/78
Gen. David C. Jones, USAF	6/21/78	6/18/82
Gen. John W. Vessey, Jr., USA	6/18/82	9/30/85
Adm. William J. Crowe, Jr., USN	9/30/85	

Staff, and the entire chain of command in the Unified and Specified Command system must build the joint operations climate. The same is true on the administrative and “force-building” side of the house—the services. The service Secretaries and the Chiefs of the services (wearing the second of their two hats) must imbue their entire service organizations with the idea that their mission is to organize, equip, train, and support forces that will fight as a part of a joint or combined team under unified or allied command.

The right conditions exist today. Secretary Weinberger understands, uses, supports, and promotes the joint system. The same can be said for the Joint Chiefs.

Doctrine and Interoperability Issues

The other part of making “purple forces” comes from having good joint doctrine, joint tactics, good techniques and procedures, equipment that supports joint and combined operations, and good joint and combined training to tie it all together.

Such modern technological developments as the use of space, the speed of today’s means of mobility, and the

improved range, accuracy, and lethality of the weapons of today and tomorrow call for joint doctrine that makes the most of those capabilities. Recognizing that fact and coupling it with the fact that our forces will fight under the command of the Commanders in Chief of the Unified and Specified Commands, the JCS have set about to involve those Commanders in Chief in the development of doctrine and techniques to take advantage of tomorrow's weapons and forces. A pilot program is under way now. It will help the JCS refine the system for keeping joint operational doctrine and techniques ahead of tomorrow's enemies and consistent with tomorrow's technology.

In battle, having ammunition that doesn't fit your weapon or landing at an airfield that can't service your airplane can range somewhere between embarrassing to downright disastrous. Being in serious danger and being within range of help of friendly forces but being unable to get help because you can't talk to the other friendly

operations if it is done sensibly and in a fashion that gets the battlefield tasks done properly. We've had some good joint equipment development programs, and we've had some that have not been good. The management of most joint programs falls correctly in the "force-building" part of the Defense Department, usually in the services or sometimes under a staff element reporting directly to the Secretary of Defense. However, correctly done, the whole business is driven by the battlefield requirements. Good requirements definition has a good chance of producing good equipment. Poor work on the requirements side almost always produces bad programs.

Recognizing that fact, the JCS asked the Defense Science Board to help them improve the joint program business. Using DSB's recommendations, the Joint Chiefs of Staff in early 1984 established the Joint Requirements and Management Board (JRMB). The JRMB consists of the Vice Chiefs of each of the four



General Vessey takes time to sound out a US Marine in Grenada during the US combined-arms operation there in 1983. He claims that interservice cooperation, as exemplified by that operation, is better than ever.

forces is the sort of stuff that causes lives, battles, and wars to be lost. Common equipment for similar jobs not only makes joint operations easier, it also makes the tax dollars devoted to the defense of the nation go a lot further. Certainly, the US armed forces have recognized that for years, and we've had elaborate systems and procedures to try to prevent foul-ups from lack of needed interoperability. Like all humanly devised systems, they haven't always worked. The JCS have tried to pay special attention to such problems and have taken a number of steps to deal with them. I would cite two.

The first follows from the old axiom that "if you can't communicate, you can't command!" Communications interoperability is crucial in joint operations. The JCS recommended and the Secretary of Defense approved the establishment of the Joint Tactical Command Control and Communications Agency to tackle the problems of communications interoperability on tomorrow's battlefield.

The second follows from the recognition that making common equipment do a number of battlefield tasks in different services will save money and improve joint

services. It is charged with examining potential joint military requirements; identifying, evaluating, and selecting candidates for joint development and acquisition programs; providing oversight of cross-service requirements-management issues; and resolving service issues that arise after a joint program has been initiated.

In its first year of existence, the JRMB has assisted the Joint Chiefs in providing good military advice to the Secretary and the services on important programs. The JRMB helped the JCS show the Secretary of Defense how to consolidate seventeen remotely piloted vehicle (RPV) and cruise-missile programs for a potential savings of more than \$4 billion while providing the forces with better support. The JRMB has helped the JCS make sensible recommendations in many other areas, including electronic warfare programs and Identification Friend or Foe systems.

Joint Training

Training is the mucilage that makes the peacetime soldiers, sailors, Marines, airmen, and their equipment and doctrine the cohesive, ready force needed to deter

war or defend the nation if deterrence fails. If we are to fight in joint operations, we must train jointly. We have a good joint exercise system. We exercise regularly in most parts of the world in which we would expect to be called on to fight. We train with numerous allies every year. We test concepts, plans, equipment, and procedures as well as the mobility support system, the C³ system, and the joint logistics system.

Admittedly, none of the joint or combined exercises stretches the entire force a fraction of the amount that a war would stretch it. Our job is to glean the maximum from the exercise program and extrapolate correctly to the wartime situation. The joint exercises will never provide enough joint training, either for troops or for commanders and staffs. But today, war games, computer-driven simulations, and a splendid communications system permit day-to-day training as well as elaborate exercises to be expanded realistically and to be used imaginatively. The National Defense University, the service War Colleges, Readiness Command, and the Joint Analysis Directorate of the JCS are all deeply involved in and are cooperating in the use of simulations for training.

Simulations can help training at all levels. The JCS and the CINCs of the Unified and Specified Commands and the Secretary of Defense have participated in simulations. The training of squad leaders, fighter pilots, and ship captains is helped by simulations. Joint training outside the joint exercise program is routine in the Unified Commands. It should be routine for the forces of the central reserve stationed in the United States. Cooperative training with nearby forces of other services ought to be routine for all—and it is for the troops commanded by officers who understand that success in battle will depend on working with the forces of the other services.

Getting the CINCs in the Loop

The Commanders in Chief of our nine Unified and Specified Commands exist to be ready to fight and to fight successfully. Should deterrence fail, they are the ones who will carry out our war plans. Under those plans, each Unified and Specified Command has a unique mission, a unique slice of geography, and a unique set of allies. Accordingly, the needs of the Commanders in Chief must be considered fully as we plan for force employment and as we build, maintain, and exercise our forces in peacetime.

The Secretary of Defense and the JCS have taken a number of steps to have the influence of the CINCs felt in the development of the forces they will employ. The CINCs participate in the Defense Resources Board program review and in the Defense Guidance development. The CINCs influence service program development through the component commanders and through the Chairman of the JCS, who is their spokesman for operational requirements. The Unified and Specified Commanders' views are solicited; they have direct access to the Secretary and the Chairman and to the service Chiefs. The future will see greater and greater influence by the CINCs in force-building, requirements definition, and doctrinal development. The result will be better and better integration of the efforts of the force-builders and the warfighters—and a safer world for the people of this nation.

Jointness: The Assessment

In his April 3, 1958, letter to Congress, President Eisenhower said, "Peacetime preparation and organization activity must conform to [this] fact. Strategic and tactical planning must be completely unified, combat forces organized into unified commands, each equipped with the most efficient weapon systems that science can develop, singly led and prepared to fight as one, regardless of service."

If Ike could inspect our forces today, I'm sure his experienced eye would see that we have room for improvement. I am certain that he would also see the finest soldiers, sailors, Marines, and airmen he had ever seen. He'd see them equipped with very, very good equipment—perhaps not yet the best science can develop—but very good. He'd see the service men and women being trained in imaginative fashions that would make him wish he'd had the same methods before D-Day. Certainly, he'd be both pleased and proud to see the

Backdropped by the flag he has spent his life serving, General Vessey ponders a question in his Pentagon office. Jointness "cannot be confined to headquarters," he writes, but "must permeate the armed forces from top to bottom."



manner in which the services operate together under the direction of the Unified Commanders.

There is much yet to be done, there is plenty of room for improvement, but our forces can operate and fight together better than they ever could—and the world is a safer place for it. That's "jointness."

Purple is a wonderful color. Even if Gelett Burgess didn't like it for cows, I suspect he'd be pleased to connect it with the joint operations of today's US military forces. ■

Gen. John W. Vessey, Jr., USA, is retiring as the Chairman of the Joint Chiefs of Staff. A forty-four-year veteran of the National Guard and the Army, he received a battlefield commission at the Anzio beachhead in 1944 and went on to serve with and eventually to command combat units in Germany, Vietnam, and the US. He has also held assignments in command positions in Thailand and has served as Army Deputy Chief of Staff for Operations and Plans, Commander of US Forces, Korea, and Commanding General, US Eighth Army. Prior to his selection in 1982 as the tenth Chairman of the Joint Chiefs of Staff, he held the position of Vice Chief of Staff, US Army.

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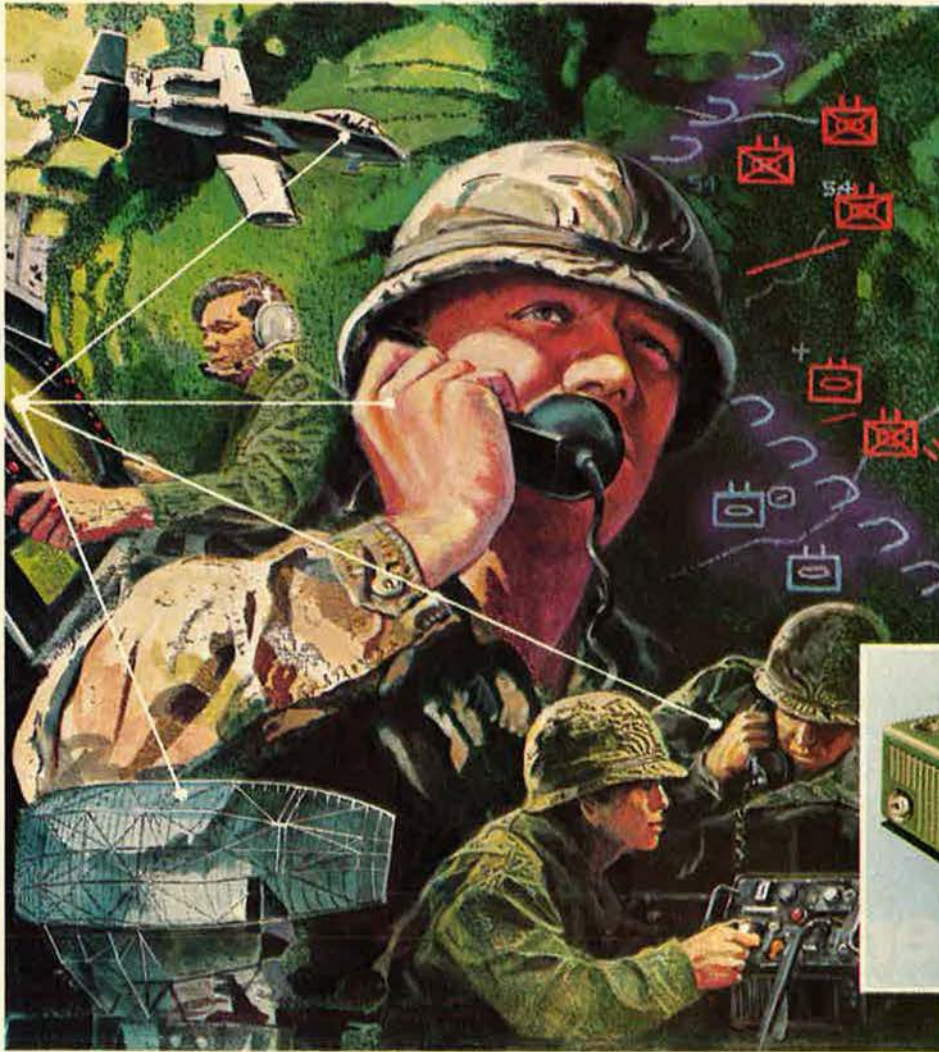
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VIEWPOINT

Structural Concerns

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

Admiral Crowe takes over at a time when critics—some of them informed and thoughtful—are questioning the way joint military ventures are conducted.



The appointment of Adm. W. J. Crowe, Jr., to be Chairman, JCS, confirms a long-current rumor. To the extent that the job rotates among the services—and there is no schedule on

this—it was the Navy's turn. The choice of Crowe instead of Chief of Naval Operations Adm. James D. Watkins was a slight departure from custom, but again, there is no set rule. Gen. John W. Vessey never served as Army Chief of Staff, and in 1953 President Eisenhower brought another CINCPAC, Adm. Arthur Radford, from Hawaii to be his Chairman. Admiral Radford had been a principal participant in the bitter postwar Navy-Air Force battle. His arrival in the Chairman's office was viewed with apprehension by the Air Force and, presumably, with elation by the Navy. As things turned out, the emotions should have been reversed.

Admiral Crowe comes with unusual academic credentials—both a master's degree and a doctorate. He also has a reputation for impartiality, a quizzical mind, and a decidedly informal manner. He reports at a time when there are a lot of questions being asked about the whole military structure, some coming from the usual hostile sources and others from more thoughtful people.

One of the more thoughtful ones is Edward Luttwak who, in his book, *The Pentagon and the Art of War*, has not so much asked questions as delivered blows. Our military forces, in his judgment, have not had a real success since Inchon, and the fault lies deep

in the structure. While he has a litany of grievances—too many officers, too much overhead—he is particularly scornful of joint military enterprises, whether as embodied in establishments like the JCS, in the unified commands, or in such operational fiascos as Desert One. He cites Vietnam as a particularly abysmal case study of joint military endeavor, one where duplication of effort was the order of the day.

In Luttwak's view, an officer assigned to a joint command is too beholden to his own service for any true objectivity. In all honesty, he has something there. It is a rare bird who shucks his service affiliations when assigned to joint duty. Those who do play it straight may imperil their future chances for promotion. Luttwak, then, has a point: Joint staffs under our present system cannot be expected to operate in a lofty and impartial way.

One Luttwak solution to what he views as hopeless disorder is the creation of a national military staff, made up of officers chosen in mid-career from the various services. These officers would be formally separated from their services and permanently recommissioned in the national staff. Drawing on extensive practical experience in the Army, Navy, Air Force, and Marines, but no longer answerable to any one service, they would, presumably, come up with unbiased advice. Well, maybe. Some of the most parochial types around are retired and thus without reason to look over their shoulders. A career in the military has a lot in common with the religious vocation. Now and then, someone converts, but it is not the usual thing. Beliefs ingrained early in life are not easily dispelled.

Nevertheless, Edward Luttwak, a respected defense scholar and a hawk in the common sense of that term, has made some very serious accusations about our military system. Although a few of these charges seem to be a bit

overblown, there is considerable truth in some of the others. An underlying theme of his book is that we have settled for comfortable mediocrity, a system in which even failure brings rewards.

Over the years since the office was first created, JCS Chairmen have come and gone more or less quietly. Gen. David Jones did create a stir during his last months as Chairman by calling for reform, but he was, by then, on his way out. The same proposals made two years earlier would have created more commotion, to understate matters.

With a few exceptions, most senior naval officers, as well as that formidable institution itself, the US Navy, have been opposed to any change in the present joint arrangements. On the other hand, Luttwak's charges cannot be answered by simply shrugging them off. All of us who have made a career in any of the services know the system is far from perfect. Layering of headquarters leads inevitably to overcentralization, and that, in turn, diminishes the worth of the people down the line.

The present Air Force leadership has recognized this. Tactical squadrons, as one example, now have far more autonomy, and hence esprit, than was the case some years ago. Squadron commanders, who have, incidentally, more real experience than most senior officers in World War II, are carefully selected and then given authority to do their jobs.

Admiral Crowe is arriving on the scene at an interesting time, a time when public enthusiasm for the military seems to be on the wane. He comes with unusual credentials and a reputation for being remarkably free of service bias. Given his bent for study, he will undoubtedly have read the Luttwak book. We can only wait to see if he has practical answers, for Luttwak's solutions are, for the most part, interesting, provocative, but unachievable. ■

The Air Force and the Army are working together effectively on close air support and battlefield air interdiction.

An Air Force A-10 banks steeply into the attack. A-10s are assigned to the close air support mission exclusively and will be USAF's primary aircraft for that mission through the 1990s and beyond.

Coordinating the Air-Ground Battle

BY JAMES P. COYNE
SENIOR EDITOR



CLOSE air support will never be the same again. For decades, it lagged behind the force modernization tides in both the Army and the Air Force because of money shortages and roles and missions disagreements. In recent years, though, priorities as well as attitudes have changed. The Air Force is much better prepared to support Army troops in contact with the enemy, and the two services are working together to conduct the air-ground battle in a truly coordinated fashion. There is high-level consensus on several urgent needs, including follow-on aircraft for close air support and forward air control. There is agreement about changes in the way close air support will be conducted and about who will direct it over the battlefield. Duplication of capabilities between the two services is being reduced to a minimum.

Part of the impetus for change comes from joint studies by Tactical Air Command at Langley AFB, Va., and Army Training and Doctrine Command at nearby Fort Monroe. These efforts were given a strong push in May 1984, when Gen. Charles A. Gabriel, USAF Chief of Staff, and Gen. John A. Wickham, Jr., Army Chief of Staff, signed a historic agreement on the Joint Development Process. The agreement included thirty-one initiatives, several of which involved close air support. In the view of the two Chiefs, the agreement set up "a long-term, dynamic process whose objective will continue to be the fielding of the most affordable and effective air-land forces."

The new cooperation reflects the realization that future wars will not be fought like any the United States has fought before and that the old ways are no longer sufficient.

Origins of Close Air Support

Close air support had its modern beginnings in the Korean War. Nearly all close air support was provided on a "preplanned basis"—with a day's advance notice required—because neither service had more than a rudimentary capability to plug into the other's communications net. A request for an "immediate" air strike might take hours. Generally, the call for air support would go up the Army chain of command from the unit in contact with the enemy, eventually reaching division or corps headquarters, which would relay the request to the Air Force. Aircraft on alert were then scrambled, or if the need was urgent, some of those already in the air were diverted from their preplanned missions. The Army got close air support, but it took time. Once over the target area, the aircraft had little direct communication with the unit being supported.

One method of communication attempted by the Marines was to lay big, colored cloth panels on the ground

to point aircraft toward targets. USAF forward air controllers—the famous "Mosquito pilots"—flew propeller-driven T-6 trainers or lightplanes. They could mark targets by firing smoke rockets, or they would talk the bombing aircraft onto the targets by radio, referring to hilltops, bends in the river, or road junctions as landmarks. This procedure usually worked, but it was rudimentary.

By the end of the Korean conflict, some radio links were available, enabling ground forces to talk to supporting aircraft. Typically, a fighter pilot from one of the in-country squadrons would be assigned to a ground unit on short-term, temporary duty to direct strikes. Tactics and techniques developed in Korea became the basis for close air support in Vietnam.

In 1962, the Army and the Air Force signed the first agreement on "fire support coordination," and for the first time, USAF pilots and supporting enlisted people were assigned for full tours with specific Army units to manage close air support. Initially, the Army provided such support equipment as vehicles and radios. Another agreement was signed in 1965, and the Air Force began providing the equipment.

By the time Vietnam had developed into a full-blown war, the system was working well. Through both ground and airborne forward air controllers (FACs), ground units could communicate by radio with supporting aircraft. Immediate responses to requests for air strikes became routine. Airborne FACs did what they had done in Korea—they cruised over the battle areas, directing strikes in support of ground units. They also located enemy supply areas, troop concentrations, and other targets of opportunity.

In the south, below the Demilitarized Zone that divided the two Vietnams, the FACs flew the ubiquitous O-1 "Birdog"—a follow-on to the Korean-vintage aircraft—and later the O-2, another unarmored propeller aircraft. They survived because the FAC tried to stay out of the lethal range of enemy ground weapons, except when diving to mark the target with a smoke rocket. Ground fire was mostly small arms, with an occasional anti-aircraft machine gun.

But in the north, above the DMZ, where FACs were also employed to locate enemy targets and direct strikes on them, the environment was far more lethal. The North Vietnamese had heavy anti-aircraft guns and surface-to-air missiles. The Air Force used high-speed FACs, flying F-100s and F-4s, up north. These aircraft, like those flying in the south, were hit by ground fire many times, but they were far more survivable than propeller aircraft because of their speed and maneuverability. There was no real threat to FACs from enemy fighters in either the north or the south.

Today's Combat Environment

The battlefields of the future would be far more lethal than those in Vietnam. "The ground threat to aircraft is formidable," says Col. Lanny Lancaster, Director of Tactical Systems Planning for Air Force Systems Command. "For one thing, there will be few areas of low lethality. Wherever the enemy is, he will have a full range of modern, capable, air defense weapons—everything from shoulder-fired weapons right on up to the latest mobile SAMs."

Soviet and surrogate-nation motorized rifle and tank regiments are equipped, at a minimum, with the ZSU-23

But the US Army would employ "offensive defensive" tactics, perhaps falling back in front of the enemy advance and counterattacking in a different place. The end result is a checkerboard battlefield, with "good" and "bad" squares interspersed. The enemy may be in some of our rear areas—at least in the first few days of the conflict—while we will be in some of his rear areas. The Air Force must be able to provide close air support to the Army units, no matter how unfriendly the skies are. And fighters will share airspace with Army helicopters.

To provide this support today, the close air support network and organization, oddly enough, has not been



In keeping with the increased attention to the air-ground team, USAF F-4Es practice swooping against land targets in support of the infantry, left, and an F-16, right, unloads its ordnance on an interdiction mission. From here on, the F-4E will be primarily a ground-attack bird. TAC has established the need for a follow-on close air support aircraft for the expanded battlefield.

self-propelled anti-aircraft gun. It is radar-controlled and can fire up to 800 rounds per minute. Tank and motorized rifle divisions have the S-60 57-mm self-propelled anti-aircraft gun, which is also radar-controlled. These are accompanied by the deadly SA-6 SAM missile system, which replaces the 57-mm gun in some units. Each motorized rifle company is equipped with the SA-7 missile, a shoulder-fired heatseeker similar to the US Redeye. A newer, longer-range SAM is the SA-8, which is deadly out to eight miles or more from its launcher. The SA-9 is a vehicle-mounted heatseeker, larger and more deadly than the SA-7. Backing up these highly mobile systems are large numbers of acquisition and early-warning radars, most of them redundant, which makes the system very hard to counter. These are tied in closely with enemy theater air defense and command and control systems. There will be enemy fighters, too, and the Soviets have an impressive capability to jam conventional radio communications.

The battlefield itself has also changed, Colonel Lancaster notes. With improved communications and more mobile forces on both sides, there may not be much in the way of "front lines." In any battle area, there will still be a Forward Edge of the Battle Area (FEBA), a Forward Line of Own Troops (FLOT), and rear areas.

changed. Working on the premise that "if it ain't broke, don't fix it," a Tactical Air Control Party (TACP) will continue to be collocated with each battalion, brigade, and division headquarters. At Army corps level, there is an Air Support Operations Center (ASOC). These organizations provide air expertise, advice, and assistance to Army commanders at each level. Any request for pre-planned air support goes from the requesting Army unit through Army communications to corps. A commander below corps level may be able to supply the needed firepower with artillery or some other asset. If so, he says so as the request comes through. If close air support is needed from USAF, though, corps passes the request to the Tactical Air Control Center (TACC). This is the primary operations center of the Air Component Commander. He cooperates with the Army Component Commander under the control of the Theater Commander. The TACC directs the appropriate Air Force unit to provide the strike aircraft for the requested day and time.

Immediate air requests, on the other hand, go up the Air Force communications net through the TACPs to the ASOC. The ASOC can communicate directly with the tactical fighter wing providing the strike, and the ASOC scrambles the fighters, keeping the TACC informed. As

in the preplanned requests, the tasking may be peeled off by an Army commander at any level who has the firepower to do the job.

Tools of the FAC

There is substantial change, however, in the equipment being used by the forward air controllers, the tactical air control parties, and the units that fly close air support missions. And the number of forward air controllers required has climbed steeply.

"The Tactical Air Forces have 235 forward air control aircraft," says Lt. Col. Thomas A. Lanum, Chief of the



Ground Attack Division in Fighter Requirements at TAC Headquarters. "We are working hard to get more and better ones." The aircraft are the Vietnam-era O-2, the OA-37 Dragonfly jet, and the OV-10 Bronco turboprop. The O-2 is too old, Colonel Lanum says. And the OA-37 is too popular. This speedy little jet is a modified T-37 and has lots of zip and capability. As a result, OA-37s from TAC's inventory are steadily being sold under the Foreign Military Sales Program to several overseas nations. Since it is out of production, its numbers are dwindling. Provided it is replaced, TAC is content to let it go, he says, because it can loiter only a short time near the battlefield.

The OV-10 will be around for a while. Average flying time on each airframe is less than 10,000 hours, and it has been certified safe for at least 20,000 hours. The Bronco is fast, even though it is prop-driven, and it can defend itself. Besides carrying marking rockets, it packs four machine guns in two sponsons along the fuselage. But it is not readily deployable.

TAC plans to replace the O-2s first and then replace the remaining OA-37s. The OV-10A will be phased out by the year 2000. Long before then, though, TAC plans to have a follow-on FAC aircraft.

Requirements for this bird, Colonel Lanum says, in-

clude wing hardpoints for fuel tanks and marking rockets, secure antijam UHF/VHF/FM/HF radios, a digital communications terminal, radar warning receiver, chaff and flare defense capability, easy deployability, an endurance time of three to five hours, and low development, acquisition, and support costs. A total of about 280 aircraft will be required, and they could well be a version of an existing aircraft. Prime candidates are modified T-37s (which would be procured from Air Training Command), a variant of the new Fairchild T-46 trainer, the OV-10D—a new OV-10 being proposed by Rockwell—or a variant of the Navy's brand-new McDonnell T-45 Goshawk trainer. The Air Force will conduct a competitive source selection, Colonel Lanum says, with production starting in the early 1990s.

New Close Air Support Aircraft?

TAC has also established the need for a follow-on close air support aircraft. "Evolving Army doctrine has expanded the battlefield for close air support," Colonel Lanum explains. "Besides the traditional area in the Forward Line of Own Troops [FLOT], we now must provide support in our own friendly rear area and in the deep maneuver area, which could be 150 kilometers into enemy territory." Required support in these areas will be considerable, because great numbers of targets will be located by new intelligence-gathering systems like JSTARS, which can pinpoint moving enemy vehicles, and PLSS, which precisely locates enemy fixed and mobile radar sites. Because these targets of opportunity are a threat on the expanded battlefield, close air support aircraft must be able to attack them immediately, just as air-to-air targets located by AWACS can be attacked without undue delays.

Existing close air support aircraft are extremely good. The A-10's only job is close air support. The F-16 is a swing-role fighter, providing both a ground attack and air-to-air capability. The F-4E will be primarily a ground attack bird from here on. The new F-15E dual-role fighter—when operating in its air-to-ground function—will be used for deep interdiction, along with the F-111. The F-4G "Wild Weasel" may see some battlefield ground-support action, but is intended to go against radar sites deeper in enemy territory, primarily beyond the FEBA.

The Army thinks highly of USAF's A-10, which puts down an impressive field of fire. The A-10 is being made more survivable by a number of improvements. These include installation of an inertial navigation system, addition of AIM-9L all-aspect heatseeking missiles for self-defense, several kinds of antijam communications, and the Global Positioning System (GPS) navigation system. The A-10 will continue to be the primary close air support aircraft through the 1990s and beyond, TAC staffers say, but it will be called upon by the Army almost exclusively for traditional work at the FLOT. Another aircraft is needed to help in this role as well as to fill Battlefield Air Interdiction requirements beyond the FLOT and to perform close air support in the deep maneuver area.

A request for preliminary information for such an aircraft was released in April. McDonnell Douglas, General Dynamics, Northrop, and LTV responded with proposed modifications to existing aircraft that would meet

TAC requirements. A formal Request for Proposal will be issued soon.

While other companies are also likely to respond to the RFP, TAC staffers expect the follow-on close air support/battlefield air interdiction platform to be a modified existing aircraft—most likely an F-16, A-7, AV-8 Harrier, or F-20. The chosen aircraft must be able to handle both the close air support and the battlefield air interdiction missions at night and under the weather. The F-16 could perform this latter mission with the new LANTIRN navigation and attack system. LANTIRN is very expensive, though, and intended for aircraft carrying out deep interdiction missions against high-value targets.

Munitions for Ground Support

Armaments are changing, too. TAC fighter units still train with the traditional “iron” free-fall bomb, but the lethality of defenses around potential targets is forcing newer weapons that do not require the launching aircraft to overfly the target directly. A-10 pilots train primarily to employ the GAU-8 30-mm gun and the AGM-65 Maverick television-guided missile. With either weapon, the pilot can fire and turn away without overflying the target.

With the Maverick, the pilot uses a television display in the cockpit to find the target and designate it for the missile. The missile homes on the designated spot. A newer version is the Imaging Infrared (IIR) Maverick, which provides the television view in the cockpit, but guides on IR emissions from the target. This provides a capability to keep fighting at night, under the weather, and in conditions of limited visibility. When using IR Maverick with Rapid Fire II—a system that assigns individual targets to specific missiles—a pilot will be able to launch at more than one target on a single pass. Both versions of Maverick are lethal to tanks and other hardened point targets. Maverick can also be employed from the F-4, the F-16, and the F-111.

The GBU-15 glide bomb uses a television guidance system fitted to a 2,000-pound Mk 84 bomb. It can be launched from low altitude by “lofting” it toward the target or at medium altitudes from standoff ranges up to five miles. It is extremely accurate. The pilot can lock it onto the target and leave the battlefield, or he can choose to guide it manually to impact. An infrared version of this weapon will soon be in the field.

An ordinary bomb is also the basis for the Paveway laser-guided bomb. These bombs are fitted with the Paveway guidance system, which homes on laser energy reflected from a target by a target designator. Results are excellent against such point targets as anti-aircraft gun emplacements, tanks, trucks, and bridges. A newer version, the low-level laser-guided bomb (LLLGB), was developed for use from very low altitudes, long standoff distances, and under poor weather conditions. Both of these weapons are still relatively new in the inventory, but may be upgraded with an autonomous seeker.

Key to the employment of these weapons on the modern battlefield is minimum exposure time for the aircraft employing them. In the Vietnam era, ground support aircraft operated in flights of four, staying over the target area for periods of several minutes to deliver ordnance. This would be suicide today because of the deadly

ground-to-air defenses. Therefore, USAF units train intensively in low-level flying and weapons employment. Tactical fighter pilots at Nellis AFB, Nev., where the Red Flag exercises take place, do most of their air-to-ground flying at very low altitudes. They spend more time practicing the ground support mission than they do on air superiority, Colonel Lancaster says. At other bases, pilots work in teams, one aircraft designating the target from a standoff position while the other goes in low, pops up briefly to deliver a weapon, and then returns to the deck to leave the area or to reposition for another attack. Exposure time is held down to ten seconds.

Weapons coming into the inventory in the future will enable pilots to reduce exposure time even more, perhaps to as little as five seconds. One of these, the Hypervelocity Missile (HVM), shows promise. It does not have a warhead. It is a kinetic kill round that streaks into the target at a speed of Mach 5. The impact velocity is more than 5,000 feet per second. It destroys tanks by shattering their armor. It will be smaller and lighter than missiles with warheads, so an aircraft can carry more of them. Used in conjunction with new guidance systems



that allow the pilot to launch and leave, more than one missile can be released on each attack, opening the possibility of multiple kills per pass.

The GPU-5A 30-mm gun pod will give aircraft carrying it the same heavy knockout punch carried internally by the A-10. It will be available very soon. Still down the pike a bit is Rapid Fire II. Now a contractor proposal from Hughes, this system processes imagery from IIR Maverick and selects several potential targets on each pass. The pilot “consents” to fire his missiles, and the computer system releases them at precise times for multiple kills.

Practice for Tomorrow's Battlefield

The most realistic training for the air-land battle is being done at Fort Irwin, Calif., site of the Army's National Training Center. There, troops in mock combat have weapons equipped with laser designators that can register kills by hitting sensors mounted on troops and equipment. Unlike old-fashioned war games that required umpires to determine if a troop or tank has been taken out, the laser systems register the hit right away. A-10s flying at Fort Irwin have already tested laser designators for their guns. So far, no method has been found for lasers to simulate bombs, nor can an A-10 pilot tell when he has been "shot down" by enemy ground fire. Nevertheless, the training is more realistic than anywhere else.

Battles fought at Fort Irwin are the modern kind. That is, close air support must be provided to friendly troops anywhere on the battlefield against hostile troops and all of their defenses. Close air support missions are carried out in conjunction with artillery and helicopters. As an A-10 pilot is attacking a target, he may be flying over friendly helicopters engaged in their own operations. He does not want to penetrate an area into which friendly

trols the fighters, but whenever there are fighters and choppers involved together, the Air Battle Captain has the lead. He cannot dictate fighter tactics, but he can direct fighters or choppers to attack different targets or to sequence attacks. In a theoretical scenario, the Air Battle Captain might preside over a battlefield where an Army OH-58 helicopter would laser-designate a target for a missile attack by A-10s, followed by attack helicopters mopping up, after which troop-carrying choppers would deliver forces to secure the area. He would run the operation. USAF fighter pilots who have flown under this system have no problem with it.

Communications Without Being Jammed

One thing emphatically proven in Army-Air Force exercises at Fort Irwin, at Nellis, and overseas is that an antijamming capability for US radios is essential. The Soviets have an extremely effective radio jamming system that, unless countered, could thwart communications and play havoc with battle management. Electronic warfare exercises held at Nellis show that jam-resistant communications will be the key to success in the next war. Aircraft being jammed had extreme diffi-

LEFT: A US Army Huey helicopter and an armored personnel carrier team up on the advance. RIGHT: An F-15 fighter displays its ample air-to-ground firepower. F-15Es will be used in the deep-interdiction and air-to-air missions. USAF and the Army are working together to conduct the air-ground battle in a truly coordinated fashion, with much accent on ending duplication of capabilities.



artillery is firing because the results are just as deadly to him as they are to the enemy. To provide safe separation between helicopters and aircraft, the choppers are assigned the airspace from the ground to the treetops, and the A-10s can descend no lower than 100 feet.

Often, artillery, helicopters, and aircraft are attacking the same target or targets close together. There has to be a traffic director, and in a big change to command and control arrangements, TAC has agreed that the traffic director during Joint Air Attack Team (JAAT) operations will be the Army pilot in the scout helicopter. He is called the Air Battle Captain. The Air Force FAC con-

culty carrying out the mission; those using an antijam system were not impeded and weren't even aware that jamming had been attempted.

"Basically," explains Capt. Richard R. Barth, Systems Officer for Advanced Communications Systems at AFSC, "the Army uses High Frequency [HF] and Very High Frequency [VHF] radios, and the Air Force uses Ultrahigh Frequency [UHF] and higher frequency bands. That's because the Army's bands operate better on the deck and the Air Force's bands operate better at altitude." This poses a problem, he says. To interoperate, each service must have the other's radios, so there is

a need for more equipment. "But the bright side of that," he points out, "is that the Soviets have a harder time jamming us because they have more frequency bands to cover."

This means that the services each have their own antijamming systems, too. Have Quick is the basic Air Force antijamming system. Its follow-on is Have Quick II. Together, they provide an antijamming capability across 7,000 UHF channels. The system works by frequency hopping. Every tenth of a second, a transmission is "hopped" to a new frequency. All transmitters

the TR-1. These TR-1s, operating in three-aircraft teams, precisely triangulate the positions of enemy radar emitters and transmit the information to the ground. The ground commander's air support element transmits strike instructions back through the TR-1 to F-16s already in the air. The Air Force is currently devising a way to have JSTARS and PLSS use the same command control and communications systems.

USAF is also developing ways to use the Joint Tactical Information Distribution System (JTIDS)—now used, for example, by the AWACS to control large numbers of

USAF OV-10 Bronco turboprop aircraft are put through their paces. A mainstay in the forward air control (FAC) mission, the OV-10 is relatively fast, can defend itself, and is expected to be around awhile.



and receivers hop at the same time to the same new frequencies. All users program the system each day for frequency hopping and get an exact time hack from the Transit satellite system. Soon the time hack will come from the Navstar Global Positioning Satellite system. On top of the frequency hopping, normal operational transmissions are encrypted just in case the enemy, on a particular day, has figured out the hopping sequence and wants to listen in rather than to jam the transmissions.

The Army system is the Single Channel Ground/Airborne Radio System (SINCGARS), which works the same way as Have Quick, but in the VHF band. It transmits digitally, in computer talk, rather than in voice, so it has the capability for medium-speed hopping. It changes frequency about every five-hundredth of a second. It also is encrypted. The basic Army radio for SINCGARS is the PRC-119, the standard backpack radio. The Air Force is buying both a ground and air version of SINCGARS so that FACs, strike flight leaders, and the Army can talk to one another. All USAF tactical fighters are equipped with Have Quick; SINCGARS is being introduced.

Locating the Targets

At the heart of joint Army-Air Force battle management will be the Joint Surveillance and Target Attack Radar System (JSTARS). The deep-looking JSTARS radar will be carried aboard a modified Boeing 707 designated C-18. JSTARS will provide commanders real-time information on the location and direction of movement of enemy tanks, trucks, and other tracked and wheeled vehicles.

Another system, already in existence, is the Precision Location Strike System (PLSS), which is mounted on

air superiority fighters—in the ground war. A new variant, Enhanced JTIDS (EJS), permits some Air Force aircraft to have a voice transmittal capability on JTIDS, which is basically a data system.

On the ground, the Air Force is also providing new equipment for TACPs. The Jeep, rapidly being phased out of the Army inventory, is the basic TACP vehicle and must be replaced with something like the Army's new "Hummer" vehicle or an armored personnel carrier (APC). Another new system, the Ground Attack Control Center (GACC), will be used primarily to control Battlefield Air Interdiction (BAI) in areas beyond the FLOT. New electrical power generators with lower IR signatures than existing ones are being provided.

Ultimately, the ground FAC will travel with the Army, and he will carry his communication equipment with him. It will probably be something like the new "kneeboard" digital communications terminal made by Litton, the AN/PSC-2. This can be plugged into any radio to transmit preformatted high-speed "burst" information. A similar small terminal on the other end decodes the burst information.

But new equipment is not all that is needed for close air support. More people are required, too. The Army's new light infantry divisions are heavily dependent on close air support because they have relatively little heavy organic firepower. Army divisions are getting aviation brigades, and each will have a TACP. Consequently, TAC will provide about 200 new people—officers and enlisted—to the Army for close air support liaison. Over the next five years, TAC expects to spend an additional \$54 million on this kind of support, and its level of commitment to close air support will be at an all-time high. ■

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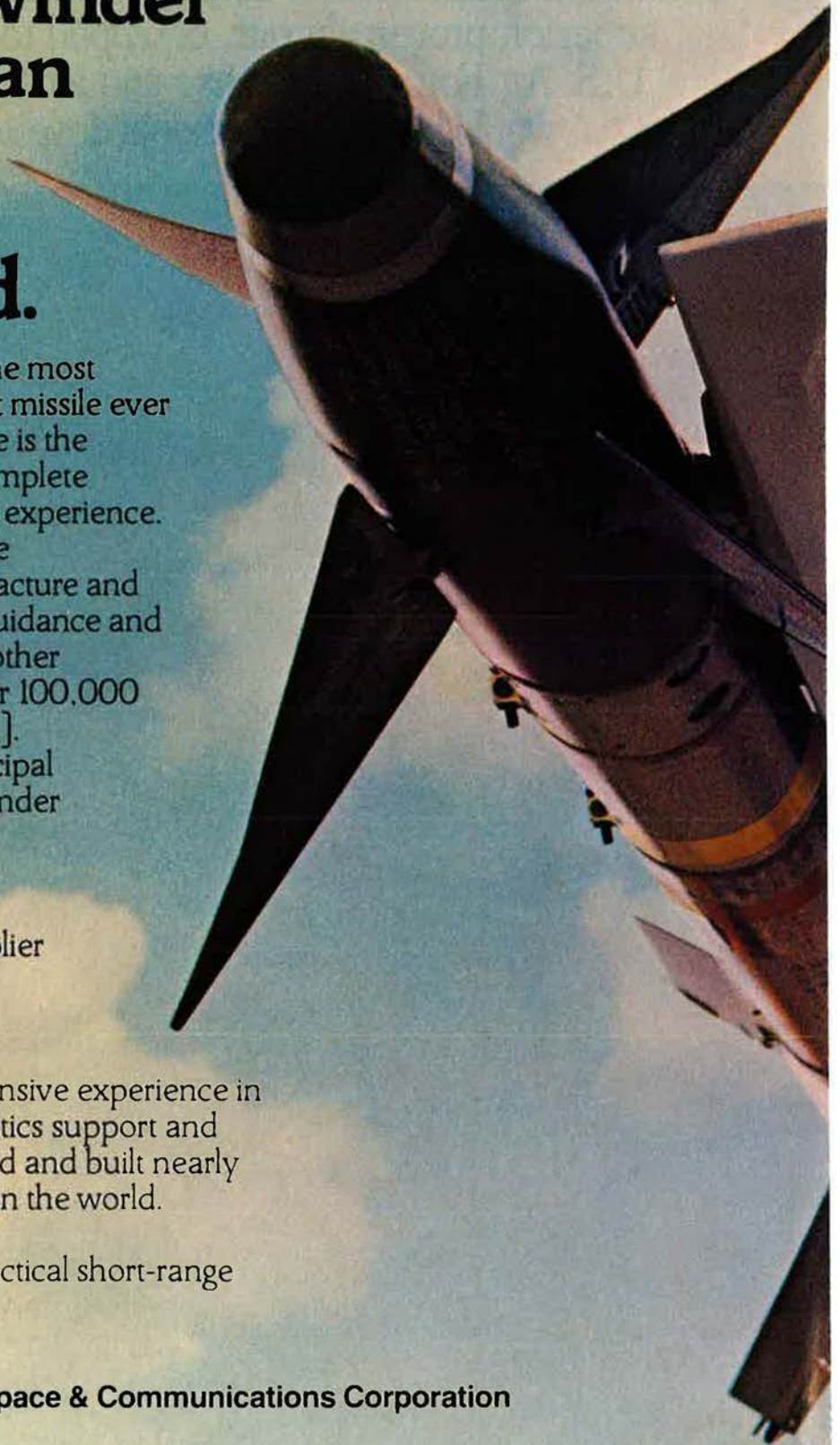
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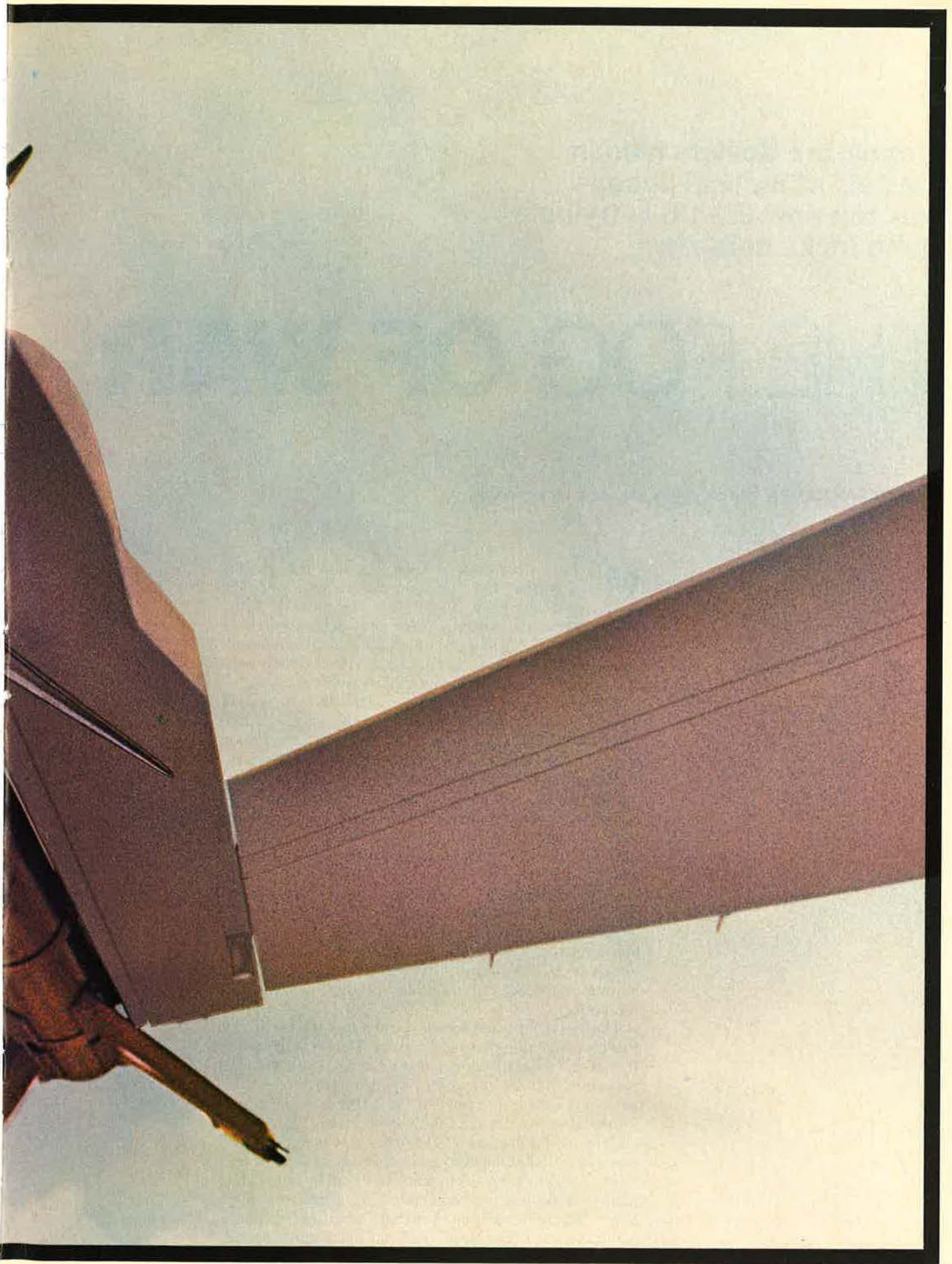
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Clearly, the Soviets lead in the field of tactical deception, but now the US is trying some tricks of its own.


THE FOG OF WAR

BY EDGAR ULSAMER, SENIOR EDITOR (POLICY & TECHNOLOGY)

MILITARY deception and devices that thicken the "fog of war" have been an integral instrument of battle since antiquity. Today, the descendants of the Trojan horse are not only alive and kicking but have assimilated such advanced trappings as artificial intelligence, disguises that can fool batteries of diverse sensors, and the benefits of rigorous systems analysis.

Deception comes in many forms and serves a range of national security objectives that includes inflating force levels that serve as arms-control "baselines," deflating military capabilities that violate arms-reduction accords, and luring the adversary into technological goose chases that fritter away his resources and keep him from high-payoff pursuits. There is overwhelming evidence that, in the application of politico-military deception, the Soviet Union's cultural heritage has stood it in good stead. Deception, or *maskirovka*, comes easily to a regime that made internal and external misinformation and disinformation the keystone of its political creed. The Kremlin's *maskirovka* arsenal runs the gamut from rubber submarines designed to dupe the US SALT negotiators to a host of tricks that camouflages the performance, nature, and numbers of deployed Soviet weapons.

The fact that *maskirovka* is deeply ingrained in Soviet Russia's psychology is hardly news. But the heirs of the Potemkin villages—conceived by Czarina Catherine II's paramour to fool her and the outside world about faltering colonization attempts in the Crimea—have transformed deception into a full-fledged science. In the psychological warfare and related fields, Soviet deception is carried out under the heading of active measures—*aktivnyye meropriyatiya*—a euphemism for an ingenious bag of dirty tricks centered on general disinformation, forgeries, the manipulation of international revolutionary and terrorist organizations, political blackmail, and kid-



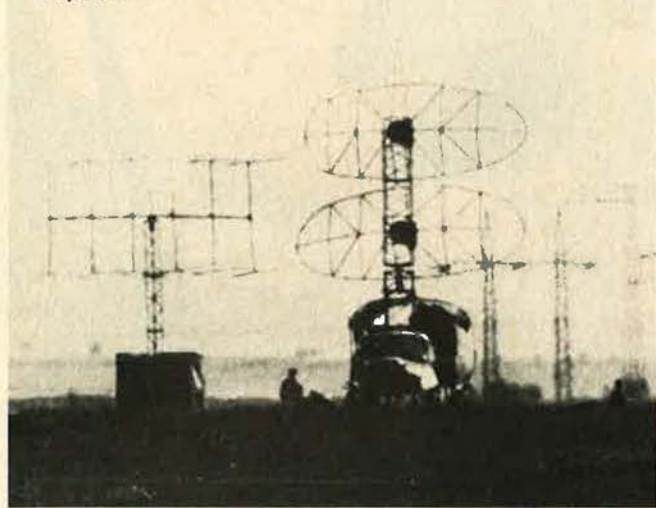
Two prototype decoy F-16 aircraft lined up with a real F-16. Even crude decoys can fool an attacker on a low-level, high-speed attack. The real F-16 is on the far left.

napping. The central target of the USSR's "active measures" since World War II has been the US, designated by the Soviet General Staff and the KGB as the *glavnyy protivnik*, or main enemy. A lesser known but nevertheless pivotal element of the disinformation campaign waged by the Soviets and their Warsaw Pact allies is to deceive the US about the real strength of Soviet bloc military forces as well as to weaken the defense system of the NATO alliance.

Deception From the Top Down

Military deception comes in a variety of forms and is a distinct subset of the grander, global disinformation operations controlled by the Politburo. The question of whether military *maskirovka* begot the "active mea-

Photo of Soviet Spoon Rest and Flat Face radar decoys taken in East Europe. During war, such mock targets would erode the effectiveness of US tactical airpower.



asures" or that the converse is true bogs down in circular arguments; what is undisputed by most historians is that deception has been part and parcel of Soviet military planning almost from the inception of the Red Army. Soviet historical writings leave no doubt that *maskirovka*, from the outset, has been the responsibility of a central authority that implemented deceptive practices through field commanders.

In World War II, for instance, the Stavka (Headquarters of the Supreme High Command) controlled the concepts and objectives of deception in major operations. In retrospect, US intelligence analysts believe that regulations and directives regarding the use of camouflage, concealment, and deception (CCD) in World War II were drawn up by the General Staff and the Stavka based on earlier theories and doctrines. On balance, Soviet *maskirovka* proved rather successful in World War II and freely mixed the political and military fields. These early military deception ploys drew on both state-of-the-art technical equipment and operational stratagems, planted information, and other schemes associated with human intelligence (HUMINT) activities.

Recently unearthed intelligence suggests that Nikolai V. Ogarkov, the "Teflon" Marshal ousted from the number-one military slot in the waning days of the Chernenko regime but rehabilitated posthaste by Mikhail Gorbachev, won his spurs in the field of military *maskirovka* in the late 1960s when he ran a special directorate of the General Staff in charge of such deception. Among his coups, scored in close cooperation with the KGB, was a series of deceptive ploys that resulted in Soviet gains at the SALT I negotiations, in which he participated as the top Soviet military representative. Another gambit attributed to Ogarkov's ingenuity in the field of *maskirovka* involved a fake floating bridge that exaggerated Soviet prowess in river-crossing operations. A limited number of empty vehicles were run across this "marvel" of rapid Soviet bridge-building capability to "demonstrate" its authenticity. Not until years later did US intelligence learn of this deception.

The Many Faces of Maskirovka

Soviet military literature has been remarkably candid about the importance of *maskirovka* and its integration into all operations by the USSR's armed forces. Military deception, according to the Soviet Military Encyclopedia, comes in three forms—strategic, operational, and tactical.

Strategic deception is carried out under the aegis of the Supreme High Command and relies on elaborate, intertwined measures to safeguard the element of surprise associated with strategic operations and maneuvers on the one hand and to deceive adversaries about the true intentions and actions of the Soviet armed forces on the other.

Operational deception is initiated and controlled by senior army or fleet commanders and is meant to conceal preparations for important pending operations.

Lastly, tactical deception is conducted as the need arises at lower echelons. The goal is to hide preparations for battle, such as the presence of reinforcements, special weaponry, and similar clues that might otherwise give away the game. Soviet military literature makes clear that the care and feeding of *maskirovka* is a full-time job that will pay off only if all related functions are carried out with constancy, high believability, and in a timely fashion under the direct operational control of the commander.

Depending on the intelligence and reconnaissance capabilities fielded by the adversary, the tools of Soviet *maskirovka* include devices and techniques that inhibit or negate the enemy's visual, thermal, radar, radio and radiolocating (radar), acoustic, and hydroacoustic sensors. In a more general sense, the Soviet armed forces' *maskirovka* doctrine hinges on concealment, feigned attack and deceptive show of force, decoys and other devices the Soviets call "imitations," and disinformation.

Tactical Deception's New High Profile

Sadly neglected for decades on the part of the US armed forces for cultural and other reasons, military—and especially tactical—deception has now been accorded a high-priority status by the Pentagon. As a first step, the extremely effective new Joint Requirements and Management Board (JRMB)—comprising the ser-

vice Vice Chiefs and the Director of the Joint Staff—has taken on tactical deception and associated concealment, camouflage, and deception devices (such as decoys) as a paramount joint requirement.

Tactical deception, as defined by the Air Force, boils down to manipulating the enemy's understanding of the battlefield situation and of US and allied force capabilities and intentions. The basic tools are distortion and falsification of evidence, which are used to gain relatively short-duration or geographically localized advantages in combat. Narrowed down to air battle considerations, tactical deception seeks to disrupt or deny the enemy's ability to identify and designate targets and to mislead enemy defenses with regard to air operations by US and allied forces. As the fencer's feint is meant to

Photo of Soviet MIG-21 decoy taken in East Europe. Deceptive shows of force are central to the maskirovka doctrine of the Soviet armed forces.



mask his thrust, tactical deception means building a counterfeit set of facts or convincing the adversary that the significance of observable facts is not what it really is. A typical earlier example of a tactical deception device was TEDS, for tactical electronic decoy system, a drone that looked to hostile radars like an F-4.

Central oversight of the Air Force's work on tactical deception—carried out in concert with the JRMB—is provided by the Deputy Chief of Staff for Plans and Operations (XO). As the then-DCS/Plans and Operations designate, Maj. Gen (Lt. Gen. selectee) Harley A. Hughes, told AIR FORCE Magazine, the roots of the current emphasis on tactical deception and ancillary CCD devices go back at least to the early 1970s, when "we became aware of what the Soviets" were doing in this field.

The Soviets, he explained, "did then what we started doing in 1979." Why the Soviets decided to go public on their tactical deception activities at that time is not clear. Educated guesses by the intelligence community include the theory that the Soviets felt that they might be able to play down their more odious disinformation campaigns by calling attention to traditional military con-

cealment and camouflage measures. Other experts argue that Marshal Ogarkov's takeover of the military deception function on the General Staff and establishment of a high-level organization devoted exclusively to this mission might have resulted in a higher profile for *maskirovka*.

The Air Force did not react in a concerted fashion to the Soviets' open emphasis of deception until 1979, when the service declassified the fact that it had developed a policy of tactical deception to strengthen operational security during wartime and to conceal troop movements in exercises.

The Influence of Detachment 1

In 1980, the Air Force set up a special organization,

Detachment 1, at its Combat Operations staff at Kelly AFB, Tex. Charged with coordinating the doctrinal approaches to tactical deception and CCD, this detachment was given the job of selling the low-cost/high-payoff pluses that tactical air forces (TAF) commanders can reap from tactical deception.

Other milestones that subsequently boosted tactical deception to its present high-priority status included the linkup in 1982 of Detachment 1 with USAF's Director of Plans and, in the following year, a report by the Defense Science Board that underscored the urgency of developing the means to carry out comprehensive tactical deception in the context of the AirLand Battle doctrine. That DSB report, in turn, served as a catalyst for Defense Department-wide interest in tactical deception, leading, among other developments, to the formation of a special study group for the Joint Requirements and Management Board that is probing research and development efforts associated with tactical deception. The newly formed panel's key job is to coordinate the R&D activities in this field for the services.

The seminal influence of Detachment 1 on Air Force planning has been pervasive. The service now has plans

to allocate about \$400 million over the next few years to research, development, and acquisition involving concealment, camouflage, and deception hardware. Investments in tactical deception in general cannot be disclosed for reasons of national security, but are thought to be greater than CCD hardware spending.

The recent formation of a system program office (SPO) for CCD research and development at AFSC's Aeronautical Systems Division created a central organization to oversee the hardware aspects of tactical deception and added further to the Air Force-wide awareness of this mission, according to General Hughes. Previously, CCD R&D had been handled in a less structured fashion at AFSC's Armaments Division at Eglin AFB, Fla.



"Moulages"—fake craters—are a relatively simple but effective means of duping enemy fighters into believing that operational runways are out of commission. Such inexpensive CCD techniques can have a high payoff.

In the same vein, the Air Force's major commands (MAJCOMs) earlier this year approved and implemented a comprehensive tactical deception training program developed by Detachment 1. At the same time, a cadre of full-time tactical deception officers (TDOs) is being assigned to all theaters of operation. These TDOs will work at the wing level, assigned to the directors of operations. By assigning TDOs to each wing, tactical deception becomes an integral element of the TAF's fundamental operational planning process at the grass-roots level, according to General Hughes.

Salty Demo

The latest and possibly most vigorous push that helped put tactical deception and CCD on the map was a major exercise at Spangdahlem AB in Germany last May that stressed air-base survivability. Code-named Salty Demo, this five-week-long exercise demonstrated the importance and effectiveness of concealment, camouflage, and deception devices in the face of a traditional, large-scale enemy attack on a "friendly" air base. Salty Demo included chemical warfare, runway repair, and simulated runway damage. On the basis of initial assess-

ments, the exercise proved the significant payoff from low-cost CCD investments. The exercise showed, for instance, that even such relatively mundane techniques as the innovative use of paint schemes to confuse the attacker and massive smoke generation can greatly increase airfield survivability.

Another relatively simple, high-payoff application of CCD involves three-dimensional "moulages" that dupe attacking enemy fighters into believing that operational runways are out of commission. (The effectiveness of this type of ruse was demonstrated by Argentine armed forces during the Falklands conflict when they repeatedly deceived British forces into believing that major runways were out of commission when in fact they were not.)

Other devices used successfully during the Salty Demo exercise involved aircraft decoys, corner reflectors, and phony operating surfaces that diverted the "attackers" from real targets. One of the lessons that came across loud and clear from this exercise is that CCD devices will frequently be quite effective even when they are relatively crude. The crews of the attacking force coming in on the deck at high speed are usually not able to examine their targets carefully and will go after any reasonable decoy.

Exploiting Smart Electronics

While USAF tactical deception and CCD experts tend to believe that the Soviets are ahead of the US in their *maskirovka* efforts—particularly the grander deception strategies—the shoe is probably on the other foot in instances where this country's basic technological lead in smart electronics can be brought into play.

Key here are such gambits as causing targets to appear in one place when they are in fact in another. This form of advanced spoofing is especially important in the case of protecting the orbits of such vital alerting assets as the E-3 AWACS and the Compass Call electronic countermeasures aircraft. This protection comes in two forms: traditional F-15 fighter cover and electronic deception that masks the actual orbits of the aircraft. The consensus is that while the Soviets are very effective when it comes to brute-force jamming, they lag behind the US in some of the relevant high-tech areas. Many of these are quite startling, but can't be discussed publicly because of security constraints.

Most of the more promising CCD applications are still in an embryonic state, including the cost-effective use of aircraft decoys and the extent to which they should simulate radar and IR signatures. Beginning next year, however, the Air Force's CCD focus will branch out from airfield survivability devices to the systematic design and fabrication of aircraft decoys.

If there is one thing clear in the Air Force's tactical deception trade, it is the recognition, as General Hughes explained, that "we are late in attacking this problem and that we must take advantage of the inherent payoffs involved in tactical deception not just in wartime but in the case of troop movements, operations security, and exercises." For that reason, the Air Force has put on a "full-court press with our geographical CINCs [USAFE, PACAF, and USAF's component of Readiness Command] to get new ideas and to get better use out of what they already have." ■

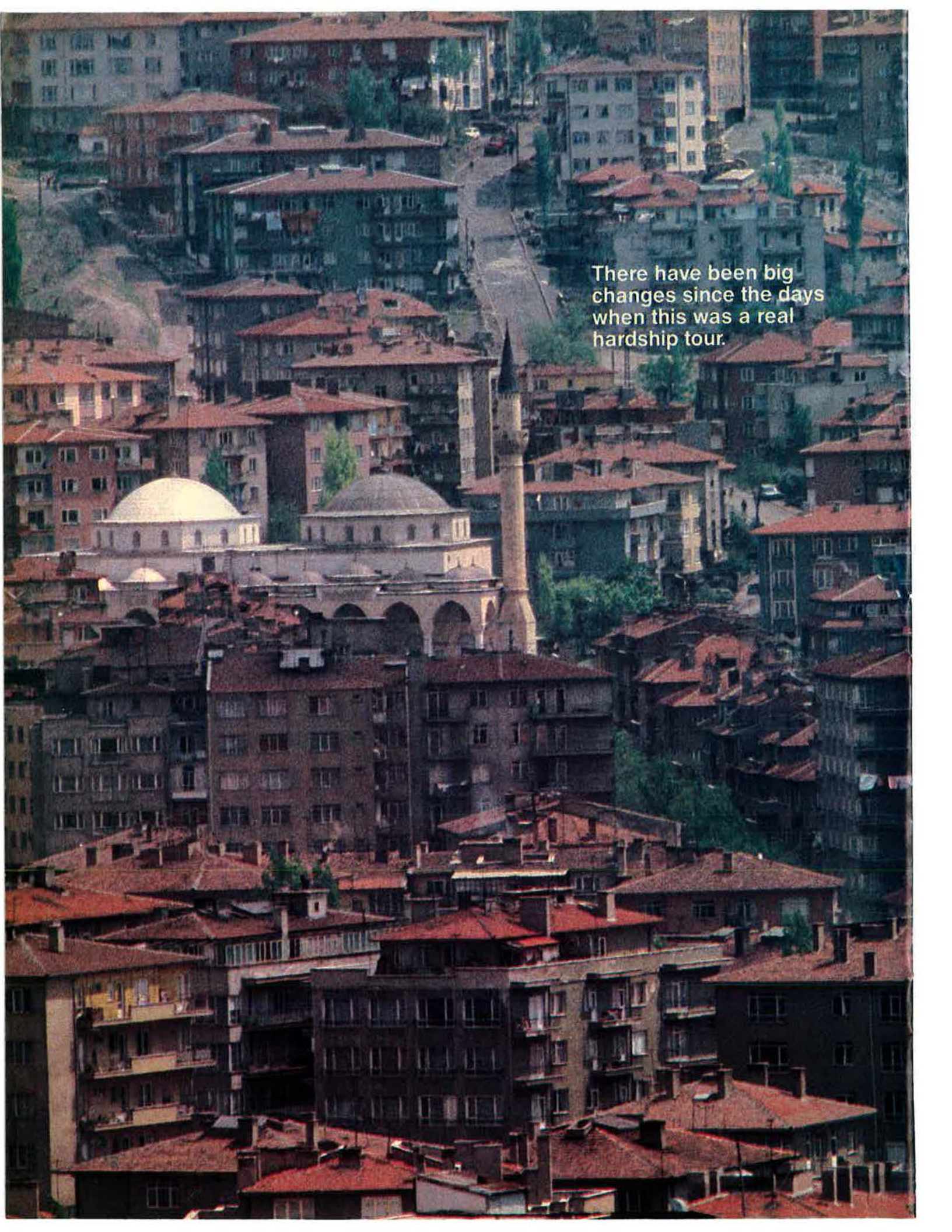


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There have been big changes since the days when this was a real hardship tour.



Look at Turkey Now

A STAFF REPORT

Early morning sun reflects from a mosque in Izmir. The Air Force has no permanent base in Izmir, relying instead on thirty separate leased facilities.

A FEW years ago, orders for Turkey meant either a twelve-month unaccompanied tour or two years of roughing it with your family. Neither case was cause for celebration. It also meant yet another chance to prove that you could accomplish the mission under discouraging conditions.

In some cases, blue-suiters chose to get out of the Air Force rather than take an assignment to Turkey. AFA National Director James M. McCoy recalls that the situation of the troops in Turkey was one of his major concerns when he was Chief Master Sergeant of the Air Force in 1979-81. Among those working hardest on the problem was the USAFE senior enlisted advisor, Sam E. Parish, the current Chief Master Sergeant of the Air Force. In the early 1980s, signs posted around the Pentagon asked, "What Have You Done for Turkey Today?"

Years of scarce funding combined with a construction ban imposed by the Turkish government in response to the US arms embargo following the 1974 Cyprus crisis had left US facilities in a sad state. Recreational facilities, services, and housing were among the hardest hit, but mission facilities suffered, too.

That's changing. In 1978, the Government of Turkey removed American forces from "provisional" status and relaxed many restrictions. That move—along with a growing recognition of just how bad the living and working conditions had become—paved the way for a massive effort to improve US facilities throughout the country.

Word of the big change is taking awhile to get around, but those who have seen the improvements are clearly impressed. Talk to someone who's in Turkey now—or someone who just returned from there—and the conversation is studded with such words as "new," "remodeled," and "under construction."

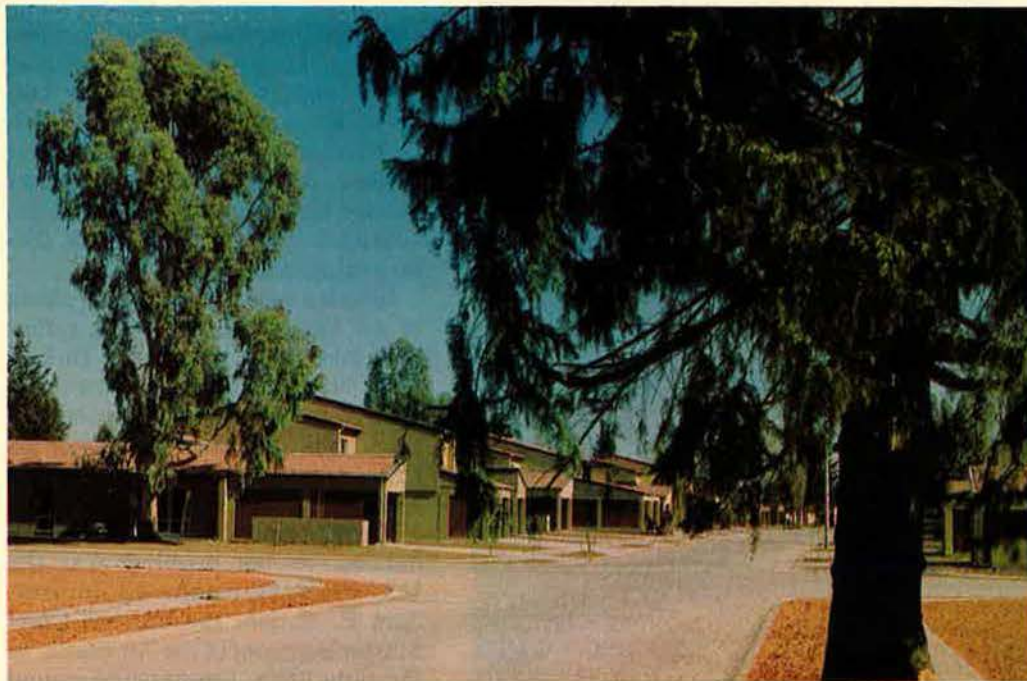
At the heart of the Turkey improvement effort is Headquarters, The United States Logistics Group, better known as TUSLOG.

TUSLOG is the central authority in Turkey for US Air Forces in Europe and reports to USAFE's Sixteenth Air Force at Torrejon AB, Spain. TUSLOG is responsible for the peacetime support of ninety-

ters staff developed a long-range plan that describes the facilities, personnel, and resources necessary to accomplish the USAF mission in Turkey through the 1990s.

That plan served as the blueprint for a Turkey-specific program objective memorandum (POM) that will ensure that Turkey-based units have the necessary resources for fu-

housing, are still spread out a little in Ankara, but the consolidation and enhancement of the physical plant on the air station itself is progressing. An additional 125 units of leased family housing are now ready. In addition, two eighty-person dormitories were remodeled and outfitted with new furniture recently.



While this modern housing complex could be at any Stateside base, this \$50 million example of nearly 800 one-, two-, and three-bedroom family units is in Incirlik, Turkey. The complex is the most ambitious housing project yet undertaken in Turkey.

eight different Defense Department and other federal units in Turkey, operational control of in-country USAF forces and aircraft, administrative control of NATO wartime assets, and command and support of USAF units participating in NATO and US exercises in Turkey.

TUSLOG's responsibilities in wartime, delineated in 1983, include reception, beddown, and follow-on logistics support for US forces deploying to Turkey.

TUSLOG has three major installations supporting units located throughout their individual areas of responsibility. The 7217th Air Base Group at Ankara supports thirteen sites. The 7241st Air Base Group at Izmir supports three additional sites, and the 39th Tactical Group at Incirlik supports an additional eight sites.

Moving Ahead

Headquartered at Ankara AS in what was once a DoD dependent school, TUSLOG recently shifted emphasis from catching up to planning for the future. The headquar-

ter mission requirements. The plan builds on the improvements generated during the past several years while USAF was catching up in Turkey. Among the most significant mission enhancements are data automation and communications upgrades, a logistics readiness center, development of a collocated operating base concept, and, most important, the resumption of alert by Turkish and US forces after ten years.

"Quality of life" upgrades have been, if anything, even more spectacular. One indicator of how conditions have improved is the dramatic increase in the number of USAF families in Turkey. USAFE officials report that almost seventy percent of those eligible for accompanied tours are electing to bring their families. US personnel in Turkey now have the same caliber of facilities enjoyed by Air Force people and their families in other USAFE locations.

Ankara

US facilities, especially leased

The commissary has been remodeled, and the base exchange now offers a full range of products. The dental clinic and the environmental health facility are new. The station also has a new civil engineering complex and fire station. An officers' club was designed, built, and put into operation in less than a year, and the remodeled NCO club can now accommodate about 200 people. The bowling and recreation centers were relocated to the air base from downtown. That facility features eight lanes, plus video games and pool tables.

Still on the horizon for Ankara are an ice cream and pizza parlor, a new dining hall, a new dormitory, and a new consolidated headquarters building.

Izmir

There is no base at Izmir. All of the Air Force's facilities are leased and scattered around the city. The Air Force relies on more than thirty separate leased facilities costing about \$2.4 million per year.

The most significant improve-

The Hodja Inn at Incirlik is one of the many new amenities built to make blue-suit life in Turkey more comfortable. The Inn is a fifty-room temporary lodging facility on base.



ment planned for Izmir is the establishment of a base. The central air station will provide security and stem the rising cost of leased space. Current plans are for a security fence, dormitories, a headquarters building, and utilities to be ready in 1988. Additional facilities will be added, with the entire base package taking about five more years to complete.

In Izmir, the Air Force leases Bayrakli Park, which provides a variety of recreational activities for USAF people and their families. An hour's drive south of Izmir is the twenty-two-acre Gumuldur recreation area, which offers access to some of the finest beaches on the Aegean Sea. Plans for the Gumuldur recreation area include a snack bar, foodland, and fifteen cabins with room for seventy people.

Incirlik

Of all the US installations in Turkey, Incirlik AB is the one most like a Stateside air base. The most important improvement at Incirlik is new family housing. Formerly, the base had only 150 permanent housing units to supplement substandard trailers brought to Incirlik from Wheelus AB, Libya. Today, 800 new two-, three-, and four-bedroom family housing units are being occupied.

The new units offer a welcome change for Incirlik families. They feature terrazzo ceramic floors, marble countertops, and Air Force-provided appliances. The \$50 million construction program is the most ambitious undertaken.

Other improvements at Incirlik include a new library and family services center, both opened in March

of this year, and a new fifty-room temporary lodging facility. A 160-person dormitory is ninety-nine percent complete.

Future improvements include a new commissary, which was begun last year, a new 108,000-square-foot hospital, a chapel addition and a consolidated open mess, both scheduled for 1988, and a new dining hall and post office scheduled for 1987.

Upgrades Everywhere

The smaller communications, munitions storage, and other military installations throughout Turkey haven't been overlooked. Improvements at these sites include racquetball courts and composite recreation facilities at communications sites. Swimming pools are scheduled to open at the munitions squadrons' locations.

Dining-hall renovations will soon be under way at five sites, and a new dining hall is programmed for Pirinlik. New dormitories are in various stages of construction—including one at Murted scheduled for completion in December 1985—and several are planned for construction in FYs '86, '87, and '88.

One of the more popular improvements is television. Currently, Incirlik is the only location with regular TV—a closed-circuit system, required because it is illegal in Turkey for anyone other than the Turkish government to broadcast over the open airwaves. Seventeen other locations have "mini-TV," consisting of videotape players and television sets. They are wired for closed-circuit TV when it becomes available. Cassettes are rotated among the sites by the Armed Forces Radio and Television Service.

But this is only the first step in improving television for the US forces in Turkey. The next step calls for direct downlinking of satellite signals in order to provide live programming. AFRTS plans to receive the signal at Incirlik and relay it from there to other sites—a superstation concept.

The US-Turkey relationship is a vital one for the security of both nations and their NATO allies. And Turkey, with its fascinating culture, beautiful coastline, and rich heritage, is becoming a much better assignment for Air Force people. ■



The base commissary at TUSLOG headquarters in Ankara has recently been remodeled. Because of facilities like this, nearly seventy percent of Air Force people eligible for accompanied tours of duty are electing to bring their families to Turkey.

The excitement of space may generate a broader interest in math, science, and technology.

The Young Astronauts

BY SUSAN KATZ



One of the main forces behind the formation of the Young Astronauts was President Reagan, who announced the program in White House ceremonies last fall.

I PLEDGE my best effort to improve my grades in science, mathematics, and related subjects, to learn about space, and to help others toward these goals."

Within the past year, more than 65,000 American children have made this pledge while joining the Young Astronaut Program, which is aimed at helping the United States retain leadership in the high technology world of the future. Formed last October following a mandate from President Ronald Reagan, the Young Astronaut Program draws on the excitement of the US space program in order to channel young minds toward high technology careers.

Specifically targeted are children in grades one through nine. They join chapters and meet at the local level, as do Boy Scouts or Girl Scouts. As with the Scouts, Young Astronauts have various membership levels. The basic divisions are Trainee (grades one through three); Pilot (grades four through six); and Commander (grades seven through nine). Each level is subdivided into three ranks, with Pledge and Star Commander occupying roughly the same positions as the more familiar Tenderfoot and Eagle Scout.

Chapters can be formed by students, teachers, schools, youth groups, or community organiza-

tions. The Wright Memorial Chapter of AFA, for example, was instrumental in bringing the Young Astronaut Program to the Dayton, Ohio, area. Ranging in size from five to thirty members, a Young Astronaut chapter can be part of a classroom activity or can form as a subgroup of another organization, such as a 4-H Club.

Members engage in activities designed to increase their involvement in math and science. Young Trainees, Pilots, and Commanders, for instance, learn the basics of propulsion theory by launching their own miniature rockets; other Young Astronaut projects come under such curriculum subheadings as "Computing Ratios," "Hypothesizing," and "Sequencing."

Details of the Young Astronaut Program and the reasons for its inception were discussed at the Aerospace Education Foundation's July Roundtable, "Educating for Leadership in Space."

"It is the concern about the state of math and science education in America that led to the creation of the Young Astronaut Program," said Roundtable participant Wendell Butler, Executive Director of the Young Astronauts. "The program is a new one. It was designed to help solve what I term a critical problem in American education."

Science on the Back Burner

The problem, as summarized by Roundtable moderator and AEF Vice President Dr. Eleanor Wynne, could go from critical to disastrous if left unchecked. Too few students take the necessary subjects in science, she pointed out. "Lack of student awareness and apathy, combined with stringent school budgets and fierce industrial competition for our most valuable resources, have forced many school districts to put these disciplines on the back burner," Dr. Wynne said. "As modern technology permeates every phase of our lives, this approach is societal suicide."

Predictions from the US Department of Labor underscore the need for math/science education, said Dr. Wynne: "Jobs for those with expertise in science and technology will increase by at least twenty-five percent in the next ten years. The ever-present question continues to sur-

face. We know the need, but will we be ready to meet the challenge?"

The facts indicate a double-edged answer: "We're slipping behind, while the other guys are gaining ground." That disadvantage, however, may not always be evident at first glance.

Dr. Curtis Graves, Director of Educational Programs for NASA, told the Roundtable audience that 69,000 engineers graduated from US schools this year. "Your first inclination, once you heard that number, was that that's a fantastic amount of engineers, and we're going to be up to our ears in engineers very quickly," said Dr. Graves. "But just so that you can understand that in perspective, the Japanese graduated 80,000 engineers and the Russians graduated 320,000 engineers just this last year."

Steadily declining high school scores do not bode well for future engineering classes. Mr. Butler told the Roundtable audience about "some frightening statistics" he had read. "I just saw a study that showed that average SAT scores in America over the past two decades have gone from 503 to 471. So anybody who thinks that we don't have a problem has a problem." SAT scores are graded with a maximum score of 800.

The disadvantage has both military and economic implications, said Dr. Graves. "We're losing ground not only on the military front but in the world marketplace. And that should frighten all of us. . . . On the other side of that coin, it's frightening to see that youngsters from Mogadishu, Somalia, are taking four years of science, four years of math in high school, and our youngsters from the larger metropolitan areas in the United States, if they are lucky, can get two years of science and two years of math in high school. That says to us that our priorities are in funny condition."

Young people in particular should be concerned, according to Roundtable panelist Harry Wugalter. Mr. Wugalter is manager of the Research Information Services and Academic Affairs Office at Rockwell International Science Center.

"American industry's ability to compete in the world markets is

eroding," Mr. Wugalter said. "Real wages in the business sector have been stagnant in recent years. Our productivity growth has been outstripped by all of our major trading partners. We have record trade deficits. Now, this information should be disturbing to young people whose future depends upon the continued strength of American business."

The President's Directive

According to Mr. Butler, these trends so disturbed at least one individual that he was moved to action. That individual was Ronald Reagan. In October 1984, Mr. Reagan held a meeting in the Oval Office during which he discussed solutions to the problem.

"The President talked about his personal concern about where we stand with respect to our trading partners—and the Russians and the Japanese as well—when it comes to the quality of our graduates," Mr. Butler said. "And so it was determined at that time that we would take advantage of the magic . . . of the United States space program—which is really the envy of the world—to try to use that program as a catalyst to encourage young people to do better in math and science."

Mr. Butler was at the time a staff member at the Office of Private Sector Initiatives. "The President gave us . . . three directives. He said, number one, don't create another government bureaucracy. Create something in the private sector.

"Number two, aim it at young people, because I'm told that the problem begins early. Young people lose their interest in math and science at a very early age—according to the educators, about the second or third grade. We've got to catch them early. If you wait until high school, it's too late.

"And third, he said, make sure that the program is tailored to the individual communities across the country. Don't try to administer a program from Washington that would fit every single community."

Following the President's mandate, members of the newly created Young Astronaut Council set out to form the Young Astronaut Program. Organizers worked with NASA, the National Air and Space Museum,

and major educational groups in order to develop a curriculum.

"We started disseminating materials in January, and we've just gotten our results from the first semester," Mr. Butler said. "We've experienced dramatic growth, and I believe that we're going to have a dramatic impact on the study of math and science in the country."

The Young Astronaut curriculum does not reinvent the wheel, Mr. Butler said. "We have a team of educators, but we borrow heavily on the aerospace educators who are already there, who have already tried, who have already tested their materials in schools and organizations across the country."

Planned curriculum packages include those developed by the Civil Air Patrol, NASA, and the Federal Aviation Administration. The Young Astronaut Program acts as a dissemination point to schools, Mr. Butler said. Material is distributed in two forms: via an electronic network called Astronet and in a monthly space poster tailored to a particular Space Shuttle mission.

The posters map out issues for exploration by students and teachers. An early poster features a photograph of an astronaut enjoying a space walk; the reverse side of the pinup details the lesson it represents. A chart for teachers (or group leaders) breaks down specific lessons in science, mathematics, technology, language arts, and reading.

Learning and Competing

The lessons are neither dull nor simple. Youngsters in the Commander level are asked to use Newtonian theory as they study the poster. "Ask each student to calculate their own acceleration in a maneuvering unit if two pounds (nine Newtons) of thrust or force is used," the instructions read. The formula is included with the poster ($F/m = a$, where $F =$ nine Newtons, $m =$ fifty kg, and $a =$ meters per second squared).

Other lessons have students laying out a Cartesian coordinate system so that they learn "translation" motion in space, studying the liquid cooling systems in Manned Maneuvering Units, and measuring the heat absorbency of different materials. The exercises are not limited

strictly to science and technology, though. A curriculum activity for Commanders has the students writing short stories and articles about "The Blackness of Space and the Blueness of Earth." Chapter leaders are asked to have the students select the group's best compositions and send the winning entries to the Young Astronaut Council in Washington, D. C.

Competition has an active part in Young Astronaut chapters. Group leaders are asked to give promotions in rank only for cause. The chapter starter kit describes the Young Astronaut Council philosophy: "As in any field of endeavor, reaching the highest level should be reserved only for those who excel in some way. Therefore, it is unlikely that all students will reach the top rank in each level."

The Council also plans to hold nationwide competitions for young members. The prize for at least one upcoming contest is a scholarship to Space Camp at the Alabama Space and Rocket Center in Huntsville. The Space Camp trip is a coveted prize; campers enjoy such activities as walking in zero gravity, working with computers, and learning about rocketry. The final day of Space Camp includes a simulated Shuttle launch, in which the youngsters travel as astronauts.

A Young Astronaut chapter from Mulberry Elementary School in Mulberry, Fla., was recently honored for its outstanding participation in the new program. Fifty sixth-graders spent part of their summer vacation in NASA astronaut training at the Kennedy Space Center, Fla. They also viewed an exclusive showing of one of the IMAX films about the Space Shuttle, *Hail Columbia*.

Another Young Astronaut contest will place two winners in starring roles of an ABC motion picture, *SpaceCamp*. The film is about a group of teens whose summer at a camp for future astronauts turns into an unexpected trip on the Space Shuttle. *SpaceCamp* is set to be released next summer.

Noncompetitive Young Astronaut activities include trips to Space Shuttle launches and ham radio conversations with orbiting astronauts. Other program activities are designed to stimulate the mind with-

out draining the pocketbook. Some chapters have challenged their members to read a specified number of books on space exploration, for instance.

High school students interested in the Young Astronaut Program are asked to become mentors for younger children. "It's not that we think there should not be a high school program," said Mr. Butler. "What we're asking the high school students to do now, and particularly [students in] Junior ROTC chapters, is to serve as mentors to our elementary and junior high school kids to help them through."

The focus is on the younger children, Mr. Butler said, because research has shown that they lose interest in math and science by the third grade. Council organizers are asking high school and college students to go into elementary and junior high schools and help them get their chapters started. "Eventually, we will have Young Astronaut Programs in high school."

Funding the Program

The new organization was designed to operate without draining limited school resources. It costs \$20 to form a chapter, usually sponsored by a local group or business. The program itself is funded through donations from private industry.

The Young Astronaut Council first sought funding from companies that had supported the Olympics, Mr. Butler said. "The country was on a high with the recently completed Olympics. We got space in the offices that were occupied by the Olympic organizing committee on a *pro bono* basis, and we started contacting firms."

Council organizers found that the space program excited companies as well as individuals, Mr. Butler said.

Fourteen major corporations signed up to sponsor the fledgling program, said Mr. Butler. He told the Roundtable audience that he had raised \$1 million in a six-month period.

As an example, Mr. Butler described the relationship between the Young Astronauts and a sportswear manufacturer. The Adidas Corp. is manufacturing a line of Young Astronaut apparel to be marketed in

144 countries. The clothing includes T-shirts, jackets, flight suits, gym shorts, and tennis shoes. Royalties from those items will be paid directly to the Young Astronaut Council, which in turn will put the money into its program.

Other sponsors include Safeway Stores, Motorola, Eaton Corp., Intersat, M&M/Mars, Burson-Marsteller, Westinghouse, Rockwell International, and Lockheed. Not all arrangements are designed for profit. The Xerox Corp., for example, recently sponsored a trip to Space Camp for fifty youngsters who otherwise could not afford to go. The company funded the entire five-day mission, including air travel, lodging, meals, and guides.

Another corporate project is designed to reach all children who have television sets. Marvel Productions has introduced a new Saturday morning cartoon series on CBS. The program, entitled "The Young Astronauts," features the crew of space vessel *Courageous* in the year 2015. The *Courageous* is on an eighteen-month mission to resupply space bases and ferry cargo within the solar system. Among the thirty-member crew are the Hamptons and their three children. The adult Hamptons had been charter members of the Young Astronaut Program in the 1980s, when they learned lessons in the classroom. The three children, however, are getting their space lessons firsthand.

The corporate/Young Astronaut liaison is designed to benefit all parties, according to Kerry Joels, Director of Curriculum for the Council. "All high technology industries should benefit from the improved pool of math/science students this would produce," Mr. Joels told AIR FORCE Magazine. "We're not necessarily trying to turn out a bunch of astronauts. Aerospace and all related fields will benefit."

Need Will Increase

The need for technically trained individuals will increase in future years, according to Roundtable panelists. Mr. Wugalter said that about 75,000 engineers per year will be needed in the United States in the year 2000 and beyond. New challenges will arise in physics and chemistry, he said. Young career-



Nine of the ten finalists for the NASA Teacher in Space program attended the Aerospace Education Foundation's July Roundtable at AFA's National Headquarters in Virginia. From left to right are Kathleen Beres, Judith Garcia, Michael Metcalf, Mickey Wenger, AEF Vice President Dr. Eleanor Wynne, Harry Wugalter of Rockwell International, David Marquart, Peggy Lathaen, Christa McAuliffe, Robert Foerster, and Barbara Morgan.

Teacher in Space

Memories of an earlier space age were evoked during the July Roundtable when nine of the ten finalists for the NASA Teacher in Space program answered audience questions.

Candidate Christa McAuliffe of Concord, N. H., told listeners about the event that sparked her interest in space travel.

"When I was in high school, President Kennedy was President of the United States at that time," she said. "I can remember his commitment to the space program and saying that before the decade was out there was going to be a man on the moon. I can remember feeling really excited and very proud that I was an American then, and we were going to expand and we were going to win this race. I can remember the excitement that that generated."

Ms. McAuliffe said she was particularly impressed by President Kennedy's emphasis on the worth of the ordinary person, and she hoped to pass on that feeling to her own students.

"The ordinary person made a difference, and that was an important part of my history, and today when I try to teach my students what history is all about, I want them to see that link. They're a part of history; they're an important part. . . . I want them to see themselves as part of the space age. They are, and they don't have that connection yet."

Teachers have to show their students the connection, she said, "because they are our future."

Ms. McAuliffe, a thirty-six-year-old mother of two, was subsequently selected to be the teacher in space, and she will blast off on January 22, 1986, for a six-day mission aboard the Space Shuttle *Challenger*. She was chosen by NASA from more than 11,000 teacher applicants.

The ten teacher finalists represented schools from across the United States. They were Kathleen Beres from Baltimore, Md.; Robert Foerster from West Lafayette, Ind.; Judith Marie Garcia from Alexandria, Va.; Margaret "Peggy" Lathaen from Friendswood, Tex.; McAuliffe; David Marquart from Boise, Idaho; Michael Metcalf from Hardwick, Vt.; Barbara Morgan from McCall, Idaho; Mickey Wenger from Parkersburg, W. Va.; and Richard Methia from New Bedford, Me. (Mr. Methia was unable to attend the Roundtable.)

Panelists learned that one candidate, Robert Foerster, was a charter leader of a Young Astronaut chapter in Indiana. Although Mr. Foerster will not be aboard the "teacher Shuttle" when it takes off early next year, his astronaut training will no doubt provide inspiration for at least one generation of Young Astronauts.

—SUSAN KATZ

seekers can look forward to work in materials processing, electronics, electro-optics, robotics, artificial intelligence, computer-aided design, and more. "It goes on," Mr. Butler said. "But they're all skills that can be learned."

Lt. Col. William Pine, Director of Education for Air Force Space Command, discussed future careers in his field. The number of jobs in Space Command will double by 1992. "Not only are the numbers growing so rapidly, but we're also finding that [the jobs are] becoming more complex," he said. "As an example, one of the jobs is a Shuttle operations officer, and in the last three months we've now put in a new requirement that you need two years of college-level physics and two years of college-level calculus."

Colonel Pine said that about thirty-five percent of Space Command's space jobs require technical training. "About nineteen percent of the people coming to Space Command three years ago had a technical degree," he said. "This year, 1985, more than seventy-five percent of the people coming to the Command had a technical background. So I think that's a message for those of us in education to take a look at as we look at the future."

Space Command does not want an entire command made up of Ph.D.s in electrical engineering, however. "We need everybody, and there's room for everybody. We need a good mix in the Command. I think that's true in the civilian community, too. . . . We need people with very strong communications skills, and we can't say enough how important it is for somebody to be able to speak and write—to communicate with other people to get ideas across. We need people to listen, and that's really important, too."

As private industry discovers the commercial uses of space, technical jobs will open up in that area as well. President Reagan heralded a new era last July when he discussed private uses of space technology. "We can produce rare medicines with the potential of saving thousands of lives and hundreds of millions of dollars," Mr. Reagan said. "We can manufacture superchips that will improve our competitive position in the world computer market, we can build space observatories enabling

scientists to see out to the edge of the universe, and we can produce special alloys and biological materials that benefit greatly from a zero-gravity environment."

The space age has obviously captured the President's imagination—and with that, his energy. In a letter dated October 17, 1984, Mr. Reagan wrote of his interest in the Young Astronauts. The letter was addressed to those inquiring about the program:

"America stands on the threshold of new challenges and opportunities in space. By accepting the challenge, we will move forward with the same courage and indomitable spirit that made us a great nation and that carried our Apollo astronauts to the moon.

"In order to maintain our position of leadership in the world of high technology, we need to rekindle the spirit of scientific adventure and help nurture it in our nation's schools."

Letters Show Spark

The kindling seems to have caught the spark. The Young Astronaut Council recently received a letter from an eleven-year-old Maryland girl named Monica Richey. Miss Richey told Council members about her reaction to a local newspaper article on the Young Astronauts. "I was very excited when I saw it," she wrote. "I said to myself, 'This is my chance!' I have been interested in space from when I was eight years old. I decided I wanted to be the first lady on the moon!"

Miss Richey wrote that she had sent a letter to Astronaut Byron Lichtenberg, who went up in Space-lab I. "I have waited and waited, studied and studied," Miss Richey wrote. "If only you could select me, I've hoped and waited for an opportunity. I dream and think about it, which brings questions to my mind which I wish to answer."

Another youngster, Linda Van-

daele, wrote the Council that she hoped to be the first child in space. "I wrote three times to NASA," Miss Vandaele said. "Finally they sent back a job brochure, and it said you had to have a college diploma and had to be in a certain height and weight range. How am I going to get a college diploma, gain weight, and grow? After all, I am only eleven. Also, to be the first child in space, you have to be more a child, not an adult."

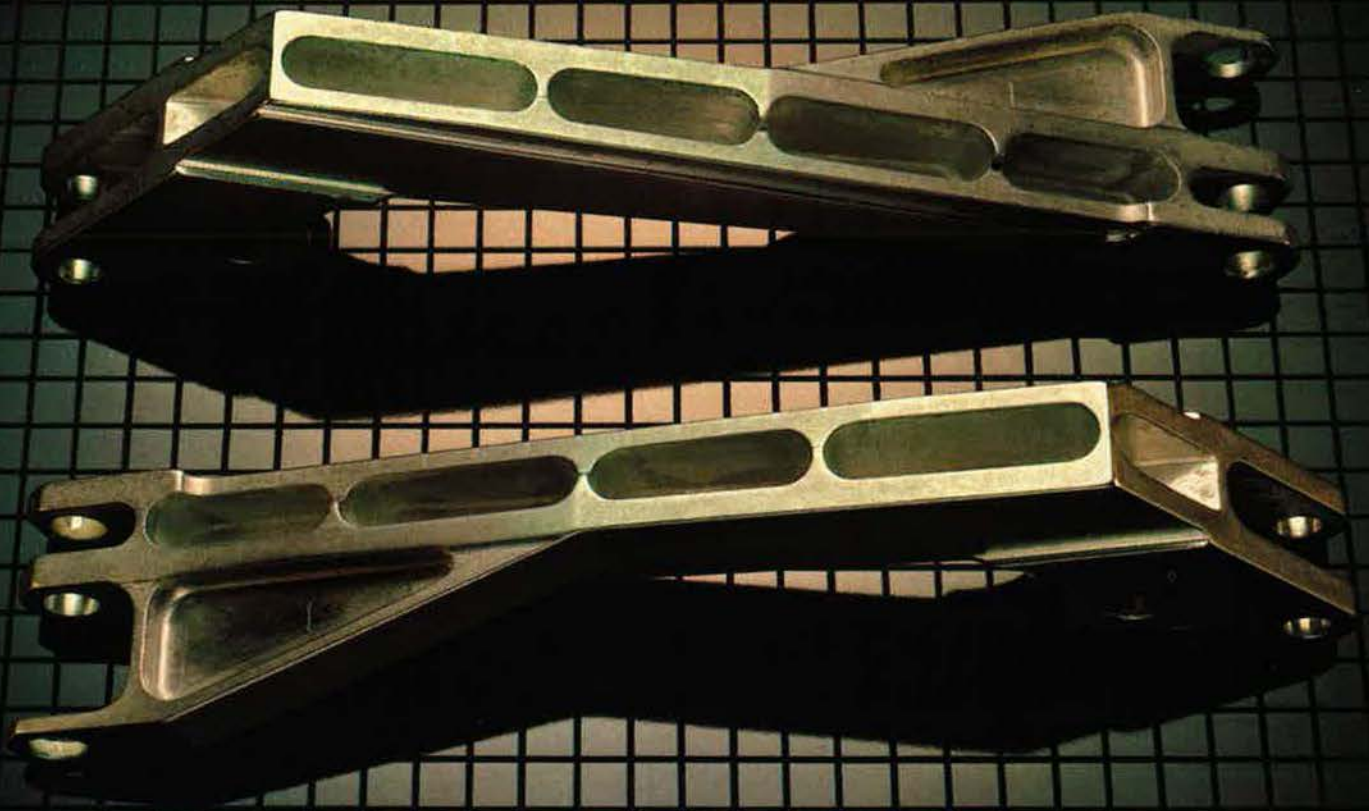
A thirteen-year-old named Charles H. Pruett wrote the Council about his interest in astronomy, planets, and the Shuttle. "I know you're not requesting this info," he said, "but I think I'd be a great Young Astronaut."

The letters seem to reflect more than a passing interest in space; there is a sense of urgency behind them, as if the young writers have already made a commitment.

If the youngsters are representative of students nationwide, the Young Astronaut Program should have no problem reaching its goal of 20,000 chapters within the next year. And their apparent enthusiasm should lessen the concern of Colonel Pine, who wondered where the US would "grow" people qualified to fill the technical slots at Space Command.

"We're not trying to create in our program a community or country of astronauts," Mr. Butler told fellow Roundtable panelists. "What we're trying to do is to make young people aware that there's a wider range of career choices available, that there are role models like the [NASA Teacher in Space program finalists with us today in the Roundtable audience], that all role models in America don't need to be Michael Jackson or Prince or Dr. J. There are some other role models. And that's what my program is aimed at—highlighting people such as yourselves and the professionals in the aerospace industry." ■

Susan Katz is a writer for the Washington Times. A member of AFA and the Aviation/Space Writers Association, she specializes in aerospace and defense topics. Miss Katz was editor of the Dixon, Calif., Tribune from 1982-85, during which time she also became director of media relations for the Travis AFB Museum. She is currently Washington Field Representative for the Travis Museum. Last June, she was named a Scott Fellow of the Aerospace Education Foundation by the Travis Chapter of AFA, and she has been selected as the 1985 recipient of the California AFA Distinguished Achievement in Journalism Award.



What's the big difference between these two aerostructure components?

Actually, the biggest difference is in how they were manufactured. The one on top was manufactured by the "Factory of Tomorrow" at Vought Aero Products Division of LTV Aerospace and Defense—and it accounts for the big differences in cost and quality and time. It's called the Flexible Machining Cell, and it's the largest, most sophisticated and advanced manufacturing facility of its type in the world.

The Flexible Machining Cell is a remarkably versatile integration of automated machining centers, cleaning and inspection stations, parts carousels and chip collection system—all served by a robot transportation system and controlled entirely by computers.

Vought Aero Products uses it to help turn out advanced aerostructures at tremendous savings in time and money. Time and cost and quality. Those are the differences our contract partners look for in a team member.

The B-1B project is a prime example. We're one of the members of the B-1B team, producing the aft and aft-intermediate fuselage sections of the advanced bomber. A portion of that task, which would require 200,000 hours using conventional machining methods, will be done in 70,000 hours in our Flexible Machining Cell. That's a 3-to-1 productivity improvement, which cuts millions off the cost of the B-1B program.

LTV Aerospace and Defense Company, Vought Aero Products Division, P.O. Box 225907, M/S 49L-06, Dallas, Texas 75265.



Aerospace and Defense
Vought Aero Products Division

L T V : L O O K I N G A H E A D

ASD and DARPA examine
new possibilities for
synergism between aviators
and airplanes.



Air Combat and Artificial Intelligence

BY LT. COL. RONALD I. MORISHIGE, USAF
and
LT. COL. JOHN RETELLE, USAF

SUCCESS in air combat will always ride on the skills of the pilots. Using those skills to best advantage, however, is becoming more and more difficult in an increasingly complicated and demanding air combat environment. Pilots need and welcome all the help they can get from new, potent technologies.

The Pilot's Associate (PA) program is designed to provide such help by applying artificial intelligence (AI) technologies in a synergistic relationship with combat pilots.

PA cannot—and is not meant to—replace pilots. But it has great potential for helping them to heighten their awareness of the situations around them and of the threats to their aircraft. It should thus be a potent means of significantly improving the mission effectiveness of future fighters.

Although the Pilot's Associate will have broad applications, the focus of the program is on single-seat fighters in a combat environment. Primarily a feasibility demonstration, the effort is not tied directly to any particular aircraft program. It includes evaluation in a real-time, man-in-the-loop, full-mission simulator. No flying evaluation is planned at this time.

The PA program is a joint five-year effort of the Air Force and the Defense Advanced Research Projects Agency (DARPA) and is one of three military applications programs under DARPA's Strategic

Computing Program. In the other two, the Army is working on an autonomous land vehicle, and the Navy is developing a battle management system for a carrier battle group. These DARPA programs have high technological risks, but their potential payoff is correspondingly high.

The Pilot's Associate program is being carried out at the Air Force Wright Aeronautical Laboratories (AFWAL), part of Aeronautical Systems Division at Wright-Patterson AFB, Ohio. AFWAL is coordinating related efforts by its Avionics and Flight Dynamics Laboratories, the Armstrong Aerospace Medical Research Laboratory, and the Air Force Institute of Technology. The AFWAL program office is managed by experienced fighter pilots and stresses communication among users, researchers, and engineers to develop a system with very high military utility.

Making the Machine an Expert

AI is keyed to expert systems. These systems are computer programs that draw on a knowledge base developed by human experts. Such systems are now being applied to medical diagnosis, oil exploration, air traffic control, and logistics planning. Several of them are planned for the Pilot's Associate effort.

In the PA, the knowledge base will take the form of "rules of thumb," engineering data, threat es-

The Visually Coupled Airborne Systems Simulator (VCASS), which looks like something out of the movie The Fly, presents flight information visually that the pilot can respond to by voice commands or visual cuing.

imates, and the seasoned operational judgment of experienced fighter pilots. The knowledge base will be developed and modified over a period of years.

A major concern of the Pilot's Associate program is to make the PA's several expert systems interface and cooperate. A partial list of key tasks that might be performed by the PA is given in the accompanying table. Many of these tasks will likely be performed by expert systems.

The Pilot's Associate seeks to reverse the trend toward proliferation of systems in fighter aircraft that generate massive amounts of data and dump it on the pilot. In current fighters, the pilot receives data from a multitude of separate sources, assimilates it, and then determines a course of action. Under combat conditions, even the best pilots can become so busy handling so many tasks that they overlook a critical factor.

As a result of this information overload, the pilot can lose some situational awareness—awareness of conditions and threats in the immediate surroundings. The problem has been obvious for some time, but there has not been a feasible solution. Now, the PA, using AI and other appropriate technologies, will provide a solution to part of the problem.

Instead of bombarding the pilot with large quantities of random data, the Pilot's Associate will integrate, prioritize, filter, and communicate the most significant information in accordance with the current situation. Information will be presented to the pilot in such a way that he can quickly comprehend the critical factors in a given set of circumstances. If the pilot has additional information or disagrees with the PA's estimate or recommendation, he will be able to override the PA or request more information from it.

Separating Us From Them

The need for development of emerging AI technologies is especially apparent when projecting future combat force structures. For instance, in some future NATO scenarios, it is virtually certain that our fighters would be outnumbered by modern Soviet fighters. In order to attain air superiority, our weapon systems would have to be employed

with optimum effectiveness. The PA will provide a significant force multiplier effect by improving the combat effectiveness of pilots.

For example, when a flight of fighters detects and engages a force of enemy fighters, the PA might recommend an unconventional attack geometry that exploits inherent aircraft and weapons strengths and capabilities in the beyond-visual-range arena. If so commanded, the PA could also execute the recommended maneuvers. It would present integrated weapons and target information to each pilot while also sharing appropriate information

by employing defensive countermeasures, by avoiding threat concentrations, and by coordinating both beyond-visual-range and close-in support.

By giving the pilot the information he needs when he needs it, the PA will enhance his control of the situation, directly improving lethality and survivability.

Beating Bad Situations to the Punch

Perhaps the key factor in the maturation of a fighter pilot is his ability to anticipate situations rather than simply to react to them. Simi-

The Pilot's Associate	
Functional Elements	Key Tasks
Systems Status	Monitors internal systems Fault diagnosis/prediction Fault correction/compensation Emergency response
Mission Planning	Navigation Fuel/resource management Threat avoidance Contingency planning Route replanning/modification
Tactics Aide	Weapon selection/employment Countermeasures employment Combat ID Target sorting/selection
Situation Assessment	Correlates information on Threat forces Friendly forces Weather Status of own aircraft
Pilot-Vehicle Interface	Determines Communication Informational Content Timing Mode

FACING PAGE:
This is a typical scene that future pilots using the VCASS would see. The projection shows flight path (center), ground threats (red dome), hostile (red) and friendly (white) aircraft, potentially hostile ground and air targets (yellow), and way markers and possible targets (black). White pillars show relative speed. Vital aircraft information (including available weapons, speed, and altitude) is shown at the bottom.

among friendly aircraft in order to coordinate the attack.

During close-in combat, the PA could help track "bandits" and monitor "friendlies" to reduce chances of double-targeting one hostile plane and ignoring another, to minimize the chances of undetected hostile shots, and practically to eliminate fratricide.

Throughout, the PA would enhance the survivability of the flight

larly, the Pilot's Associate must have the capability to anticipate hazardous situations. By anticipating potential danger, providing information that could reduce or eliminate that danger, and allowing some decision time, the PA can minimize surprise attacks and the subsequent last-ditch maneuvers that they necessitate.

Accordingly, the Pilot's Associate program stresses development of AI

technologies to reduce the number of situational surprises.

To illustrate a possible interaction between the pilot and PA, consider the number of fatal aircraft accidents in which the pilot was unaware of degrading flight conditions, his altitude, or his flight attitude. In most cases, disaster might have been prevented by improved situational awareness. Installation of ground proximity warning systems on many aircraft has not made them immune to this problem, but installation and operation of the PA would be a very different story.

pilot—who is deliberately executing the maneuver—might object to a warning about this unusual attitude. During an approach for landing, however, the criteria and rules to be applied would be quite different.

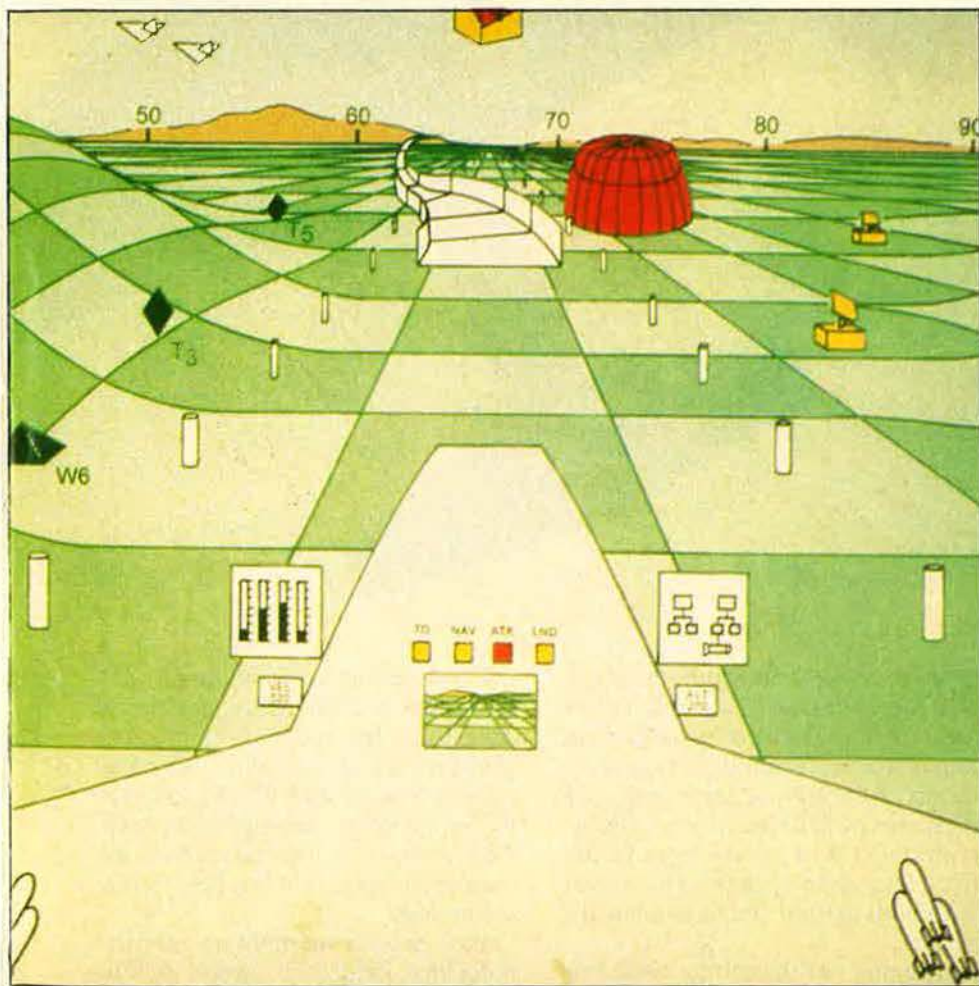
In either event, the PA would correlate and project the result of continuing the pilot's current actions. If the maneuver were projected to exceed some safety limit or minimum terrain clearance, a warning and suggested course of action would be issued. The pilot could respond by ignoring the PA prompt, implementing the suggested action, or implementing another action. Any cor-

rective action or other positive pilot acknowledgment of the warning would indicate some recognition of the PA prompt. No further PA action concerning that situation would be necessary.

However, if the pilot ignored the warning, the next PA response would be to determine the minimum recovery margin and begin a "countdown" to let the pilot know that if he did not modify his actions or otherwise acknowledge the warning, the PA would initiate recovery action at "time zero." Lack of response by the pilot would be implied consent. The pilot could preclude such PA intervention by any positive action, which might include flight-control commands, mode switching, or other situation changes.

The Air Force may find that the pilot should tailor the characteristics of the PA to match his own preferences, skills, and current experience. That tailoring would be analogous to issuing each pilot the same house and furniture, but allowing each to arrange the furniture as desired. There would be natural constraints, but also significant freedom. The pilot could tailor the default level of task delegation and have it vary dynamically as the mission progressed.

With more experience, the pilot could alter the degree of delegation. The PA would assume those functions delegated by the pilot through explicit or implicit means. Communications between the pilot and the PA would vary with pilot preference. One pilot might prefer audio response; another, visual indications; a third might not want any feedback in certain situations, but both audio and visual for others. This tailoring would promote more effective communication and enhance situational awareness. ■



To perform this function, the PA would use its extensive knowledge of the current situation to detect deviations from appropriate flight paths and to determine the reason for the deviation. If appropriate, it would advise the pilot that a deviation has occurred. In an air combat engagement, the pilot might not welcome such a message. A forty-degree, nose-low sliceback may be required during a dogfight, and the

Lt. Col. Ronald I. Morishige is currently the Air Force Program Manager for the Pilot's Associate project at Aeronautical Systems Division, Wright-Patterson AFB, Ohio. A 1967 graduate of the Air Force Academy, he also holds a master's degree in computer science from the University of Illinois. Colonel Morishige has served as an F-4 command pilot and has also supervised analysis programs on the ATF, AMRAAM, the Alternate Fighter Engine, and Cased Telescoped Ammunition. Lt. Col. John Retelle is currently assigned to the Pilot's Associate project as the DARPA Program Manager. Also an Air Force Academy graduate, Colonel Retelle holds several advanced degrees and is a graduate of the French Test Pilot's School. He has served as a flight-test engineer at Edwards AFB, Calif., and as an Associate Professor of Aeronautics at the Air Force Academy. Prior to his DARPA assignment, Colonel Retelle was a project manager at the USAF Human Resources Lab at Williams AFB, Ariz.

Why not use our reconnaissance assets to predict and help cope with natural disasters?

New Roles for Recce

BY DINO BRUGIONI

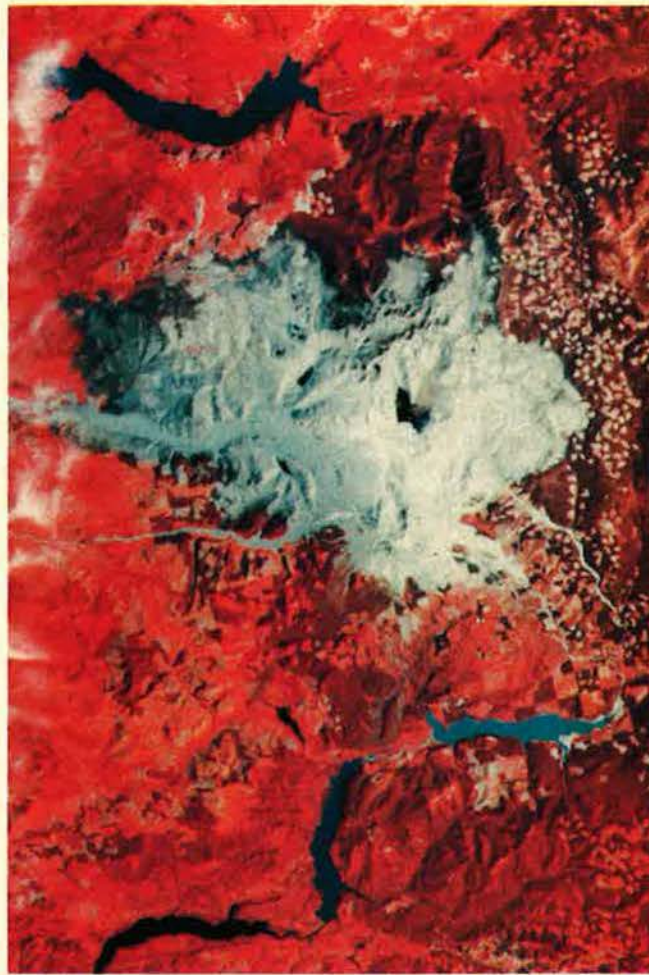
RECENTLY, the Subcommittee for Investigations and Oversight of the House Committee on Science and Technology issued its report, *Information Technology for Emergency Management*, culminating two years of hearings on the use of modern technology to deal with both natural and man-made disasters.

Opening the hearings, Subcommittee Chairman (now Senator) Albert Gore, Jr., said: "We are all aware of the tremendous technological advances made in the last few years. We have seen and benefited from their applications in the areas of health and medicine, the environment, and other scientific fields. But we must ensure that this technology is applied to our nation's ability to predict, prevent, and respond quickly and effectively to natural or man-made disasters."

I testified at those hearings that there was one resource not being used to its full potential. If it were properly employed it could save countless lives and billions of dollars in property damage each year. That resource is the nation's aerial reconnaissance and interpretation technology.

Few outside the military and intelligence fields are aware of this resource. Fewer still know how to interpret that technology, and even fewer know how and when to apply it. Yet it is the same technology with which the United States monitors SALT and the Middle East Truce Agreement; observes and predicts crop yields in the Soviet Union, Australia, Canada, Argentina, and India; and assesses damage caused by such catastrophes as the Italian, Guatemalan, and Alaskan earthquakes.





Before (left) and after (right) photos of the Mount Saint Helens volcanic eruption in 1980, taken in near-infrared imagery by NOAA's Landsat. Gray volcanic ash, which shows up clearly in the after photo, blanketed the surrounding countryside, dammed local rivers, and caused flooding in nearby lakes. Such images are useful in damage assessment.

Aerial reconnaissance and photographic and multisensor interpretation are sciences born of wartime necessity to obtain accurate information on the enemy rapidly. Since World War II, these sciences have been advanced and refined by the intelligence and mapping agencies until today's overhead reconnaissance systems provide more data with a greater frequency and cover larger areas than ever before. Computer and software developments make the entire information-gathering and interpretation system manageable.

Remote sensing of the earth can be done from a variety of platforms, such as low-flying helicopters, light aircraft, reconnaissance resources of the military services, the U-2 and SR-71, NASA satellites and Shuttles, and the meteorological satellites that photograph the hemi-

spheres from 22,300 miles in space. Surveying the earth from high-flying or orbiting platforms fitted with remote sensing devices could be the most significant technological development of our time.

Looking down on our planet to observe the complex and continuously changing interrelationship of land, sea, and air has added immeasurably to our knowledge of the fragile relationship between man and his environment. The combination of an established data base, broad area coverage, and large-scale photography has created unique opportunities for interpreting both natural and technological phenomena and disasters.

Properly interpreted, the remote sensing of our environment can provide current, definitive information that should be used in the decision-making and problem-solving proce-

dures we apply on earth. The pace of remote sensing techniques will accelerate since imagery can now be digitized. Combining imagery interpretation expertise with computer technology provides numerous innovative applications. It is now possible to analyze entire countries, regions, or continents. Remote sensing can provide data with speed and accuracy that cannot be attained from other sources.

Dimensions of the Problem

The resources of our planet are limited and in many instances are being depleted at an alarming rate. At the same time, world population is expanding geometrically. Those who interpret pertinent reconnaissance data are always impressed with the fragile web of life that is visible in the imagery. All cultural and economic activity conforms to

definite, identifiable patterns. The imagery interpreter knows these patterns as "signatures." Building codes, regulations, customs, practices, and procedures govern the methods by which man farms the land, builds homes, constructs factories, and extracts resources.

Visible also in the imagery are current activities that will affect our future livelihood adversely, such as building on flood plains, stripping the earth's timber for lumber and firewood, poor agricultural practices that cause the erosion of farmlands, the misuse or contamination of water, improper and indiscriminate disposal of wastes, and the impact of weather-related disasters, earthquakes, and volcanoes.

Natural and technological disasters kill and injure thousands of people and cause property damage of astronomical proportions. The 1983 National Oceanic and Atmospheric Administration (NOAA) *Climate Impact Assessment Report* for the United States reveals more than \$27 billion of property damage in the US directly attributable to weather phenomena. That year, the worst flooding in fifty years occurred in Latin America, while there were major droughts in Africa and Australia. And we have become all too familiar with such man-made disasters as chemical spills, explosions, fires,

nuclear accidents, and waste and sewage problems.

Potential Applications of Reconnaissance

Aerial photography and multisensor imagery can have three important applications in relation to natural and technological disasters. First, they are a valuable *historical* record; second, they could become the most important means for *predicting disasters*; third, this imagery is an unparalleled source of quick and accurate *damage assessment*. These are not discrete functions, of course. In actual use, there often would be considerable overlap. And they are by no means the only applications of overhead imagery.

Several years ago, Arthur C. Lundahl, Director of the National Photographic Interpretation Center from 1956 to 1973, discussed with the Director of Central Intelligence and the President's Science Advisor the wisdom of sharing these resources with civilian agencies. In 1967, as a result of a formal study recommending sharing, the Director of Central Intelligence entered into agreements with a number of federal agencies, giving them access to classified overhead photography. Subsequently, the National Photographic Interpretation Center

was directed to use aerial photography for such projects as assessing natural and man-made disasters, conducting route surveys for the Alaska pipeline, compiling national forest inventories, determining the extent of snow cover in the Sierras to forecast runoff, and detecting crop blight in the Plains states.

In 1975, the Rockefeller Commission reviewed the concept of sharing classified data and concluded: "The Commission can find no impropriety in permitting civilian use of aerial photographic systems. The economy of operating a single aerial photographic program dictates the use of these photographs for appropriate civilian purposes."

Nevertheless, for a variety of reasons, aerial photography and multisensor imagery are hardly being used in emergency management. The most familiar reason heard in Washington is that "it's not in our budget (or our charter)." Elsewhere, regional experts concerned with emergency management know little or nothing about these capabilities. Congressman Gore noted "the inertia on the part of emergency agencies that leads to a failure to use the data."

Images of History

Consider the three key civilian applications of this little-used imag-



Remote-sensing missions by such reconnaissance assets as this NASA U-2 aircraft have proven valuable in providing historical records, predicting natural and technological disasters, and assisting in damage assessment. A variety of sensors can be used to generate information for land-use analyses, water management, and atmospheric studies.

CAI's E-O cameras... the clear choice in real time reconnaissance.



CAI, the acknowledged leader in reconnaissance camera technology, has a full line of superior performance electro-optical reconnaissance cameras. And we're taking orders now! The KS-87, KS-127, KS-146 and KS-153 can be flexibly equipped for film or E-O applications, or both. Existing film cameras can be upgraded to E-O capability at any time. CAI's cameras provide the choice of the capabilities needed most: E-O, film, visible and near-infrared in short and medium focal length and LOROP configurations. Cameras designed to get the job done right the first time...everytime.

As a leader for more than 60 years in the design, manufacture and use of sophisticated, reliable aerial reconnaissance cameras and support equipment, CAI has pioneered in the field of E-O and real time reconnaissance systems that provide high quality, high resolution imagery even under the most demanding weather and light conditions.



KS-153

KS-87

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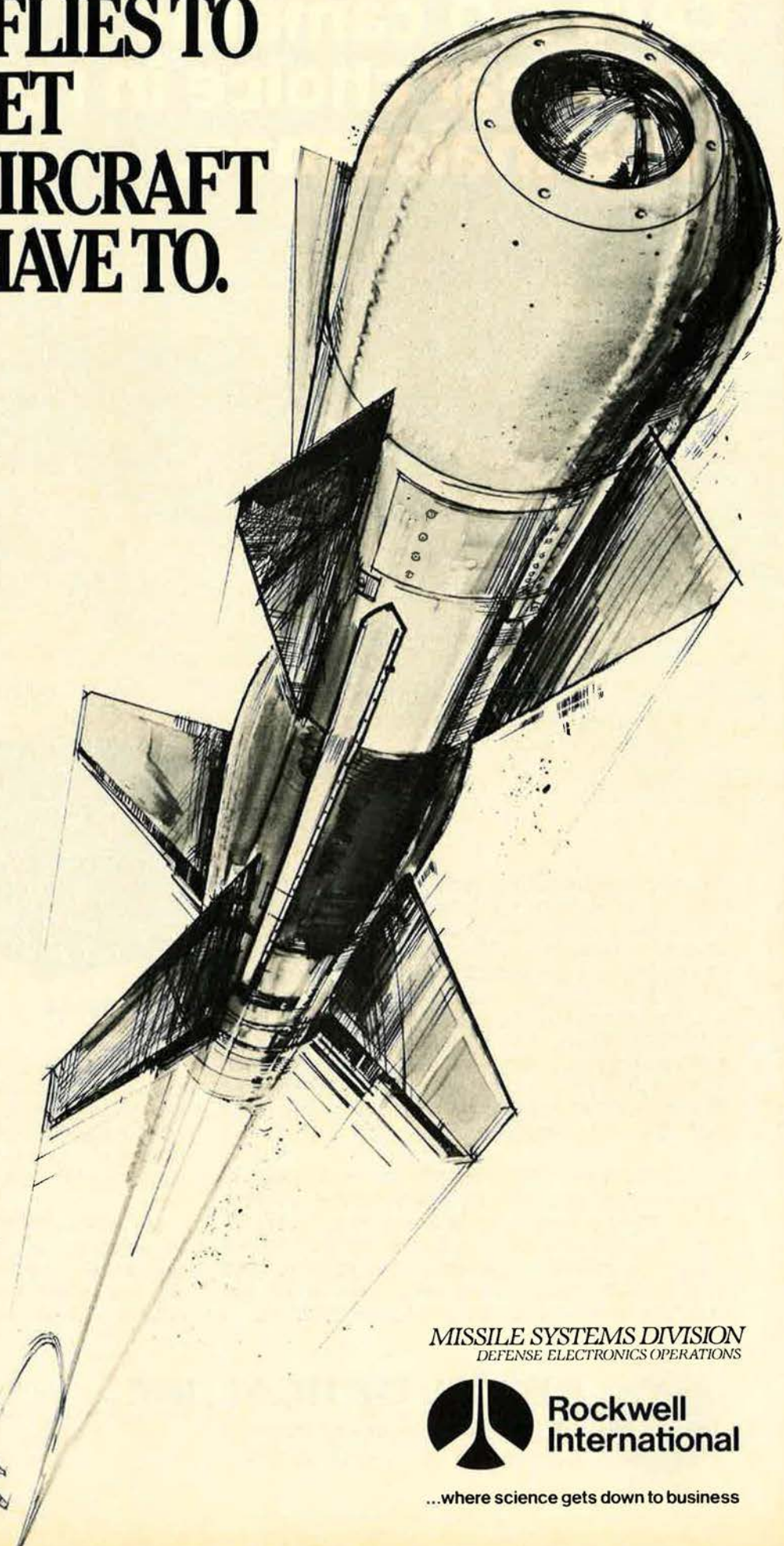
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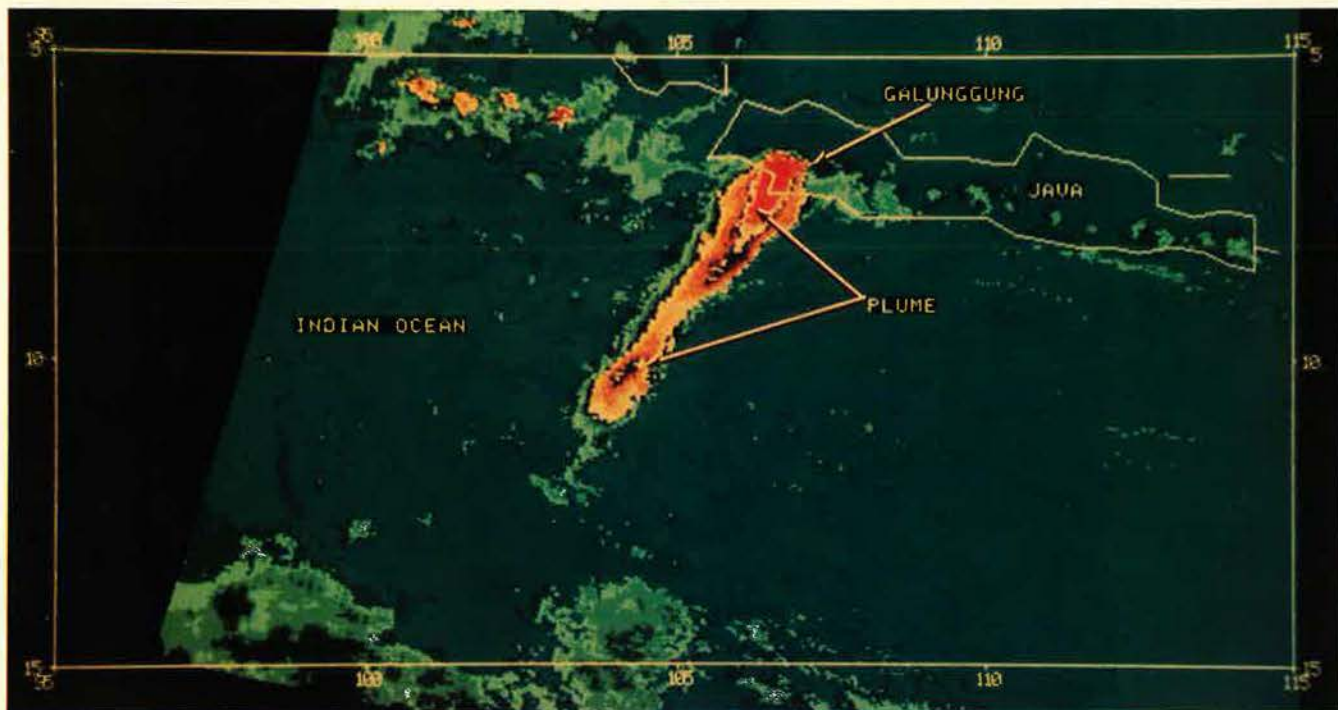


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The elongated plume of volcanic ash from the 1982 eruption of Mount Galunggung on the Indonesian island of Java shows up clearly in an image taken by the NOAA-7 satellite. Images such as this gathered by remote-sensing assets can be used to track such plumes and to warn aircraft away from airspace filled with volcanic ash, which can cause severe aircraft engine damage and possible disaster.

ery. As a *historical record*, aerial photography has few equals. The United States has an enormous data base of aerial photography and multisensor imagery gathered over the past sixty years. For example, the Departments of Interior and Agriculture have more than 25,000,000 prints of the United States. In addition, there are hundreds of other repositories holding photos taken by private citizens and local, state, military, and federal agencies. The steadily increasing volume of imagery collection may prove useful in ways that we can hardly even imagine today.

During the 1930s, for example, farmers were paid by the federal government to plow under part of their crops. To prove there was compliance with agreements, photographic missions were flown over farm areas. Most of that film found its way into the National Archives. Forty years later, when the Environmental Protection Agency was charged with locating old toxic chemical dumps, they found that these pictures provided the most reliable data on the existence of the waste sites used decades before and then abandoned and forgotten, but in most cases still hazardous.

Every day, the two Landsat satel-

lites now aloft collect more than 1,100 images worldwide. Each image covers about 100 square miles and is an irreplaceable record of a moment in time. Each establishes a baseline that is of critical importance in recognizing changes that may occur in the future.

An Ounce of Prevention

Landsat photography, supplemented by other sources of imagery, has a vast and largely unused potential for the second important civilian application—*predicting disasters*. After studying Landsat photographs, I testified in congressional hearings that the federal government has the technology, methodology, data, and expertise to have prevented, or at least greatly mitigated, the massive flooding in the west caused by snow melt in the spring of 1983. The Landsat photographs were clear, detailed, and encompassed the area of snow-melt concern.

Additional data could have been collected by SR-71 reconnaissance aircraft capable of covering the 1,450-mile length of the Colorado River in less than forty-five minutes and by U-2 aircraft equipped with a variety of sensors. These missions could have been flown as part of

the routine pilot-training programs.

The US Geological Survey had maps of sufficient detail and in scales appropriate for snow-melt measurement and analysis. The Defense Mapping Agency, the US Geological Survey, and the CIA have excellent photogrammetric capabilities that could have been used to measure accurately the amount of snow and compute runoff from the snow pack. With the flow computed, dams and reservoirs could have been drawn down enough to control flooding.

Property damage from the snow melt was estimated at more than \$1 billion. No monetary value can be placed on the 156 lives that were lost in the flooding. The only warning many people had was when water and mud crashed through their homes. Had federal and regional task forces been established, most of the flood damage and loss of life could have been prevented. The cost of implementing such a program would have been only about \$5 million, compared to the more than \$1 billion of property damage that occurred.

A Lost Opportunity

Here's another example of a lost opportunity to prevent disaster. It

took television crews to awaken the conscience of the world to the thousands dying from starvation or starvation-induced diseases in Africa. If existing multisensor imagery had been analyzed, the plight of 150,000,000 people in Ethiopia and other African countries not only could have been predicted, but action might have been taken before disaster struck. Evidence of the natural phenomena that caused crop failure occurs gradually over large areas and can be recorded through aerial photography or by multisensor imagery. Detailed analysis of large-area coverage over a period of time can identify drought or desert encroachment.

The science of determining crop conditions was developed after the USSR, experiencing a disastrous drought, secretly purchased millions of tons of US grain at bargain prices. When that became known, President Nixon called together those involved and issued an ultimatum that neither he nor any other President of the United States should ever again be caught short in similar circumstances.

Those familiar with reconnaissance and interpretation agreed that Landsat imagery could be used to monitor the distribution and vigor of crop growth and that such data, combined with other information, could produce a quantitative analysis of future yields. Analysis of the near-infrared spectrum can determine the degree of biomass, or the greenness of the crops. The more abundant and healthy the vegetation, the greater the yield. This method of determining crop yields resulted from the Large Area Crop Inventory Experiment (LACIE) in 1973 and from the later Agriculture and Resource Inventory Through Aerospace Remote Sensing (AGRI-STARS) program.

A comparison of the greenness in the African drought area in 1982 and 1983 indicated that there was considerably less vegetation in 1983 than there had been the year before. This was true not only of the crop-growing areas but in pastures as well. In other words, the area was experiencing a devastating drought. Technology exists not only to estimate the magnitude of the drought but also to predict potential food shortages.

Ingesting Volcanic Ash

Still another example: Ash clouds from volcanic eruptions can create a danger that is of particular interest to airmen, who can be given warning through the products of aerial and satellite reconnaissance. Jet engines can be severely damaged by ingesting volcanic ash. Following the eruption of Mount Saint Helens on May 18, 1980, meteorological satellites photographed the ash cloud as it moved eastward, and warnings were issued to aircraft flying in or near the cloud.

Two years later, two Boeing 747s flying in the Indian Ocean area were not so fortunate. On June 24 and July 13, 1982, these aircraft experienced severe engine problems resulting in shutdowns, caused by ingesting volcanic ash from eruptions of Mount Galunggung in Indonesia. Both aircraft were forced to make emergency landings at Djakarta. The loss of an airliner with all passengers would be a calamitous event, and that sobering fact prompted a series of investigations. It was found that sulfur dioxide in the volcanic eruption plumes is detectable from space. The Nimbus 7 Total Ozone Mapping Spectrometer (TOMS), which produces daily global images that measure how much sunlight in the ultraviolet spectral region is absorbed by ozone in the atmosphere, is also capable of determining the size and the shape of volcanic ash clouds. Another experiment revealed that the Geostationary Operational Environmental Satellite (GOES) and the NOAA polar-orbiting meteorological and environmental satellites—because of their multispectral capabilities, especially in the infrared range—have a strong potential for distinguishing and tracking ash clouds.

Infrared sensors in polar-orbiting satellites have many other warning applications. The dread of foresters is fire in inaccessible areas. Recent experiments with thermal infrared sensors aboard NOAA polar-orbiting satellites have shown the usefulness of these sensors as effective and economical means of detecting and monitoring forest, tundra, and open-range fires.

Using the 3.8-micron channel, the NOAA satellites "paint" a 2,600-kilometer longitudinal swath

with a latitudinal coverage of about fifteen degrees. Most of Alaska, for example, can be covered in a single frame, and forest or tundra fires of one square mile can be detected.

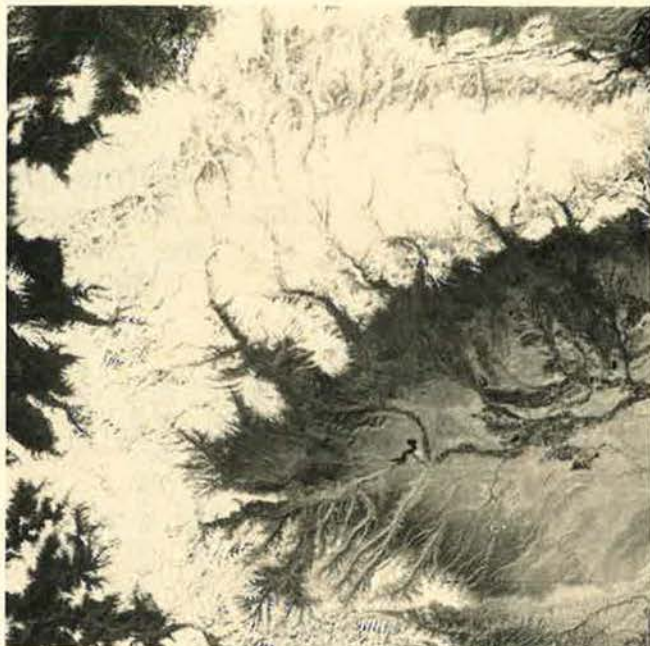
Reporting the Bad News

Finally, photographic and multisensor imagery has a potential for *damage assessment* that has not been fully exploited. Whenever a natural disaster strikes, there is an attendant breakdown in transportation, communications, public safety, and health care. The need for timely and accurate information on the scope and magnitude of the disaster becomes paramount for emergency management efforts. Aerial photography is unequaled in providing the data needed.

U-2s have been used to collect data essential in assessing the damage caused by earthquakes, hurricanes, floods, tornadoes, and oil spills. Both the U-2 and the SR-71 were employed during the eruption of Mount Saint Helens, gathering photographs and multisensor imagery for a quick assessment of the immediate dangers posed by the eruption.

Pre- and posteruption multisensor images provide a dramatic view of the destruction caused by that event. Almost a cubic mile of the crown of Mount Saint Helens was blown away. Trees as far as twenty-eight kilometers (more than seventeen miles) from the mountain were toppled like matchsticks, and timber was scorched for some distance beyond that. Sediment and debris filled Swift Reservoir and Spirit Lake. The massive flow of debris that swept down the North Toutle Valley raised its floor more than 600 feet, damming tributary rivers and creating new lakes and ponds.

The formation of these lakes posed a serious problem, since the dams created by the eruption might erode swiftly and release a deluge of water and mud down adjacent valleys. Evidence of volcanic ash carried into neighboring states by high-altitude winds could be seen clearly on aerial photos. Those photos were used for devising methods of alleviating problems created by swollen lakes and ponds. Foresters also used the images to search for ways to retrieve the blown-down and damaged timber.



Reconnaissance assets can also aid in predicting natural disasters. The photo at left, taken by NASA's ERTS satellite in 1976, reveals normal snowpack on the Uinta Mountains in Utah. The 1983 Landsat image at right, however, shows an unusually heavy snow cover. Experts can use such images to compute water runoff and warn of impending flooding.

New and Future Developments

It is generally agreed by emergency preparedness officials that a thirty- to forty-minute warning is adequate to prepare for most disasters. Warning of disasters that could occur at night is especially important. Satellites have a vital role to play in achieving this goal. In my testimony before Congress, I stated: "Although there is some collaboration among people on the ground and the aerial collector, in the future, sensors on the ground will be read by collectors in space."

An emplaced sensor that sends its data to a satellite or that can be interrogated from space has many advantages. It can be set to any desired specification, it operates twenty-four hours a day, and it can be implanted in remote locations where conditions make it impossible for man to survive. A variety of gauges and sensors that will uplink data to satellites for warning purposes is now being implanted. The US Army Corps of Engineers and the Tennessee Valley Authority are placing in remote areas hundreds of gauges that will transmit data to the Geostationary Operational Environmental Satellite (GOES) for flood warnings.

Other sensors are being implanted in earthen dams to give warning of potential trouble. The Bureau of Reclamation is using

gauges and sensors to monitor snowfall and snow melt in order to alleviate potential flooding problems. In the Pacific, tidal gauges and sensors have been located on the coast to transmit tsunami (tidal wave) warnings via GOES satellites. In hurricane-prone areas, gauges and sensors are being emplaced along streams susceptible to flash flooding, with the warning data flashed to GOES satellites. Scientists have also determined that sudden surges of hydrogen have often preceded volcanic and earthquake activity. Sensors are being emplaced along major earthquake zones in California and around volcanoes in Hawaii and at Mount Saint Helens to record hydrogen activity. Here again, data is sent via GOES to a US Geological Survey data center, where it is compared with other scientific data.

We are entering a new era of reconnaissance in which satellites will be able to collect data or interrogate sensors on earth, analyze gases in space, digest data, photograph

areas of concern, and send warnings to emergency centers.

At the Subcommittee hearings, it was obvious that most of the state, county, and city emergency officials knew little or nothing about the aerial reconnaissance and multisensor imagery capabilities that could be applied to their work. It would be a valuable contribution to domestic security if the Department of Defense, the military services (including their Reserve Forces intelligence organizations), other federal agencies, and the intelligence community shared their knowledge of reconnaissance and multisensor imagery with local and regional disaster management officials.

We have invested heavily in science and technology to protect this nation from external threats. Now we must apply appropriate elements of that science and technology to mitigate or prevent natural and technological disasters. I know of no endeavor where the funds and effort expended offer so bountiful a return. ■

Dino Brugioni writes regularly for AIR FORCE Magazine. His by-line last appeared in the March '84 issue with the article "The Tyuratam Enigma." During World War II, he flew sixty-six bombing missions and a number of reconnaissance missions over North Africa, Italy, France, Germany, and Yugoslavia. After the war, he received a B.A. and an M.A. in foreign affairs from The George Washington University. He joined the CIA in 1948, becoming a senior official and a reconnaissance and photo-interpretation expert for the agency before his retirement.

The wartime
commander of
Germany's fighter
forces reminisces about
the rise and fall of
Hitler's air force.

Galland of the Luftwaffe

BY IRENE W. McPHERSON



Photographs courtesy of Raymond Toliver and Trevor J. Constable. Their forthcoming book, Fighter General Adolf Galland, will be published in 1986.

HE WAS an aggressive, outspoken, and fearless young man. He had a charming personality and was dashing handsome with his black mustache and his service cap tipped rakishly to one side. With 104 aerial victories to his credit, he was Germany's leading fighter ace on the Western Front, recipient of Germany's highest military award, and—at the age of twenty-nine—commander of Nazi Germany's fighter forces. He is Lt. Gen. Adolf Galland, and he was the *enfant terrible* of the Luftwaffe.

Galland was brilliant, recognizing before his superiors did that Germany needed an overall strategy to guide its World War II air effort. He was frankly critical of decisions that increasingly put the Luftwaffe Fighter Command in adverse situations. Finally, in January 1945, when his criticisms could no longer be countenanced by the Reichsmarshal of the Luftwaffe, Hermann Göring, Galland was relieved of his command and placed under house arrest.

Only the sufferance of Adolf Hitler prevented his total disgrace. Hitler allowed Galland to organize a front-line fighter squadron flying the Messerschmitt Me-262, the world's first operational jet fighter. The record compiled by that squadron, although it didn't influence the outcome of the war, was a successful "last stand."

From the time of his surrender to American forces at the end of World War II to the present, Galland has been unabashedly forthright in his views of Germany's World War II efforts. As General of Fighter Command, he was in contact at various times with the General Staff, Göring, and even Hitler. He doesn't spare his criticism, whether it is directed at Germany, the Allies, or himself.

"Great mistakes were made on both sides," he has written. "It, therefore, ill behooves one to generalize about an accumulation of unusual incompetence and stupidity in the high commands of the air forces."

The Birth of the Luftwaffe

The son of a World War I German army officer, Galland was born in 1912. As a teenager, he became a successful glider pilot and in 1933, at the age of twenty-one, was one of the first aspiring pilots to join Hitler's newly born and still-secret Luftwaffe. When Hitler revealed the existence of the new Luftwaffe on March 1, 1935, and named Göring, a World War I ace, as Reichsmarshal, Galland had already been through two secret pilot training courses, one in Germany and one in Italy, and had graduated from officers' training school.

The decade of the 1930s saw the rapid buildup of the Luftwaffe despite fierce rivalry among the German armed services for shares of the official budget.

"It is to the credit of Göring," says Galland, "that, with his political influence, he could elevate the expanding Luftwaffe to the place which was really its due."

By 1945, the Luftwaffe was no longer a mighty force. Galland believes that the reasons for its demise lay in the buildup during the previous decade. After World War I, the Treaty of Versailles had dissolved the Imperial German Flying Service and forbade any worthwhile research or aircraft development. Restrictions prevented the forming of a basic cadre of commanders or the maintenance of a tactical-technical General Staff.

"Everything had to be planned and built from scratch," says Galland. "[The buildup] simply out-

stripped the supply of trained, seasoned men necessary to fill properly the key positions. [Veterans of World War I] whose military knowledge and aptitudes had remained at the level of those days had to be called back to active duty, and because the earlier training of the General Staff officers, including the junior officers, had been according to Army standards, the new generation of General Staff officers was not sufficiently prepared [to cope] with the fundamental problems of personnel, air materiel, and the conduct of aerial warfare. As a result of their lack of air force experience, [they] could barely follow the development of combat conditions."

Galland first experienced combat during the Spanish Civil War. When Generalissimo Francisco Franco, leader of the insurgent Nationalists, appealed for foreign aid, Germany responded. Disguised as a "Strength-Through-Joy" tourist, Galland entered Spain as a member of Germany's Condor Legion and flew an obsolete Heinkel He-51 biplane. His squadron's mission was ground support, concentrating on strafing Republican machine-gun nests and ground artillery emplacements. Based on his observations, he wrote a series of reports on close air support that were later incorporated in operational tactics against Poland and France.

Experience gained in Spain, according to Galland, contributed to the Luftwaffe's air superiority at the beginning of World War II because it increased the Luftwaffe's technical knowledge and tactical skill. The Luftwaffe learned, for instance, that fighter aircraft could not operate in close formation, as the Royal Air Force did up until the middle of the Battle of Britain, because only the leader could observe the airspace. The other pilots had to keep sight of the next aircraft in order not to ram it.

War Breaks Out

The Condor Legion's success in Spain bred the belief in Germany that its forces were unstoppable and could lay waste to any country they attacked. This confident optimism was heightened when the Wehrmacht, under airspace controlled by the Luftwaffe, swept through ill-prepared Poland, Holland, Belgium, and France.

German ground-attack aircraft descended so quickly on Poland in September 1939 that most of the Polish air force was destroyed on the ground. Galland flew eighty-seven missions in twenty-one days, bombing airfields, bridges, trains, and troop columns. In October, he was reassigned to Jagdgeschwader 26, an Me-109 fighter squadron. On May 10, 1940, the Wehrmacht began its sweep through Holland, Belgium, and France, and Galland found himself facing Belgian-flown Hawker Hurricanes and French Morane fighters. In ten days he scored eight aerial victories.

The British Expeditionary Force, which had been sent to the aid of the Allies after the attack on Poland, was thrown back by the Wehrmacht and forced to evacuate the Continent. Several times Galland led fighter formations over Dunkirk, the port of evacuation, in order to clear the air for German bombers attacking the British and French troops seeking escape. There Galland made his first contact with Royal Air Force Hurricanes and Spitfires.

According to Galland, the RAF fighter patrols flew almost continuously over areas occupied by the fleeing

British and French. Never before had Galland encountered opponents who flew with such courage and determination. German fighters scored a number of victories and suffered only light losses, but poor communications between fighters and bombers resulted in missed rendezvous and lack of protection for the bombers. The RAF controlled the airspace and shot down 159 German aircraft.

"Dunkirk [was] the first great failure of the Luftwaffe," Galland noted.



Reichsmarshal Hermann Göring with Adolf Galland and officers of Galland's fighter unit. Galland credits Göring's political influence with Hitler for seeing to it that the Luftwaffe received sufficient funding during the buildup of the 1930s, but faults Göring as a commander and tactician.

When Hitler launched attacks against Poland and then the Low Countries, he did not expect England and France to intervene. When they did, however, the German High Command continued the successful strategy of defeating one enemy at a time. France would be defeated first, and then Great Britain, after a show of force by Germany, would welcome a peace offer.

Shortly after the armistice in France, Galland was promoted to major and awarded the Knight's Cross. His group, J.G. 26, was stationed at Pas de Calais on the French coast opposite England when the Battle of Britain began a few days later.

"The Battle of Britain was a complete mistake," Galland recalls. "England, even in Hitler's mind, was not the next target in the war. It was a target only to make Great Britain ready for peace negotiations. Preparations for Operation Sea Lion, the invasion of England, were set, but these preparations never were taken seriously, and during the Battle of Britain, when the battle was not decided at all, *he* decided to attack Russia! When Hitler came—this was in 1940—to visit my wing personally, he made a speech and said, 'The war is already won. I was eager to avoid a second front.' At this time, he had

already decided to attack Russia. We never knew what he was doing."

The Second Front

"His [Hitler's] target had been to divide Poland in agreement with Russia, wait for some years, rebuild the German forces . . . and then attack Russia. . . . He was playing every time with a bigger risk, until he started the war and then didn't know how to finish it. The Luftwaffe was not ready for such an operation. It would take a lot of raw material to build the aircraft and use a lot of fuel we didn't have. In addition, nobody at that time knew what a strategic war would mean, what it would cost, and what was needed."

The Battle of Britain, according to Galland, was entered and conducted without a clear plan of operations. Designated targets were changed several times. Rigidly set tactics, under Göring's command, were changed summarily as circumstances seemed to him to dictate. No effort was made to coordinate strategy and development of aircraft. There was no comprehensive planning or effective command and control in the decision-making process, and logistics were poorly managed.

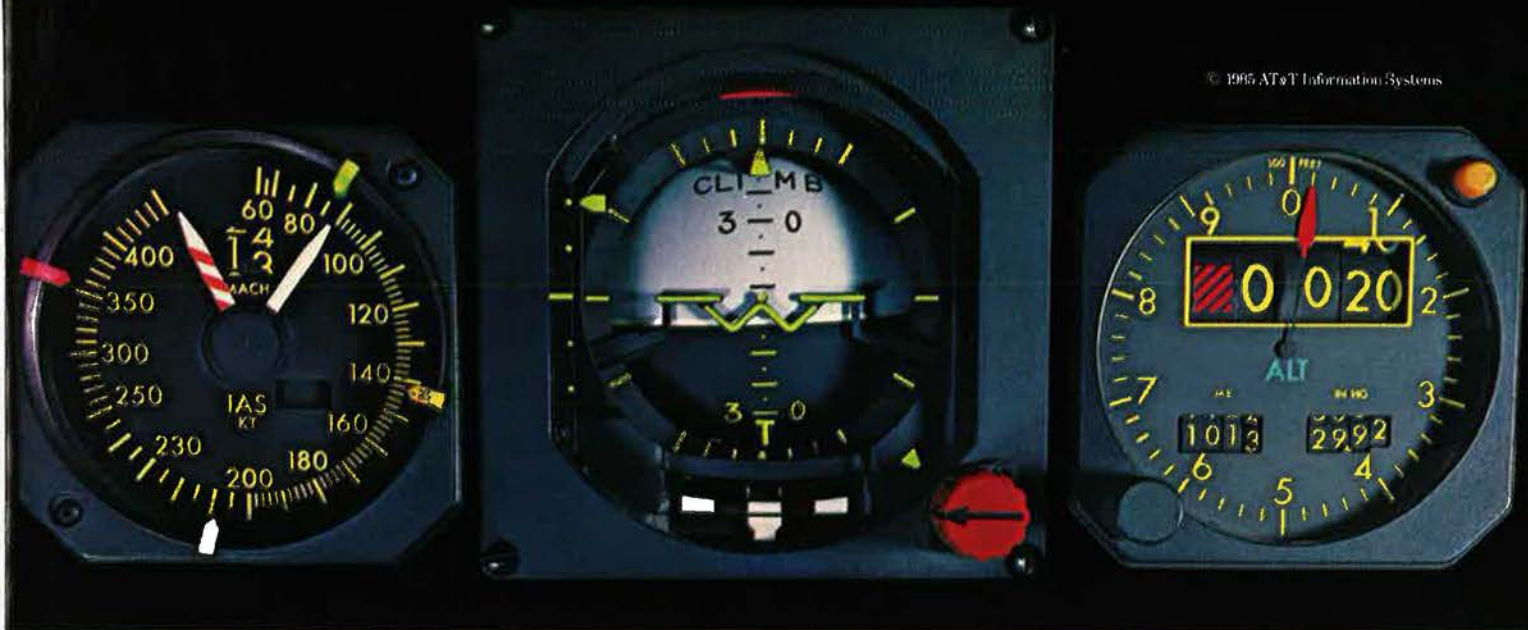
Radar, which had been introduced in Germany before the war and rejected as an unimportant development, was being used by the British. Poor performance by the Ju-87 Stuka, the Me-110 twin-engine fighter, and the He-111 bomber contributed to Germany's problems. Fighter aircraft were in short supply because of the major emphasis in the Luftwaffe on the building of fighter-bombers. Hitler himself had little respect for fighter power and seemed unable to understand its offensive potential. He was interested only in using the Luftwaffe for bombing and support of his ground troops. The Luftwaffe was unable to gain control of the air, and Göring blamed Fighter Command for the Luftwaffe's failures.

It was under these conditions that Germany's main forces were sent to the Eastern Front, where, Hitler believed, victory would be achieved within a few weeks. Galland had been promoted to lieutenant colonel and given command of J.G. 26, one of only two fighter groups to remain on the Western Front.

With the growing prospect of aid from the United States, however, England was gearing up for an offensive war. By the time Germany attacked Russia in June 1941, the RAF's bombing offensive over France and Belgium was damaging railroads, airfields, and industrial targets. Germany's warning system was so inadequate that when the RAF bombed Cologne, the damage was already done before Galland could scramble his fighters. RAF strength was growing rapidly, but the number of serviceable aircraft available to Galland in J.G. 26 had dropped by August from about 100 to only forty-five. There was an increasing strain on men and equipment. In addition, the Luftwaffe's fighter strength was being diluted by assignments to the Mediterranean theater.

Success in the Air

Infuriated by the continuing RAF raids on the Western Front, Göring sided with the German bomber commanders who dominated the planning and conduct of Luftwaffe missions and who insisted that the German



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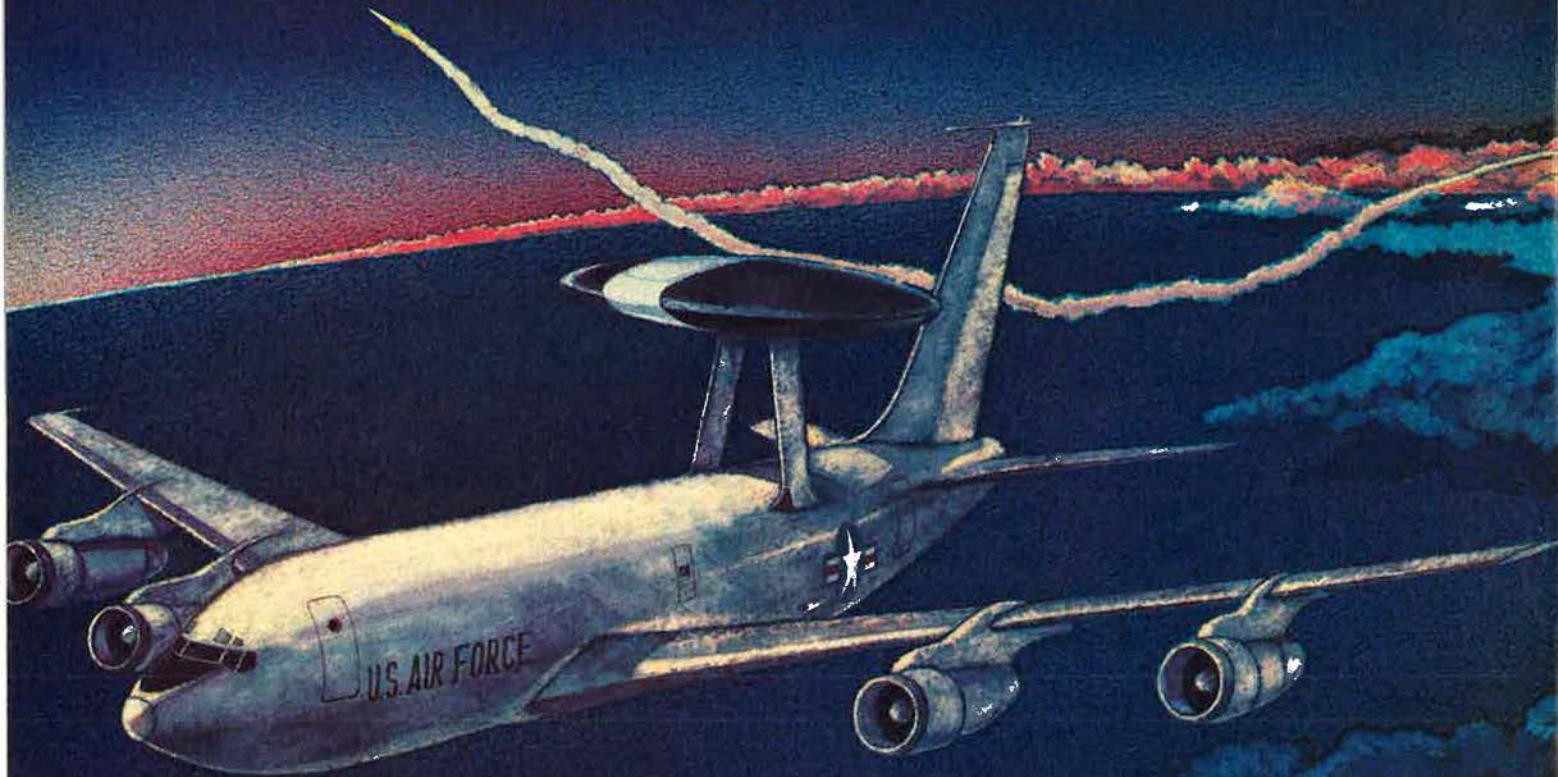


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fighters cease weaving and fly at the same speed and altitude as the bombers. Fighter Command was to cease attacking enemy fighters and concentrate solely on bomber escort.

This, then, was the pattern Göring ordered the fighters to follow. When Galland told him that this would make the fighters an easy target for the RAF, Göring replied, "I would prefer that you would be shot down instead of my more expensive bombers."

During this period, Galland achieved his greatest



Galland, left, with fellow fighter pilot Werner Mölders. Galland believed strongly that the primary function of fighter aircraft is to seek out and destroy the enemy, but was unable to convince the Luftwaffe High Command of this during the war.

number of aerial victories. He usually flew with a group of experienced pilots and was famous for his daring and his skill in long vertical dives and tight pullouts. He developed tactics that were successful but at odds with Göring's directive that the fighters fly no faster than the bombers they were escorting. In one tactic he used against RAF bombers, Galland would gradually climb out of the clouds beneath a bomber formation, getting directly behind one of the lower elements. While the escort fighters were distracted by other German fighters, Galland would shoot down one of the bombers and dive back into the cloud cover.

Galland was, above all, a hands-on fighter pilot. It came as a shock to him, therefore, when Göring announced in November 1941 that Galland would become commander of the Luftwaffe's fighter arm. This meant that he would be grounded. The following January, Hitler awarded him Germany's highest honor, the Knight's Cross to the Iron Cross with Oak Leaves, Swords, and Diamonds.

Galland had never been active politically, had never joined the Nazi Party, was ignorant of high politics, and had much to learn about staff work. Nevertheless, he

launched a battle for the fighter force he felt Germany should have and for the proper use of the fighters Germany already had.

Galland had long since begun to fear that Germany's immunity from attack was over. He firmly believed what Göring and Hitler refused to acknowledge—that the lack of priority given fighter aircraft could lead to Germany's defeat. There was, he says, "a certain dangerous self-complacency in the German High Command."

In the fall of 1942, when the first unescorted USAAF B-17 and B-24 raids were carried out, Galland issued tactical regulations to counter firepower from the close formations flown by the bombers. He prescribed either head-on attacks or concentrated rear attacks rather than individual dives, and the attacks were to end by the fighters getting away flat over the bomber formations. With the introduction of the Thunderbolt and Mustang escorts for Allied bombers, Galland again revised fighter tactics to allow offensive attacks on the escorts, but Göring overruled him and ordered German fighters to attack only bombers and to leave Allied fighters alone. Seeing this, Allied fighter pilots became more aggressive and often forced the Germans to abandon the battle.

Galland was furious and declared the order impossible to follow, but was unsuccessful in getting it changed. Refusing to listen to Galland, Göring attacked the fighter pilots as lazy and cowardly and blamed them for the change in fortunes.

The Reich Crumbles

In retrospect, Galland feels he should have taken stronger action against this great tactical error. He believes he should have staked his position and reputation on the theory that fighters should be aggressive and fight an offensive war. "A fighter must attack," says Galland. "If he waits until he is attacked . . . then it is already too late."

Galland's inspection trips during 1942-44 revealed worsening conditions in many areas. Apparently, no lessons had been learned from Germany's failures, and the Luftwaffe's High Command continued the same tactics. The restrictions placed on Fighter Command plus an inadequate supply of fighter aircraft contributed to high losses at Malta.

In North Africa, German fighter forces became depleted and exhausted. In Tunisia, Allied air superiority decimated German fighter units. In Sicily, many German fighters, lacking enough fuel to take off, were destroyed on the ground. Only on the Eastern Front, where German fighters faced inferior or obsolete aircraft, did the air war appear successful.

Galland's urgent warnings regarding the lack of fighter strength, especially on the Western Front, were ignored by the High Command. When he pressed his concept that the primary function of fighters was to seek out and destroy the enemy, it was dismissed. Following the defeat in Sicily, he demanded more fighters, better ground support facilities, and better training for fighter pilots. He foresaw a cross-Channel invasion of France and recommended the construction of new, well-camouflaged airfields with ready supplies of fuel, ammunition, and repair parts. His request was pigeonholed by the Luftwaffe General Staff.

The conflicts on the Western and Southern Fronts were merely "barricade" actions to Hitler, however. The Russians were his "real enemy." He blamed the Luftwaffe for all reverses, not recognizing that his own tactics were faulty. Göring, in turn, did not see his own shortcomings and shifted the blame to Galland and Fighter Command.

Galland faults himself, in one respect, in his relationship with Göring. He feels that his fighter force suffered because he could not bring himself to fawn upon and



Galland today tries on the National Air and Space Museum's Me-262 for size. During the war, Galland pushed for production of the Me-262 as a fighter, but was overruled by Hitler, who ordered it built as a fighter-bomber. Galland calls the Me-262 the "only truly superior weapon during the European war." (Photo courtesy NASM)

flatter Göring and give him expensive gifts, as did bomber proponents.

With hostilities increasing on the Western Front during 1943, Galland frequently stated that fighter forces on the Southern and Eastern Fronts were being wasted and should be redeployed to the Western Front, where, he believed, lay the greatest danger to Germany. He did achieve a measure of success in his efforts to increase the size of Fighter Command, however, when he and Field Marshal Erhard Milch, armaments chief of the Luftwaffe, succeeded in raising fighter production by mid-1943 from fewer than 350 per month to approximately 1,000.

In Galland's mind, the Allied bombing of Germany's oil industries caused the greatest damage to the Third Reich's war potential. By the autumn of 1944, the Luftwaffe had plenty of planes, and there were enough pilots, but lack of petrol prevented proper training of the young flyers. There was a great need to replace the Luftwaffe's ever-mounting losses, but there was a shortage, in addition to fuel, of training aircraft and instructor

pilots. The untried pilots, therefore, usually entered combat with no more than fifty hours' total flying time and were pitted against Allied fighter pilots with hundreds of hours of experience.

There was little response from Göring on the inequity of pilot training, as the Reichsmarshal had lost most of his influence with Hitler and was heavily addicted to drugs and alcohol. Galland had long since lost all respect for him.

One Last Hope

By December 1944, Galland was no longer invited to official conferences, and Col. Gordon Gollop was plotting to usurp his position and to have him tried for disloyalty to the Party, defeatism, and incompetence. In January 1945, Göring ordered Galland placed under house arrest and relieved of command. A near mutiny by fighter unit commanders brought the matter to Hitler's attention. Galland was released, but did not return to his former position. Instead, Hitler allowed him to form an Me-262 fighter squadron.

Almost two years prior, in early 1943, Galland had flown the Me-262 and had been delighted by its performance. He immediately requested production of the aircraft as a fighter, and he believes it was the "only truly superior weapon during the European war." Although the Me-262 was in the project stage as early as 1940, its production had been delayed because of the belief at that time that the war would soon be over. When the aircraft finally did go into production, Hitler—against the advice of Galland and other experts—decreed that it should be a fighter-bomber, and only a few were built as fighters.

Now, in the last weeks of the war, Galland recruited only the best fighter personnel and achieved what he had advocated and fought for during the previous years—a top-rated fighter unit flying in defense of Germany. Between the middle of April and early May, the Me-262 squadron met with a measure of success, but not to the extent that Galland had hoped for.

Late in April 1945, Galland lost his last aerial encounter to an American P-47 pilot, 1st Lt. James J. Finnegan, who did not learn until many years later that he had even damaged the Me-262, let alone shot down Germany's leading ace on the Western Front. Although injured, Galland lost himself in cloud cover, returned to his base, and crash-landed his plane. He was taken prisoner by the US Army in the hospital where he was recuperating from his injuries.

Ironically, in March 1945, when the Luftwaffe had practically ceased to exist and the surrender of Germany was less than two months away, Hitler ordered that all Me-262 jet fighter-bombers be rearmed as quickly as possible as fighters. ■

Irene W. McPherson is a free-lance writer living in the Washington, D. C., area. An Air Force wife for thirty-three years, she is proud to have been a witness to the early growth of the US Air Force as a separate service. Now retired from duty as an active Air Force wife, she devotes her time to her writing, her husband, and her nine grandchildren. Her by-line last appeared on these pages in the February '85 issue with the article "Eagle Talk," which reported on the visits of aviation greats to the Air Command and Staff College.

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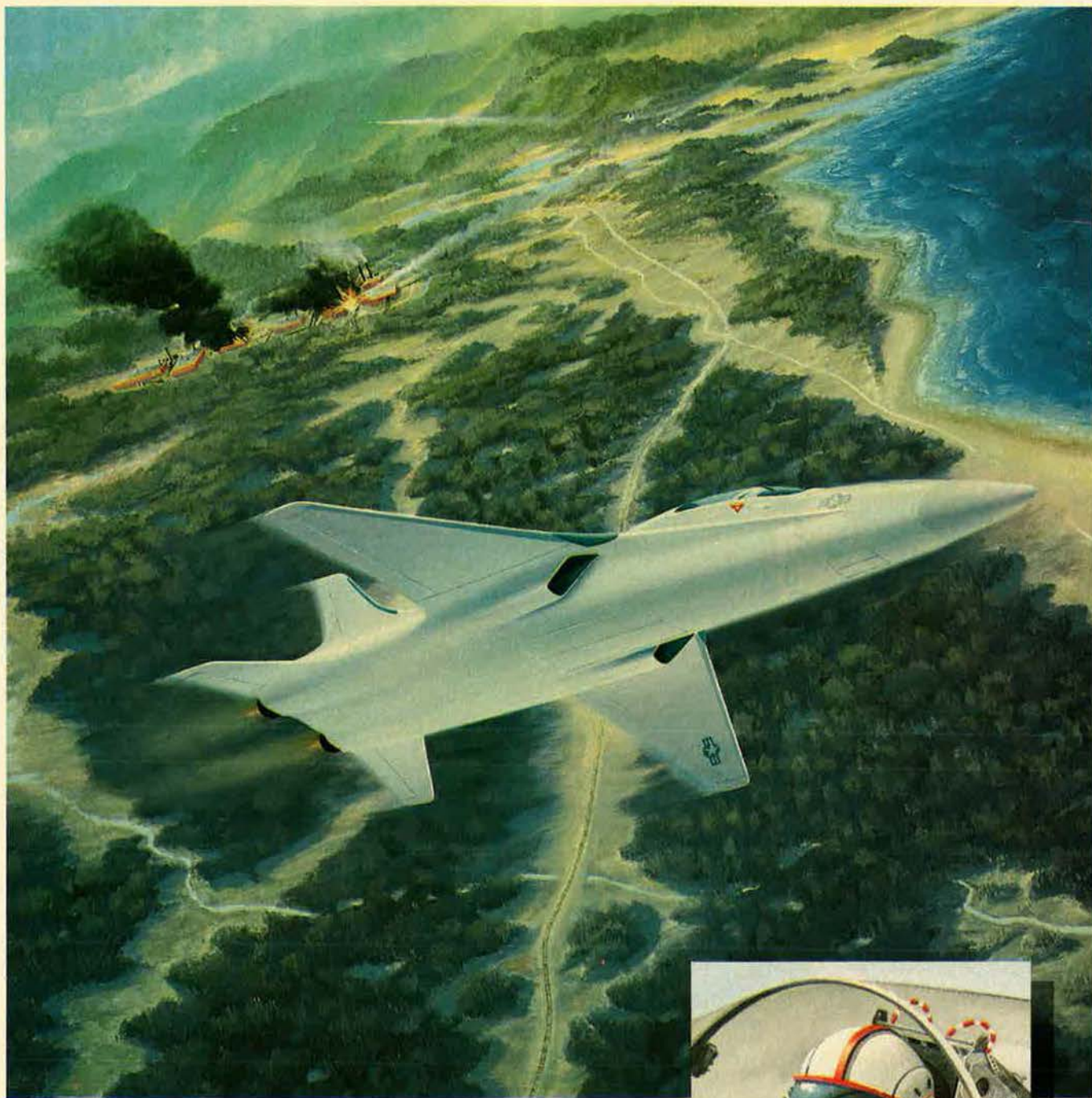
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OCTOBER 1985



Absence of flight crew from the cockpit of this Kamov Ka-32S demonstrates their confidence in the aircraft's automatic control system

KAMOV
KAMOV DESIGN BUREAU: USSR

KAMOV Ka-32

NATO reporting name: Helix

It was announced in early 1981 that a new civilian helicopter, designed under the leadership of Mr S.V. Mikheyev and known as the Ka-32, was to be put on display in the permanent Exhibition of Achievements of the National Economy (VDNKL) in Moscow. Primary applications for the aircraft were said to be surveillance, search and rescue, by day and night in all weathers, from ships that would include the atomic-powered icebreakers *Lenin*, *Sibir*, *Arktika*, and *Rossiya*.

The Ka-32 had not entered service at the time of the announcement, and was not identified officially until it was exhibited in public with other Soviet and

Polish aircraft at Minsk Airport, in late 1981, during the fourth CMEA scientific/technical conference on the use of aircraft in the national economy. As expected, it proved to be a demilitarised counterpart to the Ka-27 (NATO 'Helix-A') naval helicopter already observed on the Soviet ASW guided missile destroyer *Udaloy*. Major applications of the civil Ka-32 shown at Minsk were said to be for construction/assembly and flying crane duties, and it carried a truck as a slung load during the flying display. It was claimed to be able to lift up to 5,000 kg (11,023 lb) as an external slung load, and to have a range of 100 nm (185 km; 115 miles) with such a load.

A detailed appraisal of the Ka-32 became possible in June 1985, when a standard production aircraft was exhibited at the Paris Air Show. Its designer explained that there are two civil versions:

Ka-32. As displayed in Paris. Basic transport and flying crane, with limited avionics. Duties include transport of internal and external freight, and passengers, to offshore drilling rigs.

Ka-32S (maritime). Equipped with more comprehensive avionics, including undernose radar, for operation to full IMC standards from icebreakers in adverse weather conditions. Duties include ice patrol, unloading and loading ships, and maritime search and rescue.

According to Mr Mikheyev, the Ka-32 was conceived as a completely autonomous 'compact truck', able to stow in much the same space as the earlier Ka-25 with its rotors folded, and able to operate independently of ground support equipment. Titanium and composite materials are used extensively throughout the airframe, with particular emphasis on resistance to corrosion. Special



Kamov Ka-32 shown at this year's Paris Air Show was a basic transport/flying crane version of the important Ka-27 ('Helix-A') naval ASW helicopter (Brian M. Service)

attention was also paid to ease of handling, with a single pilot. A 'mix' in the collective control system is designed to maintain constant total rotor thrust, in order to reduce the pilot's workload when landing on a pitching deck, and to simplify transition into hover and landing. Yaw control is by differential collective pitch. The twin rudders are intended mainly to improve control in autorotation, but are effective in co-ordinating turns in normal cruising flight. Being a 'workhorse' the helicopter is not designed for negative g loading.

Flight can be maintained on one engine at maximum take-off weight. The effectiveness of the automatic control system is illustrated by an accompanying photograph of a Ka-32S in flight (see p. 111). Both crew doors are open, to show that there is nobody on the flight deck; the crew can be seen in the rear doorway of the main cabin.

Two women instructors from the Yegoryevsk flying club, near Moscow, have set a number of officially confirmed feminine records in a Ka-32. Nadezhda Yermineva set a time to height record by climbing to 3,000 m in 2 min 11.1 s on 12 May 1983. On the previous day Tatyana Zuyeva had climbed to 6,000 m in 4 min 46.5 s and set a record of 6,552 m for sustained height in level flight. The time to height records had been held previously by a Mil A-10 (Mi-24 'Hind'). Take-off weight of the Ka-32 was 7,251 kg (15,986 lb) on 11 May and 7,156 kg (15,776 lb) on 12 May. On 29 January 1985 Miss Zuyeva set a women's height record of 8,250 m (27,067 ft) in a Ka-32, and raised the sustained height record to 8,215 m (26,952 ft). Miss Yermineva climbed to 7,305 m (23,966 ft) with a 1,000 kg payload, and to 6,400 m (20,997 ft) with 2,000 kg on the same day.

The description that follows applies specifically to the Ka-32 displayed at the 1985 Paris Air Show, but is generally applicable also to the Ka-32S and the military Ka-27:

TYPE: Twin-turbine utility helicopter.

ROTOR SYSTEM: Two fully articulated three-blade coaxial contra-rotating rotors. Blades of all-composites construction, with carbonfibre and glassfibre main spars, pockets (13 per blade) of a material similar to Kevlar, and a filler similar to Nomex. As in all Soviet helicopters, blades have a non-symmetrical aerofoil section. Each blade is fitted with a ground adjustable tab. The three lower blades each carry an adjustable vibration damper, comprising two dependent weights, mounted on the root section, and there are further vibration dampers in the fuselage. Tip light on each blade of upper rotor. Blades fold manually outboard of all control mechanisms, to a

folded width within the track of the main landing gear. Electrothermal de-icing of the entire profiled portion of each blade. Heat generated by rotor head prevents icing of droop stops. Main rotor hub is 50 per cent titanium/50 per cent steel.

FUSELAGE: Conventional all-metal semi-monocoque structure of pod and boom type, making extensive use of titanium for primary components. Tailcone of composites material.

TAIL UNIT: Braced structure, comprising fixed incidence tailplane, elevators, twin endplate fins and rudders, with aluminium alloy structure and composite skins. Single bracing strut under each side of tailplane. Fins toed inward. Fixed leading-edge slat on each fin.

LANDING GEAR: Four-wheel type. Oleo-pneumatic shock absorbers. Nosewheels are smaller than mainwheels and of castoring type. Rear legs are pivoted on some versions, to retract upward about their wishbone supports so that the wheels can be moved to a position where they offer least interference to emissions from the undernose radar. Mainwheel tyres size 600 x 180. Nosewheel tyres size 400 x 150.

POWER PLANT: Two 1,660 kW (2,225 shp) Isotov TV3-117V turboshaft engines, mounted side by

side above cabin, forward of rotor driveshaft. Main gearbox brake standard. Oil cooler fan aft of gearbox. Electrothermal intake anti-icing. Cowlings hinge downward for use as maintenance platforms. All standard fuel in tanks under cabin floor and inside a container on each side of centre fuselage. Provision for auxiliary tanks in cabin. APU in rear of engine bay fairing on starboard side, for engine starting and to power all essential hydraulic and electrical services on the ground, eliminating need for GPU.

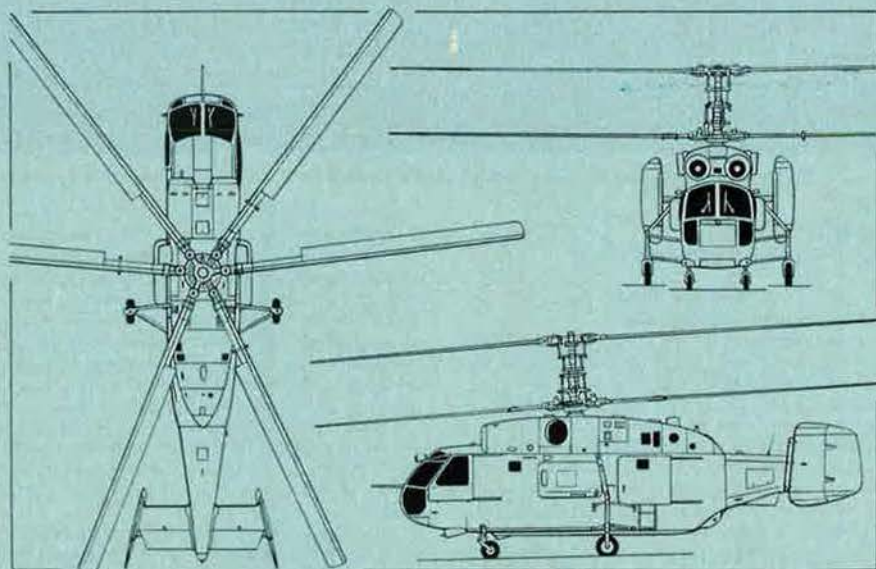
ACCOMMODATION: Pilot and navigator side by side on large air-conditioned flight deck, in fully adjustable seats. Rearward sliding jettisonable door with blister window on each side. Seat behind navigator, on starboard side, for observer, loadmaster, or rescue hoist operator. Electric windscreen anti-icing. Heated and ventilated main cabin can accommodate freight or 16 passengers, on three folding seats at rear, six along port sidewall and seven along starboard sidewall. Life-jackets under seats. Fittings to carry stretchers. No provisions for toilet or galley. Pyramid structure can be fitted beneath rotor driveshaft to cater for external cargo sling loads. Rearward sliding door aft of main landing gear on port side, with steps below. Emergency exit door opposite. Rescue hoist, capacity 300 kg (661 lb), can be installed between top of door opening and landing gear. Door to avionics compartment on port side of tailboom.

SYSTEMS: Dual hydraulic control systems without manual reversion. Spring stick trim.

AVIONICS AND EQUIPMENT: Include flight director, two HSI, air data computer, and autopilot capable of providing automatic approach and hover on predetermined course. Doppler box under tailboom. Radar altimeter. Doors at rear of fuel tank bay provide access to small compartment for auxiliary fuel, or liferafts which eject during descent in emergency, by command from flight deck. Container on each side of fuselage, under external fuel containers, for emergency flotation bags (not fitted to aircraft shown in Paris). 'Special radio compass' fairing above rear of cabin (also on ASW Ka-27, but not Ka-32S illustrated). Optional external load sling, with automatic release and integral load weighing and stabilisation systems.

DIMENSIONS, EXTERNAL:

Rotor diameter (each)	15.90 m (52 ft 2 in)
Length overall, excl rotors	11.30 m (37 ft 1 in)
Height to top of rotor head	5.40 m (17 ft 8½ in)
Wheel track: mainwheels	3.50 m (11 ft 6 in)
nosewheels	1.40 m (4 ft 7 in)
Wheelbase	3.02 m (9 ft 11 in)
Cabin door:	
Height	approx 1.20 m (3 ft 11¼ in)
Width	approx 1.20 m (3 ft 11¼ in)



Kamov Ka-32 utility helicopter (two Isotov TV3-117V turboshaft engines) (Pilot Press)



Close-up of Ka-32 rotor head (Air Portraits)

DIMENSION, INTERNAL:

Cabin: Height 1.30 m (4 ft 3 in)

WEIGHTS:

Max payload: internal 4,000 kg (8,818 lb)

external 5,000 kg (11,023 lb)

Normal T-O weight 11,000 kg (24,250 lb)

Max flight weight with slung load 12,600 kg (27,775 lb)

PERFORMANCE:

Max level speed 135 knots (250 km/h; 155 mph)

Max cruising speed 124 knots (230 km/h; 143 mph)

Service ceiling at normal T-O weight 6,000 m (19,685 ft)

Range with max fuel 432 nm (800 km; 497 miles)

Endurance with max fuel 4 h 30 min

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Following French withdrawal from the multi-nation European Fighter Aircraft programme, Dassault-Breguet is expected to promote its new Rafale fighter as, primarily, a ground attack aircraft smaller and less expensive than the British/German/Italian EFA.

DASSAULT-BREGUET RAFALE

Known initially as the ACX (advanced combat experimental), the Rafale is a prototype that will demonstrate technologies applicable to the tactical combat aircraft (ACT) needed to replace French Air Force Jaguars in the 1990s, and to the ship-based combat aircraft (ACM: *avion de combat marine*) proposed for deployment on the French Navy's planned nuclear-powered aircraft carrier.

Essential characteristics of the prototype were revealed in the early weeks of 1983, at the time of Dassault-Breguet's decision to build it. On the basis of an airframe with overall dimensions little greater than those of the Mirage 2000, the company set out to produce a multirole aircraft able to destroy everything from supersonic fighters to a helicopter in an air-to-air role, and able to deliver at least 3,500 kg (7,715 lb) of modern weapons on targets up to 350 nm (650 km; 400 miles) from its base. The ability to carry, and fire in rapid succession, at least six air-to-air missiles was considered essential, together with the ability to launch electro-optically guided and

advanced 'fire and forget' standoff air-to-surface weapons.

High manoeuvrability, high angle-of-attack flying capability under combat conditions, and optimum low-speed performance for short take-off and landing were basic design aims. This led to choice of a compound-sweep delta wing, a large active canard foreplane mounted higher than the mainplane, twin engines, air intakes of new design in a semi-ventral position, and a single fin. To ensure a thrust-to-weight ratio far superior to one, it was decided to make extensive use of composites, such as carbon, Kevlar, and boron fibres, and aluminium-lithium alloys throughout the airframe, as well as the latest manufacturing techniques such as superplastic forming/diffusion bonding of titanium components.

Ergonomic cockpit studies suggested that the pilot's seat should be reclined at an angle of 30° to 40° during flight testing, and that equipment should include a side-stick controller, a wide angle holographic head-up display, an eye-level display collimated to infinity (avoiding the need to refocus from the HUD to the instrument panel), and lateral multi-function colour displays.

The digital fly by wire control system will embody automatic self-protection functions to prevent the aircraft from exceeding its limits at all times. Functional reconfiguration of the system in case of failure, and anti-turbulence functions, will be embodied. Provisions will be made for the introduction of fibre optics to enhance nuclear hardening, and of voice-activated controls and voice warning systems.

A full scale mockup of the original ACX design was exhibited at the 1983 Paris Air Show. The new model displayed at the 1985 Paris Air Show revealed a number of significant refinements. In particular, Dassault-Breguet has been able to achieve improved flow into the engine air intakes, and greater efficiency at high angles of attack, by modifying the lower fuselage cross-section to a V shape, enabling it to dispense with centrebodies and other moving parts. The size of the fin has also been greatly reduced.

First flight of the Rafale is scheduled for mid-1986.

TYPE: Single-seat twin-engined experimental combat aircraft.

WINGS: Cantilever mid-wing monoplane of compound delta planform. Most of wing components made from carbonfibre, including three-segment full-span elevons on each trailing-edge. Elevons can be deflected identically or differentially. Full-span three-segment leading-edge slats on each wing operate automatically with the elevons to alter wing camber and provide high lift. Slats made from titanium. Wing root fairings of Kevlar. All movable surfaces actuated by fly by wire control system, via hydraulic actuators.

FUSELAGE: Conventional semi-monocoque structure: 50 per cent carbonfibre, including entire front fuselage. Kevlar nosecone and jetpipe fairings. Centre portion and side panels of air intake trunks of aluminium-lithium alloy. Wheel doors and engine doors of carbonfibre. Dorsal spine fairing from rear of canopy to jet nozzles.

FOREPLANES: Shoulder-mounted active foreplanes of sweptback planform, actuated hydraulically by fly by wire control system. Made primarily of carbonfibre, with Kevlar tips.

TAIL UNIT: Fin and rudder only, of sweptback form, made primarily of carbonfibre. Inset rudder actuated hydraulically by fly by wire control system. No tabs. Air intake in base of fin leading-edge.

LANDING GEAR: Hydraulically retractable tricycle type supplied by Messier-Hispano-Bugatti, with single wheel on each unit. All wheels retract forward. Designed for impact at vertical speed of 4 m (13 ft)/s, without flare-out. Carbon brakes on all wheels, controlled by fly by wire system.

POWER PLANT: Two General Electric F404 augmented turbofan engines, in 76.5 kN (17,200 lb st) class, mounted side by side in rear fuselage. Kidney shape plain air intakes, with splitter plates, mounted low on centre-fuselage. Internal capacity for more than 4,250 kg (9,370 lb) of fuel. Attachments for drop tanks. Provision for flight refuelling.

ACCOMMODATION: Pilot only, on Martin-Baker Mk 10 zero/zero ejection seat, reclined at angle of 30-40°. Large blister canopy, hinged to open sideways, to starboard.

SYSTEMS: Cockpit air-conditioned and pressurised. Digital quadruple redundant fly by wire flight control system, integrated with engine controls and linked with weapons system.



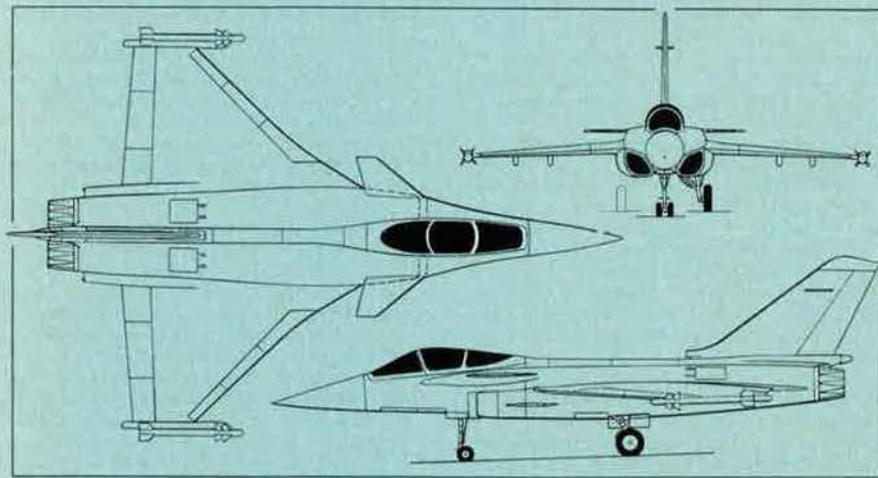
Model of Dassault-Breguet Rafale prototype at 1985 Paris Air Show. This view shows the revised engine air intakes (Brian M. Service)

AVIONICS AND EQUIPMENT: More than 780 kg (1,720 lb) of avionics equipment and racks. Look-down/shootdown radar with acquisition range in 50 nm (92 km; 57 mile) class, able to track up to eight targets simultaneously, with automatic threat assessment and allocation of priority. Digital CRT display of fuel, engine, hydraulic, electrical, oxygen, and other systems information. Wide-angle diffractive optics HUD, collimated eye-level display, and lateral multi-function colour displays by Thomson-CSF/SFENA. Crouzet voice activated radio controls and voice alarm warning system. Internal ECM suite.

ARMAMENT: Internal gun. Attachments under centreline, on air intake trunks and at wingtips for

all dimensions, notably a larger fuselage. Design and manufacturing programmes are computer assisted, and extensive use is made of carbonfibre and aramid composite (Kevlar) materials. Certification will be to FAR Pt 25 and 55 requirements, including qualification of the entire airframe to 'damage tolerance' standards. A secondary pressure bulkhead, while allowing in-flight access to the large baggage compartment at the rear, isolates the latter in the event of pressure loss. In a belly landing, the bottom fuselage fuel tanks would be protected by ventral skids and energy absorbing honeycomb pads which form an integral part of the fuselage structure.

TYPE: Three-turbofan executive transport.



Dassault-Breguet Rafale technology demonstration prototype (Pilot Press)

four Matra Mica medium-range air-to-air missiles and two Matra Magic close-range air-to-air missiles for air defence role. Typical 3,500 kg (7,715 lb) operational load for attack mission can include two laser guided bombs, six air-to-air self-defence missiles, electro-optical and ECM pods, and two external fuel tanks on 12 attachments under fuselage, air intake trunks, and wings, and at wingtips.

DIMENSIONS, EXTERNAL:

Wing span 11.2 m (36 ft 9 in)
Length overall 15.8 m (51 ft 10 in)

AREA:

Wings, gross 47.0 m² (506 sq ft)

WEIGHTS:

Combat weight, with 4 Mica and 2 Magic missiles 14,000 kg (30,865 lb)

PERFORMANCE (estimated):

Max level speed
Mach 2 (800 knots; 1,480 km/h; 920 mph IAS)
Approach speed
under 120 knots (223 km/h; 138 mph)
T-O run: at 14,000 kg (30,865 lb) AUW 400 m (1,313 ft)
at 20,000 kg (44,100 lb) AUW under 700 m (2,300 ft)
g limit +9

WINGS: Cantilever low-wing monoplane, with profile optimised for Mach 0.84 cruise. Dihedral 0° 30'. Sweepback at quarter-chord 29° inboard, 24° 30' on outer panels. Conventional two-spar light alloy torsion box structure, forming integral fuel tank in each wing, and attached to fuselage centre-section by multiple bolts. Full-span leading-edge slats in two segments on each wing, controlled manually. Outer segments are slotted and also operate automatically under the control of an angle of attack sensor. Two-segment hydraulically actuated double-slotted flaps and carbonfibre aileron on trailing-edge of each wing. Three airbrakes forward of flaps on each wing. Glassfibre wingtip fairings. Leading-edges anti-iced by engine bleed air.

FUSELAGE: All-metal semi-monocoque fail-safe structure. Use of thicker skins than those of Falcon 50 has permitted number of frames to be reduced (35 compared with 43), with less riveting. Kevlar nosecone over radar. Kevlar fairing on each side of fuselage in area of wing roots.

TAIL UNIT: Cantilever structure, with horizontal surfaces mounted partway up fin at anhedral of 8°. All surfaces sweptback. Tailplane incidence

adjustable by screwjack, driven by two electric motors controlled by 'normal' and 'emergency' controls located respectively on the pilots' control wheels and pedestal. All-metal construction, except for rear portion of fin below rudder, and tailcone, which are of Kevlar. Rudder and elevators operated hydraulically.

LANDING GEAR: Retractable tricycle type by Messier-Hispano-Bugatti, with twin wheels on each unit. Hydraulic retraction, main units inward, nosewheels forward. Oleo-pneumatic shock absorbers. Mainwheels fitted with Michelin tyres size 29 x 7.7-15, pressure 12.8 bars (183 lb/sq in). Michelin nosewheel tyres size 17.5 x 5.75-8, pressure 9.8 bars (140 lb/sq in). Hydraulic nose-wheel steering. MHB triple-disc carbon brakes. Nosewheel doors of Kevlar; mainwheel doors of carbonfibre.

POWER PLANT: Three Garrett TFE731-5A turbofan engines, each rated at 20 kN (4,500 lb st). Thrust reverser on centre engine. Fuel in two integral tanks in wings, centre-section tank, and two tanks under floor of forward and rear fuselage. Total fuel capacity 10,735 litres (2,361 Imp gallons; 2,835 US gallons). Kevlar air intake trunk for centre engine, and rear cowling for side engines. Carbonfibre central cowling around all three engines.

ACCOMMODATION: Provision of a type 3 emergency exit on the starboard side of the cabin permits a wide range of layouts for up to 19 passengers. The basic configuration has two crew side by side on the flight deck, with a jumpseat behind the pedestal. The flight deck is separated from the cabin by a door, with a crew wardrobe and baggage locker on either side. At the front of the main cabin, on the starboard side opposite the main cabin door, is a galley. A wardrobe space, behind the door, is covered by insulating panels in flight. The passenger area is divided into three lounges. The forward zone has four armchairs in facing pairs, separated by two tables. The centre zone contains a four-place sofa on the port side, facing a longitudinal table. On the starboard side, a bar cabinet contains a foldaway longitudinal bench, allowing five to six persons to be seated around the table for dinner, while leaving the emergency exit clear. In the rear zone, an inward facing settee on the starboard side converts into a bed. On the port side, two armchairs are separated by a table. At the rear of the cabin, a door leads to the toilet compartment, on the starboard side, and a second structural plug door to the large rear baggage area. The baggage door is electrically actuated. Other interior configurations include Dreyfuss 'human engineered' designs in the USA and IDEI 'travel ergonomics' concepts in France. The Dreyfuss interior features patented seating and galley innovations. It includes a crew lavatory forward, a transverse table with four chairs and two stowable lateral seats in a central conference area, a sofa bed on the port side and an executive work station opposite. An alternative eight-passenger configuration has a bedroom at the rear and three personnel seats in the forward zone. A 15-passenger layout divides a

DASSAULT-BREGUET MYSTÈRE-FALCON 900

On 27 May 1983, at the Paris Air Show, Dassault-Breguet announced a programme to develop an intercontinental three-turbofan executive transport to be known as the Mystère-Falcon 900. The prototype (F-WIDE Spirit of Lafayette) was rolled out on 18 May 1984 and made its first flight on 21 September 1984. By 1 June 1985, it had accumulated 275 flying hours in 134 flights, and an airframe was undergoing static tests at the CEAT, Toulouse. The second development aircraft was due to fly in August 1985. Approval for full production was given on 18 May 1984. Sales totalled 45 aircraft by 1 June 1985; deliveries are planned to start in the second half of 1986.

As can be seen in the accompanying illustrations, the Mystère-Falcon 900 is similar in configuration to the Mystère-Falcon 50, but with increased over-



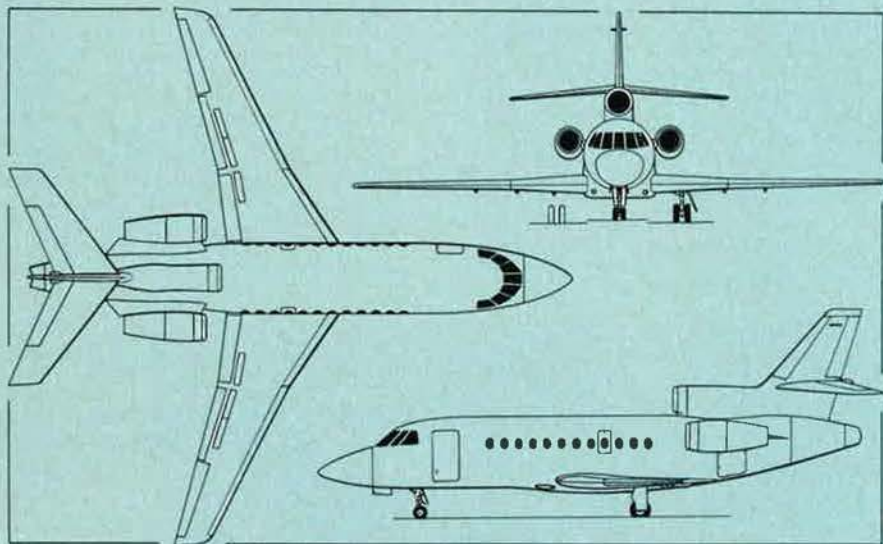
Prototype Dassault-Breguet Mystère-Falcon 900 intercontinental executive transport

VVIP area at the rear from six (three-abreast) chairs forward. The 18-passenger scheme has four rows of three-abreast airline type seats forward, and a VIP lounge with two chairs and a settee aft. Many optional items, including stereo, video, and hot running water, are available. Windscreens anti-iced electrically.

SYSTEMS: Air-conditioning system uses engine bleed air or air from Garrett GTCP36-150 APU installed in rear fuselage. Softair pressurisation system, with max differential of 0.64 bars (9.3 lb/sq in), maintains sea level cabin environment to a height of 7,620 m (25,000 ft), and a cabin equivalent of 2,440 m (8,000 ft) at 15,550 m (51,000 ft).

Flight deck volume	3.75 m ³ (132 cu ft)
AREAS:	
Wings, gross	49.03 m ² (527.75 sq ft)
Horizontal tail surfaces (total)	13.35 m ² (143.7 sq ft)
Vertical tail surfaces (total)	9.82 m ² (105.7 sq ft)
WEIGHTS:	
Weight empty, equipped	10,240 kg (22,575 lb)
Operating weight empty	10,615 kg (23,402 lb)
Max payload	1,815 kg (4,000 lb)
Max fuel	8,620 kg (19,003 lb)
Max T-O weight	20,640 kg (45,500 lb)
Max landing weight	19,050 kg (42,000 lb)
Normal landing weight	12,250 kg (27,000 lb)

Max cruising height	15,550 m (51,000 ft)
Balanced T-O field length with full tanks, eight passengers and baggage	1,555 m (5,100 ft)
FAR 91 landing field length	700 m (2,300 ft)
Range with max payload, NBAA IFR reserves	2,400 nm (4,444 km; 2,760 miles)
Range at Mach 0.75 with max fuel and NBAA IFR reserves:	
15 passengers	3,660 nm (6,780 km; 4,210 miles)
8 passengers	3,800 nm (7,035 km; 4,370 miles)



Dassault-Breguet Mystère-Falcon 90 (three Garrett TFE731-5A turbofan engines) (Pilot Press)

Cold air supply is by a single oversize air cycle unit. Two independent hydraulic systems, pressure 207 bars (3,000 lb/sq in), with three engine driven pumps and one emergency electric pump, actuate primary flying controls, flaps, slats, landing gear retraction, wheel brakes, airbrakes, nosewheel steering and thrust reverser. DC electrical system supplied by three 9kW 28V Auxilec starter/generators and two 23Ah batteries. Eros (SFIM/Intertechnique) oxygen system.

AVIONICS AND EQUIPMENT: Dual bi-directional Sperry ASCB digital databus operating in conjunction with dual SPZ 800 flight director/autopilot and EFIS. Dual Sperry FMZ 605 flight management system, associated with two AZ 810 air data computers and Honeywell laser gyro inertial platforms. Collins Pro Line II ARINC 429 series com/nav receivers.

DIMENSIONS, EXTERNAL:

Wing span	19.33 m (63 ft 5 in)
Wing chord: at root	4.08 m (13 ft 4 1/4 in)
at tip	1.12 m (3 ft 8 in)
Wing aspect ratio	7.62
Length overall	20.21 m (66 ft 3 1/4 in)
Fuselage diameter	2.50 m (8 ft 2 1/2 in)
Height overall	7.55 m (24 ft 9 1/4 in)
Tailplane span	7.74 m (25 ft 4 1/4 in)
Wheel track	4.45 m (14 ft 7 1/4 in)
Wheelbase	7.93 m (26 ft 0 1/4 in)
Passenger door: Height	1.72 m (5 ft 7 1/4 in)
Width	0.80 m (2 ft 7 1/2 in)
Height to sill	1.79 m (5 ft 10 1/2 in)
Emergency exit (overwing, stbd):	
Height	0.91 m (2 ft 11 1/4 in)
Width	0.53 m (1 ft 8 1/4 in)

DIMENSIONS, INTERNAL:

Cabin, excl flight deck, incl toilet and baggage compartments:	
Length	11.90 m (39 ft 0 1/2 in)
Max width	2.34 m (7 ft 8 in)
Width at floor	1.86 m (6 ft 1 1/4 in)
Max height	1.87 m (6 ft 1 1/2 in)
Volume	38.12 m ³ (1,346 cu ft)
Rear baggage compartment volume	3.60 m ³ (127 cu ft)

Max zero-fuel weight:	
standard	12,430 kg (27,400 lb)
optional	14,000 kg (30,865 lb)
PERFORMANCE (estimated at AWW of 12,250 kg; 27,000 lb, except where indicated):	
Max cruising speed	Mach 0.84
Econ cruising speed	Mach 0.75
Stalling speed:	
clean	104 knots (193 km/h; 120 mph)
landing configuration	82 knots (152 km/h; 95 mph)
Approach speed, eight passengers and reserve fuel	106 knots (196 km/h; 122 mph)

McDONNELL DOUGLAS

McDONNELL AIRCRAFT COMPANY (A Division of McDonnell Douglas Corporation): PO Box 516, St Louis, Missouri 63166, USA

McDONNELL DOUGLAS F-15E EAGLE

The F-15E is a two-seat dual-role fighter version of the Eagle capable of performing long-range, deep interdiction, high ordnance payload air-to-ground missions by day or night, and in adverse weather, while retaining the aircraft's proven air-to-air capabilities. The prototype, known initially as the **Strike Eagle**, was developed with industry funds as a modification of a two-seat F-15B (71-291). The rear cockpit was upgraded with four multi-purpose CRT displays for radar, weapons selection, and monitoring of enemy tracking systems. Production F-15Es will also have front cockpit modifications that will include redesigned controls, a wide-field-of-view HUD, and three CRTs providing multi-purpose displays for improved navigation, weapons delivery, and systems operation, including moving map displays, weapons options, precision radar mapping, and terrain following. A small reduction is made in internal fuel capacity to accommodate the extra equipment.

For tactical target missions at night and in all weather conditions, the F-15E will have advanced radar and infra-red systems. A new high resolution Hughes APG-70 radar, wide-field forward looking infra-red (FLIR), and LANTIRN nav/attack pod will ensure target detection/identification and improve the accuracy of weapons delivery. Successful integration of these systems was demonstrated during 1982 in flight tests at Edwards AFB, California, and Eglin AFB, Florida, resulting in accurate 'blind' weapons delivery.

For increased range/payload/weapons capability, the F-15E can utilise conformal fuel tanks (CFTs), which add a total of 4,423 kg (9,750 lb) of fuel. With



With the same three-turbofan configuration as the Falcon 50, the larger Mystère-Falcon 90 provides VIP accommodation for up to 19 passengers

a full complement of bombs carried on the CFTs' integral tangential bomb racks, the F-15E will still be able to carry up to three 2,309 litre (610 US gallon) external fuel tanks. In addition to carrying a variety of guided and unguided bombs and other air-to-ground weapons, the F-15E will retain its air superiority performance and weapons (AIM-7 Sparrow, AIM-9 Sidewinder, and AIM-120 AMRAAM). Built-in flexibility will allow for growth and increased variety in weapons carriage.

A digital, triple redundant Lear Siegler flight control system will be installed in the F-15E, permitting coupled automatic terrain following, and a Honeywell ring laser gyro inertial navigation system will provide quick reaction alignment and improved navigational accuracy. A new engine bay under development by McDonnell Douglas will enable the F-15E to be powered by either General Electric F110 or Pratt & Whitney F100 engines. The engine bay structure consists of large titanium sections manufactured with superplastic forming and diffusion bonding processes, and will permit future installation of growth versions of these engines, providing a total of up to 266.9 kN (60,000 lb) thrust in the aircraft's two-engine installation.

US Air Force and McDonnell Douglas pilots began flight testing product improvements for the F-15E on four Eagles, including an F-15C, an F-15D, and the prototype Strike Eagle, at Edwards AFB in November 1982. The programme was completed successfully on schedule on 30 April 1983, after more than 200 flights. During the tests, an F-15 took off for the first time at a gross weight of 34,019 kg (75,000 lb), i.e., 3,175 kg (7,000 lb) more than the standard max T-O weight of the F-15C with conformal fuel tanks. On this occasion, the aircraft was equipped with two CFTs, three other external tanks, and eight 500 lb Mk 82 bombs. In the overall programme 16 different stores load configurations were tested, including the carriage of 2,000 lb Mk 84 bombs and BDU-38 and CBU-58 weapons, delivered by both visual and radar means.

After evaluating the potential of the dual-role Eagle against that of the General Dynamics F-16XL, the US Air Force announced on 24 February 1984 that it had selected the F-15E for development. Design work began in April 1984 under an initial increment of a \$359.4 million fixed-price incentive contract. Construction of the first of three F-15E prototypes began in July 1985. First flight of this prototype is scheduled for December 1986, with the first production F-15E expected to fly a year later. The US Air Force plans to procure 392 dual-role Eagles. IOC is expected in late 1988.

TYPE: Two-seat twin-turbofan dual-role attack/air superiority fighter.

WINGS: Cantilever shoulder-wing monoplane. Wing uses NACA 64A aerofoil section with varying thickness/chord ratios, ranging from 6.6% at the root to 3% at the tip. Leading-edges modified with conical camber. Anhedral 1°. Incidence 0°. Sweepback at quarter-chord 38° 42'. Fail-safe structure, comprising a torque box with integrally stiffened machined skins and conventional machined ribs, of light alloy and titanium. Leading- and trailing-edges are of conventional light alloy rib/skin construction, and wingtips of aluminium honeycomb. Plain ailerons and plain trailing-edge flaps of aluminium honeycomb. No spoilers or trim tabs. Powered controls, hydraulically operated by National Water Lift actuators. No anti-icing system.

FUSELAGE: All-metal semi-monocoque structure. Upper rear fuselage, rear fuselage keel structure, main landing gear doors, and some rear fuselage fairings incorporate superplastic-formed/diffusion-bonded (SPF/DB) titanium structure, providing additional engine bay volume to permit compatibility with alternative engines.

TAIL UNIT: Cantilever structure with twin fins and rudders. All-moving horizontal tail surfaces outboard of fins, with extended chord on outer leading-edges. Rudder servo actuators by Ronson Hydraulic Units Corporation. Actuators for horizontal surfaces by National Water Lift Company. Boost and pitch compensator for control stick by Moog Inc, Controls Division.

LANDING GEAR: Hydraulically retractable tricycle

type, with single wheel on each unit. All units retract forward. Nose and main units by Cleveland Pneumatic Tool Company, each incorporating an oleo-pneumatic shock absorber. Bendix wheels and Michelin tyres on all units. Nose-wheel tyre size 22 x 7.75-9, mainwheel tyres size 36 x 11-18; pressure 21.03 bars (305 lb/sq in) on all units. Bendix five-rotor carbon disc brakes. Wheel braking skid control system by Hydro-Aire Division of Crane Company.

POWER PLANT: Two Pratt & Whitney F100-PW-220 turbofan engines, each rated at approx 106.0 kN (23,830 lb st) with afterburning for take-off; or two General Electric F110 engines. Internal fuel in eight fuselage tanks supplied by Goodyear Aviation Products Division, total capacity 7,643 litres (2,019 US gallons). Fuel gauge system by Simmonds Precision Products Inc. Optional conformal fuel tanks attached to side of engine air intakes, beneath wing, can be removed within 15 min; each has capacity of 2,839 litres (750 US gallons). Provision for up to three additional external fuel tanks, each of 2,309 litres (610 US gallons) capacity. Max total internal and external fuel capacity 20,248 litres (5,349 US gallons).

ENGINE INTAKES: Straight two-dimensional external compression inlets, on each side of fuselage. Air inlet controllers by Hamilton Standard. Air inlet actuators by National Water Lift Company.



The McDonnell Douglas F-15E Eagle has a max weapon load of 10,659 kg (23,500 lb)

ACCOMMODATION: Two crew, pilot and weapon systems officer, in tandem on McDonnell Douglas ACES II ejection seats. Stretched acrylic windshield and single-piece, rear-hinged, upward-opening canopy. Windscreen anti-icing valve by Dynasciences Corporation.

SYSTEMS: Garrett air-conditioning system. Three independent hydraulic systems (each 207 bars; 3,000 lb/sq in), powered by Abex engine driven pumps; modular hydraulic packages by Hydraulic Research and Manufacturing Company. Lear Siegler generating system for electrical power, with Sundstrand 40/50kVA generator constant speed drive units and Electro Development Corporation transformer-rectifiers. Oxygen system includes a liquid oxygen indicator by Simmonds Precision Products Inc. Garrett APU for engine starting, and for the provision of electrical or hydraulic power on the ground independently of the main engines.

AVIONICS: Lear Siegler triplex digital fail-operate/fail-safe automatic flight control system standard. Hughes Aircraft AN/APG-70 radar for multiple air-to-air and air-to-ground target sensing, acquisition, designation, and tracking. IBM CP-1075/A/YK central computer core memory digital processor, programmed to accomplish intersystem data transfers via a network of avionics multiplex data buses, and to perform mission-related computations. Standard navigation equipment includes a ring laser gyro inertial navigation set (by Honeywell on development aircraft) which includes a Kalman filter for aided navigation modes and in-flight alignment, with

multiple ground alignment modes for compliance with various tactical reaction time requirements; and Sperry AN/ASN-108 attitude and heading referencing system, used in conjunction with an AN/ASK-6 air data computer as secondary source of attitude and magnetic heading data and to perform backup navigation functions. Other equipment includes a Gould AN/APN-232 radar altimeter; Texas Instruments terrain-following radar (forming part of the Martin Marietta AN/AAQ-14 LANTIRN pod); Dynamics Control AN/AWG-27 programmable armament control set; General Electric CN-1377/AWG lead computing gyro; dual Magnavox RT-1145/ARC-164(V) UHF transceivers; Collins Tacan; and Collins ILS. AAI/IFF functions are provided through integration of a Teledyne RT/868A/APX-76A IFF receiver/transmitter, an NSA KIR/TSEC interrogator computer, Teledyne RT/1063B/APX-101 IFF transponder, NSA KIT/TSEC transponder computer, and a Litton MX-9147/APX IFF reply evaluator. Secure speech capability is provided through integration of the ARC-164 UHF radios and the NSA KY-58/TSEC system. Radio direction finding is accomplished by signal interfaces between the Collins OA-8639 automatic direction finder, ARC-164, and the aircraft's controls and displays system, which provides symbology to indicate the rela-

tive bearing to the source of audio signals. Two programmable interface units provide analog-to-digital and digital-to-analog signal conversions for avionics systems modes and functions. The controls and displays system comprises a Sperry multi-purpose programmable display processor (MPDP); Kaiser wide-field-of-view head-up display; four Kaiser 6 in multi-purpose displays, two per crew station; three Sperry 5 in multi-purpose colour displays, one in the forward station and two in the rear station; MDEC up-front controls, one in each crew station; Bendix engine monitor display; Mason throttle grip assembly and Essex flight control stick in each crew station; and two Mason hand controllers in the rear crew station. Other equipment includes two Hamilton Standard DCU-181/A engine air inlet controllers; a tactical electronic warning system comprising Loral AN/ALR-56C radar warning receiver, Northrop Enhanced AN/ALQ-135 internal countermeasures set, Magnavox AN/ALW-128 electronic warfare warning set, Tracor AN/ALE-45 countermeasures (chaff) dispenser, and an MDEC MX-9287/A interference blander set; and checkout and flight analysis equipment including an Actron avionics status panel, TEAC video tape recorder set with split screen capability, Conrac signal data recorder set, and a data transfer module. The LANTIRN pod is integrated with other avionics to provide automatic control and launch of AGM-65D Maverick air-to-ground missiles, and contains a narrow-field-of-view infra-red sensor and laser designator/ranger for target sensing, acquisition, and tracking. Cockpit



Radomes at nose and tail identify the projected AEW version of the Lockheed C-130 Hercules

flight instruments in the F-15E include a Servo Developments vertical velocity indicator in each crew station and a Ragen angle of attack indicator in the forward crew station, plus standby presentation of airspeed, altitude, and attitude. Other flight parameters are displayed on the HUD and CRT displays. Built-in test equipment includes fault identification and isolation to equipment shop replaceable units (SRU). Identification of the failed SRU within a line replaceable unit (LRU) will accompany the LRU to the maintenance facility, reducing occurrences of incorrect LRU removals.

ARMAMENT: 20 mm M61A1 six-barrel 'Gatling' gun in starboard wing root, with 940 rounds of ammunition. General Electric lead computing gyro. Provision on underwing (one per wing), fuselage or conformal fuel tank (CFT), and centreline pylons for air-to-air and air-to-ground weapons and external fuel tanks. Wing pylons use standard rail and ejection launchers for AIM-9 Sidewinder and AIM-120 AMRAAM air-to-air missiles; AIM-7 Sparrow and AIM-120 AMRAAM can be carried on ejection launchers in fuselage or on tangential stores carriers on conformal fuel tanks (maximum total load four each AIM-7 or AIM-9, up to eight AIM-120). Single or triple rail launchers for AGM-65 Maverick air-to-ground missiles can be fitted to wing stations only. Tangential carriage on CFTs provides for up to six bomb racks on each tank, with provision for multiple ejector racks on wing and centreline stations. The F-15E can carry a wide variety and quantity of guided and unguided air-to-ground weapons, including Mk 20 Rockeye (26), Mk 82 (26), Mk 83 (15), Mk 84 (seven), BSU-49 (26), BSU-50 (seven), GBU-8 (five), GBU-10 (seven), GBU-12 (15), GBU-15 (two), GBU-22 (15), GBU-24 (five), CBU-52 (25), CBU-58 (25), CBU-71 (25), CBU-87 (25), CBU-89 (25), CBU-90 (25), CBU-92 (25), CBU-93 (25) bombs, LAU-3A rockets (nine), SUU-20 training weapons (five), A/A-37 U-33 two target (one), B-57 and B-61 series nuclear weapons (five), and AGM-65 Maverick (six). An AXQ-14 data link pod is used in conjunction with the GBU-15; LANTIRN pod illumination is used to designate targets for the GBU-12, -22, and -24 laser guided bombs.

DIMENSIONS, EXTERNAL:

Wing span	13.05 m (42 ft 9 3/4 in)
Length overall	19.43 m (63 ft 9 in)
Height overall	5.63 m (18 ft 5 1/2 in)
Tailplane span	8.61 m (28 ft 3 in)
Wheel track	2.75 m (9 ft 0 1/4 in)
Wheelbase	5.42 m (17 ft 9 1/2 in)

AREAS:

Wings, gross	56.5 m ² (608 sq ft)
Ailerons (total)	2.46 m ² (26.48 sq ft)
Flaps (total)	3.33 m ² (35.84 sq ft)
Fins (total)	9.78 m ² (105.28 sq ft)
Rudders (total)	1.85 m ² (19.94 sq ft)
Tailplanes (total)	10.35 m ² (111.36 sq ft)

WEIGHTS:

Basic operating weight empty	14,379 kg (31,700 lb)
Max weapon load	10,659 kg (23,500 lb)
Max fuel weight: internal	5,952 kg (13,123 lb)
conformal tanks (2)	4,423 kg (9,750 lb)

drop tanks (3)	5,395 kg (11,895 lb)
total internal/external	15,770 kg (34,768 lb)
Max T-O weight	36,741 kg (81,000 lb)
Max zero-fuel weight	28,440 kg (62,700 lb)
Max landing weight:	
unrestricted	20,094 kg (44,300 lb)
at reduced sink rates	36,741 kg (81,000 lb)
PERFORMANCE (estimated):	
Max level speed	more than Mach 2.5 (800 knots; 1,482 km/h; 921 mph CAS)
Service ceiling	18,300 m (60,000 ft)
Ferry range:	
with external tanks, without CFTs	more than 2,500 nm (4,633 km; 2,879 miles)
with external tanks and CFTs	3,100 nm (5,745 km; 3,570 miles)
Design g limits	+9.0/-3.0

LOCKHEED

LOCKHEED-GEORGIA COMPANY (GELAC): 86 South Cobb Drive, Marietta, Georgia 30063, USA

Details of Lockheed-California's AEW&C (airborne early warning and control) version of the P-3 Orion maritime patrol aircraft appeared in this Supplement in the December 1984 issue of AIR FORCE Magazine. In a similar programme, Lockheed-Georgia is developing an AEW version of its widely used C-130 Hercules four-turboprop transport. This programme was given impetus during the 1985 Paris Air Show when it was confirmed that it would be based on a GEC (formerly Marconi) Avionics multi-mission avionics system.

LOCKHEED C-130 AEW

Lockheed-Georgia has built well over 1,700 Hercules transports since production began in 1952, including more than 1,000 for the US Air Force, Navy, Marine Corps, and Coast Guard. The remainder are in service with 57 nations worldwide, with the stretched L-100-20 and -30 civil versions in 27 countries; Hercules production continues at an average rate of three per month. Such widespread service has convinced Lockheed of the market potential for a straightforward conversion of the aircraft that could fulfill an airborne early warning role with new or existing operators. The company believes that a first customer will emerge before mid-1986, and has said that a production programme could be launched with orders for as few as ten aircraft, about one-tenth of Lockheed's estimate of the potential market. The AEW version could be based either on the current production C-130H or on conversion of earlier models already in service.

As announced in June 1985, joint engineering feasibility studies have been completed by Lockheed-Georgia and GEC Avionics in the UK, and both companies are now undertaking a more detailed definition of the mission avionics system. This is based on use of the latter's APY 920 radar, a close derivative of that currently being installed in the British Aerospace Nimrod AEW, Mk 3s ordered for the Royal Air Force. This system has already completed more than 1,000 hours of operation in the first Nimrod 3, and will be installed in

two more of the RAF's 11 aircraft by the end of this year. Combining the proven C-130 airframe with the APY 920 surveillance radar will, Lockheed claims, produce a very effective (and cost-effective) long-endurance AEW aircraft with a time on station (8-12 hours on a typical mission) equal to or greater than that of the Boeing E-3A. Moreover, the AEW information can be combined with other data and intelligence to provide either a stand-alone command and control capability with an extended radius of action, or can be downlinked to a ground- or ship-based air defence headquarters.

Flying at an altitude of 8,230 m (27,000 ft), the C-130 AEW could provide 360° surveillance coverage to the 200 nm (370 km; 230 mile) radar horizon and beyond. Aircraft performance compared with the standard C-130 is little affected, since the drag penalty of the nose and tail radomes is only about 5 per cent. Take-off and landing field requirements are unimpaired, and the aircraft's in-flight refuelling capability (tanker or receiver) is retained. The Lockheed/GEC Avionics programme plan provides for the modified airframe to be built and flight tested by Lockheed-Georgia; GEC Avionics would develop, build, and test the radar and mission avionics systems, which would then be installed and flight tested in England by Marshall of Cambridge.

The heart of the radar installation would be contained in lightweight modular units installed in the Hercules' 12.22 x 3.13 x 2.81 m (40 ft 1 1/4 in x 10 ft 3 in x 9 ft 2 1/4 in) cargo hold through the full width rear ramp opening. The forward pallet would contain the radar equipment, including computers and signal processing equipment. The self-contained second module, extensively insulated against sound and vibration, would accommodate up to six AEW control stations in the centre-fuselage area, with plenty of growth potential space for additional airborne missions such as elint, radar data fusion, and track correlation. Communications equipment would be housed in a third pallet, installed in the rear of the hold.

The APY 920 system consists of five integrated subsystems: the radar, IFF, ESM sensors, a data handling system, and communications/data link facilities. The primary sensor is a powerful S band pulse-Doppler radar, operating through high performance scanners mounted (as in the AEW Nimrod) at the aircraft's nose and tail to provide all-round coverage unobstructed by the rest of the airframe. This is augmented by an IFF interrogator/receiver and a passive-reception ESM (electronic support measures) system. Radar and IFF detections are fed to the central data handling system, where they are formed automatically into tracks and displayed for association with any ESM identifications.

The data handling system's integrated central digital processor assembles incoming target data from all sources, automatically initiating tracking of new targets while maintaining and updating existing track files with all available track data. This information is then passed, in the form of an integrated surveillance picture, to the operator display consoles, from where it can be transmitted to surface stations via a secure data link. The central processor also performs computing tasks such as the generation of visual or radar interception profiles for friendly fighters; and management functions such as the interface and control of data links, or maintaining a data base on fault conditions detected by the system's comprehensive built-in test equipment.

The AEW communications system is an automatic transmit/receive/intercom management system that provides the mission operators with a 'pool' of radios for clear and secure voice and data transmission in the HF, VHF, and UHF bands. Each mission operator has a control and display unit that allows him to access the tactical radios and to select intercom facilities. All mission radios can take part in an automatic relay giving clear or secure voice relay on VHF/UHF and clear voice relay on HF/UHF. The HF and UHF sets also provide the means of secure data link under the automatic control of the data handling system.

DIMENSIONS, EXTERNAL: As for standard C-130 except:

Length overall	35.48 m (116 ft 4.8 in)
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Forward radome:	
Length	3.93 m (12 ft 10.6 in)
Max width	3.09 m (10 ft 1.8 in)
Max depth	2.42 m (7 ft 11.2 in)
Ground clearance	0.41 m (1 ft 4.2 in)
Rear radome:	
Length	4.17 m (13 ft 8.0 in)
Max width	3.09 m (10 ft 1.8 in)
Max depth	2.48 m (8 ft 1.7 in)
Ground clearance	2.97 m (9 ft 8.8 in)
WEIGHTS (estimated):	
Basic aircraft	34,473 kg (76,000 lb)
AEW conversion	10,659 kg (23,500 lb)
*Mission fuel	16,103 kg (35,500 lb)
Mission T-O weight	61,235 kg (135,000 lb)
PERFORMANCE: Similar to standard C-130 except:	
Ferry range	4,000 nm (7,413 km; 4,606 miles)
Max mission time on station (SAR)	13 h

*Max capacity 28,123 kg (62,000 lb); tanker giveaway, with AEW equipment on board, more than 11,340 kg (25,000 lb)

ICA

INTREPRINDEREA DE CONSTRUCTII AERONAUTICE (Aeronautical Construction Enterprise): Casuta Postala 198, 2200 Brasov, Romania

ICA IAR-317 AIRFOX

Exhibited publicly for the first time at the 1985 Paris Air Show, the IAR-317 first prototype had then accumulated about 100 hours of flying since it first flew in April 1984. Completion of two more prototypes was planned by the end of 1985.

Developed under the leadership of Dipl Ing Gheorghe Mitrea, the IAR-317 is modified from an IAR-316B Alouette III. It is intended primarily as a light ground attack, training, and military liaison helicopter, although civil versions can also be produced to meet specific customer requirements. As the accompanying illustration shows, the modifications occur mainly ahead of the main rotor mast, the new cabin contours being considerably slimmer, with tandem seating for a crew of two, the second cockpit being elevated to improve the co-pilot's field of view. In the combat version, armour protection is provided for crew seats and fuel tank, toughened material is used in the cockpit transparencies, and attachments are provided for up to six external weapons.

TYPE: Tandem two-seat light attack and training helicopter.

ROTOR SYSTEM: Three-blade main and anti-torque rotors. All-metal main rotor blades of constant chord, on articulated hinges, with hydraulic drag-hinge dampers. Main rotor brake and blade folding standard.

ROTOR DRIVE: Main rotor driven through planetary gearbox, with freewheel for autorotation. Take-off drive for tail rotor at lower end of main gearbox, from where a torque shaft runs to a small gearbox that supports the tail rotor and houses the pitch change mechanism. Cyclic and collective pitch controls are hydraulically powered.

FUSELAGE: Welded steel tube centre-section, with metal skin panels, carrying the duralumin cabin at the front and a semi-monocoque tailboom. Ventral tail rotor guard.

TAIL UNIT: Cantilever glassfibre fixed tailplane, with twin endplate fins, mounted on tailboom.

LANDING GEAR: Non-retractable tricycle type, manufactured under Messier-Hispano-Bugatti licence. Hydraulic shock absorption. Steerable nosewheel, with optional locking device. Metal ski gear, floats, and emergency flotation gear optional.

POWER PLANT: One 640 kW (858 shp) Turboméca Artouste IIIB turboshaft engine, derated to 404 kW (542 shp) for max continuous operation. Fuel in single tank in fuselage centre-section, with capacity of 575 litres (126.5 Imp gallons; 151.9 US gallons), of which 573 litres (126 Imp gallons; 151.4 US gallons) are usable. One or two auxiliary fuel tanks optional, each of 125 litres (27.5 Imp gallons; 33 US gallons) capacity.



Prototype ICA IAR-317 Airfox helicopter gunship with typical weapon loads (Brian M. Service)

ACCOMMODATION: Crew of two in tandem, with elevated rear (co-pilot's) cockpit. Seats are of bucket type, adjustable vertically and horizontally, removable, and armoured in military versions. Windscreens and lower portions of side window/doors are flat-plate and of toughened material; forward and rear window/doors on each side can be jettisoned for escape in an emergency. Dual controls standard. Both cockpits heated and ventilated; air-conditioning is optional.

SYSTEM: Electrical system (28.5V DC) supplied by 4kW starter/generator and a 40Ah nickel-cadmium battery. Ground power receptacle.

AVIONICS AND EQUIPMENT: Standard avionics include TR-800A VHF nav, AHV-6 radio altimeter, radio compass, marker beacon receiver, intercom, and pilot's gyro horizon, directional gyro, and sideslip indicator. Pilot's main and secondary panels include altimeter, airspeed indicator, variometer, magnetic compass, tachometer, voltmeter, collective pitch indicator, temperature indicator, fuel gauge, oil pressure and temperature indicator, outside air temperature indicator, and clock. Pilot's main instruments (altimeter, airspeed indicator, variometer, and collective pitch indicator) are repeated on co-pilot's panel; option also for co-pilot's gyro horizon and directional gyro. Standard equipment includes gunsight, roof mounted missile sight, position lights, anti-collision light, pilot's instrument failure warning lights, instrument and panel lights, windscreen heating/demisting, windscreen wiper, retractable landing light, rotor brake, alternative static source, mission selector, and cockpit fire extinguisher. Optional equipment includes agricultural spraygear, external cargo sling, rescue sling seat, 175 kg (386 lb) capacity rescue hoist, decklock harpoon, fuel quick drain, sand filter, and flares.

ARMAMENT: Fixed armament of two 7.62 mm machine-guns, one on each side of lower front fuselage. Load-carrying beam aft of rear cockpit, with two (optionally three) weapon attachment points on each side. Typical stores loads, up to a maximum of 750 kg (1,653 lb), can include four rocket launchers (each with four or twelve 57 mm rockets), four twin-gun machine-gun pods, four 50 kg or 100 kg bombs, or '2+2' combinations of these weapons; four cartridge launchers or flare pods; four air-to-surface missiles; or six small 'Sagger' type anti-tank missiles. Naval weapons

and stores can also be carried. RAD weapon aiming system, with PKV gyro stabilised sight, in front cockpit.

DIMENSIONS, EXTERNAL:	
Main rotor diameter	11.02 m (36 ft 1¼ in)
Tail rotor diameter	1.912 m (6 ft 3¼ in)
Length overall, rotors turning	12.84 m (42 ft 1½ in)
Length overall, main rotor blades folded	10.845 m (35 ft 7 in)
Length of fuselage	9.80 m (32 ft 1¼ in)
Height to top of rotor head	3.00 m (9 ft 10 in)
Wheel track	2.602 m (8 ft 6½ in)

AREAS:	
Main rotor disc	95.38 m ² (1,026.6 sq ft)
Tail rotor disc	2.87 m ² (30.9 sq ft)

WEIGHTS:	
Weight empty	1,150 kg (2,535 lb)
Max usable fuel: standard	453 kg (998 lb)
auxiliary tanks (two, total)	200 kg (441 lb)
Max T-O and landing weight	2,200 kg (4,850 lb)

PERFORMANCE (prototype): A at 1,700 kg; 3,748 lb gross weight, B at max T-O weight; no external stores, both in ISA zero wind conditions:

Never-exceed speed, and max level speed* at S/L:

A, B	118 knots (220 km/h; 136 mph)
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*Max cruising speed at S/L:

A	108 knots (200 km/h; 124 mph)
B	102 knots (190 km/h; 118 mph)

Max rate of climb at S/L:

A	510 m (1,673 ft)/min
B	270 m (886 ft)/min

Service ceiling:

A	6,300 m (20,670 ft)
B	3,200 m (10,500 ft)

Hovering ceiling IGE:

A	5,950 m (19,520 ft)
B	2,850 m (9,350 ft)

Hovering ceiling OGE:

A	5,600 m (18,375 ft)
B	1,500 m (4,920 ft)

*Max range at S/L:

with standard fuel:

A	294 nm (545 km; 338 miles)
B	283 nm (525 km; 326 miles)

with auxiliary tanks:

A	469 nm (870 km; 540 miles)
B	437 nm (810 km; 503 miles)

*Reduced by 10% with external stores



“The Military Balance 1985/86”

Changing technologies

Changing times

Changing balance

*People who need to keep up to date
on the ever-changing military
balance find the facts in the
December issue of AIR FORCE
Magazine.*

*Closing for advertising reservations
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THE BULLETIN BOARD

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

USAF Establishes Washington Military District

If you're writing to Washington this month, check your addresses. Effective October 1, the Air Force is activating an Air Force District of Washington. The unit, which parallels a long-established Army Military District of Washington, will be responsible for all activities that support Air Force Headquarters at the Pentagon as well as for other capital-area units, such as the USAF Band and Air Force Honor Guard.

Named as Commander of the new outfit is Brig. Gen. Edward N. Giddings, who served previously as Director of the SAF Personnel Council in Washington, D. C. Units to be absorbed by the District include the 1947th Headquarters Squadron Group, paper-keepers for Pentagon people; the 1100th Air Base Wing; and elements of the 76th Airlift Division, formerly a MAC unit. Bolling AFB, site of the new command, will be transferred from MAC to the District, while the 76th Air Division, which previously served somewhat in the same capacity as the new District, will be abolished.

At press time, definitive roles and assignments of the new organization were still being sorted out. It is fairly certain, for example, that the key protocol, maintenance, and operational requirements associated with *Air Force One* operations will remain with MAC at Andrews AFB, Md. Other functions will be distributed as appropriate.

Those with long memories are harking back to the days of "Headquarters Command," which was quartered at Bolling AFB many years ago. It seems that military organizations, like fashions, repeat if one waits long enough.

Stamp Honors Korean Vets

On July 26, 1985, the thirty-second anniversary of the signing of the armistice that ended the "police action," AFA and other military, association, and government leaders were on hand in Washington to witness the First Day of Issue ceremonies intro-

ducing the new Korean War Veterans Stamp.

The twenty-two-cent commemorative honors the veterans of that conflict, in which more than 130,000 Americans were killed or wounded. It depicts US troops on the march from the Chosin Reservoir—a maneuver that generated thirteen Medals of Honor, six of them posthumously.

Speaking to the group gathered for the occasion, Paul N. Carlin, Postmaster General of the United States, said, "Stamps are much more than simply a postal price tag. Although small in size, they are invested with great power to communicate ideas . . . to teach . . . to inspire. With this commemorative stamp, we pay tribute to our compatriots who served on a distant field of battle more than three decades ago."

Artist Richard Sheaff of Needham Heights, Mass., based his design of the stamp on a photograph by David Douglas Duncan. The stamp is printed in green and red. All lettering is in red, with the words "Veterans Korea" printed in a single line running along the top. A smaller "USA 22" is in the lower right corner.

Five and a half million Americans served in Korea, and more than 50,000 died there. Fought from June 25, 1950, until July 26, 1953, the conflict marked the first time ever that US military men and women fought under the flag of the United Nations. The North Korean aggressors, who had, without warning, suddenly poured waves of soldiers and armor across the Thirty-eighth Parallel to begin the war, sent thousands of troops against the often outmanned UN forces.

Mr. Carlin noted in his address that Korea stirred up much controversy. He quoted Gen. Omar Bradley, then Chairman of the Joint Chiefs of Staff, who characterized the conflict as "the wrong war, in the wrong place, at the wrong time, and with the wrong enemy." But others, such as then President Eisenhower, reflected a different perspective, Mr. Carlin noted. He recalled President Eisenhower's words: "We have won an armistice on a single battleground, not peace in the world. We may not now relax our guard, nor cease our quest."

The efforts of those veterans who held the line of freedom in Korea, Mr. Carlin said, are being honored with



Entertainer Barbara Mandrell recently received the USAF Recruiting Service's Commander's Award for her contributions to the Air Force. Maj. Gen. Scott Harpe, Director of Personnel Programs, second from left, made the presentation as Maj. Jack Mann, Commander of the 3532d Recruiting Squadron, left, and Col. Joe Bleymaier, Commander of the 3505th Recruiting Group, look on. (USAF photo by SMSgt. Buster Kellum)

this stamp. "Our debt to the Korean War Veterans can never be fully repaid," he said. "But we hope—in this small measure—to say thank you."

USO Expands Operations

The last year has seen a burgeoning of USO airport operations. Most recently, the USO facility at the MAC terminal at Yokota in Japan opened its doors to provide the comfortable chairs, children's cribs, hot coffee, or just a place to relax that are the hallmarks of these lounges. The Yokota lounge, funded by a generous grant from the American Express Foundation, marks the return to mainland Japan of USO after a ten-year absence. It will be open twenty-four hours a day.

These airport operations are an important part of USO's overall mission. USO works closely with DoD to ensure that its network of locations is positioned to meet the changing requirements of the military traveler. This is particularly significant in light of MAC's continuing move to overseas transport by commercial carriers at commercial gateway airports. While most military passengers reportedly like the new gateway civilian charters—they're convenient—young service families on the move have to do without the support systems usually available at military terminals. This support includes such items as reasonably priced food and lodging, lounges, and nursery areas. USO is stepping up its activities in these areas to fill the gap. Today, USO offers airport facilities in thirty-one locations worldwide, including a point of contact at every commercial MAC gateway in the US.

1985 Suggestion Program Winners

MSgt. William E. Steele, Jr., 86th Component Repair Squadron, Ramstein AB, Germany, has been named the top Air Force military suggester for 1985.

The Sergeant won the honors for several suggestions, among them one that suggested combining 1,568 pages of duplicate technical data into one technical order for an estimated savings of \$192,000. He also identified a more reliable method to check the tuned status of AIM-7 missiles on F-4E/G aircraft. This idea yielded savings of \$2,347,934.

Sergeant Steele is himself not only a contributor to the Air Force Suggestion Program but a strong booster of it among those under his supervision. His subordinates have submitted nine suggestions this year. He also takes to the speakers platform at Command-

er's Call and other gatherings to talk up the program.

Meanwhile, garnering honors as the top civilian employee in the Air Force Suggestion Program was Janene Gandee, Ogden ALC, Utah. She was cited for "enthusiastic direction of the Hill AFB, Utah, suggestion program, which brought increased productivity, improved relations, and cost reductions." According to officials, Ms. Gandee and her staff have substantially reduced processing time for suggestions and accompanying award paperwork, which means that accepted suggestions can start returning dividends to the Air Force promptly.

She was also cited for giving added



Brian Hartley is one of three gifted sixth-graders from elementary schools near the Air Force Academy who are participating in a special mentorship program sponsored by the schools and the 557th Flying Training Squadron at the Academy. In the program, the students spend half a day a week at the Academy and learn about aviation, air traffic rules, and aircraft.

recognition to those who suggest by developing the "Hill Heralds," a monthly one-page publication distributed to all Hill AFB employees. It sums up all suggestion award activity that month.

VA Wants to Sell You a Home

The VA wants investors as well as private buyers to know that it has approximately 20,000 single-family homes available nationwide. Individuals need not be veterans to qualify.

These properties were formerly the security for VA-guaranteed loans. They range from the basic "starter home" to the traditional colonial to the contemporary ranch-style house. While they're available in every state, most are concentrated around the Great Lakes area and in the southwestern US.

The VA will provide competitive financing on most of these properties, and down payments are usually low. Closings can usually be scheduled within forty-five days. Cash purchasers may close sooner and are generally offered a discount off the listed price. Approximately 2,000 additional homes are acquired by the VA each month. VA officials are most interested in moving them into other hands.

VA regional offices with Loan Guarantee Divisions publish listings that state the terms and conditions for the sale of these properties. Additionally, many local real estate agents have information on the houses within their areas.

Operation Raleigh Needs Volunteers

In what has to be one of the most unusual assignments available, the Air Force is soliciting qualified volunteers to support a worldwide expedition to various countries for community work and scientific research projects.

Dubbed Operation Raleigh and sponsored by Great Britain, it brings together young leaders from fifty-two different countries. About 4,000 youths from various nations will participate, including about 1,500 from the US. It's a privately funded operation that is planned to run through December 1988. The expedition team will conduct oceanographic, archeological, and other scientific research. Community construction projects are also planned.

Air Force involvement is to provide administrative, medical, supply, and survival training specialists who will stay with the expedition for three months and then return to their normal Air Force duties. All the military services are providing volunteers. The first contingent of airmen just finished a stint in Chile.

Participating youths in the program travel aboard the *Sir Walter Raleigh*, a 1,900-ton British flagship. The four-year trip will include dockings at more than forty ports around the world, including stops in Hong Kong, India, Japan, Kenya, New Zealand, and Australia. US military volunteers will join the expedition at the expedition site and may or may not sail aboard the British flagship.

Particularly needed are volunteers with supply or medical experience. Those with civil engineering skills will be needed for the summer of 1986 to help with construction projects in Australia and New Zealand.

Airmen of any grade should contact the CBPOs for details. Volunteers with administrative, medical, supply, or survival training expertise must be at least twenty-five years old and meet the highest standards of Air Force professionalism. Foreign-language or scuba-diving experience is desirable, but not required.

CHAMPUS to Share Kidney Stone Treatment

A new benefit for CHAMPUS-eligibles is a cost-share for two procedures used in the treatment of kidney stones.

The treatment uses sound waves to break up kidney stones within the body so that they can be passed through the urinary tract less painfully. It's called "lithotripsy." One of the methods (percutaneous lithotripsy) uses a probe that is inserted through an incision in the skin directly over the kidney and applied to the stone.

The other method (extracorporeal shock wave lithotripsy) uses shock waves generated outside the body to pulverize the stones. Patients should be aware that the transurethral ureteroscopic lithotripsy procedure, which involves the insertion of an endoscope in an ascending approach through the urinary tract itself, is not covered under CHAMPUS. It is still considered investigational.

The new benefit became effective on March 25, 1985, and CHAMPUS will help pay for all treatments received on or after that date.

New AFROTC Rules

As new AFROTCers begin this

THE BULLETIN BOARD

school year, some scholarship cadets will be eligible for an extra year. Basically, any scholarship cadet who is enrolled in a program that requires more years to complete than their current scholarship covers may be eligible to receive extended entitlements.

Congress, in passing the new authority, aimed it at the increasing number of academic programs requiring more than four years to complete. Engineers, for example, have been hard-pressed to carry their heavy academic load and successfully complete their AFROTC requirements.

The new program extends scholarship entitlements for up to five total years, or ten semesters (fifteen quarters). AFROTC is currently budgeted to fund 7,500 scholarships. The extended scholarship program will be funded out of the existing budget for the 7,500 slots. No additional funds will be used to pay for the new programs.



*SSgt. Joy O. Eason, a personnel technician in the Directorate of Individual Reserve Programs at the Air Reserve Personnel Center in Denver, Colo., was recently selected to participate in this year's **Tops in Blue** overseas tour. Sergeant Eason, who began singing during high school, is shown on the job, right, and during rehearsal, left.*

Find Lost Friends

Want to find someone in the Air Force? Or someone who has been? The Worldwide Locator will assist you in locating active-duty, active Reserve, Air National Guard, or retired members of the Air Force.

How does it work? It helps to have a lot of information about the person being sought, especially full name, service or Social Security number, and grade. If this information isn't available, the date and place of birth, duty and assignments, and dates are helpful to ensure that you find "the" John Smith you're seeking.

To contact members, searchers should prepare a letter to the individual and place it in a sealed envelope that is stamped with the requestor's return address and the sought individual's name on the address portion of the envelope. This envelope should then be placed in another larger envelope and mailed to Hq. AFMPC/MPCDOO3L, Northeast Office Place, 9504 IH-35 North, San Antonio, Tex. 78233-6636.

If you are active duty, in the reserve forces, or retired (or a family member of such a person), there is no charge to you for this service. Be sure to identify yourself in order to avoid being charged.

If you fall into none of these categories, it will cost you \$2.85 (in advance) per name to receive the service. The check or money order should be made payable to AFO, Randolph AFB, Tex.

The fees are used to defray the costs of the research, and they are not refundable, regardless of whether or not the effort turns up anything.

Short Bursts

Among the many proposals concerning military retirement sure to be floated this legislative session is a measure sponsored by Sens. Paul Simon (D-Ill.) and Thomas F. Eagleton (D-Mo.) that would **revise minimum service requirements**. It would not be retroactive, but would require new recruits to serve twenty-five years to receive fifty percent of base pay. Thirty years service would net sixty percent retirement. They tout their bill as eventually saving about \$10 billion a year.

The Air Force Academy wants to hear from **jumpmaster-rating qualified junior officers** who want to teach the skill to cadets. Applicants must have a Parachuting Association "C" License and at least 150 free falls. **Soaring teachers**, who must be rated pilots, are also being sought. Details are available from Capt. Sandy Scott at AUTOVON 259-2495.

Blue-suiters overseas can now see most of the **top television shows**. Armed Forces Radio and Television Service boasts that it now provides overseas audiences 93.4 percent of all major US network 1984-85 prime-time series. Officials say this is a goal never before achieved.

The **Air Force's top young lawyer** for 1985 is **Capt. Harold C. Davis** of the Air Force Military Training Center at Lackland AFB, Tex. Captain Davis, selected from about 6,000 attorneys under age thirty-six, is the chief of the military justice division at the Center.

If you guessed that **candy bars lead all snack items** bought in Air Force commissaries, you'd be right—almost double the runner-up items, chips and cookies.

Members leaving active duty who still have a **reserve military service obligation** are now being issued **red identification cards**. Officials say the cards will make accounting for those in the Individual Ready Reserve faster and more efficient in the event of an emergency recall. The red identification card, by itself, does not authorize any benefits.

Air Force retirees in Alabama, Delaware, Georgia, Idaho, Massachu-

setts, Maine, Maryland, Minnesota, New Mexico, Kansas, North Carolina, Oklahoma, South Carolina, Utah, Indiana, and Wisconsin can now have **state income tax withheld from their retired pay**. The program is voluntary, and the withholding must be in an even amount over \$10. To join up, write to AFAFC/RP, Denver, Colo. 80279-5000, giving name, address, Social Security number, and amount desired to be withheld. Questions on how to file or any other questions about the state return should be directed to the state agency responsible for income taxes.

The overall **Outstanding Personnel Manager of the Year** is **PACAF's Capt. Lisa A. Goldner**. Captain Goldner, who had also been named the Outstanding Junior Personnel Manager at base level, was honored last month at AFA's National Convention.

Sen. Strom Thurmond (R-S. C.) has introduced, for the fifth consecutive congressional session, a **bill to help out widows of military retirees** who died before the establishment of the Survivor Benefit Plan. Popularly dubbed the **Forgotten Widows Bill**, it would also cover those widows of spouses who died before being able

to convert from the old Retired Serviceman's Family Protection Plan (RSFPP) to the more relatively generous SBP. The Senator is cautiously optimistic that his bill has a chance this session.

The Supreme Court has ruled that **someone once barred from a military base has no constitutional right to reenter**, even during subsequent "open houses." According to the Air Force Policy Letter for Commanders, a base commander has broad discretion under military regulations to issue a letter barring an individual from reentering the base without permission. A 1909 federal law makes it a crime to violate the conditions of such a bar, and the Supreme Court has interpreted that authority as still valid.

Recently, **DoD honored seven civilian employees** with the **Distinguished Civilian Service Award**, the highest award DoD gives to civilians. The lone Air Force recipient was **Joseph LaQuanti**, Chief of the Ballistic Systems Division at AFSC's Foreign Technology Division, Wright-Patterson AFB, Ohio. He was honored for his work in "assessing Soviet ballistic missile capabilities and threat." ■

SENIOR STAFF CHANGES

RETIREMENTS: M/G William A. Gorton; M/G Dewey K. K. Lowe; B/G Richard L. Meyer; B/G Kenneth W. North; M/G Waymond C. Nutt; B/G Thomas G. Tobin.

CHANGES: M/G Thomas A. Baker, from Dir. of Personnel Plans, DCS/M&P, Hq. USAF, Washington, D. C., to Cmdr., 16th AF, USAFE, Torrejon AB, Spain, replacing retiring M/G William A. Gorton . . . B/G Edward P. Barry, Jr., from Dep. Cmdr. for Launch & Control Systems, Space Div., AFSC, Los Angeles AFS, Calif., to Vice Cmdr., BMO, & Prgm. Dir. for Small ICBM, AFSC, Norton AFB, Calif., replacing B/G David B. Englund . . . B/G Harold N. Campbell, from Vice Cmdr., Ogden ALC, AFLC, Hill AFB, Utah, to DCS/Log., Hq. USAFE, Ramstein AB, Germany, replacing M/G Lewis G. Curtis . . . M/G William M. Charles, Jr., from Cmdr., Sheppard TTC, ATC, Sheppard AFB, Tex., to C/S, 4ATAF, Heidelberg, Germany, replacing M/G Harold W. Todd . . . M/G Lewis G. Curtis, from DCS/Log., Hq. USAFE, Ramstein AB, Germany, to Cmdr., San Antonio ALC, AFLC, Kelly AFB, Tex., replacing retiring M/G Waymond C. Nutt.

M/G Eugene H. Fischer, from Cmdr., USAF TFWC, TAC, Nellis AFB, Nev., to Ass't DCS/P&O, Hq. USAF, Washington, D. C., replacing M/G (L/G selectee) Harley A. Hughes . . . Col. (B/G selectee) Albert A. Gagliardi, Jr., from IG, Hq. ATC, Randolph AFB, Tex., to Dep. US Mil. Rep., NATO Mil. Committee, Brussels, Belgium . . . B/G David M. Goodrich, from Dep. Dir., DMA, Washington, D. C., to Cmdr., 24th AD/NORAD Region, TAC, Griffiss AFB, N. Y., replacing retiring B/G Kenneth W. North . . . M/G Lee V. Greer, from Cmdr., Log. Mgmt. Systems Ctr., & DCS/Log. Mgmt. Systems, Hq. AFLC, Wright-Patterson AFB, Ohio, to Cmdr., Sacramento ALC, AFLC, McClellan AFB, Calif., replacing retiring M/G Dewey K. K. Lowe . . . B/G Michael D. Hall, from Dep. Dir. for Operational Test & Eval., OSD, Washington, D. C., to Cmdr., Hq. AFOTEC, Kirtland AFB, N. M., replacing M/G Richard W. Phillips, Jr.

B/G Trevor A. Hammond, from Vice Cmdr., Sacramento ALC, AFLC, McClellan AFB, Calif., to Cmdr., Log. Mgmt. Systems Ctr., & DCS/Log. Mgmt. Systems, Hq. AFLC, Wright-Patterson AFB, Ohio, replacing M/G Lee V. Greer . . . B/G Peter T. Kempf, from Cmdr., 833d AD, TAC, Holloman AFB, N. M., to Cmdr., USAF TFWC, TAC, Nellis AFB, Nev., replacing M/G Eugene H. Fischer . . . M/G William J. Mall, Jr., from Cmdr., 23d AF, Hq. MAC, Scott AFB, Ill., to Dir. of Personnel Plans, DCS/M&P, Hq. USAF, Washington, D. C., replacing M/G Thomas A. Baker . . . B/G Mary A. Marsh, from Dir. for M&P, OJCS, Washington, D. C., to Ass't Dep. Dir. for Collection Mgmt., DIA, Washington, D. C. . . . B/G Gary H. Mears, from Cmdr., 834th AD, MAC, Hickam AFB, Hawaii, to Vice Cmdr., Warner Robins ALC, AFLC, Robins AFB, Ga., replacing B/G Garryl C. Sipple.

M/G Robert B. Patterson, from Cmdr., 322d AD, MAC, & DCS/Airlift, Hq. USAFE, Ramstein AB, Germany, to Cmdr., 23d AF, Hq. MAC, Scott AFB, Ill., replacing M/G William J. Mall, Jr. . . . M/G Richard W. Phillips, Jr., from Cmdr., Hq. AFOTEC, Kirtland AFB, N. M., to Cmdr., Sheppard TTC, ATC, Sheppard AFB, Tex., replacing M/G William M. Charles, Jr. . . . Col. (B/G selectee) James F. Record, from Cmdr., 388th TFW, TAC, Hill AFB, Utah, to Cmdr., 833d AD, TAC, Holloman AFB, N. M., replacing B/G Peter T. Kempf . . . B/G Daniel A. Taylor, Jr., from Dir., Materiel Mgmt., Sacramento ALC, AFLC, McClellan AFB, Calif., to Vice Cmdr., Ogden ALC, AFLC, Hill AFB, Utah, replacing B/G Harold N. Campbell . . . B/G Richard J. Trzaskoma, from Vice Cmdr., 23d AF, Hq. MAC, Scott AFB, Ill., to Cmdr., 322d AD, MAC, & DCS/Airlift, Hq. USAFE, Ramstein AB, Germany, replacing M/G Robert B. Patterson.

SENIOR ENLISTED ADVISOR CHANGE: CMSgt. John T. Horsch, to SEA, AFTAC, Patrick AFB, Fla., replacing retired CMSgt. Donald V. Tate. ■

Crusade in the Pacific

For a gung-ho fighter pilot named Grant Mahony, there was no such thing as combat fatigue.

BY JOHN L. FRISBEE
CONTRIBUTING EDITOR

IN November 1940, Lt. Grattan "Grant" Mahony and eleven other members of Flying School Class 40-A arrived in the Philippines to fly obsolescent early model P-40s and obsolete P-35s and P-26s for the 4th Composite Group—later the 24th Pursuit Group. Only three of the young pilots would survive the war that began thirteen months later when the Japanese attacked Pearl Harbor and the Philippines. The story of these men and the 207 other members of 40-A is told in Col. Frank Schirmer's remarkable history of his class.

If Colonel Schirmer's book can be said to have a central character for the World War II years, it is Grant Mahony, who, with two brief interludes in the States, spent three years fighting the Japanese Air Force over Luzon, Java, China, and Burma before his return to the Philippines in late 1944.

A classmate, retired Col. Walter Coss, who shared a house with him before the shooting started, says Grant Mahony then was a normal, gung-ho fighter jock, easy to live with and an excellent pilot. Then came the attack on the Philippines, and the Pacific war became for Grant Mahony a personal crusade that could end only with victory or death.

In ten days of air combat before the handful of AAF planes based around Manila was destroyed by

swarms of enemy bombers and fighters, Mahony shot down one Zero, flew an extraordinary P-40 night reconnaissance mission in bad weather to pinpoint Japanese landings on Luzon, dive-bombed and strafed Japanese troops, and was one of the first AAF pilots to be awarded the Distinguished Service Cross. Another classmate, retired Col. William A. Sheppard, said, "Of all the fighter pilots present [including 'Buzz' Wagner], Grant was the best combat pilot and flight leader . . . daring, easy to follow, using good judgment," and never looking for personal glory.

In mid-December 1941, Mahony and other pilots were evacuated to Australia, where Grant spent six weeks training new fighter pilots. He then led a flight of twelve fighters to Java, where thirty-nine P-40s fought desperately against massive formations of Japanese aircraft until the last Warhawk was lost. Mahony shot down three enemy planes in four days and became commander of the 17th Pursuit Squadron (Provisional) before being "drafted" by Maj. Gen. Lewis Brereton, who was en route to India to set up the Tenth Air Force.

Mahony suffered through several months as a staff officer and instructor of newly arrived fighter pilots before he managed to get himself assigned to Claire Chennault's China Air Task Force, successor to the American Volunteer Group and forerunner of Fourteenth Air Force. Retired Maj. Gen. John Alison, one of Chennault's aces and a former president of AFA, says Grant Mahony was an "inspired, aggressive squadron commander" who "held the theater record for steam locomotives destroyed."

Ten months of combat in China earned Mahony an unsought two months in the States. He then volunteered to join Johnny Alison and

Phil Cochran as a P-51 squadron commander in the 1st Air Commando Group, which was supporting Maj. Gen. Orde Wingate's guerrillas in Burma. According to Alison, "Grant didn't believe there was such a thing as combat fatigue." He led the long, tough missions and even tried to persuade Alison to go with him on a two-way P-51 strike from Burma across Thailand and the South China Sea to strafe Japanese bombers on Clark Field in the Philippines. General Alison's "computer didn't work the same as his" in figuring fuel consumption.

Following ten months of combat in Burma, Mahony languished in a Stateside assignment from June to November 1944, when he volunteered for a third tour, this one flying P-38s in the Southwest Pacific as deputy commander of the 8th Fighter Group. On January 3, 1945, he led a formation of P-38s that escorted bombers to an enemy airfield at Puerto Princessa on the Philippine island of Palawan. As they left the target, Mahony spotted a seaplane anchored offshore. He ordered the group to stay up while he went down to get the seaplane in an area well covered by enemy anti-aircraft guns.

Like so many other veteran fighter pilots who had survived countless air-to-air engagements, Mahony was shot down by flak, ending the long combat career of a man whom Fourteenth Air Force ace Gen. Bruce Holloway called "the finest combat squadron commander I have ever known."

At the time of his death, Lt. Col. Grant Mahony is believed to have flown more combat hours than any other AAF fighter pilot, the majority of those hours as a volunteer. Tragically, his personal crusade ended short of final victory, but no fighter pilot contributed more valiantly to that victory than did Grant Mahony. ■

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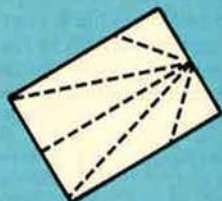
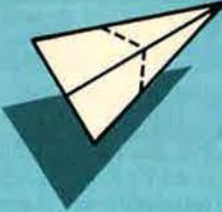
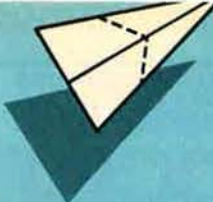
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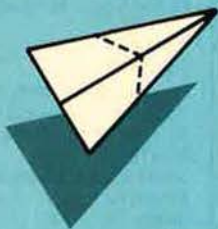
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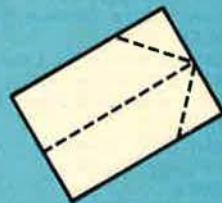
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AFA INTERCOM

By Robin L. Whittle, AFA DIRECTOR OF COMMUNICATIONS

AFA's Gathering of Eagles Is Gathering Steam

From Maine to Montgomery and across the Midwest to Utah and the Pacific, AFA members are making plans to meet in Las Vegas next year for AFA's fortieth anniversary celebration. A wide variety of reunion groups and aerospace leaders from throughout the world is also preparing to attend this landmark aerospace event.

The Gathering of Eagles is shaping up to be a singularly significant program for the Association, its sister organizations here and overseas, and aerospace leaders from throughout the world. The Gathering, which will take place in Las Vegas on April 27-May 1, 1986, will celebrate forty years of aerospace progress and will look ahead to tomorrow's aerospace world and the US Air Force of the twenty-first century.

"This is a golden opportunity to mingle with the living legends of America's proud aerospace past as well as those who are key to our future," said AFA National President Marty Harris. "AFA is celebrating its fortieth anniversary in a style and form that have been our hallmark from the beginning—educating ourselves and others about national defense requirements and the importance of aerospace power while enjoying camaraderie and fellowship with the key players who contribute to America's significant aerospace strength."

AFA is planning four days of exciting aerospace exhibits by the free world's leading aerospace companies, vintage aircraft displays and flybys by the Confederate Air Force, a USAF tactical capabilities exercise, symposia and Roundtable discussions on the key aerospace issues of today and tomorrow, receptions, a banquet, and a blockbuster Las Vegas Gala—all in celebration of AFA's fortieth anniversary and the fortieth anniversaries of USAF's Strategic Air Command, Tactical Air Command, and Aerospace Defense Command.

AFA's "Eagle Honor Roll"—the listing of individuals who are participat-

ing in the Gathering—reads like a *Who's Who* of the global aerospace world. The list already includes the Air Force Medal of Honor recipients, the Doolittle Raiders, many Air Force aces, senior officials from American, allied, and friendly air forces around the globe, leading American educators, industrialists, and US congressional representatives, Washington-based defense and air attachés, AFA leaders, Air Force Senior Enlisted Advisors, Arnold Air Society, Angel Flight, and Civil Air Patrol leaders, and many others.

"So many fond memories rushed to mind when I first learned of AFA's Gathering of Eagles. Forty years of monumental change have made this event ever more meaningful to those of us who were pioneers in the American 'crusade for airpower,'" said Gen. Jimmy Doolittle, USAF (Ret.). General Doolittle is serving as Chairman Emeritus of the Honorary Patrons of the Gathering.

"You sense the presence of 'eagles' in the milestones that mark American

and allied aerospace progress. An enormous effort has been expended by men and women with far-reaching vision who have propelled us ever skyward and beyond the 'known' and the 'safe'—here are the eagles!" said Honorary Patron Jimmy Stewart, who is a retired Air Force Reserve brig-

Registration Deadline

Registrations for AFA's Gathering of Eagles must be postmarked prior to November 1, 1985, if you want to take advantage of the greatest cost savings. The complete registration package price goes up after that date for both AFA members/patrons and nonmembers. From now until November 1, the complete package will cost \$195 for members/patrons and \$225 for all others. After November 1, the complete package price goes up to \$205 for members/patrons and \$235 for all others. The price goes up again on March 1. Register today!



Jimmy Doolittle recently presented a print commemorating the 1942 raid on Tokyo to Valen R. Woodward, left, President of AFA's Albuquerque Chapter. Assisting in the ceremony was Richard A. Knobloch, Chairman of the Doolittle Raiders. The Raiders will attend AFA's Gathering of Eagles in Las Vegas, Nev., next year.

adier general and a charter AFA member. "AFA's Gathering of Eagles will bring together all the eagles—those who have soared and those who have enabled them to—the key people in this vast aerospace world we admire and in which we are so intimately involved."

Information about the Gathering appears on pages 134 and 135 of this issue.

Fourth Annual Mid-America Ball

AFA's Scott Memorial and Spirit of St. Louis Chapters sponsored the



Then-CINCMAC Gen. Thomas M. Ryan, Jr., was sponsored in June as an Ira Eaker Fellow by the Air Force Ball of Mid-America. The Ball, a joint effort by AFA's Scott Memorial and Spirit of St. Louis Chapters, raises funds for the Aerospace Education Foundation and the James S. McDonnell USO facility in St. Louis.

fourth annual Air Force Ball of Mid-America at the Chase Hotel in St. Louis on June 14 and raised "thousands of dollars for AFA's Aerospace Education Foundation and the James S. McDonnell USO facility, although we don't have a firm count yet," said Ball Founder and Coordinator Hugh Enyart, National Vice President for the Great Lakes Region and one of AFA's two Men of the Year for 1985.

A large crowd attended the black-tie affair, which included a dramatic flag ceremony by the Air Force Band of Mid-America and a patriotic fireworks display in the ballroom. "They did the AFA logo, the American flag, and Niagara Falls in pyrotechnics," Mr. Enyart said of the thirteen-minute demonstration.

A highlight of the evening was the presentations of a Jimmy Doolittle Fellowship to Col. George E. "Bud" Day, USAF (Ret.), Medal of Honor recipient, and an Ira Eaker Fellowship to then-CINCMAC Gen. Thomas M. Ryan, Jr., who also received a "Swag-

INTERCOM

ger Stick" from David Breese, Inver'an Pipe Band Drum Major. The bagpipers had performed a beautifully melancholic rendition of "Amazing Grace" for the invocation.

Guests at the Ball included Rep. Melvin Price (D-Ill.) and his wife, Gerry; former CINCMAC Gen. Robert E.

mand; and Maj. Gen. Orlando Gonzales, USA, representing Gen. John Wickham, Jr., Army Chief of Staff.

A new highlight of the Ball this year was a briefing session that featured Hon. Richard E. Carver, Assistant Secretary of the Air Force for Financial Management; Lt. Gen. (Gen. selectee) Duane H. Cassidy, then DCS/Manpower and Personnel and now CINCMAC designate; Maj. Gen. Alfred G. Hansen, Director of Logistics, Plans and Programs; Maj. Gen. Claudius E. Watts III, Director of the Budget; and AFA National President Martin H. Harris. The session, which was covered by the O'Fallon, Ill., *Progress*, was videotaped by the AFA chapters for continuing use locally and possibly nationally.

AFA organizers of these events, in addition to Mr. Enyart, included Mary Ann Seibel, Under-Forty National Director and President of AFA's Spirit of St. Louis Chapter; Bob Ruzicka, Spirit of St. Louis Chapter leader; and Jeanne Schobert, Scott Memorial Chapter Vice President for Programming.

AFAers Convene in the Keystone State

Pennsylvania AFAers gathered at the Viking Motor Inn in Pittsburgh on July 12-14 for their state convention and mapped out plans for a state-sponsored Jimmy Doolittle Fellowship and a memorial scholarship to honor native son Gen. Jerome F. O'Malley, a great friend of Pennsylvania AFA and a native of Carbondale, Pa. Pennsylvania AFA President Jack Flaig, who was reelected during convention business sessions, showed AFA's new sound/slide presentation, which was developed as a recruiting tool to attract civilian patrons into AFA. He encouraged chapters to order a copy and use it.

At the awards luncheon, former AFA national president and board chairman Gerald V. Hasler of Albany, N. Y., "gave a firm and thought-provoking speech on the need for aerospace power to keep America strong in the face of an ever-increasing Soviet military buildup," Mr. Flaig reported. His presentation was well received. "Other AFA states and chapters ought to consider using the outstanding resources available to them in the form of past national officers of the Association," Mr. Flaig said.

Awards presented during the luncheon included a "Region of Merit" award sponsored by the Northeast Region. The award was presented to Francis E. Nowicki of Wayne, Pa. Pennsylvania AFA's Terry Fry CAP Award, named for a young CAP cadet



Pennsylvania AFAers report that their July state convention was a resounding success. Among those attending a banquet during the convention were, from left, Brig. Gen. Robert G. Chrisjohn, Maj. Gen. Jack L. Watkins, Pennsylvania AFA President Jack Flaig, and past AFA national president John Brosky.

who was killed in a training camp accident in Pennsylvania, was presented by his parents, Tom and Barbara Fry, to Kevin Loughran of Bristol. Lt. Col. Gary Gerardine, Commander of CAP Group 1500, accepted.

Lt. Col. Henry J. Williams, Commander of the 3511th Air Force Recruiting Squadron in Pittsburgh, was honored with the state AFA's exceptional service award for "tremendous support of AFA's activities in western Pennsylvania over a three-year period," Mr. Flaig said. "His recruiting squadron finished second in the nation for overall performance. He has since been transferred to the plans and programs directorate at the Pentagon." Also honored with Pennsylvania AFA's exceptional service award was Lt. Col. Maurice L. Stocks, Commander of the 3518th Air Force Recruiting Squadron in Harrisburg, for his outstanding support of AFA activities in northeastern and central Pennsylvania. He has since been transferred to the National War College. His squadron, according to Mr. Flaig, finished first in the nation for overall performance. The commanders of the two recruiting squadrons, in turn, presented Pennsylvania AFA President Flaig with an award for his and AFA's support of Air Force recruiting throughout the state.

SSgt. Carla Loop was honored as the top Air Force recruiter in the state by Pennsylvania AFA. "We asked the two squadron commanders who, in their estimation, had the best overall performance as a recruiter, and they both recommended Sergeant Loop, who is a member of the 3511th

Squadron. She concentrates on western Pennsylvania," Mr. Flaig said.

2d Lt. David M. Tobin, who graduated from the University of Pittsburgh and who is now stationed at Wright-Patterson AFB, Ohio, was honored with the Jack B. Gross Award. The Award, which was initiated by longtime AFA national treasurer, board chairman, and now National Director Jack Gross, goes to the outstanding AFROTC cadet in Pennsylvania for the preceding school year. Col. David N. Thompson, Professor of Aerospace Studies at the University of Pittsburgh, helped in the presentation. Lieutenant Tobin was described by Col. David Penniman, AFROTC Commandant for the Northeast, as "the best cadet and cadet commander I have ever seen." Colonel Penniman supervises some seventy AFROTC detachments.

Other award recipients were the Joe Walker-Mon Valley Chapter, named the outstanding Pennsylvania chapter for 1985, and Maj. Gen. Frank J. Smoker, who received an exceptional service award.

Pennsylvania AFA's highest honor is its "Man of the Year" award, and it went this year to Altoona Mayor Dave Jannetta, who is an Under-Forty AFA National Director and President of the Altoona Chapter. At the convention, he was also elected Director of the Central Region.

AFA National Director and former national president and board chairman Judge John Brosky served as master of ceremonies for the evening aerospace banquet. The speaker was Maj. Gen. Jack L. Watkins, Command-

er of SAC's 1st Strategic Aerospace Division at Vandenberg AFB, Calif.

According to Mr. Flaig, General Watkins played out a very impressive demonstration of communications technology during his talk. "Through a satellite-directed radio telephone hookup, he contacted the Airborne Command Post flying at 33,000 feet somewhere over the Great Plains, and he asked the general in charge of the 'Looking Glass' aircraft to tell the Pennsylvania AFA crowd a little of what he was doing at that moment," Mr. Flaig recalled. "The transmissions were heard loud and clear throughout the banquet hall. The airborne general identified himself as Brig. Gen. John R. Farrington, Commander at Beale AFB in California. He said they had a wide array of battle plans to study and a worldwide briefing on political problems around the globe. They were also in close touch with the SAC Command Post and the Pentagon Command Post. They were receiving radar reports from NORAD and Space Command."

Concluded the Pennsylvania AFA President, "It was an exciting demonstration of how we must be ever vigilant, alert, and prepared."

Pennsylvania officers elected for 1985-86 include Jack Flaig, President; Tillie Metzger, Vice President; Anthea L. Germano, Secretary; Frank V. Juliano, Treasurer; Richard P. Hart, Director, Eastern Region; David L. Jannetta, Director, Central Region; and Jack P. Hickey, Director, Western Region.

Back to School for New York AFAers

During the New York AFA convention, it was "back to school" for those who attended New York AFA's chapter officer and committee chairmen workshop conducted by AFA national staff members Jim McDonnell, Robin Whittle, and Dave Noerr on August 2 at the Niagara Falls Hilton Hotel. That evening, a catered reception was held at Niagara's famed Aquarium. AFAers journeyed from throughout the Northeast Region to attend the New York State Presidents' reception and the other convention events.

The next morning, a dramatic POW/MIA Memorial Service was staged against the backdrop of the American Falls at a park site rimmed by American flags and one Canadian flag. Taps was played at the conclusion of the short but poignant service, which featured Under Secretary of the Air Force Edward C. "Pete" Aldridge, who later addressed the evening banquet. Also participating were Col. Robert J. Win-

(Continued on p. 133)

Midwest Region—Steady Growth, Renewed Activity

AFA's Midwest Region is experiencing continued growth and renewed activity. For this we can thank the dedicated officers on the state and chapter levels as well as all Midwest chapter members for their interest and enthusiasm.

We have added two new chapters—the CMSAF Richard D. Kisling Chapter in Iowa and the Garden City Chapter in Kansas. We are also witnessing the reawakening of what has been our only inactive chapter.

Our Midwest regional workshop was well attended and proved to be both educational and inspirational for all who participated.

—Charles H. Church, Jr., National Vice President, Midwest Region.

Iowa

Iowa AFA has two chapters—**All-Iowa Chapter** in the Des Moines area, led by **Carl B. Zimmerman**, and the **CMSAF Richard D. Kisling Chapter** in Sioux City, led by **John T. Hines**.

Chartered only a short time, the Kisling Chapter got off to a running start by sponsoring a meeting featuring **Lt. Gen. James M. Keck**, former Vice CINCSPACE, and AFA National Director **Jim McCoy**. Chapter officials attended a regional workshop and have initiated a chapter newsletter. By March, the Chapter had 125 members and was firming up plans for a chapter banquet in April.

Kansas

Kansas AFA is led by **Cletus J. Pottebaum** and has three chapters—the **Air Capital Chapter** in Wichita, led by **Russ Barrett**, the **Garden City Chapter**, led by **Samuel M. Gardner**, and the **Topeka Chapter**, with **Ron May** as President.

President Pottebaum says the major accomplishment was the formation of the Garden City Chapter in Garden City. A chartering meeting was held April 11, and thirty-seven members and spouses attended.

In other action, Kansas AFA President Pottebaum attended a series of lectures at Wichita State University on "Peace and War" and, as a result, worked out an arrangement to schedule the Air University National Security briefing team into Wichita this fall to address Wichita State University, Friends University, and Kansas Newman College as well as the major civic clubs.

The Air Capital Chapter sponsored the second annual outstanding NCO and airman of the year recognition dinner, with



In June, the Ak-Sar-Ben Chapter named former CINCSPACE Gen. B. L. Davis as its "Man of the Year." General Davis chats with, from left, Chapter membership recruiters **Lloyd Grimm**, **SSgt. Debra Phillipson**, and **James Paxson**. (Photo by Ed Rath)

150 attending. **Helene Little**, manager of operations analysis for the Boeing Military Aircraft Division, was the featured speaker. The Chapter honored **TSgt. John Herron** and **A1C Kevin Townsend** as NCO and Airman of the Quarter, and each received complimentary one-year AFA memberships.

In 1983, Air Capital officials were instrumental in resurrecting a Veterans Day parade, which had not been held in Wichita for fourteen years. The Chapter got the community involved and helped research Medal of Honor recipients who lived in the Wichita area; two served as Grand Marshals. In 1984, Chapter officials helped research and find WW I veterans to serve as Grand Marshals in the parade. They located thirty-four veterans and eight widows who participated. Scrapbooks of newspaper clippings, programs, and photos on the parades were compiled and presented at an AFA luncheon to **Edwin Cassell**, director of volunteer services, VA Medical Center in Wichita, for the VA library. Copies of the printed parade program were given to public, university, and high school libraries in Wichita.

At one of its monthly meetings, Air Capital officials honored **Russell F. Jump** as the first annual "Outstanding Aviation Pioneer of the Year." He was a WW I pilot and Mayor of Wichita in the 1950s and participated in the 1984 Veterans Day parade.

Topeka Chapter officials were making plans during the year to initiate contact

with the Topeka Chamber of Commerce Military Affairs Committee.

Missouri

Led by **Orville R. Blair**, Missouri AFA has four chapters: **Central Missouri Chapter** near Whiteman AFB, led by **Garrett R. Crouch**, **Harry S. Truman Chapter** near Richards-Gebaur AFB, led by **Raymond W. Peterman**, **Ozark Chapter** in Springfield, **Edward G. Dunaway**, contact, and the **Spirit of St. Louis Chapter**, led by President **Mary Ann Seibel**.

The Missouri State convention was held June 15 at the Chase Park Plaza Hotel in St. Louis and featured speaker **Dr. Frederick W. Roos**, senior scientist and staff member of the McDonnell Douglas Research Laboratories.

Central Missouri Chapter officials kicked off a membership drive with a dinner in April that featured **Lt. Gen. James M. Keck**, **USAF (Ret.)**, former Vice CINCSPACE, as speaker. Goals for the year were to present a \$300 scholarship to the winner of the AFOTC scholarship competition and \$100 to the runners-up, donate \$100 to the Whiteman AFB Missile Combat Competition Association in support of the team, and present a one-year membership to the honor graduate of each class of the preparatory courses at Whiteman AFB.

AFA's Harry Truman Chapter sponsored a dinner honoring **Col. Guion S. Bluford, Jr.**, that was well publicized locally. Among



The Air Capital Chapter recently honored Russell F. Jump as the "Outstanding Aviation Pioneer of the Year." Pictured are, from left, Kansas AFA President Cleve Pottebaum, Mr. Jump, and Chapter officers Russell Barrett and Bill Myers. (Photo by E. H. Sayre)



The officers of the new Garden City Chapter show off their charter. Pictured are President Samuel Gardner, Vice President Paul McVey, Secretary Floyd Switzer, and Treasurer Roger Cox.



Spirit of St. Louis Chapter member Dr. Paul A. Whelan presents the Chapter's Outstanding CAP Cadet Award to Cadet Lt. Debbie Moore.

the 200 in attendance were the Kansas City Mayor and Kansas City Police Chief and a number of AFA officials. Truman Chapter Treasurer **Col. Charles E. McGee, USAF (Ret.)**, is National Commander of the Tuskegee Airmen and introduced Colonel Bluford.

The new Ozark Chapter contact, Edward G. Dunaway, is working with local AFA leaders to reorganize the Chapter.

AFA's Spirit of St. Louis Chapter includes community leaders and aerospace industry executives; its military advisory board represents the "Total Force," with active-duty Air Force, Air National Guard, Air Force Reserve, AFJROTC, AFROTC, and CAP members. The Chapter sponsored the first AFA Aerospace Education Workshop ever held in St. Louis, works closely with Parks College (**Dr. Paul A. Whelan**, Vice President and CEO for Parks College, is Chairman of the Chapter's Aerospace Education Committee), sponsors an airman awards program for outstanding enlisted and cadet members that has helped to build the Chapter's image among enlisted people while stimulating their involvement with AFA, and sponsored an awards dinner in March honoring seven individuals for outstanding contributions to national security and the community at Scott AFB. Each received a plaque and a copy of *The Chiefs*. The guest speaker at the dinner was local newsmen and radio personality **Bob Hardy**.

Each year, the Chapter cosponsors a

joint dinner meeting with the Scott Memorial Chapter in Illinois. This year's dinner was held in Belleville, Ill., and featured AFA National President **Marty Harris** as speaker. National and local awards were presented, and music was provided by the Air Force Band of Mid-America. For the fourth consecutive year, the two chapters also cosponsored the Air Force Ball of Mid-America, with many government, civic, and industry leaders attending (see p. 128). Spirit of St. Louis Chapter officials also cosponsor "Town Hall Forums" with the local Chamber of Commerce. The last forum featured then-JCS Chairman **Gen. John W. Vessey**. In addition, for the past two years, the Spirit of St. Louis Chapter has sponsored a "Salute to the Veteran" in conjunction with local Veterans Day activities. The dinner program was cosponsored with the St. Louis Veterans Day Committee and featured **Lt. Gen. James A. Abrahamson**, Director of the Strategic Defense Initiative Organization, as speaker. Comedienne **Martha Raye**, who has entertained American soldiers for decades and who is a retired Air Force Reserve lieutenant colonel, also attended the dinner.

Nebraska

Donald D. Adams is Nebraska AFA President and oversees two chapters: **Ak-Sar-Ben Chapter** in Omaha, led by **James M. Keck**, and the **Lincoln Chapter**, led by **Lloyd L. Johnson**.

Ak-Sar-Ben Chapter officials sponsored

"A Salute to the Strategic Forces" military ball in June in conjunction with the AFA national symposium at the Red Lion Inn in Omaha. During the evening, four individuals, one posthumously, were invested as Jimmy Doolittle Fellows of AFA's Aerospace Education Foundation. Then-CINCSAC **Gen. B. L. Davis** was also honored as Chapter "Man of the Year." Chapter officials have also shown Foundation Roundtable videotapes at Offutt AFB and in the community via cable television.

Lincoln Chapter officials recently sponsored a dinner with the Ninety-Nines at the Air Guard NCO Club. More than 150 people attended the event.

Region Reports Due

Printed below is the deadline schedule for submission of materials for use in forthcoming "AFA Regional Reports."

New England	November 1
Central East	December 1
Southeast	January 1
North Central	February 1
Southwest	March 1
Foreign Chapters	April 1



AFA State Contacts

Following each state name, in parentheses, are the names of the communities in which AFA Chapters are located. Information regarding these Chapters, or any place of AFA's activities within the state, may be obtained from the appropriate contact.

ALABAMA (Auburn, Birmingham, Huntsville, Mobile, Montgomery, Selma): **Jim Patterson**, 802 Brickell Rd., N.W., Huntsville, Ala. 35805 (phone 205-837-5087).

ALASKA (Anchorage, Fairbanks): **Michael T. Cook**, P. O. Box 25, Fairbanks, Alaska 99707 (phone 907-456-7762).

ARIZONA (Green Valley, Phoenix, Sedona, Sun City, Tucson): **Meryll Frost**, 7426 E. Random Ridge Drive, Tucson, Ariz. 85710 (phone 602-298-1580).

ARKANSAS (Blytheville, Fayetteville, Fort Smith, Little Rock): **Aaron E. Dickerson**, 710 S. 12th, Rogers, Ark. 72756 (phone 501-636-7460).

CALIFORNIA (Apple Valley, Edwards, Fairfield, Fresno, Hermosa Beach, Los Angeles, Merced, Monterey, Novato, Orange County, Pasadena, Riverside, Sacramento, San Bernardino, San Diego, San Francisco, San Jose, Santa Barbara, Santa Monica, Sunnyvale, Vandenberg AFB, Yuba City): **David Graham**, 29611 Vista Plaza Drive, Laguna Niguel, Calif. 92677 (phone 714-495-4622).

COLORADO (Boulder, Colorado Springs, Denver, Fort Collins, Grand Junction, Greeley, Littleton, Pueblo, Waterton): **Thomas W. Ratterree**, P. O. Box 26029, Colorado Springs, Colo. 80936 (phone 303-599-0143).

CONNECTICUT (Brookfield, East Hartford, Middletown, North Haven, Storrs, Stratford, Waterbury, Westport, Windsor Locks): **Raymond E. Choquette**, 16 Tonica Springs Trail, Manchester, Conn. 06040 (phone 203-646-4818).

DELAWARE (Dover, Wilmington): **Joseph H. Allen, Jr.**, 31 Muirfield Court, Dover, Del. 19901 (phone 302-674-3400).

DISTRICT OF COLUMBIA (Washington, D. C.): **Howard W. Cannon**, 1501 Lee Highway, Arlington, Va. 22209-1198 (phone 703-247-5820).

FLORIDA (Avon Park, Brandon, Cape Coral, Daytona Beach, Fort Walton Beach, Gainesville, Homestead, Jacksonville, Leesburg, Miami, Naples, Neptune Beach, New Port Richey, Orlando, Panama City, Patrick AFB, Redington Beach, Sarasota, Tallahassee, Tampa, West Palm Beach, Winter Haven): **H. Lake Hamrick**, 206 Sotir Ave., N. W., Fort Walton Beach, Fla. 32548 (phone 904-862-5067).

GEORGIA (Athens, Atlanta, Columbus, Rome, Savannah, St. Simons Island, Valdosta, Warner Robins): **Wilbur H. Keck**, 116 Stillwood Drive, Warner Robins, Ga. 31093 (phone 912-922-0655).

GUAM (Agana): **Joe Gyulavics**, P. O. Box 21543, Guam 96921 (phone 671-734-2369).

HAWAII (Honolulu): **Don J. Daley**, P. O. Box 3200, Honolulu, Hawaii 96847 (phone 808-525-6296).

IDAHO (Boise, Mountain Home, Twin Falls): **Stanley I. Anderson**, Box 45, Gowen Field, Boise, Idaho 83707 (phone 208-362-9360).

ILLINOIS (Belleville, Champaign, Chicago, Elmhurst, Peoria, Springfield-Decatur): **Kyle Robeson**, P. O. Box 697, Champaign, Ill. 61820 (phone 217-352-3936).

INDIANA (Bloomfield, Fort Wayne, Indianapolis, Lafayette, Logansport, Marion, Mentone, South Bend, Terre Haute): **John Kagel**, 1029 Riverside Drive, South Bend, Ind. 46616 (phone 219-2348855).

IOWA (Des Moines, Sioux City): **Carl B. Zimmerman**, 608 Waterloo Bldg., Waterloo, Iowa 50701 (phone 319-232-2650).

KANSAS (Garden City, Topeka, Wichita): **Cletus J. Pottebaum**, 6503 E. Murdock, Wichita, Kan. 67206 (phone 316-683-3963).

KENTUCKY (Lexington, Louisville): **Jo Brendel**, 726 Fairhill Drive, Louisville, Ky. 40207 (phone 502-897-7647).

LOUISIANA (Alexandria, Baton Rouge, Bossier City, Monroe, New Orleans, Shreveport): **James P. LeBlanc**, 3645 Monroe St., Mandeville, La. 70448 (phone 504-626-4516).

MAINE (Bangor, Limestone, N. Berwick): **Alban E. Cyr, Sr.**, P. O. Box 160, Caribou, Me. 04736 (phone 207-496-3331).

MARYLAND (Andrews AFB area, Baltimore, Rockville): **Francis R. O'Clair**, 6604 Groveton Drive, Clinton, Md. 20735 (phone 301-372-6186).

MASSACHUSETTS (Bedford, Boston, Falmouth, Florence, Hanscom AFB, Lexington, Taunton, West Springfield, Worcester): **John F. White**, 49 West Eagle St., East Boston, Mass. 02128 (phone 617-567-1592).

MICHIGAN (Alpena, Battle Creek, Detroit, Kalamazoo, Marquette, Mount Clemens, Oscoda, Petoskey, Southfield): **Robert J. Schaeztl**, 42247 Trotwood Court, Canton, Mich. 48187 (phone 313-552-3280).

MINNESOTA (Duluth, Minneapolis-St. Paul): **Paul G. Markgraf**, 2101 E. 3d St., St. Paul, Minn. 55119 (phone 612-735-4411).

MISSISSIPPI (Biloxi, Columbus, Jackson): **R. E. Smith**, Route 3, Box 282, Columbus, Miss. 39701 (phone 601-327-4422).

MISSOURI (Kansas City, Knob Noster, Springfield, St. Louis): **Orville R.**

Blair, 1504 Golden Drive, St. Louis, Mo. 63137 (phone 314-867-0285).

MONTANA (Great Falls): **Ed White**, 2333 6th Ave., South, Great Falls, Mont. 59405 (phone 406-453-2054).

NEBRASKA (Lincoln, Omaha): **Donald D. Adams**, FirstTier Inc., 17th & Farnam, Omaha, Neb. 68102 (phone: 402-348-7905).

NEVADA (Las Vegas, Reno): **Vern Frye**, 4665 Rio Encantado Lane, Reno, Nev. 89502 (phone 702-825-1125).

NEW HAMPSHIRE (Manchester, Pease AFB): **Robert N. McChesney**, Scruton Pond Rd., Barrington, N. H. 03825 (phone 603-664-5090).

NEW JERSEY (Andover, Atlantic City, Belleville, Camden, Chatham, Cherry Hill, E. Rutherford, Forked River, Fort Monmouth, Jersey City, McGuire AFB, Middlesex County, Newark, Old Bridge, Trenton, Wallington, West Orange, Whitehouse Station): **Gilbert Freeman**, 42 Weirimus Lane, Hillsdale, N. J. 07642 (phone 201-666-5379).

NEW MEXICO (Alamogordo, Albuquerque, Clovis): **Louie T. Evers**, P. O. Box 1946, Clovis, N. M. 88101 (phone 505-762-1798).

NEW YORK (Albany, Brooklyn, Buffalo, Chautauqua, Garden City, Hempstead, Hudson Valley, New York City, Niagara Falls, Plattsburgh, Queens, Rochester, Rome/Utica, Southern Tier, Staten Island, Suffolk County, Syosset, Syracuse, Westchester): **Robert H. Root**, 57 Wynnwood Ave., Tonawanda, N. Y. 14150 (phone 716-692-2100).

NORTH CAROLINA (Asheville, Charlotte, Fayetteville, Goldsboro, Greensboro, Kilty Hawk, Raleigh): **Bobby G. Suggs**, 501 Bloomfield Drive, Fayetteville, N. C. 28301 (phone 919-323-5281).

NORTH DAKOTA (Concrete, Fargo, Grand Forks, Minot): **James M. Crawford**, 1720 9th St., S. W., Minot, N. D. 58701 (phone 701-838-0010).

OHIO (Akron, Cincinnati, Cleveland, Columbus, Dayton, Mansfield, Newark, Youngstown): **Chester Richardson**, 1271 Woodledge Ave., Mineral, Ohio 44440 (phone 216-652-5116).

OKLAHOMA (Altus, Enid, Oklahoma City, Tulsa): **G. G. Atkinson**, P. O. Box 25658, Oklahoma City, Okla. 73125 (phone 405-231-6213).

OREGON (Eugene, Portland): **Zane R. Harper**, 5360 SW Dover Lane, Portland, Ore. 97225 (phone 503-244-4561).

PENNSYLVANIA (Allentown, Altoona, Beaver Falls, Coraopolis, Drexel Hill, Erie, Harrisburg, Homestead, Johns-

town, Lewistown, Mon-Valley, Philadelphia, Pittsburgh, Scranton, State College, Willow Grove, York): **Jack B. Flaig**, P. O. Box 375, Lemont, Pa. 16851 (phone 814-238-4212).

PUERTO RICO (San Juan): **Fred Brown**, 1991 Jose F. Diaz, Rio Piedras, P. R. 00928 (phone 809-790-5288).

RHODE ISLAND (Warwick): **King Odell**, 413 Atlantic Ave., Warwick, R. I. 02888 (phone 401-941-5472).

SOUTH CAROLINA (Charleston, Clemson, Columbia, Myrtle Beach, Sumter): **James Catington**, 2122 Gin Branch Rd., Sumter, S. C. 29154 (phone 803-481-2634).

SOUTH DAKOTA (Rapid City, Sioux Falls): **John E. Kittelson**, 141 N. Main, Suite 308, Sioux Falls, S. D. 57102 (phone 605-336-2498).

TENNESSEE (Chattanooga, Knoxville, Memphis, Nashville, Tri-Cities Area, Tullahoma): **Jack K. Westbrook**, P. O. Box 1801, Knoxville, Tenn. 37901 (phone 615-523-6000).

TEXAS (Abilene, Amarillo, Austin, Big Spring, College Station, Commerce, Corpus Christi, Dallas, Del Rio, Denton, El Paso, Fort Worth, Harlingen, Houston, Kerrville, Laredo, Lubbock, San Angelo, San Antonio, Waco, Wichita Falls): **Bryan L. Murphy, Jr.**, General Dynamics, P. O. Box 748 MZ 1221, Fort Worth, Tex. 76101 (phone 817-429-0693).

UTAH (Brigham City, Clearfield, Ogden, Provo, Salt Lake City): **Harry Cleveland**, 224 N. Jackson Ave., Ogden, Utah 84404 (phone 801-621-2365).

VERMONT (Burlington): **John D. Navin**, 6 Belwood Ave., Chocheater, Vt. 05446 (phone 802-863-1510).

VIRGINIA (Arlington, Danville, Harrisonburg, Langley AFB, Lynchburg, Norfolk, Petersburg, Richmond, Roanoke): **C. W. Scott**, 7 Bray Wood, Williamsburg, Va. 23185 (phone 703-553-3822).

WASHINGTON (Bellingham, Seattle, Spokane, Tacoma, Yakima): **David Anderson**, 915 E. Lake Sammamish Shore Lane, SE, Issaquah, Wash. 98027 (phone 206-392-5052).

WEST VIRGINIA (Huntington): **David Bush**, 2317 S. Walnut Drive, St. Albans, W. Va. 25177 (phone 304-722-3583).

WISCONSIN (Madison, Milwaukee): **Charles Marotske**, 7945 S. Verder Drive, Oak Creek, Wis. 53154 (phone 414-762-4383).

WYOMING (Cheyenne): **William Helms**, 808 Shoshoni, Cheyenne, Wyo. 82009 (phone 307-638-3114).

ner, 914th Tactical Airlift Group, AFRES; Col. James C. Cook and 1st Lt. Bruce W. Chaplin, 107th Fighter Interceptor Group, ANG; and 1st Lt. Fred Barber, 914th TAG. The service was carried live over WHLD-AM, which had been designated the official radio station for the New York state convention. Shuttle bus service carried convention-goers back to the Hilton for the state business meeting, which occurred prior to the awards luncheon.

Honored at the luncheon for achievement was Maxine Donnelly, an AFA 1985 Medal of Merit recipient, who was honored as New York AFA "Woman of the Year." Exceptional service citations went to Dorothy Welker, Iron Gate Chapter; Irene Keith (posthumously), Queens Chapter; "The Runway," the New York AFA newsletter; Rick Marino, Suffolk County Chapter; Charles Jacob, Lloyd Schloen-Empire Chapter; Chautauqua Chapter, named the outstanding small chapter of the year; H. H. Arnold Memorial Chapter, outstanding large chapter of the year; L. D. Bell Chapter, outstanding in programming and events; Colin P. Kelly Chapter, membership recruiting; Ronald J. Rochevot; Brother Leo Meriman; Lt. Michael J. Basille; Gerald V. Hasler, for two decades of outstanding service to AFA; and Robert W. Blocker, Colin P. Kelly Chapter Community Partner.

The luncheon address was given by AFA National President Martin H. Harris, who discussed the implications of what he termed the half-baked story. "Journalists, in their zeal to report

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controversy and to beat out competitors, come up with the yeasty part of a story that, if left in the oven to bake awhile, might not raise a ruckus when it's served to the public in print or on the nightly news," he said. "So many crucial decisions about tomorrow's security are being made today by a public that may not have the whole story." President Harris went on to discuss the effect of sensational news on congressional oversight of the defense acquisition process and Soviet developments in strategic defense.

Also addressing the luncheon were Edgar E. Ulsamer, AFA Assistant Executive Director/Policy and Communications, who gave both sides of the Strategic Defense Initiative issue, and Dr. Eleanor Wynne, Vice President of AFA's Aerospace Education Foundation, who discussed the Foundation's new directions and showed a videotape.

In the evening, the Honor Guard from Old Fort Niagara, representing the British 8th (King's) Regiment of Foot, stood at attention as the C. A. Palmer Fife and Drum Corps of Palmyra struck up patriotic fife-and-drum music to lure convention guests from the poolside reception to the banquet hall for the dinner. A sixty-page convention booklet awaited guests at each table setting, along

with a brochure on AFA's Gathering of Eagles.

Several prestigious New York AFA awards were presented during the dinner. The Col. Bernt Balchen Award, which honors a person of national prominence whose contributions to aviation have been unique, went to Lt. Gen. Elwood "Pete" Quesada, USAF (Ret.), the first Commander of TAC. The Lawrence Sperry Award was presented to George Martin Skurla, President of the Grumman Corp., and to William P. Lear (posthumously). Mrs. Moya Lear accepted the award.

The evening's address—a "Report to the Stockholders"—was given by Under Secretary of the Air Force Edward C. "Pete" Aldridge, who updated the audience on a wide range of critical Air Force programs and issues. The address was well received, according to New York AFA President Robert H. Root.

New York AFA officers elected during the convention included Robert H. Root, President; John H. Householder, Vice President-West; John Dolan, Vice President-Central; Maxine Donnelly, Vice President-East; Michael Salerno, Secretary; and Walter Zywan, Treasurer. The convention was hosted by the Lawrence D. Bell Chapter in Buffalo, led by President Vincent Tampio.

Washington Convention Salutes Strategic Airpower

The Washington State AFA convention "did quite well in attendance, considering that Seattle's big 'Sea Fair' event culminated on the weekend we had our convention," reported Al Lloyd, Washington State Vice President and Communications Director. Held August 2-4 at the Sea-Tac Marriott Hotel, Washington State's eighteenth annual convention was themed "Fifty Years of Strategic Airpower" and included a tour of Seattle's Museum of Flight at Boeing Field.

The convention's luncheon program was emceed by Frank Troutman and featured a slide presentation by Mr. Lloyd on the convention theme. The show covered strategic airpower from 1935 to the present, with more than eighty outstanding visuals depicting key milestones in the development of airpower. Mr. Lloyd's briefing set the tone for the evening address by H. C. "Rick" Cotton, director of business development for the B-1B program at Rockwell International.

The evening program began with the posting of the colors by AFROTC Detachment 910 from the University
(Continued on p. 136)



New York AFA Vice President Maxine Donnelly was honored at the New York state convention as the state's "Woman of the Year." Congratulating Donnelly is AFA National Director Bill Rapp, left, and New York AFA President Bob Root.



AFA's GATHERING OF EAGLES—1986

An
Event
Without
Equal

YOU'LL step off the plane on Sunday, April 27, 1986, into a world of reverie punctuated by the mild roar of the crowd assembling at the spectacular MGM Grand Hotel in Las Vegas for the evening's "Welcome Aboard Reception." A sumptuous array of MGM Grand-style foods and beverages will complement animated conversations about the bombing raid on Ploesti and the Messerschmitt that escaped over Normandy—and the pilot who flew it just might be among those who are coming from overseas!

And coming they are—from small towns in the Midwest and the Old South to villages dotting the Rhine and towns across the Channel. AFA's "Gathering of Eagles" in the spring of 1986 is an international event for everyone who has ever served, supported, or been associated with the mighty American Air Force and the air forces of allied and friendly countries over three generations. They are coming to recall the battles and to help AFA celebrate its fortieth anniversary. It's a reunion of those from past glory who will help AFA look ahead to the future—the Medal of Honor recipients like AFA's first president, Jimmy Doolittle . . . the aces like Gabby Gabreski . . . and the heroes like Doolittle's Tokyo Raiders—they're all coming, along with scores of reunion groups, unit associations, service school classes and related organizations that will help create an air of nostalgia and reverie.

Fueling the feeling of a walk back in time will be the thunderous flybys of the old warbirds—B-29, B-17, P-51, P-40, etc.—that will warm up the crowd as today's combat-ready fightin' Air Force waits in the wings to "show its stuff." The event is Tuesday's "Tactical Capabilities Exercise," which promises to be a show-stopper in the true Las Vegas tradition. And what a perfect finale—the Air Force Thunderbirds cap a morning charged with forty years of exhilarating aerospace progress as they roar past your very eyes. A B-17 and B-1 flyby—side by side—will overwhelm even the toughest fly-boy who thought he'd seen it all! And if that whets your appetite, then you'll love to experience the high-tech drama captured by the world's leading aerospace manufacturers in hundreds of exhibits housed in the huge Las Vegas Convention and Conference Center downtown. Wear comfortable shoes, for the exhibits will cover thousands of square feet of floor space in an area the size of nine football fields! The exhibits are next on Tuesday's schedule, but will be open on Monday, April 28, from noon to 6:30 p.m. and again Wednesday and Thursday. A leisurely walk through the exhibits will get you in the mood for AFA's symposium on "Global Aerospace," featuring key leaders from around the Western world who will candidly appraise what's in store for the free world's air forces—their strategy, their weaponry. Then it's back to the exhibits for a reception so you can reflect on the day's phenomenal happenings and gather steam for an evening spent at your own pleasure!

Wednesday promises to be just as exciting, as the Confederate Air Force continues its amazing feats throughout the day while two key events take place at the

Convention and Conference Center—"Educating for Leadership in Space" and "Your Air Force—Today." Leading educators and industrialists will join forces in discussing what's necessary for leadership in space while key Air Force commanders assess the United States Air Force.

Only the lucky first 3,500 registrants will be able to attend Wednesday evening's reception and Honors Banquet at the MGM Grand, because that's all that can be seated for this inspiring event. We'll pay respects to the glorious eagles whose names dot the history of the world's aerospace exploits. If you've ever wanted to see them all at the same time in the same place—this is it! And it may be the last time, for fate may interfere with the chance that it could happen again.

Thursday opens with a day full of Confederate Air Force activities, the exhibits continue, and AFA holds a Roundtable on "Designing Tomorrow's Air Force," with Air Force Systems Command and its division chiefs as participants. A reception will again take place in the exhibit areas, and then it's time for the finale—a blockbuster Gala Stage Show with Tennessee Ernie Ford as emcee, Chuck Yeager as general chairman, and a score of cameo appearances by America's leading stage and screen stars.

Well, that's about it. But the real meaning of AFA's "Gathering of Eagles" may be in the chance meetings and unexpected reunions . . . in the wink of an aviator's eye who remembers a shared battle . . . in the spark that triggers a long-forgotten memory . . . in the smile that spreads across the face of a buddy who slowly, tentatively recognizes an older version of the kid he thought was lost as he bailed out of his flaming Mustang . . . in the tear that slips out of a clouded eye for those not here who would have loved it—all of it—and who might have said:

"Why didn't we get together when I could have been with you?"

—BY ROBIN WHITTLE

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AS THE...

AIR FORCE ASSOCIATION PRESENTS ITS

GATHERING OF EAGLES 1986



James H. Doolittle
Gen. USAF (Ret.)
Leader, Doolittle Raiders
April 18, 1942



Sen. Barry Goldwater
Chairman
Senate Armed Services
Committee



Chuck Yeager
Brig. Gen. USAF (Ret.)
Broke the sound barrier
October 14, 1947



James Stewart
Motion Picture Star
Air Force Veteran
Charter AFA Member



Gen. Charles Gabriel
Air Force Chief of Staff

PLUS

USAF Aces & Medal of Honor recipients ☆ Doolittle Raiders ☆ global aerospace leaders ☆ leading educators, industrialists, & U.S. Congressional reps ☆ and defense & air attaches will be in Las Vegas for AFA's Gathering of Eagles.

Major Attractions: Global aerospace company exhibits, symposia, receptions, countless reunions, Thunderbirds, Confederate Air Force displays/fly-bys, tactical capabilities exercises, Honors Banquet and a stunning "Gathering of Eagles" Gala Stage Show are only part of this event!

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of Washington and a welcome by Washington State President Dave Anderson. Introductions were made by John Gayton, past state president, and various awards were presented by Medal of Honor recipient Joe Jackson, who is Second Vice President of AFA's Greater Seattle Chapter.

Award winners included the AFJROTC unit at Washington High School in Tacoma, which was selected by AFROTC staff officers as the best in the state in the areas of military training and academic achievement; CWO Stacy O'Neal, a Civil Air Patrol cadet in the Sand Point Squadron who was judged by Washington CAP officials as the outstanding cadet in the state because of his superior performance in CAP activities, search and rescue, flying, extracurricular activities, and academic achievement and who was accepted by four of the national military academies (he opted to attend the Air Force Academy); Lt. Col. Martin "Dick" Heiz, CAP, honored as the Washington state senior member of the year by the wing; AFROTC Detachment 910, University of Washington, for the best record in the western region as determined by the region IG team; and SMSgt. (selectee) Guy E. Watson, 3161st USAF Recruiting Squadron, judged by his squadron as the outstanding recruiter.

Elected as Washington State officers for 1985-86 were Edward Hudson, President; Charles Burdulis, Executive Vice President; Virginia Leitch, Secretary; Ronald Powell, Treasurer; Al Lloyd, Vice President/Seattle; Dick Lewis, Vice President/Spokane; Dick Kender, Vice President/Yakima; Ken Powell, Vice President/Peninsula; and Johnson West, Vice President/At Large.

Setting the Record Straight

Ohio State President John Boeman has been setting the record straight when he spots naïve or misinformed op-ed pieces in the local newspapers or "hard news" stories that don't tell the whole story.

"I've become more and more convinced that if we have inaccurate and unfavorable media coverage in any given community, this affords AFA members an opportunity to set the record straight and further the objectives of the Air Force Association," Mr. Boeman said.

On June 19, Armand Hammer, Chairman and Chief Executive Officer of the Occidental Petroleum Corp., wrote an opinion piece for the *Cleveland Plain-Dealer* that dealt with the planned summit meeting between President Reagan and Soviet leader

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Mikhail Gorbachev. Mr. Hammer stated that "the rewards for establishment of a genuine friendly relationship are so immense, and the time so right, that both sides must dare make concessions previously considered impossible. . . . Both sides must recognize that there is little to lose in trusting the other."

Mr. Boeman's well-reasoned and well-researched response was printed in the *Cleveland Plain-Dealer* on July 1 under the headline "Soviet Pattern: Coexistence, Subversion." Mr. Boeman repeated some of Mr. Hammer's points and then summed it up in the two key words: mutual trust.

In his response, Mr. Boeman noted "what Soviet expert George F. Kennan called 'that ambiguity and contradictoriness of Soviet policy which has endured to this day: the combination of the doctrine of coexistence—the claim, that is, to the right to have normal outward relations with capitalist countries—with the most determined efforts behind the scenes to destroy Western governments and the social and political systems supporting them.'"

Said Mr. Boeman: "Americans cannot object to our President's meeting with Gorbachev, if he thinks that best. We elected him to conduct our foreign policy. But let us have no illusions as to what Armand Hammer has so conveniently omitted—the repeat-

edly stated intentions of every man in the Kremlin since Lenin took it over. Until those expressions of Communist ideology have changed, any earnest handshake . . . would be hypocrisy. Our Constitution is what every member of our armed forces swears to support and defend—at whatever risk required—against all enemies, foreign and domestic. Without that support and defense, the amendments to our constitution, referred to as the Bill of Rights, guarantee nothing.

"What we must expect our President to do is convince Gorbachev and his Kremlin cohorts that, while there are significant and sometimes violent differences of opinion among us as to how we should attain our constitutional objectives, we will not compromise those objectives."

AFA's Active Grass Roots

Imagine a high school football star who's also an actor of note and who has, throughout his high school career, maintained top grades while taking the toughest advanced courses in science and math. The young man is **George Zlupko**, and during a meeting of the Altoona, Pa., Chapter on July 31, he was awarded the Carl J. Long Science Award as the outstanding science student in Pennsylvania. The award was created in 1965 by AFA National Director **Carl J. Long**, who convenes a prestigious committee to select the recipient from among nominations submitted by AFA chapters throughout the state . . . **E. F. "Sandy" Faust**, AFA National Director and 1985 Presidential Citation winner, addressed the AFROTC Field Training Dining-In at the Lackland AFB, Tex.,



AFA National Director Carl J. Long, second from left, recently presented the Carl J. Long Science Award to George Zlupko, second from right. The Award recognizes outstanding achievement in science and math. Pennsylvania AFA President Jack Flaig, left, and Altoona Chapter President Dave Jannetta attended the ceremony.

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Colors: Yellow, Navy, Plum

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TOTAL AMOUNT ENCLOSED				\$

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10-85

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Officers' Open Mess on July 10. He spoke on the topic of "Officership." Mr. Faust is also a national trustee of the Arnold Air Society and Angel Flight, a director of the Retired Officers Association, a director of the World Affairs Council of San Antonio, a director of the Lone Star Chapter of the Association of Former Intelligence Officers, and a participant in numerous other civic activities.

AFA's **Carl Vinson Chapter** in Warner Robins, Ga., which was named the outstanding chapter in communications for 1985, conducted twin membership drives—one on-base at Robins AFB and the other in the community. On July 3, Chapter officials held an awards luncheon to honor those who had contributed to the drives. Those honored included **Col. Ralph Spory, Lt. Col. Jere Cater, and SMSgt. Kenneth Light**, all of whom

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directed the on-base drive, and **Albert Harrell** of Southern Bell in Warner Robins, who led the community-wide drive. The Vinson Chapter goal was 682 members, and by May 1, the count had reached 724 new members, 301 Life Members, and thirteen community partners. In other Vinson Chapter news, officials cosponsored a POW/MIA Recognition Luncheon with the Air Force Sergeants Association Auxiliary at Robins AFB on July 19. Georgia Secretary of State **Max Cleland**, a triple amputee Vietnam

veteran who headed the Veterans Administration under President Carter, was an honored guest at the event. Among the sellout crowd of 300 were two MIA families and twenty-three former POWs or their surviving spouse. The printed program listed the names of the former POWs, wives of former POWs, and the families of MIAs in the Middle Georgia area, and the list was subsequently published by Vinson Chapter Community Partner Bank-South.

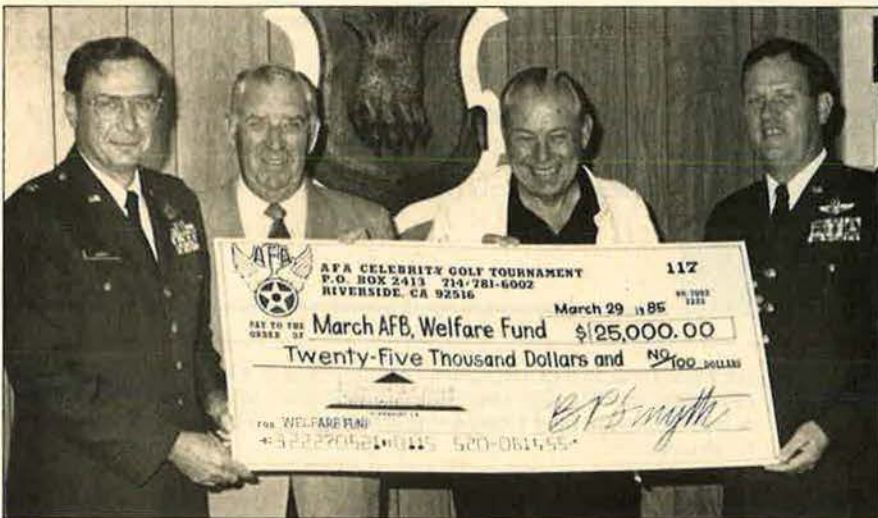
"Hometown boy makes good" is how Spokane Chapter President **Andy Kelly** introduced the featured speaker—**Brig. Gen. Stuart R. Boyd**, Commander of the Air Force International Logistics Center at Wright-Patterson AFB, Ohio—at a chapter meeting in June. General Boyd, who graduated from Spokane's Lewis & Clark High School, supervises military support to some sixty nations that totals more than \$15 billion a year. An Air Force Academy graduate, he flew the F-4 with the 497th Fighter Squadron "Nightowls" in Thailand . . .

Admiral Rosendahl Chapter officials **Mel and Ruby Rosenthal** and **Frank and Gloria Hicks** represented the Chapter at the annual AFJROTC awards ceremony at Brick Memorial High School, Bricktown, N. J., in May. School Principal **Rosemary Cunningham** and aerospace education instructors **MSgt. James Tierney** and **Lt. Col. W. Morris Riddle** gave opening remarks prior to award presentations by a number of veterans organizations. Rosendahl Chapter Awards Chairman Mel Rosenthal presented AFA's bronze medal to **Cadet Maj. Raymond Benedict**, and Frank Hicks, Chapter Secretary, presented the cadets a framed painting of an F-16 Fighting Falcon. The painting now hangs in the cadets' room. Each year, the winner of AFA's bronze medal will have his or her name engraved on a plaque that is mounted beneath the painting. Chapter Vice President Gloria Hicks also accepted a plaque from the AFJROTC cadets on behalf of the Chapter. The event was reported on by Ruby Rosenthal, Chapter Communications Director.

Two outstanding Northern Virginia high school students have been selected to receive the 1985 **Don Steele, Sr., Chapter** \$1,000 scholarships. Recipient **Didier Kaczmarek**, son of **Ms. Daniele Maffre**, graduated in June from Washington-Lee High School with a 3.59 grade point average and will enter AFROTC at Virginia Military Institute this fall. He plans to major in mechanical engineering. The other scholarship winner was **Thomas C. Coglitore**, son of **Col. and Mrs.**



The Carl Vinson Chapter helped to sponsor a POW/MIA recognition luncheon at Robins AFB, Ga., in July. Honored guest at the luncheon was Max Cleland, seated, Georgia Secretary of State and former VA administrator. (Photo by Kathy Snead)



A check for \$25,000, representing proceeds from the Riverside County Chapter's Bob Hope Celebrity Golf Tournament, was presented recently to the Welfare Fund at March AFB, Calif. Those attending the presentation included, from left, Col. Terry D. Murphy, 22d Air Refueling Wing Commander, Chapter Treasurer Ed Campbell, Chapter President John Hinton, and base Commander Col. Ronny C. Covert.

Sebastian F. Coglitore. Thomas recently graduated from Springfield High School with a 3.5 grade point average. As captain of the varsity cross-country track team, he led the team to its first district championship in fifteen years. He has now entered AFROTC at the University of Southern California and will study aerospace and astronautical engineering. The Chapter Scholarship Committee, which was chaired by Chapter Secretary **Mary Anne Thompson**, conducted interviews with the twelve applicants and also selected alternate recipients in case the students selected cannot fulfill the scholarship requirements. They are **Joseph V. Orsi** of Manassas, Va., an electrical engineering major at the University of Alabama, and **Susan Campbell**, an Oklahoma State University business administration major. In other Steele Chapter news, Communications Director **Mike Winslow** presented AFA's bronze medal to **Cadet Maj. John F. Fitzgerald, Jr.**, Wakefield High School, "for ranking in the top ten percent of his graduating class and the top five percent of his aerospace education studies in addition to the key characteristics of leadership and responsibility," Mr. Winslow said.

The **Utah AFA** convention program included **Dr. Dan Litchford** of Weber State College on the topic of "motivation," reports Ute Chapter President **Peggy Mohler**; the Ute Chapter hosted the convention in August. . . AFA's **Florida Highlands Chapter**, named the outstanding small (20-150 members) chapter for 1985, had four award winners at the **Florida AFA** convention on July 26-28 in Orlando. Secretary/Treasurer **Wilbur E. Young** was named "Chapter Man of the Year," and **Col. Vic Tucker**, former Avon Park Air Force Range Commander who served on the Chapter council until he was reassigned to TAC headquarters, founding President **Roy Whitton**, and **Lt. Al Shockey**, Range executive officer and chapter membership chairman, received citations . . . Southern Indiana Chapter members **Charles Huppert** and **Lt. Col. Forrest Smith** presented their own "Huntley-Brinkley" report on their "Trip to China" at a dinner meeting in August, reports Chapter President **Marcus Oliphant**. Incidentally, Southern Indiana's newsletter, "Communicator," sports business cards from six Community Partners—Creative Images Photography, Strout Realty, Marshall Hatfield Tax and Bookkeeping Services, Mutual of Omaha, Stone Clad, Inc., and KITE Inc.

Cadet Col. Brian Boyles of San Jose State University recently received

AFA's Silver Medal from Tennessee Ernie Ford/Silicon Valley Chapter President **Jack McCarthy**. Cadet Boyles began pilot training at Sheppard AFB in Wichita Falls, Tex., last summer after receiving his commission . . . "We are the future" is the motto of Arnold Air Society Area XIII, and several of these future Air Force leaders from the University of Nebraska helped out at AFA's national symposium on strategic forces in June, during which they witnessed the arrival of the first operational B-1B. **Richard Burchfield, Tamara Averett, William Watts, AAS Area XIII Commander Toby L. Corey, Tim Ketterer, Mike Frazier, David Feddern, Major Jordon**, and AFROTC Detachment 465 Commander **Monty Perry** all pitched in to help make the symposium a success . . . AFA's Hellenikon Air Base Chapter in Greece held a luncheon at the Apollon Palace in late June. The luncheon featured **Maj. Gen. William Gorton**, Sixteenth Air Force Commander, and **Col. B. F. Fruehauf**, 7206th Air Base Group Commander, as participants. Chapter organizers included **CMSgt. Marvin L. Rogers**, Vice President, **Susie Santor**, Chapter Secretary, and **Capt. Leon Gormley**, luncheon project officer.

In a year-end article in the chapter newsletter, Fort Worth Chapter President **Dan Heth** reported that the Chapter, which was named the outstanding large (more than 900 members) chapter for 1985, had chalked up several noteworthy achievements. Chapter membership as of July stood at 4,527, and the Chapter Speakers Bureau, which had made fifty-four presentations to more than 3,000 people in 1984, exceeded those figures in the first six months of 1985. In August, the Chapter sponsored a Texas-style barbecue during "An Evening with the Thunderbirds" . . . AFA's Pittsburgh Chapter has published its newsletter, "Tail Feathers," for twenty-eight consecutive years, reports editor and Chapter President **Bob Carr**, who at this writing is a nominee for AFA National Director . . . More than 750 guests turned out to honor **Gen. Lawrence A. Skantze**, Commander of Air Force Systems Command, as the 1985 recipient of the Dowling College Distinguished Citizen Award at a dinner in his honor at the Colonie Hill in Hauppauge, reports New York Vice President and Communications Director **Maxine Donnelly**, winner of a 1985 Medal of Merit and New York AFA "Woman of the Year." **Dr. Victor P. Meskill**, President of Dowling College, cited the General's leadership in behalf of the nation's defense and

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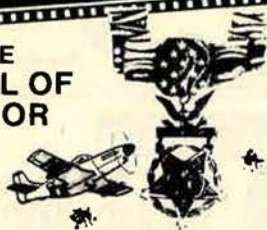
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INTERCOM

noted that the banquet in his honor was the largest and most successful in Dowling's history. Proceeds fund scholarships and support academic programs . . . Volume one, number one of the Thomas W. Anthony Chapter newsletter, "Allegiance," was published last spring, and by summer, it had been transformed into a magazine, thanks to the success of advertising sales and the prolific work of editor **T. J. deCellier**, editorial review board chairman **A. Kenneth Brown**, advertising sales manager **Dana Spencer**, and Chapter President **Spann Watson**.

The summer edition of the San Bernardino Chapter newsletter, "Contrails," sums up the results of the Chapter's golf tournament quite well: "The eighteenth annual Bob Hope AFA Charity Golf Tournament rang up another big win for worthy causes in a series of unbroken fund-raising successes that is now nearly two decades long." Now that's success! Elsewhere in the issue, San Bernardino Chapter President **Frank DePhillipo** cites testimony by **Robert A. Gates**, Chairman of the National Intelligence Council and Deputy Director for Intelligence, CIA, on Soviet modernization programs that will enable the USSR to replace currently deployed interconti-

mental nuclear attack forces—land and sea-based ballistic missile systems and heavy bombers—with new and improved systems by the mid-1990s . . . Some time ago, AFA's Richmond, Va., Chapter announced an event in its newsletter and published a telephone number to call to make reservations for the event. Unfortunately, however, the phone number was incorrect. Interested members who called the erroneous number reached **Dorothy Furgueson**, who was unaware of AFA. Instead of turning down the calls, she graciously took the reservations and got them to the right people. As a result, she became an AFA patron and has been attending Richmond Chapter meetings ever since!

AFA has three new chapters—**Gen. Bennie L. Davis Chapter** in Brookfield, Conn., **Mansfield Chapter**, Mansfield, Ohio, and the **Terre Haute-Wabash Valley Chapter** in Terre Haute, Ind. . . . All the necessary approvals have been given to erect a monument at the Air Force Academy that will honor America's World War I Overseas Flyers. That organization, which has 131 members, is spearheading a fund-raising campaign to generate the \$30,000 needed to build the monument. New York AFA Vice President for the Western Region **John Householder** is starting up a \$1 contribution campaign to support the monument. AFA members who wish to help should contact Mr. Householder at 11 Beverly Place, James-town, N. Y. 14701. The phone number is (716) 487-5014 . . . "Nassau Mitchel

Eagle Watch

Watch this space each month for updates on the activities planned for AFA's Gathering of Eagles. The Gathering of Eagles, to be held on April 27–May 1, 1986, in Las Vegas, Nev., will surely be the aerospace event of the decade!

The following groups, in addition to those listed in the September 1985 "Bulletin Board," have signed up to attend the Gathering.

18th Tactical Fighter Wing
Mr. Cletus Pottebaum
6503 E. Murdock
Wichita, Kan. 67206

82d Troop Carrier Squadron
436th Troop Carrier Group
Mel Pliner, Secretary
Star Rte. 2, Box 10N
Pagosa Springs, Colo. 81147

86th Fighter Bomber Group
Association
525th Fighter Bomber Squadron
Gilbert Hurt, Secretary/Treasurer
4920 Montcrest Dr.
Chattanooga, Tenn. 37416

If your group is listed here and you haven't signed up, notify the contact listed. On the other hand, if you are a member of any kind of alumni group, we hope that you are giving serious thought to bringing it to Las Vegas for the 1986 meeting and to signing it up for all the GOE events. Remember, eagles don't flock—they gather. We are encouraging all "affinity groups" that want to gather with us to *sign up now!*

If you're interested in how this might be worked out, call Max Keeney, AFA Headquarters, (703) 247-5800, and get all the details.

publishes newsletter" was the recent headline in the New York state newspaper, "The Runway." Nassau Mitchell Chapter President **Lyn Zywan** and Communications Director **Ed Cohen** released volume one, number one of "The Sidewinder" last spring. "Lyn is to be congratulated for her perception in recognizing the importance of effective communications in stimulating membership interest and support," New York officials said, and AFA heartily agrees! . . . In June, outgoing Lloyd Schloen-Empire Chapter President **Bill Pritchard** was honored with an award for his contributions to the Chapter, and Chapter founders **John Kamak** and **James Kehoe** joined newly elected Empire Chapter President **Anthony Christiano** in congratulating Mr. Pritchard. Mr. Christiano, incidentally, is the latest new Life Member of AFA. ■

UNIT REUNIONS

Allied Services

Allied service personnel who served in or around the Chosin Reservoir in Korea during November through December 1950 will hold a thirty-fifth-year reunion on December 4-7, 1985, in San Diego, Calif. **Contact:** Paul Hirt, 1340 Old Chain Bridge Rd., McLean, Va. 22101. Phone: (703) 448-1300.

Arnold Air Society Conclave

The Donald M. Kilpatrick Squadron of the Arnold Air Society will host the 1985-86 Area 1 Conclave on October 25-27, 1985, in South Portland, Me. **Contact:** Kelly J. Conant, Arnold Air Society, Donald M. Kilpatrick Squadron, Detachment 326, AF-ROTC (ATC), University of Maine, Orono, Me. 04473. Phone: (207) 581-1384.

Caterpillar Ass'n

The Caterpillar Association of the United States will hold a reunion on February 14-15, 1986, in Fort Myers, Fla. **Contact:** Lt. Col. Johnny Brown, USAF (Ret.), P. O. Box 1321, Kenosha, Wis. 53141.

Pueblo Army Airfield

Veterans of the Pueblo Army Airfield are planning to hold a reunion on July 20, 1986. **Contact:** William Feder, Sr., P. O. Box 7433, Pueblo West, Colo. 81007. Phone: (303) 547-3402 or (303) 547-2285.

8th Fighter Wing

Members of the 8th Fighter Wing and supporting units who served at Itazuke, Tsuiki, and various Korean bases between March 1949-July 1951 will hold a reunion on April 24-26, 1986, in Las Vegas, Nev.

Contact: Col. Don Miller, USAF (Ret.), 1018 Leisure World, Mesa, Ariz. 85206. Phone: (602) 985-5821 or (602) 286-1423.

9th Troop Carrier Command Ass'n

Veterans of the 9th Troop Carrier Command "Pathfinders" are planning to hold their first reunion on November 6-9, 1985, in Dallas, Tex. **Contact:** William J. Garard, 1210 La Cruz Dr., El Paso, Tex. 79902.

25th Bomb Group

Former members of the 25th Bomb Group will hold a reunion on October 17-20, 1985, in Wichita, Kan. **Contact:** Warren Borges, 162 Topsfield Rd., Ipswich, Mass. 01938. Phone: (617) 356-2881. AUTOVON: 955-4196.

41st Air Depot Group

A reunion will be held in mid-May 1986 for former members and attached units of the 41st Air Depot Group. The 41st Air Depot Group, comprising the 41st Repair Squadron, 41st Supply Squadron, 441st Quartermaster Platoon, 1762d Ordnance Company, and 2500th Quartermaster Trucking Company, served during World War II in North Africa and Bari, Italy. **Contact:** LeRoy Adolph, 6128 E. Alta Ave., Fresno, Calif. 93727. Phone: (209) 255-4251.

Classes 42-A, 42-B, and 42-C

Cadet Classes 42-A, 42-B, and 42-C (Mather and Luke Airfields) will hold a reunion on February 20-23, 1986, at the Westin South Coast Plaza Hotel in Costa Mesa, Calif. **Contact:** Lt. Col. R. E. Monroe, USAF (Ret.), 1210 Park Newport, #215, Newport Beach, Calif. 92660. Phone: (714) 759-0111.

Class 43-D

Members of Class 43-D will hold a reunion on April 27-May 1, 1986, in Las Vegas, Nev. **Contact:** Gene Causey, 3914 W. Shore Rd., Edgewater, Md. 21037. Phone: (301) 798-0341.

47th Bomb Group

The 47th Bomb Group Association will hold a reunion on October 10-13, 1985, at the Sheraton-Greensboro Hotel in Greensboro, N. C. **Contact:** Costa Chalas, Rainbow Travel, Inc., 67 Trapelo Rd., Belmont, Mass. 02178. Phone: (617) 484-5620.

482d Bomb Group

Former members of the 482d Bomb Group and attached units will rendezvous during the eleventh annual 8th Air Force Historical Society reunion on October 17-20, 1985, in Wichita, Kan. **Contact:** Dennis R. Scanlan, Jr., One Scanlan Plaza, St. Paul, Minn. 55107.

Class 67-C

I am interested in contacting members of Undergraduate Pilot Training Class 67-C (Craig AFB, Ala.) who may be interested in starting a newsletter and holding a reunion.

Please contact the address below.

Ellison S. Summerfield
6704 Orange Wood Rd.
Highland, Calif. 92346

Phone: (714) 862-3676

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Bombardier:
LT. EDGAR W. KELLER
Navigator:
LT. JEROME PERLMAN

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- 1) All AFA members under 65 years of age who are currently receiving military retired pay and are eligible for benefits under Public Law 89-614 (CHAMPUS), their spouses under age 65 and their unmarried dependent children under age 21, or age 23 if in college. (There are some exceptions for older age children. See "Exceptions and Limitations".)
- 2) All eligible dependents of AFA members on active duty. Eligible dependents are spouses under age 65 and unmarried dependent children under age 21, or age 23 if in college. (There are some exceptions for older age children. See "Exceptions and Limitations".)

EXCEPTIONAL BENEFIT PLAN

(See chart at right)

FOUR YEAR BASIC BENEFIT. Benefits for most injuries or illnesses may be paid for up to a four-year period.

PLUS THESE SPECIAL BENEFITS . . .

- 1) Up to 45 consecutive days of in-hospital care for mental, nervous, or emotional disorders. Outpatient care may include up to 20 visits of a physician or \$500 per insured person each year.
- 2) Up to 30 days care per insured per year in a Skilled Nursing Facility.
- 3) Up to 30 days care per insured per year and up to 60 days lifetime in a

CHAMPUS-approved Residential Treatment Center.

- 4) Up to 30 days care per insured per year and up to 60 days lifetime in a CHAMPUS-approved Special Treatment Facility.
- 5) Up to 5 visits per insured per year to Marriage and Family Counselors under conditions defined by CHAMPUS.

YOUR INSURANCE IS NON-CANCELLABLE

As long as you are a member of the Air Force Association, pay your premiums on time, and the master contract remains in force, your insurance cannot be cancelled.

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AFA CHAMPLUS® insurance is administered by trained insurance professionals on your Association staff. You get prompt, reliable, courteous service from people who know your needs and know every detail of your coverage. Your insurance is underwritten by Mutual of Omaha, the largest individual and family health insurance company in the world.

AFA OFFERS YOU HOSPITAL BENEFITS AFTER AGE 65

Once you reach Age 65 and are covered under Medicare, AFA offers you protection against hospital expenses not covered by Medicare through the *Senior Age Benefit Plan* of AFA Hospital Indemnity Insurance. Members enrolled in AFA CHAMPLUS® will automatically receive full information about AFA's Medicare supplement program upon attainment of Age 65 so there will be no lapse in coverage. However, no Medicare supplement benefits can be issued to residents of the state of Georgia.

AFA CHAMPLUS® BENEFIT SCHEDULE

Care	CHAMPUS Pays	AFA CHAMPLUS® Pays
<i>For Military Retirees Under Age 65 and Their Dependents</i>		
Inpatient civilian hospital care	CHAMPUS pays 75% of allowable charges.	CHAMPLUS® pays the 25% of allowable charges not covered by CHAMPUS.
Inpatient military hospital care	The only charge normally made is a \$7.10 per day subsistence fee, not covered by CHAMPUS.	CHAMPLUS® pays the \$7.10 per day subsistence fee.
Outpatient care	CHAMPUS COVERS 75% of outpatient care fees after an annual deductible of \$50 per person (\$100 maximum per family) is satisfied.	CHAMPLUS® pays the 25% of allowable charges not covered by CHAMPUS after the deductible has been satisfied.
<i>For Dependents of Active-Duty Military Personnel</i>		
Inpatient civilian hospital care	CHAMPUS pays all covered services and supplies furnished by a hospital, less \$25 or \$7.10 per day, whichever is greater.	CHAMPLUS® pays the greater of \$7.10 per day or \$25 of the reasonable hospital charges not covered by CHAMPUS
Inpatient military hospital care	The only charge normally made is a \$7.10 per day subsistence fee, not covered by CHAMPUS.	CHAMPLUS® pays the \$7.10 per day subsistence fee.
Outpatient care	CHAMPUS covers 80% of outpatient care fees after an annual deductible of \$50 per person (\$100 maximum per family) is satisfied.	CHAMPLUS® pays the 20% of allowable charges not covered by CHAMPUS after the deductible has been satisfied.
<p>NOTE: Outpatient benefits cover emergency room treatment, doctor bills, pharmaceuticals, and other professional services. There are some reasonable limitations and exclusions for both inpatient and outpatient coverage. Please note these elsewhere in the plan description.</p>		

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Choose either AFA CHAMPUS® Inpatient coverage or combined Inpatient and Outpatient coverage for yourself. Determine the coverage you want for dependent members of your family. Complete the enclosed application form in full. Total the premium for the coverage you select from the premium tables on this page. Mail the application with your check or money order for your initial premium payment, payable to AFA.



EXCEPTIONS & LIMITATIONS

Coverage will not be provided for conditions for which treatment has been received during the 12-month period prior to the effective date of insurance until the expiration of 12 consecutive months of insurance coverage without further treatment. After coverage has been in force for 24 consecutive months, pre-existing conditions will be covered regardless of prior treatment. Children over age 21 (age 23 if in college) will continue to be eligible if they have been declared incapacitated and if they were insured under CHAMPUS® on the date so declared. Coverage for these older age children will be provided at slightly higher rates upon notification to AFA.

EXCLUSIONS

This plan does not cover and no payment shall be made for:

- routine physical examinations or immunizations
- domiciliary or custodial care
- dental care (except as required as a necessary adjunct to medical or surgical treatment)
- routine care of the newborn or well-baby care
- injuries or sickness resulting from declared or undeclared war or any act thereof
- injuries or sickness due to acts of intentional self-destruction or attempted suicide, while sane or insane
- treatment for prevention or cure of alcoholism or drug addiction
- eye refraction examinations
- Prosthetic devices (other than artificial limbs and artificial eyes), hearing aids, orthopedic footwear, eyeglasses and contact lenses
- expenses for which benefits are or may be payable under Public Law 89-614 (CHAMPUS)

PREMIUM SCHEDULE

Plan 1—For military retirees and dependents (Quarterly Premiums) Inpatient Benefits

Member's Attained Age	Member	Spouse	Each Child
Under 50	\$21.88	\$27.35	\$14.85
50-54	\$32.70	\$40.88	\$14.85
55-59	\$39.78	\$49.73	\$14.85
60-64	\$45.80	\$57.25	\$14.85

Inpatient and Outpatient Benefits

Under 50	\$30.82	\$36.98	\$37.13
50-54	\$42.35	\$50.82	\$37.13
55-59	\$56.01	\$67.21	\$37.13
60-64	\$64.48	\$77.38	\$37.13

Plan 2—For dependents of active-duty personnel (Annual Premiums)

Inpatient Only	None	\$ 9.68	\$ 5.94
Inpatient and Outpatient	None	\$38.72	\$29.70

APPLICATION FOR AFA CHAMPUS*

Group Policy GMG-FC70
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 _____ Current Age _____ Height _____ Weight _____ Soc. Sec. No. _____
Month/Day/Year

This insurance coverage may only be issued to AFA members. Please check the appropriate box below:

- I am currently an AFA Member. I enclose \$18 for annual AFA membership dues (includes subscription (\$14) to AIR FORCE Magazine).

PLAN & TYPE OF COVERAGE REQUESTED

Plan Requested (Check One) AFA CHAMPUS* PLAN I (for military retirees & dependents) AFA CHAMPUS* PLAN II (for dependents of active-duty personnel)

Coverage Requested (Check One) Inpatient Benefits Only Inpatient and Outpatient Benefits

Person(s) to be insured (Check One) Member Only Member & Children Spouse Only Spouse & Children Member & Spouse Member, Spouse & Children

PREMIUM CALCULATION

All premiums are based on the attained age of the AFA member applying for this coverage. Plan I premium payments are normally paid on a quarterly basis but, if desired, they may be made on either a semi-annual (multiply by 2), or annual (multiply by 4) basis.

Quarterly (annual) premium for member (age _____) \$ _____

Quarterly (annual) premium for spouse (based on member's age) \$ _____

Quarterly (annual) premium for _____ children @: \$ _____

Total premium enclosed \$ _____

If this application requests coverage for your spouse and/or eligible children, please complete the following information for each person for whom you are requesting coverage.

Names of Dependents to be Insured _____ Relationship to Member _____ Date of Birth (Month/Day/Year) _____

(To list additional dependents, please use a separate sheet.)

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 amount is mailed to AFA, (b) only hospital confinements (both inpatient and outpatient) or other CHAMPUS-approved services 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 coverage 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. I also understand and agree that all such pre-existing conditions will be covered after this insurance has been in effect for 24 consecutive months.

Date _____, 19 _____ Member's Signature _____ Form 6173GH App.

Application must be accompanied by a check or money order. Send remittance to:
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PAM development began in 1976 as a privately funded commercial venture. It has launched numerous commercial satellites, first from our Delta rocket and more recently from the space shuttle. The PAM-DII chosen by the Air Force is a new-generation booster with an improved motor capable of lifting a 4200-pound satellite to geosynchronous orbit altitude. The first Air Force PAM-DII launch is set for 1986 from Kennedy Space Center.

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For more information, write PAM Marketing,
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