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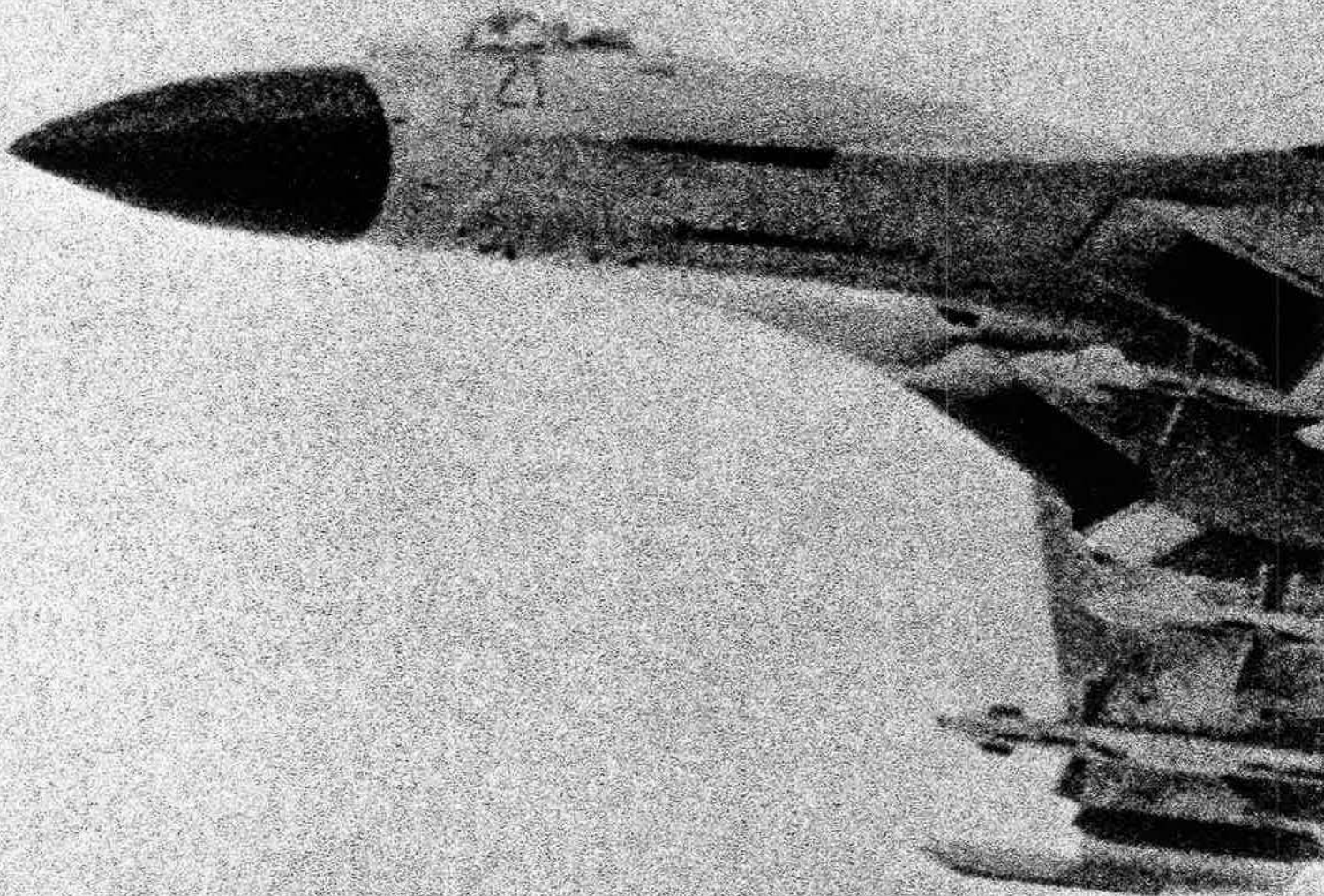
MAGAZINE



Tactical Forces and the AirLand Battle



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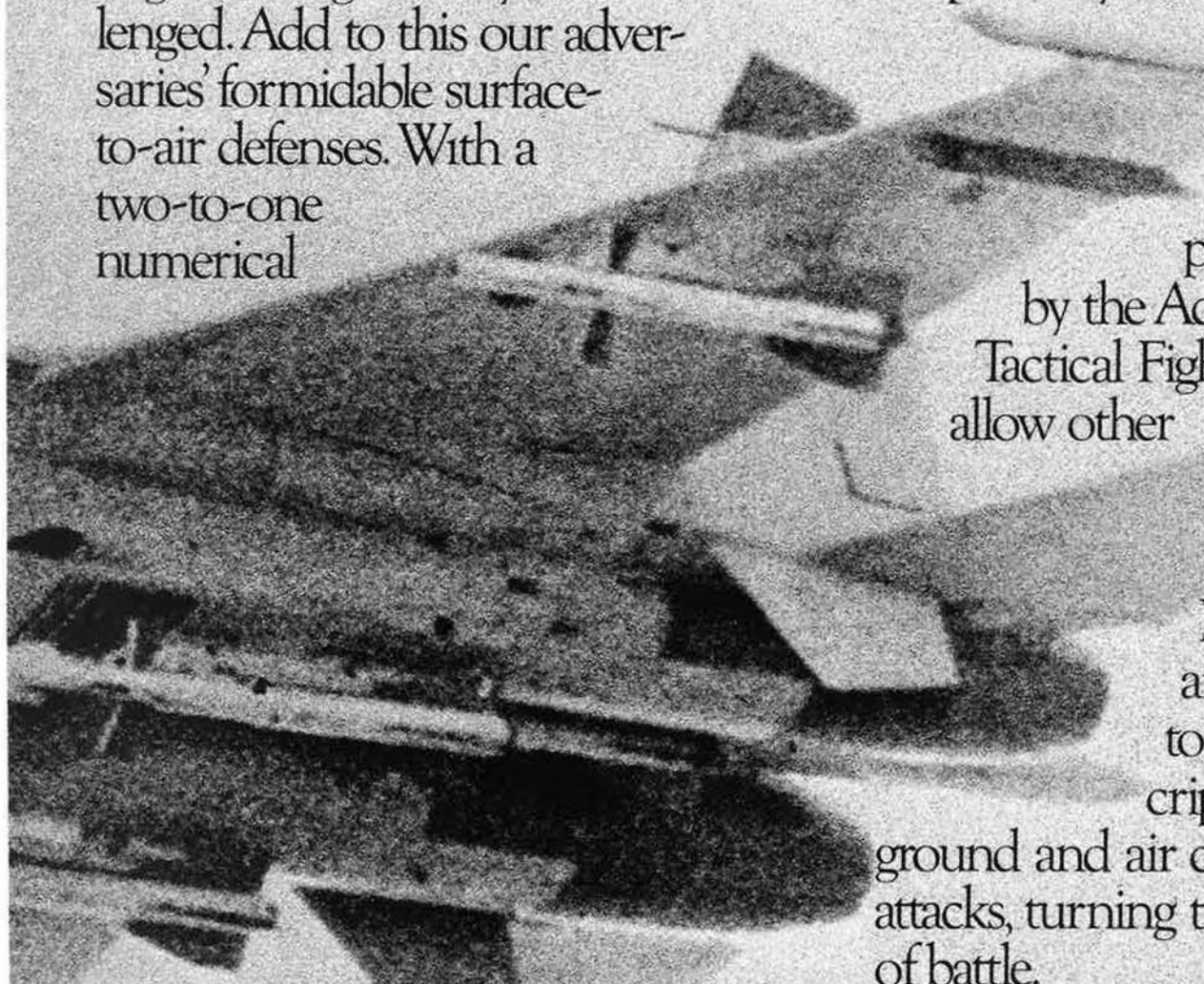
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About the cover: Ground troops ready this F-16 from the 56th TTW, MacDill AFB, Fla., for an air-to-ground training sortie. A special section on Tactical Airpower begins on p. 34. (Photo by Frederick Sutter/IDI)

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Ready for Unreadiness?

By John T. Correll, EDITOR IN CHIEF

NO CHANGE in the armed forces over the past ten years has been more impressive than the gain in military readiness. In 1988, for example, Tactical Air Command achieved an 88.2 percent combined mission-capable rate for its operational fighters. That was the best rate ever and forty-nine percent better than in 1980. Last year, 83.6 percent of the TAC aircraft that landed in need of repair were ready to go again within eight hours. In 1980, only 32.4 percent could be back in the air that promptly.

These improvements and others in the fitness of today's combat forces did not happen by chance. They are the result of a sustained financial commitment to training, adequate support, and equipment that is more reliable and easier to maintain.

Unfortunately, readiness is expensive. It is with bitter regret that the armed forces, pushed into a corner by one budget reduction after another, have now conceded that they cannot hold the high readiness standards seen these last few years. They recognize that they are losing something important.

An altogether different perspective was expressed by Edward N. Luttwak, writing in the *Washington Post* of February 21. He says that the readiness budget can and should be cut for sound strategic reasons, and that we should seek better value for our defense dollar than "the costly upkeep of immediate warfighting capability." We have an opportunity to do this, he says, because Soviet General Secretary Mikhail Gorbachev has "radically altered the political atmosphere" and "removed the once very real threat that Soviet forces might launch a surprise attack on the West."

No dewy-eyed dreamer, Mr. Luttwak acknowledges that Soviet power has increased in the Gorbachev era, that military production continues undiminished, and that there has been very little change in the Soviet armed forces. He contends, however, that for the first time since the 1920s, "the Soviet public is not being kept in a state of moral war-readiness" and that "the regime cannot possibly start a war without prolonged psychological preparation."

He proposes that the Pentagon shift its resources into programs for long-term security and cut back severely on training, fuel, replacement parts, and expendables consumed by high-tempo peacetime operations. Readiness, he says, "is purchased day by day for that day, and has little lasting value."

Mr. Luttwak, who is among the best known of the defense reformers, occasionally has some good ideas—

but this is not one of them. Decreased readiness may be a financial imperative, but the nation should recognize the risk that it runs.

The danger has not disappeared, even if the probability of immediate conflict is low. Mr. Gorbachev's domestic program is a ticking time bomb. The Soviet empire in Eastern Europe is restless and stirring. The Middle East is as volatile as ever.

It is not difficult to imagine events that could bring the crisis mentality back in a hurry.

Drawdown of nuclear weapons in Europe gives an even greater military advantage to Soviet conventional forces that are equipped, trained, and positioned for offensive action. It is, therefore, with some hazard that we reduce our own readiness. There are also long-term consequences.

Once readiness is lost, it cannot be recovered instantly. About two years elapse, for example, between the budgeting for spare parts and the time they appear in squadron supply bins. If maintenance backlogs are left alone, they tend to get worse. When maintenance has to borrow a part off one airplane to fix another, the mission-capable rate drops precipitously.

Experience and training levels are built up slowly. A squadron's combat edge emerges gradually in the course of exercises, deployments, and everyday operations. If we decide suddenly that we want readiness back, it will not be possible to run all the aircrews through Red Flag in two months. Another consideration is safety. If pilots train only enough to maintain minimum proficiency, we can look for an increase in accidents.

Investment in long-term security is important. Nobody argues that case more emphatically than the Air Force Association and this magazine. It is also true—if only because the budget-makers have made it so—that the current round of reductions cannot skip over readiness without doing catastrophic damage to other aspects of military capability.

It will be discouraging, but probably not disastrous, if the mission-capable rate slips a couple of percentage points. Regression toward the "hollow forces" condition of ten years ago, however, would be cause for alarm.

The ultimate measure of a military force is its ability to fight today. Even deterrence, the strategy of leading an adversary to keep the peace by making victory in war impossible or not worth the price, derives from that. For a nation that is serious about protecting itself and its interests in the world, a marginally trained, poorly supplied, half-supported military force is no bargain. ■



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\$6 Million Men

As one of the \$6 million men General Welch refers to [*"Tough Choices for Hard Times," February '89 issue*], I'd like to comment on some of his views. Does he really think that pilots who decide to leave the Air Force were not the right "kind of people who elect this \$6 million education in the first place"? I spent almost thirteen years flying fighters in the Air Force and flew with many excellent pilots who would have carried out their wartime mission in a heartbeat if called on.

Many of these were at the top of their profession—[Fighter Weapons School] grads, test pilots, aggressors, excellent instructors and tacticians, and those honored as the "Best Fighter Pilot in TAC." Pilots from every one of these categories are my co-workers now—flying "an airborne bus."

Does the General believe that these people should not have been given a "\$6 million education"? We were dedicated to our jobs and for our own reasons elected to leave the Air Force. I felt that I gave 100 percent of myself during my Air Force career and resent the implication that maybe the \$6 million was wasted.

I always thought that we wanted thinking, rational pilots who can effectively fight in the dynamic battle arena. But if [such a] person uses rational thinking, weighs all the factors involved, and then decides to leave the Air Force, he is crucified and called a money-hungry mercenary! Is this right? Do we want blind obedience from our pilots? If so, then maybe robots are the way to go—or maybe strict ground control like the Soviets. But I don't think anyone really wants to go that far.

I'm not saying that everything about my Air Force job was bad. I miss strapping on an F-16 and having the satisfaction of completing a challenging mission. I miss the air-to-air fights, good scores on the range, and the camaraderie of a fighter squadron. I had some great experiences in the Air Force that I couldn't have had without it, but you have to weigh all the factors involved.

My present employer doesn't ask

me to work on Saturday getting ready for an inspection. I don't have to come in to paint the ops room or plant trees around the squadron building. I don't have to spend time getting an advanced degree because I need it to get promoted. If I have four days off, I can go to Timbuktu if I want—he won't charge me vacation. He doesn't care what my wife does for a living or whether or not she likes ice-cream socials.

Best of all, when I leave work for the day—I'm *done!* I don't take OERs, mission-planning, or after-action reports home with me. My free time is mine alone, to do with as I please. I've probably had more unrestricted free time with my family in the short time I've been with the airlines than in the past ten years in the Air Force.

I think about the television ads promoting the Air Force as "a great place to start." Does that only apply to non-pilots? When others use their Air Force training for a civilian job, it's OK—why not for us? I think my thirteen years more than paid back my training costs. But for those who are still concerned about the cost, maybe this is a little consolation: Who would you rather trust your life to on an airliner—the \$6 million man or a \$100,000 one?

Maj. Dean A. Colello,
USAFR
Beaver Falls, Pa.

I read the February 1989 article "Tough Choices for Hard Times" and find the remarks by Generals Welch and Cassidy on pilot retention somewhat shallow and shortsighted.

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 preferably typed. We are sorry we cannot acknowledge receipt of letters to "Airmail." We reserve the right to condense letters as necessary. Unsigned letters are not acceptable. Photographs cannot be used or returned.—THE EDITORS

I agree that forty-three percent retention of the eight- to fourteen-year group of pilots is "a tragedy for the country." But to put the blame solely on the character of said pilots is ludicrous. General Welch's "\$6 million man" wants to stay in and fly. That is the mission: to "Fly and Fight." To honor this wish would ensure a professional cadre of pilots and warriors ready to train and lead the lieutenants and junior captains into battle. But these professionals are leaving for the Guard and Reserve. And guess who continues to wax the Regular Air Force at Gunsmoke?

True, acceding to the pilots' wishes would end the "Up or Out Air Force," but readiness and morale would soar. Changing the selection process to find career-oriented managers who want to be Chief of Staff only makes for good shoe clerks, not professional leaders and warriors. This axiom has been borne out in World Wars I and II, Korea, and Vietnam.

Family pressures are a small part of why the old heads are leaving. They are tired of being ignored, ripped from the cockpit, and passed over. Today's potential conflicts are their worry, but management has its attention on future "gold watches" at the expense of O&M. That attitude cost the Romans their empire.

Hire your automatons, General; they will stomach the frustration and dissatisfaction of the Regular Air Force. But you will lose the Billy Mitchells, the Bob Scotts, the Dick Bongs, and the Robin Oldses. They will leave to control their lives.

George T. McClain
Apple Valley, Calif.

I just read a classic case of someone not getting the word. The February '89 issue article "Tough Choices for Hard Times" was enlightening, to say the least.

General Welch states that the Air Force has "listened intently to all the announced reasons why pilots leave us. . . . Nonetheless, the pilots keep leaving. . . ." No kidding. The Air Force heaps money on the problem, \$12,000 a head, leather jackets, but

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Airmail

nothing works. Has the Air Force really listened? I wonder.

The *only* reason I have ever heard from a pilot leaving the service is that he wants to fly, and sitting in an office unrelated to flying makes that difficult. An example: A KC-135 qualified pilot was selected to be an executive officer in a security police squadron. Since his term of commitment was near, he elected to resign his commission. When asked how he could be induced to stay in the service, he said, "Put me back on the flight deck."

To make a long story short, the "system" required that he accept this wonderful, career-broadening opportunity, and his wishes did not matter, so the airlines got another "\$6 million man," and the Air Force had to train two replacements instead of one. (One to fill the slot in the aircraft, and one to fill the slot in the aircraft left by the one who filled the slot in the police squadron! An \$18 million executive officer.)

I don't understand why people in the field hear what will keep pilots, but the decision-makers don't (or won't).

Is the Army's example so bad? War-rant officers who do nothing but fly and [perform] flight-related duties. I do not know if the Army is experiencing a retention problem, but I have not heard about anyone throwing \$12,000 at them to keep them from heading out the gate.

Lorin Hart
Altus, Okla.

The Secretary of the Air Force, Chief of Staff, CINCMAC, and others are still unable or unwilling to respond correctly to the serious problem of pilot retention. Throwing money, e.g., a \$12,000-per-year bonus, at the problem is not a solution. Money has not been and will not be the issue or the cure. It is merely a knee-jerk reaction when all else has failed.

General Welch's comment, "There may be something fundamentally wrong with our approach to picking people," is completely off track. General Cassidy's opinion of "limited objectives . . . hard time competing in this Air Force of ours . . . tough time with his self-esteem . . . not so sure they're the kind of guys from whom we'd extract the great leadership . . ." is pure hogwash.

Many of the fine pilots and leaders who have separated would have and may yet provide excellent leadership to the Air Force and to the United States. Is President George Bush a less effective administrator or is he

lacking in self-esteem because of his separation from the Navy? I have yet to meet a pilot having "a tough time with his self-esteem."

In March 1987, a report entitled "A Comparison of Military and Civilian Sector Pilot Careers" appeared. Although the Air Force leadership did not want it distributed, many copies are available. The results of the report make the career-comparison decision easy. . . .

I separated from active duty in 1980. I fly for the airlines and the reserves. My story is no different than [that of] any of my peers who have followed the same path. Having an eight-, ten-, or twenty-year obligation for pilot training is not the solution to the retention problem. The solution is simple and cheap. Let pilots fly airplanes. Listen to their problems, treat them like human beings, and don't burden them with additional duties, eight moves in twenty years, and an up-or-out rank structure.

Lawrence M. Kampa, Jr.
Orland Park, Ill.

James Canan's article "Tough Choices for Hard Times" in the February '89 issue was interesting, but showed why pilot retention is so poor in the Air Force. Quotes from senior USAF generals make it very obvious that they are unwilling to make the "tough choices" that the pilot-retention problem requires. Their attitudes explain why the pilot-retention rate is at an all-time low and getting worse every day.

As a former F-16 pilot now flying for a major US airline, I agree with General Welch that I may be a "misplaced \$6 million man." However, I don't feel as misplaced as I would have if I had stayed in the Air Force. . . . I find the job of flying in the glass cockpit of a modern jet airliner much more "compelling and uplifting" than any nonflying one USAF had to offer.

General Welch further commented that "the service has responded by doing all the things we could . . . nonetheless the pilots keep leaving us and in very significant numbers." Every Air Force pilot must have chuckled when he read that. Very little has been done to keep pilots in, amounting only to bribery (jackets and bonuses) and longer UPT service commitments for new pilots. If a pilot is only motivated by money, he surely will separate for the airlines.

General Welch also was quoted [as saying] that something must have been "fundamentally wrong" with the way we were all selected because we

got out. I am sure all of my USAF Academy classmates now in the airline business (the number is significant) would heartily disagree. As cadets, we all dreamed of the day we would be Air Force officers and pilots, flying the best aircraft in the world. We never considered getting out until the realization came that if we wanted to fly we would have to take our valuable skills elsewhere.

We all gladly accepted our six-year UPT service commitment, just as future graduates will accept their ten-year commitment. That "longer commitment" the General speaks of will have no impact on the kind of people desiring to be USAF pilots. Unless needed changes are made, it will only serve to keep them in for a few more years until they get out.

The most ludicrous comment of the article, made by General Cassidy, shows just how out of touch Air Force leadership is with the pilot community. He stated that a pilot who remained in *only* as a pilot would "have a tough time with his self-esteem." I have never met a pilot who had a problem with his self-esteem because he was flying the jet he loved. In fact, just the opposite seems to be true. Those who have the problem are the pilots misplaced to some career-enhancing rated supplement satellite nonflying staff tour somewhere. . . .

General Cassidy made several remarks that go right to the heart of the pilot-retention problem. He said that although USAF leadership has resisted allowing pilots to be pilots, they "now have the ability to do that in the Air Force Reserve program." That is exactly why the pilots are leaving in droves. Why should a highly trained F-16/F-15/C-141 pilot stay in and either not fly or pilot an airplane built before he was born, when he can do the job he loves and was trained for in the Guard or Reserve? The modernization of those forces has as much to do with the retention rate as airline hiring does.

As long as we have Air Force leadership that believes that all pilots should want to be like them, leadership that believes that pilots should stay in no matter what is done to them or to their families, leadership that believes the way to keep pilots in is to bribe them or force them to stay in with service commitments, and leadership that will not admit that life is better in the airlines and the Reserve, then the retention problem will never be solved, and the \$6 million men of the Air Force will continue to keep the friendly skies safe.

Daryll Keeling
Eagan, Minn.

After about three years of Air Force flying, every pilot must choose. The choices are:

1. Driving a "bus" through the sky as an airline pilot.
2. Flying the best first-line tactical aircraft for one's country.

To me the choice was easy in 1955. I never regretted my twenty years as an Air Force pilot—climaxed with an RF-101 combat tour in Vietnam.

Lt. Col. Tony Weissgarber,
USAF (Ret.)
San Antonio, Tex.

Stevens Defenders

I'd like to take exception to Mr. Summers's comments [*"Airmail," February '89 issue, p. 17, "Stevens Critiques"*].

My first response was disbelief. How could anyone not love the Air Force lore preserved by Bob Stevens? Then I realized our differences were ones of perspective. While Mr. Summers's heart certainly is filled with support "of our brave fighting men," his military memories are from a civilian point of view.

On the other hand, those of us who chuckle—no, delight—at Bob Stevens's humor have lived it. All those "war stories" describing the antics of our fellow airmen give us healthy reminders of "Hey, do you all remember when. . . ."

Mr. Summers, God bless you for caring, but if you don't mind, we need the smiles Bob Stevens brings. . . .

MSGt. Harvey E. Haynes,
USAF
Scott AFB, Ill.

I disagree with Christopher Summers's "Stevens Critiques" in your February 1989 issue. He called Bob's cartoons "mindless attempts to be humorous" and said that they are a "negative influence on the morale and self-esteem of our brave fighting men."

During my thirty-one years in the Air Force as a pilot, staff officer, and commander, I found that most aircrew members thoroughly enjoyed Bob Stevens's cartoons. I didn't encounter any who felt demeaned or suffered low morale because of them.

In fact, one of the most refreshing aspects of flying in the Air Force was the ability of highly trained professionals to laugh at themselves. We learned from our own mistakes and the mistakes of others—we didn't brood about them or try to hide them. We passed them on so that others would learn.

Openness such as this frank interchange by aircrew members has saved others from making the same

mistakes. Safely on the ground, pilots joke about their own boners, but they all learn even as they laugh.

We love you, Bob!
Col. Robert F. Darden, Jr.,
USAF (Ret.)
Waco, Tex.

Writer Summers apparently is not aware of the real Air Force world, where airplanes break down, weather closes in, honest mistakes are made, and [examples of] Murphy's Law abound.

Bob Stevens provides a window to this world. His cartoons can be nostalgic (we older types [identify] with the aircraft and the situations), are usually informative, and are always entertaining. They are a perfect complement to an excellent publication.

God bless Bob Stevens. I hope he continues his work for another twenty-five years!

Lt. Col. Hal Richter,
USAF (Ret.)
Barrington Hills, Ill.

Mr. Summers claims to be a civilian. . . . If he had ever been in the service, he would know that laughing at one's own misdeeds and screwy experiences is the best way to fend off the mental problems that could otherwise consume many of us.

Not only has Bob Stevens been right-on all these years; we in the Thunderbolt Pilots Association, Ltd., cherish his membership and are very proud that he is one of us.

Far from being depressed, Mr. Summers, those of us who have been there appreciate everything Bob Stevens has penned. If the people to whom these sometimes bizarre [things] happened thought that they were putting themselves down, they wouldn't have volunteered the information to him.

I have several stories about my own escapades that I would love to share with everyone else, and I don't consider them to be a "negative influence on the morale and self-esteem of our brave fighting men." Quite the contrary! It is this type of release that *builds* morale. Too bad there wasn't more of it in Vietnam instead of the drugs they used as a poor substitute.

Stuart Moak
Larchmont, N. Y.

I have been an AFA member since February 1968, and when the new issue of AIR FORCE Magazine hits my mailbox, the first place I turn is to "There I Was . . ." for a good chuckle and, yes, to read a little aerospace history. I have just read the comments by Mr. Christopher Summers in the Feb-



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Aircraft Products Group
Aircraft Modernization and Support Division

L T V : L O O K I N G A H E A D

ruary '89 issue concerning Lt. Col. Bob Stevens's world-famous contribution to aerospace power and offer these thoughts in return.

First, Mr. Summers, as a civilian, you probably have not appreciated the value of humor during a nine- or ten-hour mission when you have run out of coffee, your orbit is between two thunderstorms, the autopilot just went down the dumper, and you have run out of ideas and airspeed. Sometimes, a good laugh is the very thing that gets us through.

Second, Stevens is drawing the truth. He doesn't make this stuff up, it really has happened! To quote my favorite Chief Master Sergeant in the whole Air Force, Lincoln Jeffus, "I don't lie; the truth is too much fun!" If you look at the bottom of the page, Stevens always credits his source, who is usually the subject of that month's yarn.

Thirdly, and most important, "There I Was . . ." is a mirror of one of the vital principles of our democracy, freedom of expression, humorous or otherwise. Those of us in uniform tend to exercise it with a passion, considering the serious nature of our profession. We recall lighter moments during times when there wasn't much to smile about and recharge our batteries with a little GI humor.

Maj. Thomas M. Webb,
USAF
Tinker AFB, Okla.

Borman Booster

Ms. Keating does a grave injustice to Frank Borman in her critique of his excellent book *Countdown*. [See "Airman's Bookshelf," February '89 issue, p. 93.]

Colonel Borman provides a fascinating account of his experiences to date. Here's a forthright guy with the guts to call the shots as he sees them. A fine role model for future young aviators and managers alike.

The Eastern Air Lines account is important to us all, since corporate business, large or small, is what keeps America competitive. He understands something Congress and the unions do not: "The customer sets the price."

Countdown will be enjoyed by all readers interested in aviation and in the climb to being one of America's great corporate leaders.

G. M. Matteson
DeKalb, Tex.

Unpredictable History

In his editorial, "The Doctrine of Tranquility," in the February '89 issue,

John T. Correll observes that "history . . . does not always follow logic" and that "we should remember that the course of human events is not always logical. . . ." If these conditions are accepted, they compel us to question the basis of the accompanying advice not to be "too quick to abandon the policies and provisions that have kept the peace for forty years."

If we are as unpredictable as appears to be the case, the absence of war in Europe since the 1940s demonstrates only that there has been no war, a condition attributable to what, exactly? Mr. Correll implies that the deterrent effect of NATO has prevented war, but that argument requires the existence of rational behavior on the part of the potential antagonists. This may or may not have been the case; we are unable to demonstrate why there has been no war.

This does not argue against the utility of NATO or against a prudent state of military readiness in Europe or elsewhere in our sphere of vital interests. Mr. Correll's prediction of nothing other than unpredictability is exactly on the mark, if past experience can be relied on. That is the reason for "keeping one's powder dry," and we should not mislead ourselves about causal relationships.

Col. Keith W. Geiger,
USAF
Maxwell AFB, Ala.

Vietnam Lesson

With all due respect to General Milton ["*The Mistakes of Vietnam*," January '89 issue, p. 101], he makes the usual points: "Washington had lost its nerve and was no longer concerned with winning. . . . Our political leaders had never really been interested in winning. . . . It was North Vietnam [after Tet] that we were up against."

Let's stop this self-flagellation once and for all. We didn't lose the Vietnam War—not the bureaucrats, not our military leaders, not our politicians. It was not our war to win or lose.

The South Vietnamese lost the

war—with larger forces in the field, better equipment, and total air superiority. The final lesson of that tragic conflict is that there is one element that no one in Washington can include in any Military Assistance Program—what the Chinese call "dragon's blood" and what we usually refer to as "balls."

Dennis J. Doolin
Deputy Assistant Secretary
of Defense for East Asian
and Pacific Affairs
(1969-74)
Okinawa, Japan

A Thankless Job

I am writing you this letter with reference to the picture and, more specifically, the accompanying caption dealing with the High Mobility Multipurpose Wheeled Vehicle (HMMWV). [See "*Aerospace World*," January 1989 issue, p. 33.] The last sentence states, "The Hummers were used in a Reforger exercise for the first time last fall," referring to Reforger 1988.

Detachment 3, 4th Air Support Operations Group (ASOG), stationed at Lucius D. Clay Kaserne, Garlstedt, Germany, was the first unit in USAFE to become fully operational in the HMMWV with the AN/GRC-206(V)3 communications central installed. My unit derived great pride from converting to the new Tactical Air Command and Control System in the short six weeks just before Reforger 1987. They, from the senior NCO to the lowest ranking airman, worked as a team to install the communications equipment into the Hummer. . . .

To the men who were there . . . and those currently assigned to Detachment 3, I salute your efforts in performing a difficult, little appreciated, and often thankless job.

Capt. Harry H. Lade,
USAF
Garlstedt AIN, Germany

"Stumpy" or Not

This is in response to the plea of Daphne J. Connolly ["*Airmail*," February '88 issue, p. 10], which was sparked by C. V. Glines's story in the December '88 issue, "The Battle Log of Birdman Silver."

C. V.'s quotes from Col. John Ballard are consistent with the data presented in his article in the March 1961 issue of *Airman*, "The Saga of John Silver, Airman Extraordinary." Whatever the protocol at Major Ballard's 11th Signal Company at Schofield Barracks in the mid-1930s, the custom somehow was lost by the time communication from the Office of the

AFA Symposium

An AFA National Symposium, "Systems/Logistics/Acquisition," will be held April 27-28, 1989, at Stouffers Hotel, Crystal City, Arlington, Va. Representatives from Hq. AFSC and Hq. AFLC will participate. For more information, call Jim McDonnell at 1-800-727-3337, ext. 5810.

Chief Signal Officer reached us. Museum records contain the following letter from that office dated July 19, 1937, [that reads in part:]

"According to the Chief Signal Officer's records 'Stumpy John Silver' has been placed on display in the Army Aeronautical Museum, Wright Field, Dayton, Ohio.

"For the Acting Chief Signal Officer:

"R. W. Minckler,
"Captain, Signal Corps."

Whatever was correct in the records of the Chief Signal Officer in 1937 was/is good enough for us to consider as primary source data.

To carry the point to its obvious conclusion, I guess we'll have no more "Haps," "Jimmys," or "Gabbys" in our history, or any more "C. V.s" for that matter.

Silver, John NMI, a.k.a. "Stumpy" John, has a prominent place in our display for all to see without debate, but with the affection of our million and a half visitors each year.

Richard L. Uppstrom
Director, USAF Museum
Wright-Patterson AFB, Ohio

Roll Call

I have been trying to locate the following serviceman: Henry Cummins. Rank: staff sergeant (first class), Telecommunications. Base: Burtonwood, Liverpool, England, in 1951. Date of Birth: approximately 1925 or '26. Origin: believed to come from Texas.

Units known to have been at Burtonwood during this period include 1965th AACS Squadron; Det. of 1813th AACS Group; 6972d Communications Security Flight NB AACS—Airways and Air Communications Service.

Jeffrey H. Grayer
21 Thornbury Dr.
Uphill
Weston-s-Mare
Avon BS23 4YF, United Kingdom

I am looking for information on the whereabouts of three World War II B-29 crewmen or their next of kin. Lt. George R. Bishop was the squadron navigator in the 878th Bomb Squadron, 499th Bomb Group, 73d Bomb Wing on Saipan. Major Estes was an aircraft commander in the 19th Bomb Group, 314th Bomb Wing, on Guam. Lt. Ross K. Drake was an aircraft commander in the 3d Photo-Reconnaissance Squadron on Guam.

I'm also looking for a picture of the painting on Lieutenant Mellen's aircraft *Hasta Luego*. This exceptional picture of a beautiful Spanish danc-

ing girl appears in none of the books featuring B-29 nose art. Lieutenant Mellen and his aircraft were lost while returning from target.

Col. Arthur W. Dern,
USAF (Ret.)
37 Coes Hill Rd.
Southwick, Mass. 01077
Phone: (413) 569-5979

I am attempting to locate the widow or any living relative of Col. Henry R. Mooney, who was commander of the 459th Bombardment Group, Fifteenth Air Force, Italy, in 1944-45. I am historian of the 459th Bomb Group Association and am hopeful some of Colonel Mooney's mementos (photos, orders, letters, etc.) can be located and will assist my writing of the group's history.

Lyle H. McCarty
19235 Harleigh Dr.
Saratoga, Calif. 95070
Phone: (408) 867-3160

I am a collector of memorabilia of the USAF Air Commandos and Special Operations Squadrons. I also collect the printed word on this subject in the way of historical data and fact sheets, etc. I would like to try and get in contact with Don Schoppely of the 21st Special Operations Squadron who was stationed at Nakhon Phanom, Thailand, sometime during the late 1960s or early 1970s.

The reason is that within my collection I have a flight coverall (party style) of SEA manufacture with his name embroidered on it with a full display of patches, etc. I acquired this during a vacation in the United States several years back and, as a research project, would like to get in touch with him.

Roy Turner
21 Old Brickfield Rd.
Old Kilns
Aldershot GU11 3UE
Hampshire, England

Collectors' Corner

I am currently working on the F/A-18 Hornet at McDonnell Douglas in St. Louis. I am a collector of fighter aircraft photographs and memorabilia. Any photos or information related to the F/A-18, F-15, AV-8B Harrier, or other fighter aircraft would certainly be appreciated.

Phil Tapscott
6018 Boulder Creek Dr.
Apt. #1712
Hazelwood, Mo. 63042

I need help in locating two very hard-to-find books about the Doolit-

tle Tokyo Raid of April 18, 1942. The titles are *Gusts of the Kremlin*, by Robert G. Emmons, and *Target Tokyo*, by James M. Merrill.

I have had the pleasure of meeting General Doolittle at his home in Carmel, and these books would complete my collection of published Tokyo Raid material. Anyone who has any information regarding the aforementioned books, please contact me at the address below.

Ted Briscoe
4809 Atherton Ave., #25
San Jose, Calif. 95130

Wanted: Aircraft Recognition Models, World War II to the postwar period, urgently needed for a display.

James A. Dorst
115 Beach Rd.
Hampton, Va. 23664

I returned in late September from a trip to Spain and Gibraltar. If anyone from the 423rd Bomb Squadron, which served there from 1945 to 1946, wants photographs, etc., drop me a letter.

Charles R. McCreight
725 Lewis Rd.
Sumter, S. C. 29150

I am a high school senior and have been trying to start a collection of F-15 squadron patches with little success. I would like to obtain patches from each squadron of the 36th TFW, 18th TFW, and 21st TFW, as well as a 32d TFS patch and any of Tactical Air Command's F-15 tactical fighter squadrons and fighter-interceptor squadrons. I would greatly appreciate any information that could be sent to me on how and where I could obtain any of these patches.

Buddy White
8750 Applewood Ct.
Mentor, Ohio 44060

TO OUR READERS

The February 1989 issue of AIR FORCE Magazine carried a flyer from Fusion Video whose order form unfortunately did not provide a place for the customer's address.

If you mailed in an order using this flyer and have not received your videos, please call Fusion's toll-free customer service number to verify your order:

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By mid-1942, the Nazis owned Europe. It was obvious to the Allies that precision bombing had to knock out Germany's manufacturing centers. The advent of the P-51 long-range fighter enabled the Allies to rule the sky of Germany. This award-winning film captures the drama, tragedy, and finally the victory over Hitler's armies.

#2429 84 Min. \$29.95

EAGLE COUNTRY



Have you ever dreamed of flying in the world's hottest fighter aircraft? The F-15 Eagle's superior dogfight capabilities will keep you at the edge of your seat as the F-15s go head-to-head against F-14s, F-16s, and F/A-18s. This one is for anyone interested in aviation.

#2150 85 Min. \$59.95

photo courtesy U.S. Airforce

FALCON DOMAIN



The F-16 Fighting Falcon was designed to out-fight any enemy aircraft in the sky and is armed to dominate. In this full-color panorama, you get a detailed look at the systems, weapons, and "magic" that make the F-16 a 21st century fighter plane. You'll be strapped in the cockpit during gut-wrenching dog-fights as the pilots take the F-16 to the edge. From the LANTIRN infrared night attack system to the high-powered ride with the "Thunderbirds," Falcon domain is a stunning film to add to your collection.

#2178 90 Min. \$59.95

THE RED BARON

This is the story of Manfred von Richthofen, WWI's premier ace who shot down 80 Allied planes! This Ace of Aces was the greatest aerial tactician of World War I. Included are interviews with the last surviving pilots who flew with and against him. Excellent WWI dogfight footage, crashes, and The Red Baron's last flight are highlighted in this compelling story of the most legendary personality in the annals of aviation.

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HISTORY OF NAVAL AVIATION

From the first aircraft carriers, the job of naval aviation has been filled with danger and excitement. This historical look back at the proud tradition of naval aviation is brilliantly chronicled. If you want to know where naval aviation is heading, you must appreciate where it has been. GREAT FOOTAGE!

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An exciting overview of America's current frontline jet fighters that puts you in the cockpit for a 9G ride you won't soon forget. This is a closeup look at the F-14, F-15, F-16, F/A-18, and the new F-20. Jet Fighter puts you in the cockpit where you can experience dogfights and weapon demonstrations that will leave you speechless. All Action!

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AIR WAR IN VIETNAM

The most awesome display of aerial fire-power ever was unleashed in Vietnam. Air War in Vietnam uses the pick of air combat footage to tell the story from the first U.S. advisor to the massive U.S. bombings. Also included is captured North Vietnamese footage of their anti-aircraft defenses.

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MOFFETT AIRSHOW: 1988

The largest air show in the U.S. is the setting of this thrilling 2 hour video review. You're in the cockpit with the USAF Thunderbirds, F/A-18 Hornet, the Air Force "Smoke Squadron" Team, as well as on an actual submarine chase. A lot of action!

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When the MiG-15 jets were suddenly introduced into the Korean War, our air superiority was threatened. America's answer was the F-86 Sabre Jets. Take this gut-wrenching ride and get a ringside seat to the Korean air war.

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From the Mustang's development to her glory days as deep escort into Germany, this action-packed film is the definitive record of the legendary P-51. Made with the cooperation of the USAF, interviews with combat pilots including Ace Donald Strait (13 1/2 kills) are interwoven with superb air-to-air and in-the-cockpit footage.

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The magnificent Air Force Thunderbirds put on a spectacular aerial show in this specially produced thirty-minute highlight film. You'll be strapped into the cockpit and get a look at the hottest pilots and planes in the business. WOW!

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TOP GUNS: THE REAL STORY

This is a thrilling look at the fighter pilots of the '80's. Set to a surging musical score and gut-wrenching cockpit footage, this film allows you to experience the excitement from the Top Gun Training School to the life or death struggle in the air. Breathtaking!

#2754 60 Mins. \$29.95

TOP GUN AIR SHOW

Straight from Fightertown, USA, you can now see the hottest fighter planes in this in-depth 2-hour extravaganza. The F-14, F-16, F/A-18, and the Blue Angels highlight this grand film that features the world's hottest pilots.

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Moderation on SDI

By James W. Canan, SENIOR EDITOR

The debate is no longer as vehement as it was. Advocates are more realistic in their claims, while critics concede some successes, technology spinoffs, and real defense value.



Washington, D. C. President Bush took office vowing to "vigorously pursue" the Strategic Defense Initiative in the footsteps of President Reagan, whose goal of a leakproof defense against ballistic missiles gave rise to the SDI program more than five years ago.

Thus did Mr. Bush seem to set the stage for another acrimonious go-round in the running annual debate over SDI bona fides, purposes, and funding. In the past, that debate has been characterized all too often by strident and exaggerated claims for and against the SDI program. But this may no longer be the case.

It seems that moderation is setting in. SDI is not the provoker of passions pro and con that it used to be. Its yeasayers and naysayers are calming down.

One reason for this is the departure of Mr. Reagan and his point man in pushing SDI, former Secretary of Defense Caspar W. Weinberger. Their uncompromising insistence that SDI had the makings of an airtight ballistic missile defense (BMD) system had a lot to do with the program's research momentum and successes to date. But the pair's unrelenting advance in advancing SDI also had the effect of politicizing and polarizing the debate surrounding it.

Personalities and politics aside, there are broader reasons why the vehemence is going out of that debate.

For one thing, a new consensus about SDI seems to have caught on in strategic and scientific circles. Skeptics and supporters of the program are finding common ground on two main points.

These are that SDI has almost no chance of culminating in a full-up BMD system that the nation could afford to pay for and deploy in the foreseeable future, and yet, paradoxical as it may seem, that the program has proven to be well worth the candle nonetheless.

Many SDI champions now grudgingly concede that it would be just about impossible, any time soon, to devise, test, integrate, and deploy all the weapon systems and battle management and command control communications and intelligence (BM/C³) systems required for an all-encompassing BMD.

On the other hand, it has also become evident to the reflexively anti-SDI camp that the program has a lot more merit than they thought. It clearly could produce a limited BMD system in short order, should there be a national political decision to do so, and there is no doubt that it has long since gotten the attention of the Soviet political and military leadership.

From a technical standpoint, it has also become obvious that SDI is a real winner in many ways not necessarily related to BMD but vital to national security.

The Air Force's increasing operations in space and ever-bigger plans for space are of a piece with the military possibilities being pondered and the systems being explored in SDI research, development, and testing.

Dr. Robert Selden, Chief Scientist of the Air Force, gets to the heart of the matter in observing that "SDI is the driving technology program in space sensors, space communications, and a great many other areas that are important to all the services, but particularly to the strategic Air Force."

This helps to explain why SDI, as Dr. Selden puts it, "has developed into a more collaborative program" with the Air Force than it used to be, back

when its complementary nature was less apparent and when its potential for undermining the tried-and-true concept of strategic nuclear deterrence induced a certain wariness in blue-suit circles.

Dr. Selden notes that SDI was also "very controversial in the technical community, and now a lot of that controversy has died down. As SDI has been worked through, both sides have changed. The advocacy side discovered that doing SDI is really hard. But the opposition discovered that a great many of the things that had been talked about in the program could in fact be done.

"As SDI has become harder and harder to do, it has also become harder and harder to make the case that it is technologically stupid."

Now that SDI is no longer viewed as leading to deployment of a BMD system in the near future, it is being regarded in a more relaxed manner. It is now seen, says Dr. Selden, as "a vehicle for research that addresses whole sets of different technical problems in a variety of areas that are viewed as important outside of SDI per se."

One of those problems—and a big one—is computer software. Critics of SDI made software their battle flag early on. They claimed that a fail-safe, flawless battle management/C³ system for directing the fire of SDI battle-station satellites against thousands of enemy ICBMs and their warheads would require computer programming of unattainable complexity.

Not so, declared SDI officials. They acknowledged that software was troublesome but denied that it would be deadly. To substantiate their claim, they sharpened the program's focus on software research, went after it harder, and laid plans to distribute BM/C³ computers in space in ways that would make the software work loads of all SDI satellites as manageable as possible.

There is no telling at the moment whether the SDI program's work on software has progressed to the point of entirely mollifying the critics. Their apparent abatement may be due more to a lessening concern that SDI is



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verging on deployment than to their assessment that its software will be up to snuff.

What counts the most in SDI's concentration on software shortcomings is its spinoff effect throughout the computer-dependent US military, which is plagued with problems of software capability and reliability in many high-tech systems. The SDI program has served to underscore those problems on a grand scale and to attract the funding and intellectual attention needed to address them across the board.

Ripples from SDI research on sensors, computers, and communications links for a space-based boost surveillance and tracking system (BSTS) are becoming apparent in the Air Force's broader-gauge considerations of new capabilities for early warning of ballistic missile attack.

Air Force Gen. John L. Piotrowski, Commander in Chief of US Space Command and North American Aerospace Defense Command (NORAD), addressed this connection at an Air Force Association symposium on strategic forces.

After making it clear that he unreservedly supports the SDI program, General Piotrowski declared: "BSTS was envisioned before SDI as a follow-on to the satellite early-warning system that we have today. So, whether or not SDI goes away, we would still want to go forward with improvements to our early-warning system, and BSTS represents that capability."

USAF is responsible for acquiring systems for the space segment of the SDI program and would also operate them. Its top acquisition officer in this respect, Maj. Gen. Thomas S. Moorman, Jr., agrees that SDI is becoming less controversial and is widening its technological vistas.

General Moorman, Director of Space and SDI programs in the office of the Assistant Secretary of the Air Force for Acquisition, praises the SDI program for having done "remarkable, extraordinary things in technology areas." He also notes, though, that "it continues to be a very tough program for us in terms of deciding exactly what we want it to do in the face of budget uncertainties."

The Air Force fits most snugly into the SDI scheme of things by virtue of the service's responsibility for performing the "force application" mission in space. General Moorman points out that many technologies having to do with that mission are being brought along in SDI, and that

this warrants USAF's status as "a major player" in the program.

If a BMD system is ever deployed, the Air Force expects to be in charge of its space-based weapons, sensors, BM/C³ systems, and their thoroughgoing integration. USAF is already heavily involved in the space launching and testing of hardware embodying SDI technologies, and the pace of such testing is picking up this year.

Scheduled are Delta Star, a test of SDI-developed space sensors for detecting, discriminating among, and tracking spaceborne targets, and Bear, a test of particle-beam weapon technologies. The Army will handle a test of the ground-launched HEDI (High Endoatmospheric Defense Interceptor) weapon for shooting at warheads on their way down from space, but USAF will also be involved.

SDI space tests anticipated after the turn of the decade include a BSTS satellite, a Midcourse Surveillance Tracking System (MSTS) satellite, and the Zenith Star test of some elements of a potential laser weapon.

Even if a BMD system never comes to pass, the results of all such SDI tests will be valuable to the Air Force in its pursuit of advanced technologies for future space operations. Those operations are booming as never before.

USAF has scheduled thirty-five space launches in 1989, the most in any year of this decade. The Air Force unclassified space budget stands at a whopping \$12.2 billion, which accounts for all but \$3.2 billion of the space budget of the entire Department of Defense.

The substantial size of the Air Force space budget—indicative of the growing cost and proliferation of space systems and space operations—underlay the recent move by USAF's leadership to accord space the status of a full-fledged mission and to institutionalize it as such in the Air Staff and throughout Air Force's major commands. (*For more on this topic, see "Space Comes Into Its Own," beginning on p. 20, March '89 issue.*)

This move puts space operations and acquisition of space systems on a par with air operations and acquisition of airborne systems in USAF's planning, programming, and budgeting process.

Paying the freight for space will only get tougher. New satellites and boosters needed to launch them are coming on line all the time. They will do wonders for national security, but they will also cost the Air Force plenty.

The Milstar (Military Strategic and Tactical Relay) communications satellite is a prime example. The cost of each ultrasecure, extremely high frequency (EHF) Milstar and its Titan IV/Centaur booster system is now a cool \$1 billion.

The Milstar program should be well worth the price. Milstar satellites will be extremely hard to jam. They are expected to provide unrivaled robustness, survivability, and communications security.

The first Milstar satellite is scheduled for launch in the early 1990s. Three satellites are expected to be at work in space by the midpoint of the decade. They will constitute the IOC—initial operational capability—of a much larger Milstar constellation to be dispersed over time in geosynchronous orbits and in orbits at various inclinations to the equator.

The Milstar satellites are extremely expensive because they are being built to be far more capable and survivable than any communications satellites have been to date. General Moorman acknowledges that the Milstar program "faced tough sledding in both schedule and funding" last year.

Even so, says the General, the Air Force saw the program through a "critical design phase," pressed on with its full-scale development, and successfully tested a Milstar payload—piggybacking on a Navy communications satellite—for compatibility with Milstar terminals destined for air, land, and sea deployment.

The Air Force also "finished fabricating ninety percent of the Milstar [space] bus in 1988 and completed all structural modifications required for its launch on the Titan IV," General Moorman adds.

He takes special note of USAF's "turnaround in resolving the problems we were having with custom-built LSI [large-scale integration] chips in Milstar's digital processing units." This means that USAF has put the toughest parts of the Milstar development program behind it, and "engineers are now being replaced by manufacturers" in Lockheed Missiles & Space Co.'s Milstar work.

USAF is also moving to upgrade its constellation of Defense Satellite Communications System satellites. Three of the DSCS III latest-generation satellites, built by General Electric Astro-Space, are now operational, along with two older TRW DSCS II satellites still in orbit. Several more DSCS III satellites will be launched, some as operational spacecraft, oth-

ers as spares idling in orbits but ready to be switched on if necessary.

The Air Force is moving to launch greater numbers of spare satellites in various constellations to ensure that it will not be caught short in a crisis or in wartime. This also adds to the cost of doing business in space.

In at least one vital space program, the number of operational satellites is on the rise. USAF now plans to deploy twenty-one operational Navstar Global Positioning System (GPS) navigation satellites, being built by Rockwell International, instead of the eighteen originally planned. There has been no change in the original plan for three spare Navstars.

The Air Force launched its first operational Navstar satellite last February aboard the first of the new family of Delta II boosters built by McDonnell Douglas for the express purpose of getting the GPS constellation into space. Navstar satellites will blanket the earth with coverage from six different orbital tracks.

The Pentagon's decision to expand the GPS constellation is evidence of the growing clout of the commanders in chief of the unified and specified warfighting commands.

"The requirement for twenty-one operational [Navstar] satellites came straight from the CINCs," General Moorman affirms. "They came to realize the tremendous force-enhancement value of the GPS."

The CINCs made the case that they needed the three additional satellites to confirm the accuracy of GPS time, position, and motion data in some geographical areas. They weren't just playing a hunch. They have been getting data from Navstar test satellites in space for some time and have come to depend on them. The first such satellite was launched in 1978.

The corporate Air Force has always been partial to the Navstar program for its ultraprecise fixing of positions for US forces on the move anywhere in the world. But the program's high and mounting cost, now estimated at \$8 billion to \$9 billion, gave the Air Force pause all along.

USAF restrained its spending for the Navstar program just enough each year to incur the displeasure of its own space aficionados and those throughout the Defense Department. The service's reluctance to go all out in funding GPS and other space programs, while weighing them along with other priorities, earned it a reputation in some quarters for not regarding space as seriously as it should.

The Air Force has now moved to dispel that reputation, and much of its motivation has come from the CINCs.

Declares General Moorman: "The process of defense procurement in obtaining weapon systems works best when there is 'operational pull'—hard requirements for the systems from the warfighters. In the past, to a degree, space systems had a lot of 'technology push' but not a lot of operational advocacy."

Over the past couple of years, the CINCs have made known their interest in so-called "lightsats"—small, relatively inexpensive communications and surveillance satellites that could be launched "on demand," maybe aboard land-based or submarine-based missiles, in accordance with combat exigencies.

USAF restrained its spending for the Navstar program just enough each year to incur the displeasure of its own space aficionados and those throughout the Department of Defense.

Such satellites are envisioned as weighing much less than the roughly 2,000 pounds or so that the lightest of existing satellites in space—weather and navigation satellites—now weigh. Some lightsat advocates talked of weights no greater than 1,000 pounds and no less than 500 pounds. They claimed that "single-purpose" lightsats could be built cheaply in this weight range to do quick and adequate, if not polished, jobs for hard-pressed combat commanders in dire and immediate need of informational services from space.

The Air Force clearly wasn't crazy about the lightsat idea. It acknowledged that lightsats would have some

advantages, such as greater flexibility in launching. But it also claimed that they would require a dedicated launch infrastructure that would be costly in its own right.

The Air Force was at pains to point out that the comparatively heavy, much more sophisticated satellites by which it has always set store were justifying their existence at every turn in space and had performed beautifully, in several cases, long past their expected lifetimes.

Moreover, says General Moorman, "The Air Force was concerned that the initial claims for lightsats were a bit optimistic and, in many respects, a little superficial and were quoting costs for building the satellites that the Air Force did not think could be realized.

"Also, it was not clear at the beginning of the debate what the requirements were [for lightsats], or what could be done to the satellites to make them inexpensive and have them meet the requirements."

Withal, says General Moorman, the debate over lightsats is "very healthy, because we always have to try to find ways to do things less expensively in space." It has led to an analysis of lightsats and their attendant infrastructure by the Defense Advanced Research Projects Agency (DARPA) in cooperation with USAF.

"There is an awful lot of pressure to drive down the cost of doing business in space," General Moorman declares. "The two primary components are the cost of the satellites and the cost of transporting them into space."

Driving down space transportation costs is the main goal of the Advanced Launch System (ALS) program being undertaken by the Air Force and NASA. It is aimed at developing the technologies of engines, structures, software, and ground-handling equipment for the next generation of US space launchers, and for incorporation of those technologies, if possible, in existing launchers as time goes by.

Here again, the SDI program is a driving force. The demands that the big, bulky, heavy SDI spacecraft are expected to make on Air Force launch systems if they are ever to be deployed in space caused USAF to begin exploring, a few years ago, concepts for heavy-lift launch vehicles (HLVs) that would do the trick. That work led in turn to the ALS program which, like SDI itself, is broader of scope and seems calmer of purpose than it was at first. ■

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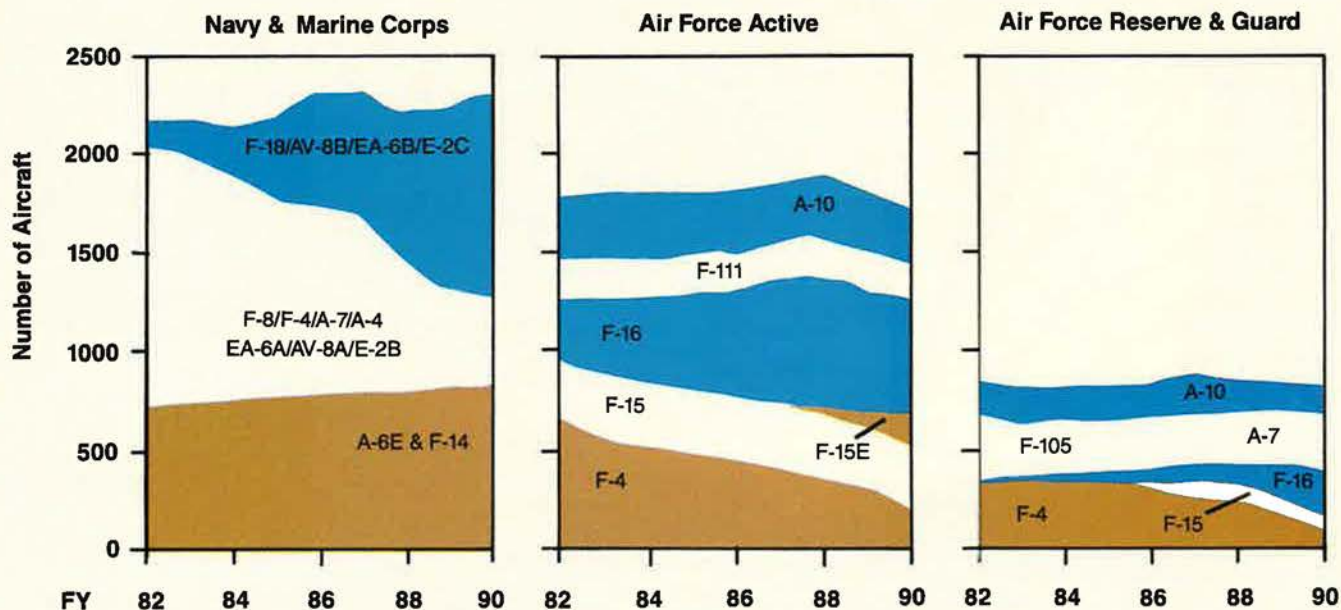
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The Chart Page

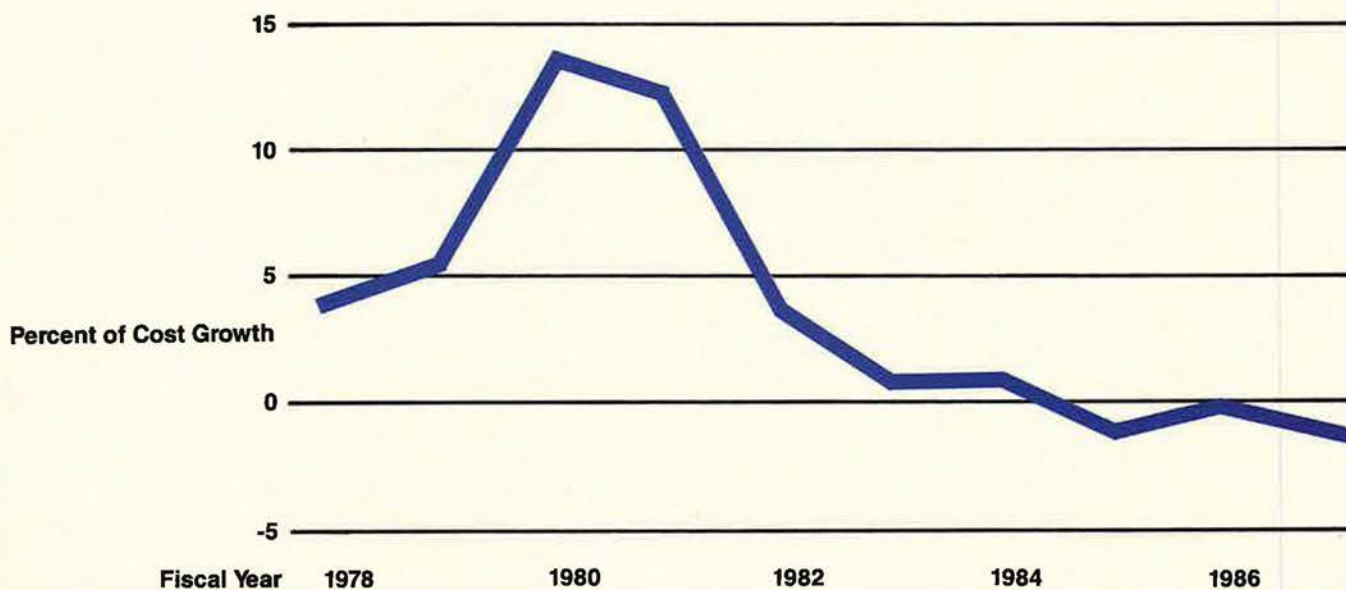
Edited by Colleen A. Nash, STAFF EDITOR

Tactical Air Forces Structure



Source: DoD Annual Report to Congress, FY '90

From Overruns to Underruns



This chart shows the annual rates of program cost growth (excluding economic and quantity changes) for weapons with minimum R&D costs of \$200 million or procurement costs of \$1 billion (1980 constant dollars).

Source: DoD Annual Report to Congress, FY '90

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By Brian Green, CONGRESSIONAL EDITOR

Washington, D. C.

Bush Budget Revisions

President Bush announced in a speech to Congress that the Fiscal Year (FY) 1990 defense spending request would be frozen at FY '89 levels, adjusted for inflation. Budget authority (the amount that can be legally obligated) would be set at \$299.3 billion, \$6.3 billion less than the last Reagan request. The Air Force top line in the budget request will be \$98.5 billion, down from \$100.5 billion.

President Bush also informed Congress of a revised long-term defense spending plan that includes one percent increases in FYs '91 and '92 and two percent increases thereafter. Many in the Air Force believe that those reductions could force a decision to cut deeply into force structure, acquisition, or readiness. Air Force Chief of Staff Gen. Larry Welch is on record as suggesting that modernization sacrifices may have to be made to keep a ready force fielded in the future.

Options for the Pentagon could be even tougher if Congress accepts the Senate Budget Committee estimate that the Bush revision underestimates defense budget outlays by \$3.0 billion. Outlay estimates are based on a calculation of current and past year budget authority that will be spent during a fiscal year. If the estimate is too low, cuts in FY '90 budget authority beyond those already recommended by the Bush Administration could be required to meet stringent deficit targets.

CBO Outlines Tough Choices

The Congressional Budget Office (CBO) issued a series of options for reducing the defense budget, including deferral of the B-2 Stealth bomber program, major reductions in SDI, slowing the F-16 and C-17 programs, cancellation of the F-15E and rail-garrison-based Peacekeeper ICBM, and reducing the tactical air forces by three wings to thirty-two.

The biggest savings, according to CBO, could be achieved by deferring the B-2 until 1993 and reducing SDI. While the Stealth spending profile is

classified, CBO says the outlay reductions for the Air Force through 1994 would be in the range of \$20 billion to \$30 billion. The Air Force believes this figure is inflated. Reducing the SDI increase requested by the Reagan Administration—forty-nine percent from FY '89 to FY '90—to five percent real growth would save \$880 million in outlays in FY '90. Holding the rate of growth steady at five percent would save \$14.1 billion through FY '94, according to CBO.

CBO claims a total of \$2.8 billion in reduced operating costs through FY '94 if the Air Force would eliminate three tactical wings. Such an approach, says CBO, "seems consistent with past Air Force decisions made in the face of limited budgets." The Air Force maintains that a force of thirty-five wings is the minimum needed to meet its commitments. (*For more on proposed force cutbacks, see "Back Through the Winger," p. 34.*)

COLAs Under Attack

Cost-of-Living Adjustments (COLAs) for retired military veterans and their widows and survivors receiving Survivor Benefit Plan (SBP) annuities would be eliminated in FY '90 in President Bush's budget proposal. Every year thereafter, COLAs would reflect the consumer price index (CPI) minus one percent. When a person reached age sixty-two, his or her retired pay would be recomputed as if fully adjusted by inflation from the date of retirement; annual CPI adjustments minus one percent would then resume.

Noncareer veterans and Social Security recipients are not affected by the proposal. The COLA reductions would be imposed, however, on not-yet-retired personnel who entered service prior to August 1, 1986. They had been exempted by the 1986 Military Retirement Reform Act.

Strategic Options Explored

A panel, two members of which were chairmen Rep. Les Aspin (D-Wis.) of the House Armed Services Committee (HASC) and Sen. Sam Nunn (D-Ga.) of the Senate Armed

Services Committee (SASC), identified ICBM vulnerability as the key strategic issue that must be addressed and recommended that top priority in strategic programs go to ICBM modernization. The panel's report recommends one of two ICBM options, either a road-mobile single-warhead Midgetman or "carry hard." The carry hard concept involves a relatively small number of ICBMs based in hardened launch canisters, each with its own launch-support equipment and deployed at one of a very large number of launch shelters. Carry hard could be used to deploy a two-warhead Midgetman, Peacekeeper, or Minuteman III. The report recommends that silo-based ICBMs, if not deployed in carry hard, be shifted to the third ICBM option, rail-garrison Peacekeeper, "as funds become available in the late 1990s."

Last year, Congress determined that only \$250 million of the \$600 million earmarked for R&D on rail-garrison Peacekeeper could be spent prior to February 15, to allow the new administration to set its ICBM priorities. The Bush Administration, off to a slow start on the defense program, has not yet determined how to spend its ICBM modernization funds. Representative Aspin and nineteen other House Democrats signed a letter asking President Bush to limit Peacekeeper deployment to fifty missiles, to "pull back" FY '89 funding for rail garrison (to roughly \$200 million for basic R&D, according to the HASC staff), and to pursue other strategic options "such as the survivable Midgetman missile." The Air Force still strongly supports rail-garrison basing for the Peacekeeper.

The report also recommends that "current plans for modernization of bombers and their associated weapons should be carried out. The completed B-1 force should continue to be deployed." The B-2 should be deployed after careful development, according to the report. Strategic defense should be geared toward enhancing deterrence and funded at current levels with modest annual increases, the report says. ■

By Jeffrey P. Rhodes, AERONAUTICS EDITOR

Washington, D. C.
★ Slightly more than three years after the space shuttle *Challenger* disaster and just over a year after letting the contract, the Air Force saw its decision to develop a new generation of unmanned space boosters come to fruition, as the first McDonnell Douglas Delta II booster successfully lifted off from Launch Complex 17 at Cape Canaveral AFS, Fla.

The February 14 launch also marked several other firsts. It was the first launch of an operational (Block 2 model) Navstar Global Positioning System (GPS) satellite and the first time the 1st Satellite Control Squadron at Falcon AFB, Colo., had taken command of a satellite.

The 128-foot-tall Delta II is an improved derivative of the Delta I, which has successfully boosted 170 out of 182 payloads into orbit since 1960. This first Delta II—and the next eight boosters as well—is the “interim” design, known as Model 6925. This version of the Delta II can boost 3,190-pound payloads into geosynchronous transfer orbit (GTO).

The remaining eleven Delta IIs that the Air Force has ordered (Model 7925) will feature strap-on solid-rocket motors made with lightweight graphite epoxy casings. These graphite epoxy motors will be six feet longer than the steel-encased motors on the Model 6925. The Model 7925 will be able to boost 4,000 pounds to GTO.

The Block 2 Navstar is the first of twenty-four Rockwell-built GPS satellites that will be launched by 1992. Twenty-one of the satellites will make up the operational constellation with three on-orbit spares. The GPS spacecraft will circle the earth in six different planes at an altitude that averages 11,000 miles. The Air Force plans to launch a new GPS satellite every sixty days. Two Navstars are still on the space shuttle payload manifest, but they may be switched to Delta IIs.

The Navstar satellites will be used by US and NATO military forces (airplanes, ships, ground vehicles, and ground troops) to provide three-dimensional position and velocity information with new accuracy. The satel-

The first McDonnell Douglas Delta II lifts off from Launch Complex 17 at Cape Canaveral AFS, Fla. The 128-foot-tall Delta II is the first of a new generation of space boosters ordered in the wake of the Challenger disaster. The rocket boosted the first operational Navstar Global Positioning System satellite into orbit. The Air Force plans to launch a Navstar satellite about every sixty days until the entire twenty-four-satellite constellation is in orbit.



lites will give receivers position data accurate to a fifty-foot-diameter circle anywhere on the globe. In many cases, accuracy will be to within ten feet. The GPS satellites will also give time data based on their internal atomic clocks, which are accurate to within one second every 300,000 years. In addition to the coded military signal, there will also be a clear acquisition signal for civilian users.

An indication of the importance of the GPS constellation is the incentive program the Air Force has established for McDonnell Douglas. The company will get \$3 million for every successful launch and a \$1 million bonus each year if all contract obligations are met. With one failure, McDonnell Douglas will have to forfeit all of the incentive payments. Two failures will result in forfeiture of all incentives and half the profits. Three failures will result in the company giving up all incentives and profits.

Approximately thirty-five minutes

after launch, 2d Space Wing's 1st Satellite Control Squadron crews at Falcon AFB's Mission Control Complex 1A assumed control of the satellite in its elliptical orbit. During the first two days the satellite was in orbit, crews collected data to ensure that the GPS spacecraft was working. On the third day, the satellite's motor was fired to boost it gradually into its permanent 11,000-mile circular orbit. The navigation system itself is operated by crews of the 2d Satellite Control Squadron at the Navstar Master Control Station, also at Falcon AFB.

★ The Air Force has completed its preliminary investigations into the crashes of two Rockwell B-1B bombers last fall and has pinpointed the probable causes of the mishaps.

The November 8 crash of a B-1B from the 96th Bomb Wing at Dyess AFB, Tex., was apparently caused by a fire that was fed by a fuel leak in the left overwing fairing. The fire de-

stroyed control lines. All four crewmen ejected safely.

The plane, piloted by Capt. Michael E. Waters, had returned to Dyess after a low-level training mission and was making touch-and-go landings. As the aircraft neared the departure end of the runway, ground observers reported seeing flames and puffs of smoke coming from the left engines. The crew then heard a loud bang, which was followed by the fuel leak. While the exact location of the fire's origin could not be determined, the flame pattern analysis of the wreckage indicated that the fire did not start in the engines.

The aircraft's central integrated test system survived the crash and provided a detailed record of the temperatures, pressures, and flow and quantity levels of fuel in the aircraft. The flow rate measurements in the overwing fairing area gave evidence of the fuel leak.

The Air Force blamed pilot error for the November 18 crash of a B-1B from the 28th Bomb Wing at Ellsworth AFB, S. D. The accident report determined that neither aircraft nor engine icing was a contributing factor in the mishap, although the weather at Ellsworth included light snow and fog at the time.

The Air Force said that Maj. Thomas C. Skillman, the aircraft commander, had missed on his first attempt, a non-precision instrument landing system approach. He then asked for a Tactical Air Navigation approach and, descending below standard altitude, struck three wooden poles approximately 2,900 feet from the end of the runway, a high-voltage power line, and an approach-light stanchion. All four crewmen ejected safely.

The report said that the pilot failed to "establish sufficient visual cues to determine the runway environment" before going below the minimum descent altitude. The copilot was faulted for failing to advise the aircraft commander that this procedure had been overlooked.

In a related note, the prototype Swedish Saab JAS-39 Gripen fighter crashed on landing on February 2 at the company's facility in Linköping. Test pilot Lars Radestrom suffered a broken arm and minor burns. It was the prototype's sixth flight. Preliminary investigations point to the failure of the aircraft to respond to inputs from the fly-by-wire control system.

★ There have been several interesting developments in the General Dynamics F-16 program. Here is a brief rundown:

Near the beginning of this year, **GD**

Lt. Col. John Plantikow, chief of the Standardization/Evaluation Division of the 380th Bomb Wing at Plattsburgh AFB, N. Y., recently became the first person to rack up 3,000 hours in the General Dynamics FB-111. Several of his "YOTs" (You Over There), or weapon systems officers, were present when he landed. Colonel Plantikow was also the first pilot to reach the 1,500-hour plateau in the FB-111, back in 1981. He averages about five and a half hours of flying time per week.



—USAF photo by 1st Lt. Cara Mason

delivered the first Block 40 F-16C to the Air Force. The Block 40 aircraft is the new F-16C/D baseline model, and it includes significant structural and avionics upgrades that have been developed through the F-16 Multinational Staged Improvement Program. The Block 40 will also be the baseline for deliveries to Bahrain, Egypt, Israel, and Turkey.

The main improvement in the Block 40 is provision for the Martin Marietta Low-Altitude Navigation and Targeting Infrared for Night (LANTIRN) system. This two-pod system will allow the F-16 to perform night and under-the-weather missions.

Other improvements include replacement of the original analog flight-control system with a four-channel digital system; an upgraded leading-edge flap-drive system; an improved APG-68 radar; a Navstar

Global Positioning System receiver; and an engine bay that will accommodate either the Pratt & Whitney F100 or the General Electric F110 powerplant. The aircraft's structure has been strengthened to allow for heavier loads at high-G maneuvers and an 8,000-hour airframe life.

Air Force Systems Command's Aeronautical Systems Division (ASD) at Wright-Patterson AFB, Ohio, recently awarded **GD a \$31,527,511 contract for development and construction of a Variable Stability In-flight Simulator Test Aircraft (VISTA).**

The VISTA test-bed will be an F-16D modified with reconfigurable flight controls and the capability to test integration of aircraft subsystems. Its electronics will include a variable stability system that can be programmed to imitate the characteristics of the aircraft being simulated (either a pro-



—USAF photo by SSGT. Donald Winner

Col. (Dr.) Forrest Riddle (right), flight surgeon from the 24th Medical Group at Howard AFB, Panama, supervises the loading of Maj. Dennis Gill, 24th Combat Support Group airfield operations commander, into an Army medevac helicopter. Major Gill, who was injured by a stingray while scuba diving near the mouth of the Panama Canal, recovered quickly in the hospital at Howard.

prototype or production version of an aircraft that is not an F-16).

The back seat of the VISTA aircraft will be the command cockpit, while the front seat will be the simulation cockpit. The simulation cockpit will have both center and sidestick controls; the stick, throttle, and rudder pedals will be run by the variable stability computer.

Calspan will design and integrate the variable stability system, and Bendix will provide modified F-16 production digital flight-control computers. It is scheduled to fly in 1990.

The VISTA aircraft will replace the thirty-one-year-old NT-33 in-flight simulator. The new aircraft is expected to support aeronautical research and development until about the year 2020.

The Air Force's **Aggressor training units** will be **converting to F-16s**. Even though the "dissimilar" aspect of Dissimilar Air Combat Training (DACT) will be lost, the F-16s better represent the capabilities of Soviet MiG-29s than do the aging and structurally weakened Northrop F-5Es they will replace.

The fifty-four Aggressor F-16s will be assigned to Nellis AFB, Nev.; RAF Bentwaters, England; Kadena AB, Okinawa, Japan; and Tyndall AFB, Fla. Nellis will receive between twenty and twenty-four F-16C/Ds this year for use in the ongoing Red Flag adversary exercises. Kadena (F-16C/Ds) and Tyndall (F-16A/Bs) will be fully equipped by 1990, while Bentwaters should receive its full complement of F-16C/Ds by 1991.

The Aggressor aircraft are flown by pilots specially trained in Soviet-bloc

tactics to provide realistic combat training. The Aggressor F-16s will be fully combat-capable (unlike the F-5s) and have Soviet-style paint schemes.

The first F-16A/Bs modified to the Air Defense Fighter version have been delivered to the Tactical Fighter Weapons Center at Nellis for testing. The ADF program will provide the F-16 with AIM-7 radar-guided missile capability; advanced Identification, Friend or Foe (IFF) capability; HF radio; a small-target-detection capability; and a spotlight mounted on the left side of the cockpit. The Ogden Air Logistics Center at Hill AFB, Utah, is currently scheduled to modify 270 F-16A/B aircraft for ten Air National Guard and two active-duty air defense units.

Finally, the "Flying Fiends" of the 51st Tactical Fighter Wing's **36th Tactical Fighter Squadron** at Osan AB, Korea, **became the latest unit to convert to the F-16.** The 36th TFS was reactivated on January 6. The unit's McDonnell Douglas F-4Es will be sent to other units or released for the Foreign Military Sales program.

★ APPOINTED—Ten US scientists have been selected to participate in the Soviet Phobos mission to Mars. This is the first mission in which American scientists have been formally selected under the 1987 Space Agreement between the US and Soviet Union. The Phobos probe will first orbit Mars and then fly by Mars's inner moon, Phobos. A lander will be deployed to take measurements on the surface of Phobos. The US Participating Scientists are Thomas C. Duxbury (Jet Propulsion Laboratory), Bruce C.

Murray (Cal Tech), Bradford A. Smith and William V. Boynton (University of Arizona), Frazer Fanale and Dale Cruickshank (University of Hawaii), James W. Head (Brown University), Norman F. Ness (University of Delaware), Andrew F. Nagy (University of Michigan), and Gary Olhoefft (US Geological Survey).

Soviet **Gen. Petr Lushev**, sixty-five, has been appointed as the **new Warsaw Pact commander in chief**, the Soviet news agency TASS reported in early February. He replaces Marshal Viktor Kulikov. General Lushev has held the post of commander in chief of Soviet troops in the German Democratic Republic.

★ HONORS—Capt. Marjorie Graziano, a flight nurse with the 2d Aeromedical Evacuation Squadron at Rhein-Main AB, West Germany, was recently presented the Dolly Vinsant Award, which is given annually to the top Air Force evacuation nurse. The award, presented by the Confederate Air Force, is named in honor of Wilma "Dolly" Vinsant, the only American flight nurse killed in the line of duty during World War II.

Maj. Gen. M. Gary Alkire, Commander of Air Force Commissary Service, **became the first person inducted into the AFCOMS Order of the Sword**, the highest honor that the enlisted force can bestow on an individual, in late January. General Alkire was cited by his enlisted force for his emphasis on mixing military and civilian workers in management positions.

★ PURCHASES—In late February, the Army's Natick Research Engineering and Development Command awarded **AAI Corp.** a \$13.5 million contract to **design, build, and test a new system for air-dropping heavy cargo** from low-flying military aircraft. Known as the Low-Altitude Retrorocket System (LARRS), the new system will permit pinpoint drops of military vehicles, weapons, and other cargo weighing up to thirty tons from altitudes as low as 300 feet. AAI is based in Hunt Valley, Md.

Air Force Systems Command's Aeronautical Systems Division (ASD) awarded **Bendix Communications** of Baltimore, Md., a \$161.9 million contract to **develop the Mark XV Identification, Friend or Foe (IFF) system.** **Raytheon**, based in Lexington, Mass., **will be the second-source producer.** The Air Force plans to buy more than 10,000 of the secure, antijam Mark XV sets at a cost of approximately \$5 bil-



Painted to resemble a Soviet MiG-29, one of the F-16Cs to be used for Aggressor training makes an acceptance flight from the General Dynamics plant in Fort Worth, Tex., to Nellis AFB, Nev., where eventually up to twenty-four of the aircraft will be assigned. The Aggressor F-16s will be fully combat-capable.

lion. The electronic question-and-answer system will replace the Mark XII IFF and will be installed in more than seventy Air Force, Army, and Navy aircraft, all Navy ships, and several Army air defense systems. West Germany, Britain, Italy, and France are participating in the development effort. The first Mark XV test articles are expected to be delivered in 1992.

The **Chinese People's Liberation Army (PLA)** has bought six **Boeing CH-47D Chinook medium-lift helicopters** for routine military support missions and to provide civilian disaster relief anywhere in China. The deal, worth more than \$100 million, includes aircraft spares, but excludes engines, engine tools, and engine spares. Boeing Helicopters will build the Chinooks at its plant in Philadelphia, Pa., and will train a cadre of PLA pilots and maintainers. The company will also provide technical support.

In the first competitive buy of the **Navy's AIM-54C Phoenix air-to-air missile**, **Raytheon**, the second-source producer, edged out **Hughes**, which had developed the missile. Raytheon's Missile Systems Division in Bedford, Mass., received a \$140.3 million contract for 208 (51.6 percent) of the 403-round procurement. Hughes's Missile Systems Group in Tucson, Ariz., will build the remaining 195 missiles on a \$131.9 million contract. The AIM-54s are to be delivered by September 1991.

In another case in which the second-source manufacturer beat out the lead contractor, **Martin Marietta Missile Systems** in Orlando, Fla., will build **sixty-five percent of the Army's FY '89 buy of AGM-114 Hellfire anti-armor missiles**. Martin Marietta received a \$113.8 million contract for 4,550 AGM-114s. **Rockwell Missile Systems Division** will build the remainder of the 7,000-round buy. All of the missiles are to be delivered by July 1991.

Norway has issued the team of **Hughes** and the Norwegian company **Norsk Forsvarsteknologi (NFT)** a \$12.5 million contract to design and test a **mobile air defense system that will be the first surface-to-air application of the AIM-120A Advanced Medium-Range Air-to-Air Missile (AMRAAM)**. A Norwegian Advanced Surface-to-Air Missile System (NASAMS) battery will consist of three Hughes TPQ-36A three-dimensional radars, three NFT fire-distribution centers, and up to nine launchers, each with six AMRAAMs. The fire units will be linked to each other, and the missiles can be remotely located up to fifteen miles away from the centers.

Amn. Lori Meyers became the first female member of the Air Force Honor Guard's Drill Team when she was selected after recent tryouts. She was the third female to try out in the Drill Team's thirty-nine-year history.



—USAF photo by SSGT. Brigitte L. Wright

★ **DELIVERIES**—The first of fifty upgraded **Teledyne Ryan BQM-34A Firebee drones** was delivered to the **Air Force** in ceremonies at the company's San Diego, Calif., plant on January 17. The upgrades to the Firebee, which was developed in the 1950s, include a Microprocessor Flight Control System (MFCS) and a J85-100 engine that has been recycled after use in manned aircraft. The MFCS features automatic speed controls and automatic in-flight self-test and fault diagnostic capabilities. The drones will be delivered to the 82d Tactical Aerial Target Squadron at Tyndall AFB, Fla.

Martin Marietta delivered the first of four preproduction Air Defense Antitank System (ADATS) vehicles to the Army's White Sands test range in New Mexico in early February. The missile/armored vehicle combination is the Line of Sight Forward-Heavy (LOS-F-H) part of the Army's five-part Forward Area Air Defense System (FAADS). The four ADATS units (each built on an M2 Bradley Fighting Vehicle chassis) will undergo preliminary testing until October, when initial operational test and evaluation (IOT&E) is scheduled to begin. IOT&E will run until January 1990, and a full-rate production decision is expected next spring.

★ **MILESTONES**—Two more all-male bastions have fallen. For the first time in the thirty-nine-year history of the **Air Force Honor Guard Drill Team**, one of its twenty members will be a woman. Amn. Lori Meyers practiced for six months and was selected early

this year. The Drill Team performs an eighteen-minute routine that consists of precise movements with fourteen-pound M1 carbine rifles and fixed bayonets. The routine includes a series of complex tosses and exchanges. Airman Meyers has been in the Honor Guard since April 1988.

For the first time in the 213-year history of the US Navy, a woman has been designated as a prospective commanding officer. Cmdr. Deborah S. Gernes, executive officer of the repair ship **USS Cape Cod (AD-43)**, along with eighty-six male officers also in the selection pool, could assume command of a ship in mid- to late 1991. Although Commander Gernes, a sixteen-year Navy veteran, could be the Navy's first female skipper, she is prohibited by law from serving on combat ships. She is eligible to command a fleet oiler, repair, salvage, combat logistics, or ammunition ship.

Under a company-funded effort, **Bell Helicopter Textron flew its newest, all-composite, four-blade, bearingless rotor system for the first time** on January 24. The new rotor was flown on an **AH-1W "SuperCobra"** lent to Bell by the Marine Corps. The "Whiskey Cobra" had its twin blades replaced by four blades that give the helicopter more blade area than the AH-64 Apache. The new rotor, based on Bell's bearingless 680 rotor, is intended for long life, has high ballistic tolerance, dramatically reduces vibration, and should improve the helicopter's maneuverability. After being tested, the four-blade AH-1W will be demonstrated to

the Marines and offered for an operational evaluation.

The Navy successfully carried out the nineteenth and final pad launch of the Lockheed UGM-133A Trident II, or D5, sea-launched ballistic missile on January 26. The forty-four-foot-tall, seven-foot-diameter missile lifted off from Launch Complex 46 at Cape Canaveral AFS, Fla., and traveled an undisclosed distance before its inert reentry vehicles landed in the Eastern Missile Test Range in the Atlantic. This launch marked the sixteenth successful launch in eighteen valid tests, with one shot being ruled a "no test." A twentieth pad test was canceled. The first submarine launch will occur later this year.

Both Rocketdyne and Pratt & Whitney recorded milestones during January in their respective National Aerospace Plane (NASP) engine design efforts. Rocketdyne successfully completed tests of a 1/7-scale model of its NASP scramjet engine in the wind tunnel at NASA's Langley Research Center in Hampton, Va. All components of the engine from inlet to exit nozzle were checked at simulated flight conditions ranging from five to eight times the speed of sound. P&W successfully tested a full-scale heat pipe in a cowl section that demonstrated a heat flux more than 100 times greater than any attained before. The heat pipe enabled the cowl section to survive Mach 20 conditions, including a surface temperature of about 3,500 degrees. This test was conducted in a vacuum chamber at P&W's West Palm Beach, Fla., facility.

The latest test of the Rockwell AGM-130 rocket-powered glide bomb marked several milestones. The successful January 26 launch over the Gulf Test Range near Eglin AFB, Fla., was the first time the weapon had been fired from an F-111, the first launch over water at a ship target, the first launch from an altitude of 20,000 feet, and the first extended-range launch—twenty-four miles. The launch was the fourth consecutive success for the AGM-130 and the first of three development, test, and evaluation (DT&E) launches from an F-111.

Longevity Milestone No. 1—When Air Force Systems Command's Space Division's Space Test Program launched the Spacecraft Charging at High Altitude (SCATHA) satellite on January 30, 1979, the experiment was expected to stay in orbit for only three years. During periods of high solar radiation or solar flares, satellites become highly charged. Ten years later,

nine of the thirteen instruments on the \$32.1 million satellite are still operational. SCATHA was designed to monitor other satellites in near-geosynchronous orbit and gather information on the electrical charging phenomena, which in turn, was used to help design other satellites.

Longevity Milestone No. 2—Northrop completed the 3,806th and last aircraft in the F-5/T-38 series on February 16. After final assembly, the "Tail-end Charlie" F-5E will be delivered to Singapore this summer. The last F-5s procured under the Foreign Military Sales (FMS) program, aircraft numbers 2,609 and 2,610 built, were delivered in January 1987. At peak production in the 1960s, Northrop was turning out a new F-5 or T-38

every one-and-one-half working days. More than thirty countries fly F-5s. Six countries coproduced or built F-5s under license.

★ NEWS NOTES—The Department of Defense announced in early February that the annual Reforger (Return of Forces to Germany) exercise for 1989 will be postponed, and a modified Reforger will be held from January to March 1990. The Reforger Enhancement Program will integrate new computer simulation technology, command-post exercises, and field-training exercises to get maximum training value from the entire Reforger exercise. In addition, a command field exercise, which trains commanders and their staffs at differ-

April Anniversaries

- April 24, 1909: Wilbur Wright pilots a Wright biplane at Centocelle, Italy, from which the first aerial motion picture is taken.

- April 25, 1914: Navy Lt. (j.g.) P. N. L. Bellinger, flying a Curtiss AB-3 flying boat from the battleship USS *Mississippi* (BB-23), makes the first US operational air sortie against another country when he searches for sea mines during the Vera Cruz incident.

- April 6, 1924: Leaving Lake Washington near Seattle, Wash., four Army Air Service crews begin the first circumnavigation of the globe by air. The four Douglas World Cruisers (modified DT-2 torpedo bombers) are christened *Seattle*, *Chicago*, *Boston*, and *New Orleans* and were purchased at a cost of \$192,684, which included fifteen spare engines, fourteen sets of replacement pontoons, and 200 percent airframe replacement parts. The spares and replacements were dispersed around the world to help support the flight.

- April 24, 1929: Elinor Smith, at age seventeen, sets a women's solo endurance record of twenty-six hours, twenty-one minutes, and thirty-two seconds in a Bellanca CH monoplane at Roosevelt Field, Long Island, N. Y.

- April 3, 1939: President Franklin D. Roosevelt signs the National Defense Act of 1940, which authorizes the Army Air Corps to have a \$300 million budget and 6,000 airplanes and increases AAC personnel to 3,203 officers and 45,000 enlisted troops.

- April 11, 1944: Led by Royal Air Force Wing Commander R. N. Bateson, six de Havilland Mosquitos of 613 Squadron bomb an art gallery at The Hague where population records are kept. These records, many of which were destroyed, had been used by the Gestapo in efforts to suppress the Dutch resistance.

- April 4, 1949: Meeting in Washington, the foreign ministers of Belgium, Britain, Canada, Denmark, France, the Netherlands, Iceland, Italy, Luxembourg, Norway, and Portugal, along with the US Secretary of State, sign the North Atlantic Treaty.

- April 1, 1954: President Dwight D. Eisenhower signs into law a bill creating the Air Force Academy.

- April 2, 1959: Chosen from a field of 110 candidates, seven test pilots—Air Force Capt. Leroy G. "Gordo" Cooper, Jr., Virgil I. "Gus" Grissom, and Donald K. "Deke" Slayton; Navy Lt. Cmdrs. Alan B. Shepard, Jr., and Walter M. "Wally" Schirra, Jr., and Lt. M. Scott Carpenter; and Marine Lt. Col. John H. Glenn, Jr.—are announced as the Project Mercury astronauts.

- April 15, 1959: USAF Capt. George A. Edwards sets a new speed record of 816.279 mph in a McDonnell RF-101C Voodoo on a 500-km closed course at Edwards AFB, Calif.

- April 20, 1959: The prototype Lockheed UGM-27A Polaris sea-launched ballistic missile successfully flies a 500-mile trajectory in a Navy test. Three days later, the Air Force carries out the first test of the North American GAM-77 Hound Dog air-launched strategic missile at Eglin AFB, Fla.

- April 6-13, 1984: The eleventh US space shuttle mission (41-C) is a spectacular success as the defective Solar Max satellite is repaired in orbit. After mission specialist George "Pinkie" Nelson fails to capture the satellite on his spacewalk, T. J. Hart uses *Challenger's* remote manipulator arm to catch Solar Max on the fly. Nelson and James "Ox" Van Hoften repair the satellite in the shuttle's payload bay before it is rereleased.

Adm. William J. Crowe (left), Chairman of the Joint Chiefs of Staff, and Ted Danson, star of the NBC-TV sitcom "Cheers," trade jokes during a break in filming. Admiral Crowe, an avid fan of the show, played a central role in an episode that aired in March. The Admiral frequently quotes the wit and wisdom of Norm Peterson, a "Cheers" character played by George Wendt, in his many talks and speeches.



Senior Staff Changes

RETIREMENTS: B/G Edward N. Giddings; B/G Clarence H. Lindsey, Jr.; B/G Joel M. McKean.

CHANGES: B/G (M/G selectee) **Malcolm B. Armstrong**, from Vice Dir., Operational Plans and Interoperability, J-7, OJCS, Washington, D. C., to Dir., Operational Plans and Interoperability, J-7, OJCS, Washington, D. C. . . . **Col. (B/G selectee) William E. Collins**, from Cmdr., Goodfellow TTC, ATC, Goodfellow AFB, Tex., to Spec. Ass't to DCS/L&E for R&M, and Spec. Ass't to Ass't Sec'y of the Air Force for Acq. for R&M, Hq. USAF, Washington, D. C., replacing retired B/G Frank S. Goodell . . . **M/G Robert D. Eaglet**, from Prgm. Dir., F-16 SPO, Hq. ASD, AFSC, Wright-Patterson AFB, Ohio, to Ass't Dep. to Ass't Sec'y of the Air Force for Acq., Hq. USAF, Washington, D. C., replacing retiring M/G Donald L. Lamberson.

Col. (B/G selectee) Ralph H. Graham, from Prgm. Dir. for Recon. and EW, Hq. ASD, AFSC, and Dir., Air Force EC Office, AFLC/AFSC, Wright-Patterson AFB, Ohio, to Prgm. Dir., F-16 SPO, Hq. ASD, AFSC, Wright-Patterson AFB, Ohio, replacing M/G Robert D. Eaglet . . . **Col. (B/G selectee) James E. McCarthy**, from DCS/E&S, Hq. PACAF, Hickam AFB, Hawaii, to Dep. Dir., E&S, DCS/L&E, Hq. USAF, Washington, D. C., replacing M/G Joseph A. Ahearn . . . **B/G James C. McCombs**, from Cmdr., US Forces Azores, USLANTCOM, and Cmdr., 1605th MASW, Twenty-First AF, MAC, Lajes Field, Azores, to Dir. of Transportation, DCS/L&E, Hq. USAF, Washington, D. C., replacing retired B/G Clarence H. Lindsey, Jr. . . . **Col. (B/G selectee) John D. Wood**, from DCS/Pers., Hq. AFLC, Wright-Patterson AFB, Ohio, to Vice Cmdr., San Antonio ALC, Kelly AFB, Tex., replacing B/G W. John Soper.

SENIOR EXECUTIVE SERVICE (SES) CHANGES: **Edward T. Constable**, from Dep. Dir., Contract Appeals, AF Contract Law Ctr., Wright-Patterson AFB, Ohio, to Dep. Staff Judge Adv., Hq. AFLC, Wright-Patterson AFB, Ohio . . . **Ted M. Lynch**, from Dir., Engineering, Airlift & Trainer Sys., Hq. ASD, AFSC, Wright-Patterson AFB, Ohio, to Dir., Engineering, C-17, Hq. ASD, AFSC, Wright-Patterson AFB, Ohio.

SCIENTIFIC AND PROFESSIONAL (ST) CHANGES: **Dr. Brendan B. Godfrey**, from Vice Pres., Operations Mission Research Corp., Albuquerque, N. M., to Chief Scientist, Hq. AFWL, AFSC, Kirtland AFB, N. M. . . . **John A. Graniero**, from Electronics Engineer, Dir. of Communications, RADC, Griffiss AFB, N. Y., to Tech. Adv., Dir. of Communications, RADC, Griffiss AFB, N. Y. . . . **Dr. David F. O'Brien**, from Dep. Dir., Advanced Sys., Hq. AFTAC, Patrick AFB, Fla., to Chief Scientist, Hq. AFTAC, Patrick AFB, Fla. ■

ent levels of command, will also be staged. Reforger '90 will also involve fewer troops than had participated in previous exercises. A corps-level exercise called Caravan Guard will be held in the fall to test the improved training techniques planned for Reforger '90.

The US and Canada recently agreed to an extension of the 1983 Cruise Pact, which allows for US testing of cruise missiles over Canada. The extension allows for testing of up to seven General Dynamics/McDonnell Douglas AGM-129A Advanced Cruise Missiles (ACMs) or Boeing AGM-86 cruise missiles per year. The US-Canada agreement will be in effect until 1993.

The conflict isn't over yet, but Pacific Air Forces did win a major battle recently in the war on paperwork. During its annual "Pack Rat Day," classified-document handlers throughout the command destroyed the equivalent of more than 145 five-drawer containers full of classified records. With unneeded classified material destroyed, there is less chance of a security breach, and in places like Korea, which would be the front lines of a conflict, far fewer classified documents would need to be destroyed should hostilities break out. In a parallel program to keep PACAF headquarters publications and supplements simple, useful, and to a minimum, twenty-seven percent of 390 publications were rescinded, and thirty-five percent of 389 supplements were revised or rescinded.

The University of Texas at San Antonio and Air Force Systems Command's Human Systems Division (HSD) at Brooks AFB, Tex., signed a first-of-a-kind agreement on January 17 that will promote the transfer of technology from the government to the private sector. HSD's Human Resources Laboratory at UT-SA will cooperate in designing, developing, testing, and evaluating knowledge-based (artificial intelligence) systems for various applications in educational and training fields. HSD has lent two graphics computer terminals to UT-SA for five years for the work. The agreement was made possible by the Federal Technology Transfer Act of 1986.

In a change to the Air Force's new Specialized Undergraduate Pilot Training (SUPT) program, both tanker/transport and bomber/fighter candidates will be trained at each of Air Training Command's five pilot training bases. Reese AFB, Tex., Vance AFB, Okla., and Columbus AFB, Miss., were to have been dedicated tanker/transport pilot training bases,



Except for a suspension of activity when the temperature bottomed out at minus 110 degrees, the *Brim Frost '89* exercise went off as planned. The biennial Joint Chiefs of Staff exercise, held in Alaska, involved 26,000 people, 120 aircraft, 1,000 vehicles, and hundreds of tons of equipment. The security police detachment at Clear AFS (shown here), a Ballistic Missile Early Warning System radar complex, mounted a "defense" against an "opposition" force trying to enter the site as part of the exercise.

while Laughlin AFB, Tex., and Williams AFB, Ariz., were to have been the bomber/fighter training bases. The change is expected to provide flexibility in training.

The 135th in a series of Follow-on Operational Test (FOOT) launches of the Boeing LGM-30G Minuteman III intercontinental ballistic missile was successfully carried out from Vandenberg AFB, Calif., early in the

morning of January 25. The missile and its launch and maintenance crews came from the 341st Strategic Missile Wing at Malmstrom AFB, Mont. Two days earlier, the Navy successfully conducted the thirty-first demonstration and shakedown operation (DASO) launch of a Lockheed UGM-96A Trident I, or C4, sea-launched ballistic missile off the coast near Cape Canaveral AFS, Fla.

The launch was conducted to qualify the USS *Benjamin Franklin* (SSBN-640), a backfitted Poseidon submarine, and its crew to deploy with the Trident I. It was the fifty-sixth C4 launch.

Air Force Logistics Command (AFLC) will move program management of all contractor-supported Air Force aircraft to the Oklahoma City Air Logistics Center at Tinker AFB, Okla. The move will create a single management point for all Contractor Logistics Support (CLS) aircraft. Four of the five ALCs were managing CLS aircraft. In addition to the KC-10A, E-4B, C-137, C-22A, EC-18, and coming VC-25A aircraft, Oklahoma City ALC will now manage the C-9, T-43, C-131, T-41, C-21, C-29A, E-9A, C-20A/B/F, C-23, C-140, as well as the planned C-26, C-27, and Tanker/Transport Training System (TTTS) programs.

Military Airlift Command has been providing humanitarian airlift to some of the survivors of the earthquake that devastated Armenia late last year. Thirty-seven severely injured children with their guardians and doctors were flown from Moscow and Yerevan to Andrews AFB, Md., by C-141B crews from the 437th Military Airlift Wing at Charleston AFB, S. C., in early February. Twelve of the children were then flown to civilian hospitals in Buffalo and Syracuse, N. Y., by C-9 crews from the 375th Aero-medical Airlift Wing at Scott AFB, Ill. The other children are now being treated in civilian hospitals across the US. MAC active-duty, Guard, and Reserve units have now flown more than 885,000 pounds of relief supplies into Yerevan.

★ **DIED—Sir Thomas Octave Murdoch Sopwith**, famed British pilot and aircraft designer, in his sleep at his home in Brooklands, England, on January 27. He was 101. Born in London in 1888, Sir Thomas taught himself how to fly in 1910, and he became a test and racing pilot the next year. He set up a flying school in 1912. Two of his pupils were Harry Hawker (whose company Sir Thomas would later head) and Hugh Trenchard, who was known as the "father" of the Royal Air Force. Sir Thomas's company built more than 16,000 airplanes (which included 6,000 Camels alone) during World War I. He later launched the Hawker Hurricane, the backbone of the RAF during the Battle of Britain, as a private venture. Sir Thomas was Britain's thirty-first licensed pilot, and he loved to race—planes, cars, motorcycles, and sailboats. ■

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First the goal was forty-four tactical wings. It's now down to thirty-five—and even that level is under scrutiny for budget reduction.

Back Through the Wringer

BY JOHN T. CORRELL
EDITOR IN CHIEF

IF THINGS had gone according to plan, the tactical air forces would have reached a strength of forty wings in 1986, leveling out at forty-four sometime this year. That was the schedule prescribed in the original defense recovery program in 1981.

Before the Air Force drew anywhere near such numbers, though, the recovery ran out of gas. It ground to a halt in 1985, and since then, the defense budget has fallen 11.4 percent behind inflation.

Two years ago, the Air Force announced that it would postpone building beyond the thirty-seven combat-coded fighter and attack wings it had then. Last year, after funding for the Five-Year Defense Plan was "reshaped" downward by \$230 billion, the Air Force lowered the level again, this time to thirty-five wings.

More budget reductions are now on the way, so the thirty-five-wing force may not be secure either. In February, the Congressional Budget Office published a long shopping list of federal cost-cutting options. One of them was to take another three wings out of the tactical air forces.

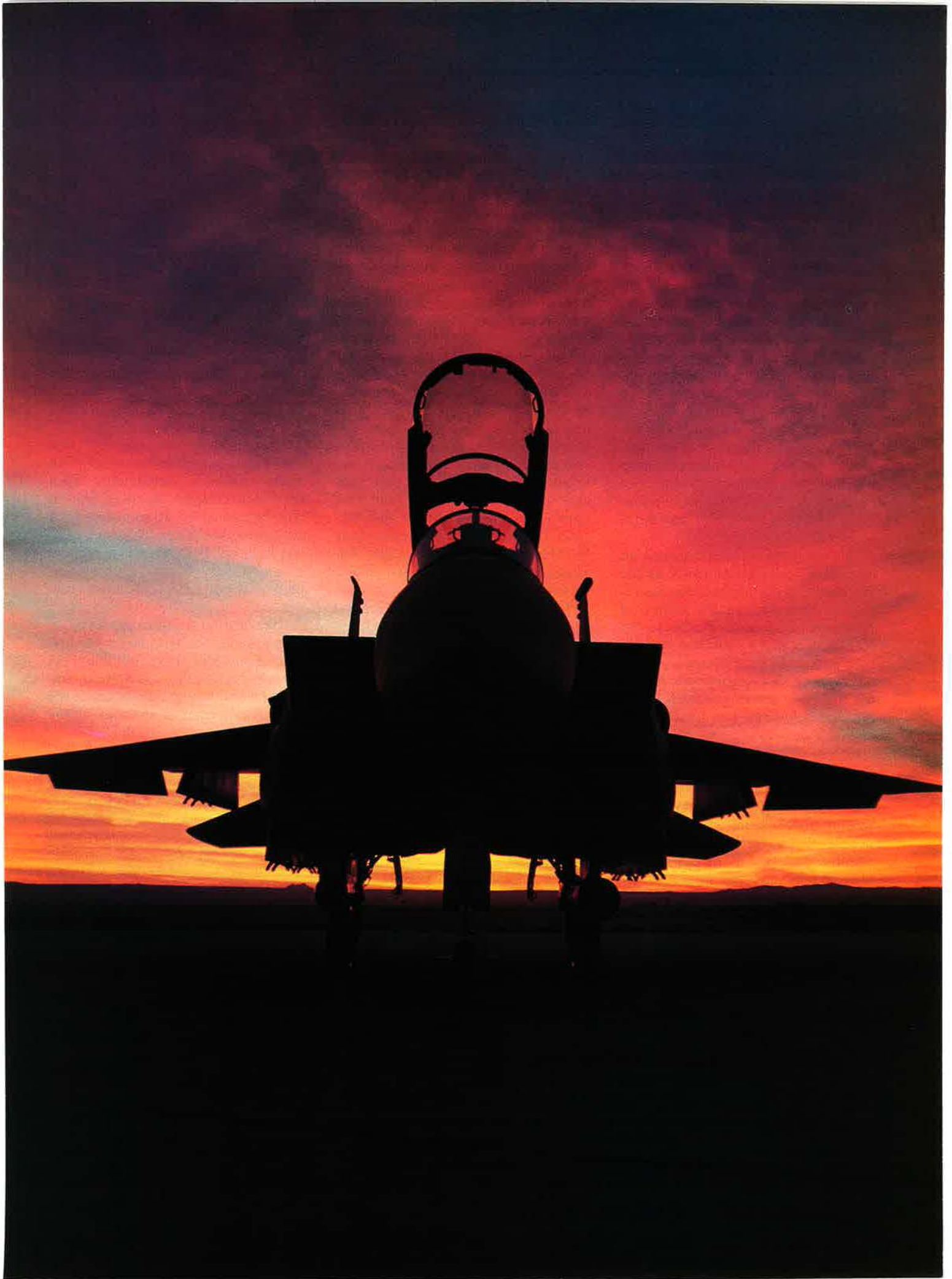
By CBO's calculations, falling back to a thirty-two-wing force can save \$3.6 billion in operating costs over the next five years. Further economies would be possible in aircraft procurement, CBO noted, since a smaller tactical force would need fewer airplanes.

The thirty-two-wing force is only one cost-cutting option, of course, and there would be fierce opposition to a step that radical. (CBO is not pushing this option or any of the others on its list. Its job is to identify cost-cutting possibilities and estimate their value in savings.)

But even optimists in the Pentagon concede that defense will do no better than the "zero real growth"—meaning an inflation-adjusted freeze—that President Bush is requesting for FY '90. That means substantial reductions from the budget the outgoing Reagan Administration sent to Congress in January. It had asked for two percent real growth in defense, in keeping with the formula established by the "budget summit" in late 1987.

The tactical forces will share significantly in the damage. Their budget share is too big to pass over. They account, for example, for

With the first F-15E unit slated to become operational this fall, the Air Force's wait for the "superb" dual-role fighter (right) appears to be nearing its end. Not even the F-15E program, however, is immune to harsh questions and criticisms as Washington struggles to cope with defense budget cuts and uncertainties. Pressing for the full complement of F-15Es shapes up as a priority task for Air Force leaders.



about thirty percent of the Air Force's total spending. Something will have to give in force structure, modernization, or readiness and sustainability.

Grappling With Budgets

Air Force leaders, appearing at an AFA symposium on tactical warfare January 26-27 in Orlando, Fla., described the difficulty of planning and fielding effective forces when the budget assumptions keep changing.

Gen. Larry D. Welch, Air Force Chief of Staff, is incensed by the "chorus of critics" who blame the armed services for the mismatch between the lowered budgets and a "bow wave" of bills due. He attacked the "loose and unwarranted charge that somehow [we in] the services have been allowed to develop whatever we wanted without concern for the future budget implications. That is complete and total nonsense.

"Every program went through an agonizing, detailed scrutiny in the Air Force, in the Office of the Secretary of Defense, in the Office of Management and Budget, by legions of staffers, and by congressmen and senators. If there is indeed a bow wave showing up now, it's not because the waves are higher. It's because someone has lowered the ocean."

Other critics, he said, complain that the services have no coherent strategy or that they are developing the wrong weapon systems for the requirements ahead. Many of these people, he charged, "have a hidden agenda, and that is to cut the defense budget with the minimum appearance of pain."

There is less disagreement about strategy than all the talk might suggest. "The real issue is not strategy," General Welch said. "The real issue is not the programs. The real issue is the budget."

Lt. Gen. James P. McCarthy, Deputy Chief of Staff for Programs and Resources, gave the symposium his projection of what zero-growth funding would mean to the Air Force.

The impact in FY '90 will be a reduction of \$2.7 billion if the cuts are allocated proportionately. If the zero-growth pattern were to continue for the full course of the Five-

Year Defense Plan, the Air Force would lose \$40.9 billion.

President Bush's stated intention is to seek one percent real growth for defense in FY '91 and two percent in FY '92. Whether he will get it or not remains to be seen. The mood on Capitol Hill is against any increase in defense spending.

Focusing the zero-growth implications on the specific concerns of the symposium audience, General McCarthy said that the tactical air forces stand to take cuts of \$800 million this year and perhaps \$12.3 billion over the next five years.

How much is a billion dollars when choosing where to cut? General McCarthy cited several examples, each of which would yield savings of approximately that amount if eliminated: half of the annual procurement of tactical missiles, twenty percent of all tactical operations and maintenance for a year, one year's worth of O&M for five tactical fighter wings, twenty-four F-15Es, fifty F-16s, or 1,600 Advanced Medium-Range Air-to-Air Missiles (AMRAAMs).

That list illustrates what General McCarthy meant when he said that tough decisions lie ahead.

Tactical Forces Today

The tactical air forces—active duty, Air National Guard, and Reserve—are in impressive condition

today. The money spent earlier on modernization and increased training shows.

The most obvious change in recent years has been the steady phaseout of the Vietnam-era F-4 Phantom and the corresponding growth of the F-16 fleet. Tactical Air Command says that by 1994, half of its aircraft will be F-16s. The Air National Guard and the Air Force Reserve have been reequipped along with the active-duty forces.

Much of the force modernization has been achieved by upgrades and modifications of existing systems instead of procurement of all-new ones. The F-15E, for example, is a variant of the basic fighter, now outfitted for a dual air-superiority and deep-interdiction role.

"Because of that approach, the F-4 remained viable for twenty-five years," General Welch said. "That approach brought the F-16 from a day fighter to an around-the-clock multimission fighter. That approach has kept the F-15 the world's finest air-superiority fighter over a fourteen-year period, which is unprecedented.

"We are sometimes accused of being fascinated with new systems. The record will prove that that's not true. We rely more and more on upgrading and taking advantage of the growth potential of systems we already own."



AMRAAM—the Advanced Medium-Range Air-to-Air Missile—is seen as a near-term high priority for air-to-air forces. The missile, shown here at the Hughes facility in Tucson, Ariz., would greatly extend the fighting range of current and future fighters. Raytheon is the second-source manufacturer.

The venerable F-111s of USAFE, such as these aircraft based at RAF Upper Heyford in Great Britain, currently give the US Air Force its only all-weather, day-or-night strike capability in the European theater. F-15Es and F-16s fitted with the LANTIRN navigation-targeting system would expand that power, but plans call for keeping the F-111s and other types of older planes up to date and in service for years to come.



Gen. Robert D. Russ, Commander of TAC, listed for the symposium audience the system priorities of the tactical air forces. The foremost requirements for the air-to-air mission are the Advanced Tactical Fighter (ATF) and AMRAAM. Top priorities among air-to-ground systems are the F-15E fighter-bomber, the Low-Altitude Navigation and Targeting Infrared for Night (LANTIRN) system, and a variant of the F-16 for close air support. (*See "What's Bogging Down the Air-Land Fighter?" p. 40.*)

General Welch said that the ATF was "exactly on schedule" in the demonstration/validation phase of acquisition, but that the Air Force had decided to add a year to the full-scale development (FSD) phase because that "is going to be a bigger task than was recognized at the outset."

Gen. Bernard P. Randolph, Commander of Air Force Systems Command, dismissed as untrue "those dumb articles in the paper about how we're compromising and we're backing off on requirements and things aren't happening in the ATF." But, he added, "we're going to be sure when we sign the FSD contract it's something that industry can produce and the government can afford."

General Russ said that the Air Force is still looking for the ATF to

be an airplane that cruises at Mach 1.5 in military power; has nine-G maneuverability and low infrared, radar, and visual signatures; and achieves survivability through a combination of speed and stealth. Compared with current fighters, the ATF should require a third fewer people for support and two-thirds less airlift for deployment.

The baseline has not changed. It calls for the ATF to weigh no more than 50,000 pounds and for a unit cost of \$35 million in 1985 dollars. Minor variation from that might not kill the program, General Russ said, but "the higher it goes over the baseline that we've established, the more difficult it becomes to sell the airplane."

A Choice of Biscuits

General Russ declared that AMRAAM, which will be the primary ordnance for the ATF, has been "the most successful air-to-air missile program we've ever had. Seventy-seven percent of the missiles we have fired have been successful." The probability of kill with one AMRAAM is better than that for two of today's AIM-7 Sparrows, he said. AMRAAM is now in low-rate production.

Gen. Merrill A. McPeak, Commander in Chief of Pacific Air Forces, told the symposium audience that AMRAAM is the number-

one near-term priority for his command. It's needed, he said, "not just for air defense but also to give the F-16 the capability to fight its way in to the target and back."

"We simply don't have the force structure out there to escort all of our attack packages. In many situations, F-16s will escort themselves. With today's threat, that means penetrating against fourth-generation, look-down/shoot-down aircraft. Our current F-16s, equipped only with heat-seeking missiles, are out-gunned by that threat."

General Russ said that he had flown the F-15E, now being delivered to its first operational unit, and pronounced it "superb." It will be fully operational this fall. It can carry 24,500 pounds of bombs (compared to the 6,000-pound load of a World War II B-17 Flying Fortress) and deliver them at night with "the accuracy we normally reserve for day bombing." The F-15E, he pointed out, is inseparable from LANTIRN, which is what enables it to operate at night and in bad weather on deep-strike missions.

With budgets shrinking, a questioner in the audience asked, why not forgo the F-15E and perform that mission with the Navy-developed Advanced Tactical Aircraft (ATA) when it becomes available?

"The question wants to know if I subscribe to the hot-biscuit syn-

drome," General Russ shot back. "Don't eat a biscuit now. Wait for one to come out of the oven. The F-15E is here today. It's in production. The ATA is an airplane of the future. We subscribe to the ATA. I think it is going to be a superb airplane. We see it as a follow-on to our F-111."

The long reach of the F-15E and the capability of LANTIRN at night and in weather are "critical" to PACAF, General McPeak said. "In the Korean War, we went to great lengths, even strapped spotlights on A-26s," he continued. "It's hard not to ask why, almost forty years later, we still have virtually no capability to operate effectively at night in a high-threat environment."

The F-15E with LANTIRN will mean "a roughly 200-mile increase in operating radius over the F-16, which is no slouch" in that respect, General McPeak said.

Like other senior officers speaking in Orlando, General McPeak hopes to see the A-16 replace A-10s in close air support. He said that the F-16, already "first class" for ground attack, will be even better if USAF modifies it for close air support, "but if we don't, the F-16, as is, will do the job."

Total-Force Mix

A recurring proposal, voiced in Congress and elsewhere, is to save money by transferring more missions to the Guard and Reserve. USAF's total-force mix at present is 74.3 percent active duty, 10.8 percent Air Force Reserve, and 14.9 percent Air National Guard.

There is no longer any doubt that the Guard and Reserve components are first-rate. They often outperform active-duty forces in competitive events.

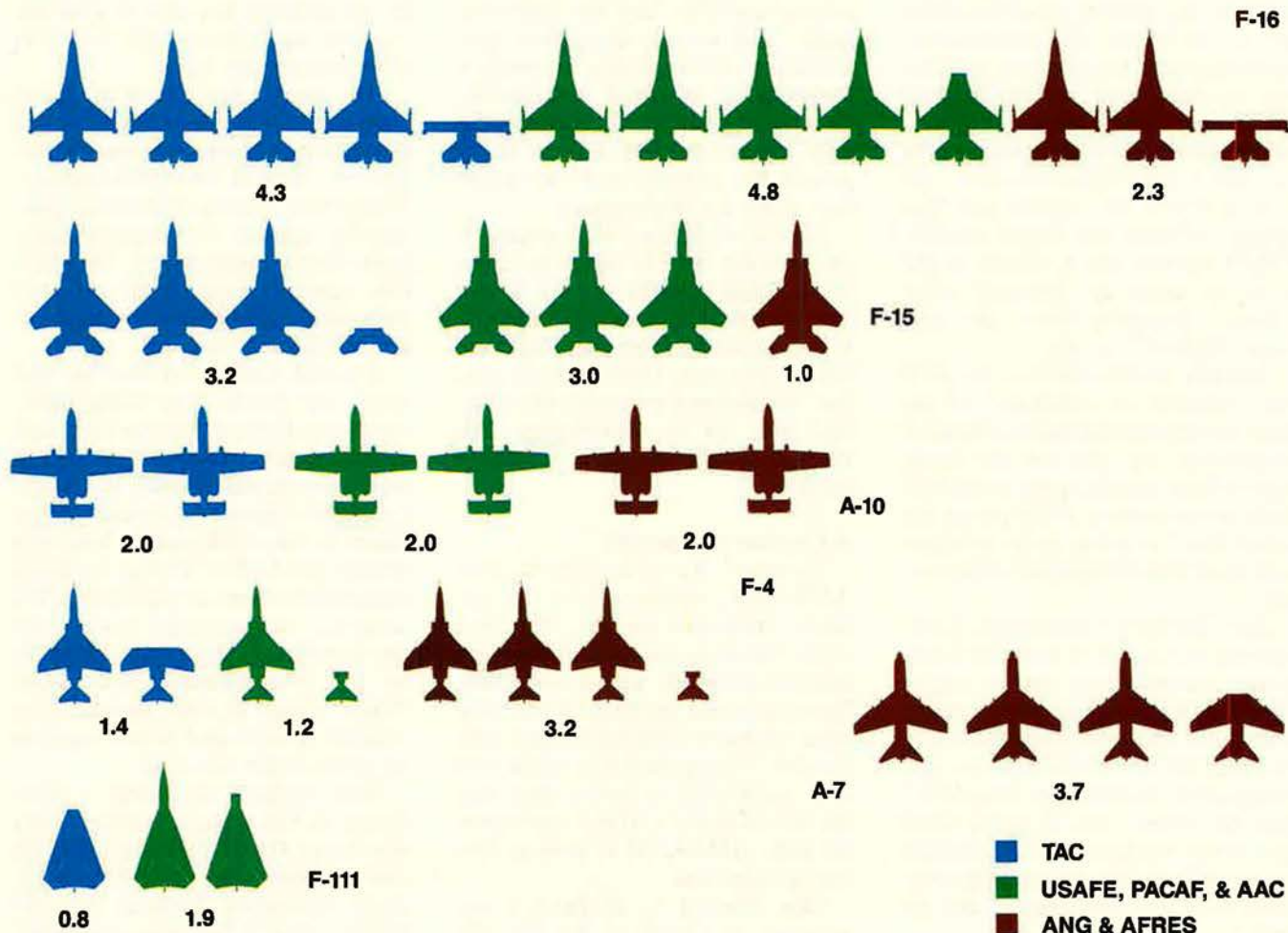
But, Maj. Gen. Roger P. Scheer,

Chief of the Air Force Reserve, told the symposium, the most desirable mix of active-duty and Reserve forces is "probably darn close to where we are today." If the Guard or Reserve takes over a mission and performs it with the same operational intensity as the active forces do, the cost is the same.

"We can probably field most units on a moment's notice on a purely voluntary basis for a short period of time," General Scheer said, but major mobilization for a peacetime contingency would be difficult. "I don't think it's a good idea to give the American public the perception that the defense of this country can be satisfied with reserve forces," he concluded.

Both the Air Force Reserve and the Air Guard have been modernized along with the active-duty forces and now operate first-line equipment. Brig. Gen. Philip G.

Tactical Air Forces Today



As of February 1989, the tactical air forces fielded the equivalent of 36.8 combat-coded fighter and attack wings, configured as shown here by aircraft and component. This force is being cut to thirty-five wings.

Killey, Director of the Air National Guard, said that about 100 Guard units have converted to new aircraft since 1980. It has been many years, General Scheer said, since the time when "the equipment we flew was of little value to anybody."

One reason for the quality of Guard and Reserve forces is experience in their ranks. The average Reserve flyer, General Scheer said, is thirty-five years old, has 9,700 flying hours (130 of them in combat), and puts 100 days a year into the Reserve. The average maintenance man is thirty-eight years old with nineteen years of service, sixteen of which have been in the maintenance field. These veterans also operate smoothly in teams, having served together for many years in the same organizations.

The profile in the Guard is similar. This allows units to reach and maintain high standards, General Killey said, "because we're not in an initial training mode all the time." The current share of the total force mission keeps the Guard operating at a brisk pace.

"Traditionally, thirty-nine days a year belong to the Air National Guard," General Killey said. "One UTA [unit training assembly] weekend a month and fifteen days summer camp. Those days are long gone. Our junior NCOs are using about fifty days a year to fulfill their requirements. Our senior NCOs are up to about eighty days, and our pilots are averaging 110 days a year. That's a full-time part-time job."

One cloud on the horizon is the question of state control of the National Guard. As explained by General Killey, this controversy stems from the militia clause of the US Constitution, under which the federal government organizes, arms, and disciplines the Air National Guard and employs it in service of the United States, but which assigns training authority to the states.

The issue arose when some governors took exception to Guard units building roads and training in Central America. "A few thought that the reason we were doing that was to prepare for invasion of Nicaragua," General Killey recalled. They threatened to keep their Guardsmen at home in protest.

Congress prohibited state interference in such deployments, but

—Photo by Frederick Suter/DI



Money spent on modernization through the 1980s has left tactical forces in impressive condition. Most obvious has been a steady phaseout of Vietnam-era F-4s in favor of newer aircraft, such as this F-16 of the 63d Tactical Fighter Training Squadron, MacDill AFB, Fla., armed with an AIM-9 Sidewinder air-to-air missile.

Minnesota and Massachusetts challenged that ruling. Massachusetts lost its case; Minnesota's is still pending in the circuit court. The decision there may be appealed to the Supreme Court.

"What's at stake here," General Killey said, "is the credibility of the National Guard."

AFSC Not an Advocate

In a major break with past practice, General Randolph has served notice that Systems Command will no longer act as an advocate for systems. AFSC will develop systems and manage acquisition programs, but won't be "going over to the Hill to sell anything," General Randolph said at the symposium.

Advocacy of systems will be the job of using commands—TAC in the case of the tactical air forces—and the Pentagon. Adding emphasis to his message, General Randolph said that "nobody in Systems Command is going to go out peddling systems. Now, we've got 53,000 people, and I'm sure that not every one of them has that word—but they all will, very soon."

General Randolph called on the defense industry to adopt "Total Quality Management," which he describes as a philosophy rather than a tightly defined program. He cited Martin Marietta's LANTIRN as a "before and after" example.

During full-scale development, General Randolph recalled, LANTIRN was demonstrating poor forward-looking infrared quality and tracking capability.

Even though the program was a high priority for the tactical air forces, its future was in question. Martin Marietta achieved a turn-about with a management shakeup, a \$70 million capital investment in a fully automated "factory of the future," and a commitment to do the job right, he said.

General Randolph chastised industry for "short-run focus on the balance sheet" and for inefficient operations. He acknowledged that the government shares in the blame for acquisition problems by its failure to stabilize programs and budgets and by "telling you [in industry] to do something that we both know you can't do."

He declared most electronic countermeasures work a "disaster" and said that "we've got a perfect record on software schedules. We've never made one on time yet."

To inspire total quality management, he said, Systems Command will use past performance ratings of contractors as a factor in source selection for new business and will set aside money in program budgets to award on a subjective basis for outstanding performance by contractors. ■

The Mudfighter faction has seen the data, but doesn't like the answers. Therefore the program is on hold—and more studies are in progress.

What's Bogging Down the AirLand Fighter?

THE close air support fighter of the 1990s is still stuck in the bureaucratic bogs of Washington.

The Air Force has spent some \$27 million already to evaluate twenty-eight different aircraft for the close air support mission. The findings point to the A-16, a variant of the F-16 multirole fighter, as by far the best choice.

In the opinion of Air Force leaders, further studies would only belabor the obvious.

Despite the hefty accumulation of data, doubters in Congress and in the Office of the Secretary of Defense (OSD) aren't satisfied. In December, the Defense Department set aside money to conduct more studies.

There is also to be a competitive flyoff, ordered by Congress, between the A-16, the A-7F, the AV-8B Harrier, and the "A-10C," a lone airplane reengined for the purposes of the flyoff.

Underlying all of this, of course, is a dispute about the basic characteristics required in a close air support airplane. The faction that disagrees most with the Air Force consists of advocates of the "Mudfighter"—a notional airplane that

BY JOHN T. CORRELL
EDITOR IN CHIEF

Four F-16s in special camouflage green maneuver above central Texas. For this close air support demonstration, they have been outfitted with 30-mm gun pods, Pave Penny laser tracking pods, and Maverick missiles.



would be relatively slow and simple, but heavily armored, loitering above clusters of ground troops in contact with the enemy.

The Air Force says that the Mud-fighter would not survive on the battlefield of the future. Moreover, it would not provide the kind of air support the Army needs and says it wants.

The AirLand fighter needs to be fast, both to pass quickly through the lethal zones of enemy air defenses and to keep up with a composite strike force consisting of fast US and allied aircraft. Maneuverability will also be important to the AirLand fighter's survivability.

The battle, as foreseen by the Army and the Air Force, will require the attack fighter of the future to operate at increased depth—not only near the FLOT (Forward Line of Own Troops) but also beyond it and behind it. In fact, there will probably be multiple FLOTs. It will be difficult, and perhaps academic, to say exactly when close air support ends and battlefield air interdiction begins.

At an AFA symposium in Orlando, Fla., January 26–27, Gen. Larry D. Welch, USAF Chief of Staff, said that the Air Force has provided the data from all of its studies to the factions that have put the program on hold. What, then, is delaying the decision?



Except for continental air defense, all tactical air missions are to support the Army, whether it's keeping enemy fighters off the soldiers' backs, delaying or disrupting enemy forces before they can join the battle, or performing close air support. Twenty-seven percent of USAF's tactical force is committed to close air support, and half the rest are swing-role multipurpose aircraft.

"Very simple," General Welch said. "The data does not say 'Mud-fighter.' No matter how you slice it, the data says 'A-16.'"

Those who want a different answer are demanding more studies.

The AirLand Battle Concept

The story begins in 1982, when the US Army introduced the AirLand Battle doctrine, its new concept of how the Air Force and the Army would meet a major enemy on

a modern battlefield. After some initial wariness, the Air Force signed up to the AirLand Battle doctrine a year later, and since then has supported it vigorously.

Previous concepts of war imagined the combatant forces facing each other across a fairly clear dividing line, with most of the actual fighting done in the general vicinity of a Forward Edge of the Battle Area (FEBA).

AirLand Battle doctrine assumes

—USAF photo by MSgt. Patrick Nugent



In the air over Europe, USAF's tactical first team today consists of the A-10 close air support aircraft, the F-16 multi-role fighter, and the F-15, still the world's best in the air-superiority mission. The A-10 is a superb aircraft, but too slow for the battlefield of the future. Evaluations point to the A-16 as the best possible successor to the A-10.

that the battlefield of the future will be fluid and nonlinear. It envisions deep operations by mobile forces on both sides. It predicts a high operational tempo, increased lethality, and intense use of electronic measures and countermeasures. Fighting would continue at night and in bad weather. Both the US and its European allies now define the Army corps commander's area of responsibility as extending 150 kilometers into enemy territory.

A corollary to the AirLand Battle doctrine, called the Follow-on Forces Attack (FOFA), would seek to destroy or disrupt enemy forces in rear echelons before they can be brought to bear in the conflict. Tactical airpower is the prime instrument of FOFA. It must also respond to a breakthrough by operational maneuver groups and be prepared to fight in rear-area battles.

These changes have had a significant impact on Air Force tactical requirements. Old distinctions between close air support and battlefield air interdiction have become blurred. The A-10, currently USAF's primary close air support aircraft, will be too slow and otherwise inadequate for the AirLand Battle era.

The Air Force began looking for a replacement in 1985, Lt. Gen. Michael J. Dugan—DCS/Plans & Operations, and soon to be Commander in Chief of US Air Forces in Europe—recalled for the symposium audience. In 1986, the Air Force identified the A-16 and the A-7F as alternatives. That finding, however, ran afoul of opinion in OSD, which formed a special body, the Close Air Support Mission Area Review Group, which has kept the project in the study phase since then.

Senior leaders in the Army and the Air Force are in accord about doctrine, objectives, and division of battle duties. There are some dissidents in the lower ranks of the services, but most of the sour notes are from what General Dugan called "those CAS experts on the Potomac."

Their vision of close air support, he said, is to have it "piecemealed in time and space across the front, responding to but not shaping the battlefield. Ones and twos, here and there, responsive but not neces-

sarily effective or decisive. A [reactive] rather than a pro-active force."

General Dugan acknowledged that this view is shared by many in the junior and middle ranks of the Army, but observed that such opinions tend to change as soldiers move up in the ranks and take responsibility for broader pieces of territory.

One Army officer who definitely does not believe in using aircraft in scattered ones and twos is Army Lt.

Gen. Edwin S. Leland, Jr., Chief of Staff of US European Command. He formed his opinion from experience with close air support in Vietnam and from seeing its applications elsewhere, notably as commander of the National Training Center at Fort Irwin, Calif.

It is not a good use of tactical aircraft to send them after one tank at a time, he told the symposium audience. Other weapons are better choices against "eaches." When

A Soldier's View

If mobile enemy forces break through on a fluid battlefield, AirLand fighters can be on the scene in a hurry. Airpower is best used against big targets and at critical points. Lt. Gen. Edwin S. Leland, Jr., Chief of Staff of US European Command, agrees with Air Force leaders on how tactical airpower could best support the Army in the AirLand Battle.

His views are based on the experience of several tours in Vietnam, his subsequent command of armor units up to division level, and two years as head of the National Training Center at Fort Irwin, Calif. In his present assignment, he is concerned with joint forces employment by the largest of the US unified commands.

Tactical airpower, he says, is at its best against "exposed and moving targets, [but] less effective if somebody's hunkered down in an assembly area or in a prepared defensive position." Employing attack aircraft in ones and twos with battalion task forces does not use them to best advantage.

"AirLand Battle doctrine is a maneuver doctrine," he says. "It's important that whoever attacks us not enjoy initial success. The key word is agility. We need to maneuver ourselves around the battlefield faster than [the enemy] can. The avenues of approach run both ways. If they can attack us, we can attack them."

General Leland believes that in wartime, Soviet forces would stick to their doctrine and fight the way they've trained, stacking one echelon in after another at the point of attack. Tanks and other ground weapons will dominate the engagement there. The density of air defense makes the center a risky place to employ helicopters or attack fighters.

"In that particular environment, there are lots of things that can kill [enemy] tanks," he said. "The additional little bit of good I get from aircraft may not be worth the risk. I'd rather use the aircraft a bit farther out, working a different target than the one that's being worked here [in the center] by the ground forces."

Effective uses of tactical airpower, he believes, include assailing the enemy's flanks and weighting a main attack with sheer firepower. It is unique, however, in its capacity to attack certain critical targets "such as a rocket that outranges anything we have." The Army needs ground weapons that can assault the enemy deep, he says, but "right now, the Air Force is FOFA [Follow-On Forces Attack]."

Also critical is USAF's ability to be on the scene in a hurry when enemy elements break through and move on the Army's flanks or back. It will not be possible to completely contain mobile forces on the fluid battlefield. "We're going to get had somewhere," General Leland says. "Tacair is very precious in responding to that."

Army attack helicopters and Air Force attack aircraft can work effectively together on many kinds of targets, he believes—even some in the enemy's rear echelons. This would be possible only if the helicopters could go in at night and over rough terrain where enemy forces are unlikely to be.

"If you overfly the enemy with a helicopter, he's got all the advantages," he said. "Helicopters make a lot of noise, and they're very obvious. It does not take a sophisticated weapon to bring one down." The intention of joint air attack is for the aircraft to achieve the mass destruction, with the helicopters policing up the singles.

Does the rank and file of the Army believe that the Air Force is serious about supporting them in the AirLand Battle? "I guess I think the answer is yes," General Leland says. "I would not have answered that way five years ago. The difference is the National Training Center."

"Out there, we rotate through all of our mechanized and armored forces that are in the United States. Every day, from just after first light until dark, seven days a week, there is close air support working with the Army."

"We have a whole generation going through one of the more impressionable times of their military experience. The Air Force is there as a major participant. That operation has done more for building confidence in the Army concerning the use of tacair than anything else since I've been around."



There may be a role for the A-7, shown here being modified at LTV's Texas plant for an "A-7 Plus" (YA-7F) configuration, in the AirLand Battle force of the future. Equipped with new engines, avionics improvements, and airframe modifications, the enhanced version will take part in the coming flyoff of close air support contenders.

employing attack fighters, he said, "use whole bunches against relatively big targets." (For more of General Leland's thinking, see "A Soldier's View," p. 43.)

Surveying the Options

Gen. Robert D. Russ, Commander of Tactical Air Command, told the symposium audience that the Air Force considered three broad options for close air support modernization: development of a com-

pletely new airplane, modification of the existing A-10 and A-7 fleets, and adaptation of some aircraft already in production. Criteria included performance and survivability in the AirLand Battle arena, availability in the early 1990s, and affordable cost.

The idea of an all-new airplane foundered quickly. It would take too long and cost too much. General Russ said that "it took nine years to build the F-16 and eleven years to

field the A-10. It's not likely that, if we started today, we'd have a new airplane before the year 2000." The R&D costs would probably be \$3 billion, he added.

Next, the Air Force explored the reengineering of the A-10. The result would be an attack fighter with good effectiveness and a twenty percent gain in speed over the existing model. The attendant penalty, however, is an increase of 200 to 300 percent in fuel consumption and a sixty-four percent decrease in range. The speed would still be lower than desired.

Two A-7s are being converted to the YA-7F, or "A-7 Plus," configuration and will fly sometime this year. They will have new engines, avionics improvements, and various airframe modifications. "If the test demonstrates that it meets the operational requirements, and if the cost stays about half that of the F-16, it could be a partial solution," General Russ said.

Turning to in-production aircraft, General Russ said that the AV-8B Harrier, used by the Royal Air Force and the US Marine Corps, is an "excellent airplane." Counting costs for special support and logistics infrastructure, though, it would be more expensive than the A-7 and A-16 options, he said. Flying the same profile and carrying the same payload as an A-16, the Harrier would have thirty-five percent less range and forty percent less loiter time.

General Dugan also addressed the Harrier option, agreeing in response to a question that it would be able to operate off runways that had been shortened by bomb damage. "The typical problem is to get from where the runway is to wherever the fight is," he said. "If that's a couple of hundred miles away, no matter what size runway the AV-8B gets off, it doesn't quite get there with enough punch. The Marine problem is different. Typically, you have one Marine division and one air wing operating as a close team in a close geographic spread."

The aircraft that measures up best in all respects is the A-16. It fills all the operational requirements, is in production, and is affordable.

"The A-16 may not be the perfect solution—but it's damn close," General Dugan said. ■



The Army rotates all of its Stateside mechanized and armored forces through the National Training Center at Fort Irwin, Calif. It is here that the new generation of green-suiters see for themselves how tactical airpower operates to their benefit on the modern battlefield, playing an instrumental role in FOFA (Follow-on Forces Attack).

—Photo by Hans Halberstadt/DTI



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Who leads in the race between armor and antiarmor? The edge seesaws continuously.

Destroying Enemy Armor

BY F. CLIFTON BERRY, JR.

FORT KNOX, Ky., is where the gold reserves of the United States are buried. It is also the home of the US Army Armor Center and School. There, near the Patton Museum, in buildings named for past armor and cavalry heroes, armor doctrine and tactics are taught.

For many years, the guardians of armor lore at Knox stressed two basic articles of faith: First, armored forces are decisive on the battlefield because of their firepower, shock action, and mobility; second, the best weapon against a tank is another tank. Those tenets may have been true in the era encompassing World War II, Korea, and Vietnam. But no longer. Attack aircraft and helicopter gunships possess firepower, mobility, and shock action in abundance. Saying a tank is the best weapon against another tank is no longer the certainty it once was either. Indeed, so many weapons are effective against tanks that they could be approaching endangered species status.

But don't count tanks out of the game just yet. They abound in the hundreds of thousands worldwide, and developments in armored vehicles and weaponry continue to

make them a threat on any battlefield for long into the future.

In numbers alone, armored forces represent serious threats to war planners. On the Central Front in Europe, even the Warsaw Pact's own weapon-counters admit they enjoy an edge over the NATO alliance in tanks, other armored vehicles, and heavy artillery. At the same time, tanks in Soviet units have been equipped in recent years with the new reactive armor, a development that has rendered many of NATO's antiarmor weapons ineffective.

Notwithstanding the euphoria surrounding Soviet and Pact troop reductions and withdrawals, prudent NATO governments are compelled to search for and develop more effective means of protecting their own armored forces and of killing the enemy's. The same rule is imperative on the other side. Thus, both sides are committing money and resources to the armor-vs.-antiarmor race. Armor-vs.-antiarmor developments are surging elsewhere: Israel, South Africa, and South Korea. For example, reactive armor technology was developed in Israel and made its way to the USSR

As depicted by an artist, this is what happens when a round from a SADARM (Search and Destroy Armor) weapon descends on a self-propelled howitzer. SADARM-guided weapons now being developed will make tomorrow's battlefields much tougher on tanks and other types of armored vehicles and are causing military leaders to re-think how to build and use such vehicles.



via Syria, which captured Israeli tanks in the 1982 Lebanon war.

Why the US Lags Behind

In 1985, a task force of the Defense Science Board assessed the status of the armor-vs.-antiarmor competition between the US and the USSR. Gen. Donn Starry, USA (Ret.), the US Army's senior combat-experienced armor expert, chaired the task force. Its principal conclusion was that the US was probably behind the Soviets and was falling "further behind at an alarming rate." In 1985, Starry and his colleagues considered the problem serious, approaching national urgency. Three years later, in April 1988, he told Congress it was worse, a matter of "considerable national urgency." In late 1988, he told a Washington conference that the USA is falling "further back every year."

The short, simple reasons for the slippage are easy to cite but hard to correct. Among them are the sluggish US development process that entails always trying to catch up and inevitably falling back, a "hobby shop" mentality in the government laboratories, and the lack of a coherent combined arms doctrinal view of "What's next?"

Sen. Carl Levin (D-Mich.) of the Armed Services Committee cites two major policy questions that contribute to the armor-vs.-antiarmor imbalance. The US has begun addressing the problem with urgency, but its NATO allies have not. Second, within the US so many urgent priorities demand attention and funds that the armor-vs.-antiarmor issue is but one mouth among many clamoring for sustenance. Senator Levin asks, "Where will we find the money to address the most serious Soviet threat to our freedom—the mass of Soviet armor in Central Europe?" Acknowledging that it's a minority view, he contends that the most likely way a real nuclear war will start is from an imbalance of armored forces in Central Europe. Thus, if the armor-vs.-antiarmor imbalance is corrected, three desirable outcomes ensue. Security is enhanced, the chance of war is reduced, and the nuclear threshold is raised.

Gen. E. C. Meyer, USA (Ret.), the Army Chief of Staff 1979-83,

cautions against considering the armor-vs.-antiarmor requirement as solely a tank-vs.-tank problem. In his view, it is a "combined arms problem." That means combining and applying the combat power of several branches of the Army, the Air Force, the Navy, and allied nations to defeat enemy armor. To accomplish that, however, General Meyer says, the system must overcome institutional and structural biases within each of the components.

Changing the Process

Changing the lethargic US R&D process will take years, if it can be done at all. Providing funds for armor vs. antiarmor may be more achievable, even in a period of constrained budgets. Somehow, institutional biases may be overcome if the common threat is severe enough. However, if armored forces go to war today or in the near future, the battles will be fought with weapons and tactics that are known today.

Obviously, the threat is diminished if the enemy cannot produce armored vehicles and provide them to fighting units. Armored combat power is most decisive when it is employed at the right place and the right time. If the armor does not reach the point of decision, its power has not been realized.

Thus, the use of strategic airpower to cripple the enemy's productive capacity far in the rear could have an indirect but powerful influence on diminishing the armored forces reaching the main battle area. However, destroying all of the enemy's production is not likely, especially in the critical first days of a conflict. Therefore, the additional use of strategic and deep-striking tactical airpower to prevent armored vehicles from making the journey from factory to logistical depots could further reduce enemy armor in the battle area.

Closer to the point of decision, air interdiction strikes by aircraft, such as F-111s and F-15Es, will blast lines of communications, choke-points such as bridges and junctions, and vital targets such as fuel and ammunition storage dumps. Those efforts also contribute to reducing enemy armor strength at the point of contact.

Armor Strengths and Vulnerabilities

Actions such as strategic and deep interdiction air campaigns strike not the enemy's armor itself, but its production and distribution means. As the focus of antiarmor efforts moves closer to the battle area, the strengths and vulnerabilities of armored vehicles and units



Like tanks everywhere, the US Army M1 main battle tank is most heavily armored on the front and sides. Soviet tanks are now being given the added advantage of reactive armor in these areas. When struck by a shell, reactive armor keeps the shell from penetrating the tank by counterexploding against it.



An indirect-fire SADARM weapon descends along a ballistic trajectory to a point above a tank—having found it via radar—and then blasts a self-forging fragment warhead into the top of the target.

need to be considered in making weapons choices.

Tanks are most heavily armored on the front and sides. General Starry locates the heaviest armor protection on Soviet tanks in a frontal arc of 110–115 degrees. There the heavy armor (and reactive armor) protects the tank's main armament.

From World War II until the advent of reactive armor, even the relatively thick frontal armor could be penetrated by rounds that used chemical energy as the piercing force. Shaped-charge warheads are chemical-energy devices. A chemical-energy warhead forms a stream of molten metal when the round strikes a target. The hot, dense stream pierces normal armor and devastates the tank's interior. Reactive armor breaks up the stream before it can become effective. Thus, reactive armor effectively neutralizes chemical-energy warheads. Kinetic-energy warheads (heavy, dense metal projectiles traveling at high speeds) can defeat reactive armor.

Reactive armor cannot be hung everywhere on a vehicle, nor can its entire structure be composed of thick armor plate. After the frontal arc, a tank's sides are next most heavily protected. Its top and belly are less well-armored by comparison and thus more vulnerable.

Tanks seldom travel alone. They are organized into combined arms teams. Armored personnel carriers with infantry troops aboard are part of the team. So are self-propelled and armored artillery units, both field and air defense. Those vehicles are lightly armored by comparison with battle tanks. They can be knocked out more easily. Their removal thins out the tanks' accompanying defenses, exposing them and their crews in sequence.

Clearly, if the strengths of enemy armor can be avoided and its vulnerabilities exploited, the antiarmor task is easier to perform. The idea is to use as many effective weapons in as many ways as possible against enemy armor as early as possible; that is, to kill armor before it reaches the point where the last weapons in its path are the main guns of your own tanks, or short-range portable antitank missiles in the hands of infantry soldiers. At that point, if enough enemy armor is at the point of decision, the enemy will punch through.

Barriers and Mines

To keep enemy armor from reaching decision points, or to direct it into killing zones, barriers and mines are employed. Natural barriers are cheapest. On the Central Front, that means rivers such as the Elbe and Rhine, and heavily forested hilly areas such as the Taunus Mountains. Man-made barriers such as cities channel armor toward more easily traversed corridors, such as the Fulda Gap and Hessian Corridor. Major armored forces can be expected to flow through those corridors. Thus barriers and corridors, both natural and man-made, create killing zones where traffic is dense and the hunting is rich.

The Congressional Budget Office estimated in a mid-1988 study that NATO would gain significantly from constructing barriers along the inter-German border. The CBO estimated that, at fairly low cost (less than \$5 billion), barriers along the border could reduce the Pact's favorable force ratio against NATO by up to twenty percent in the early days of conflict. Barriers could include steep slopes planted with trees or deep ditches created by detonating previously buried pipes filled with explosives. Such barriers would not stop an invasion, but they would slow and channel the attacking forces to NATO's advantage.



The vulnerability of tanks to modern weapons is all too evident in this shot of a tank being chewed up by rounds from a GAU-8 rapid-fire gun. But tanks should not be counted out of a major role in modern warfare just yet. They abound and are being upgraded in many ways to keep on fighting far into the future.

The use of mines against armor supplements and reinforces natural and man-made corridors and barriers. Mines fix or delay the enemy; they reshape and mold the battlefield to the defending commander's design and control. They are not like direct or indirect-fire weapons that are shot and immediately hit or miss the target. Mines have an influence that can stretch from hours to days. Also, they attack the vulnerabilities of armored vehicles.

Although advances have been made in the frontal and flanking armor of battle tanks over the past thirty years, protection from bottom attack has not been improved. In fact, the US Army notes in its mine warfare manual that the belly armor of Soviet tanks from the T-55 through the recent T-80 is relatively unchanged. These vehicles are fair game for mines.

Mines may be placed into one of two categories for this discussion: conventional or scatterable. Conventional mines are emplaced by hand or by mechanical planting equipment. They do not self-destruct. On the other hand, scatterable mines self-destruct after a set period of time. They are delivered by aircraft, artillery, and helicopters. Delivering scatterable mines by aircraft and helicopters assumes a temporary condition of air superiority in the required location.

While the air-to-air fighters such as F-15s and F-16s are gaining air superiority, other USAF aircraft such as the A-10 and A-7 (and perhaps the F-111) will be flying tactical antiarmor sorties near the forward edge of the battle area. In addition to using their guns and missiles, these aircraft will be scattering antitank mines such as the Gator. US Army helicopters will be scattering similar mines. Mine warfare is a case where the Air Force, Navy, and Army have cooperated to ensure commonality. Within the Family of Scatterable Mines (FAS-CAM), a high percentage of sub-assemblies are identical. Components of individual Gator antitank mines dispensed by the Air Force and the Navy are identical to the Army's helicopter-dropped Volcano mines. They vary mainly in the electronics and launching systems.

Gator mines can be dispensed from USAF/USN jets flying low

and at speeds up to 800 knots. Within seconds, a single attack aircraft can lay 432 antipersonnel (AP) and 132 antitank (AT) mines to create a barrier 650 meters by 200 meters. A single Army UH-60 Blackhawk helicopter flying at fifty feet and 120 knots can in fifteen seconds lay 800 AT and 160 AP mines. They fall into a field of two lanes (one from each side of the chopper), measuring 1,000 meters by fifty-five meters. The ground commander has a choice of one short and two long self-destruct times for Gator and Volcano mines. Thus they create a barrier that can impede, channel, or destroy the enemy, but which will self-destruct at a predictable future time. That permits the commander to plan to maneuver his forces through the barrier after it has neutralized itself.

Closer to the line of contact, rockets and artillery can also deliver scatterable mines. The Multiple Launch Rocket System (MLRS) of twelve tubes fires a 227-mm rocket from each tube. Each warhead weighs 154 kilograms (339 pounds) and can be fired accurately to ranges greater than thirty kilometers. The heavy warhead packs a variety of submunitions. For minelaying, it carries twenty-eight AT2 mines. They are dispensed out of the warhead, descend by parachute, and become armed and ready by hitting the ground. At shorter ranges, the Army division's own 155-mm howitzers can spew both AT and AP mines out to seventeen kilometers.

Direct Attacks

Mines are indirect weapons whose influence extends over time. The category of "direct weapons" includes such devices as bombs, guns, artillery, missiles, and rockets. For antitank employment, the trends are toward multiple munitions, standoff munitions, and munitions that attack armor's weak points.

In future conflicts, if development programs work out, other tactical aircraft of US and allied air forces will be attacking enemy armor with such weapons as the hypervelocity missile (HVM) and modular standoff weapon (MSOW). The HVM develops stunning kinetic energy to blast through armor

with a combination of mass (the projectile is a slug of very dense metal) and hypervelocity (its speed is more than 5,000 feet per second, nearly twice as fast as a rifle bullet). The MSOW is intended to carry either a single heavy warhead or many submunitions, some of which will be armor killers. It will be launched from aircraft that stand off from the target area, thus reducing vulnerability.

While those devices are in development, other munitions that attack armor's weaknesses are nearer to being fielded. An Air Force example is the sensor fuzing weapon. Carried aboard a tactical aircraft, it pops out forty antiarmor Skeet warheads. The Skeets use infrared sensors to find heat-emitters such as tank engines, then home in to blast them with a dense metal projectile.

The combined effects munition is another cluster munition system now in production. Its submunitions are carried in a dispenser that can be released as low as 200 feet at speeds up to 700 knots. When dropped from the carrying aircraft, the dispenser spins and then opens up, spraying its submunitions over a predictable pattern area. These submunitions decelerate, then sense targets and blast them from the top with shaped-charge, incendiary, or fragmentation warheads.

Still another indirect-fire weapon that carries multiple submunitions and attacks armor from the top is called SADARM, for sense and destroy armor. It can be fired from eight-inch howitzers or delivered by aircraft and rockets. The SADARM uses millimeter-wave radar to find armored targets, then blasts a self-forging fragment warhead into the top of the target.

The Close Battle

Ideally, all of these weapons would stop enemy armor before it reaches defending troops. But that will not happen, and front-line units will have plenty of armored targets to engage. The venerable BGM-71 TOW (tube-launched, optically tracked, and wire-guided) antitank missile, with its chemical-energy warhead, will be fired from Army helicopters and ground troops at advancing enemy armor. The TOW missile was quite effective against light tanks in the late days of the



The advent of the TOW (tube-launched, optically tracked, and wire-guided) antitank missile in the 1970s marked the start of something big in land warfare. The venerable TOW missile has been followed into the field by an ever-wider assortment of antitank weapons of increasing sophistication and lethality.

Vietnam War. However, its chemical-energy warhead is countered by reactive armor, and its range is less than four kilometers. A newly developed TOW-2A tandem warhead explodes reactive armor, then punches through with its shaped charge. But the TOW missile, being wire-guided, exposes the gunner to enemy fire for ten to fifteen seconds while the missile is en route to the target.

The fiber-optics-guided missile (FOG-M), now in development by the Army, permits the gunner (in a helicopter, in a land vehicle, or on the ground) to hide behind hills or trees while guiding the missile through a fiber-optic cable. It is planned for use against tanks and helicopters at the fairly short range of four to five kilometers.

When the enemy gets really close, at ranges of 1,500 meters and closer, the main 120-mm guns of the M1 Abrams tank go into action.

With the stabilized gun, laser rangefinder, and fire-control computer, the Abrams gun system has a high first-round kill probability. The Abrams commander and gunner can get off that vital first round, be assured of a kill, and move before the enemy can react. But the high-velocity 120-mm round is a flat-trajectory weapon and will hit the sides of the target.

Close by the Abrams are M2 Bradley Infantry Fighting Vehicles, armed with the TOW missile and 25-mm guns, both direct-fire weapons and subject to all the limitations of such. The Army is developing a round called STAFF (smart top attack fire and forget) to hit the top of enemy tanks. STAFF will fit both the 120-mm gun and the TOW missile launcher, in addition to indirect-fire weapons.

New Developments

One need not penetrate a tank's turret to put it out of the fight. Soft kills that disable the tank, its systems, or its crew members serve just as well. Examples range from the use of fuel air explosive (FAE) to high-powered microwave beams. FAE weapons convert fuel into microscopic droplets, then explode them, creating overpressures similar to those from low-yield nuclear devices. An overpressure of six pounds per square inch (psi) will disable humans; sixteen to eighteen psi will knock out mechanical sys-

tems. Early FAE weapons used in the Vietnam War created overpressures of 300 psi at a thirty-meter range. The Soviet R&D establishment is known to be investing heavily in FAE applications.

Likewise, precisely focused lasers can knock out the sighting systems of enemy tanks, rendering them temporarily useless. The US Army is accelerating such development, aiming to produce a handheld laser for the purpose.

In several countries, including the US, research on high-power microwaves is speeding up. The idea is to disable the electronic nerve systems of enemy armor by zapping them with focused microwave beams. Electromagnetic coil guns are showing promise, though power supplies and carrier vehicles must be reduced to battlefield size.

Finally, there are unmanned antiarmor weapons that will bring profound changes within the next decade: robotic weapons and robotic vehicles to attack enemy armor, for instance, and unmanned aerial vehicles capable of loitering over an area and attacking on command. They will be equipped with "brilliant" munitions, as compared with current "smart" munitions.

With all those developments, it may appear that the antiarmor forces are getting the upper hand. But armor development in several countries is moving forward rapidly into hitherto unexploited areas. Examples include "proactive armor," which will sense incoming projectiles and set them off even before they touch the tank; and electromagnetic armor, with similar potential.

Clearly, one can no longer say with finality that the best weapon against a tank is another tank. Nevertheless, tanks still possess the characteristics of mobility, firepower, and shock action now and will for a long time in the future. One thing is certain about the armor-vs.-antiarmor race: it is a growth business worldwide. ■

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Our conventional forces had better be good, since we will be relying on them more.

—Staff photo by Guy Aceto

After the INF

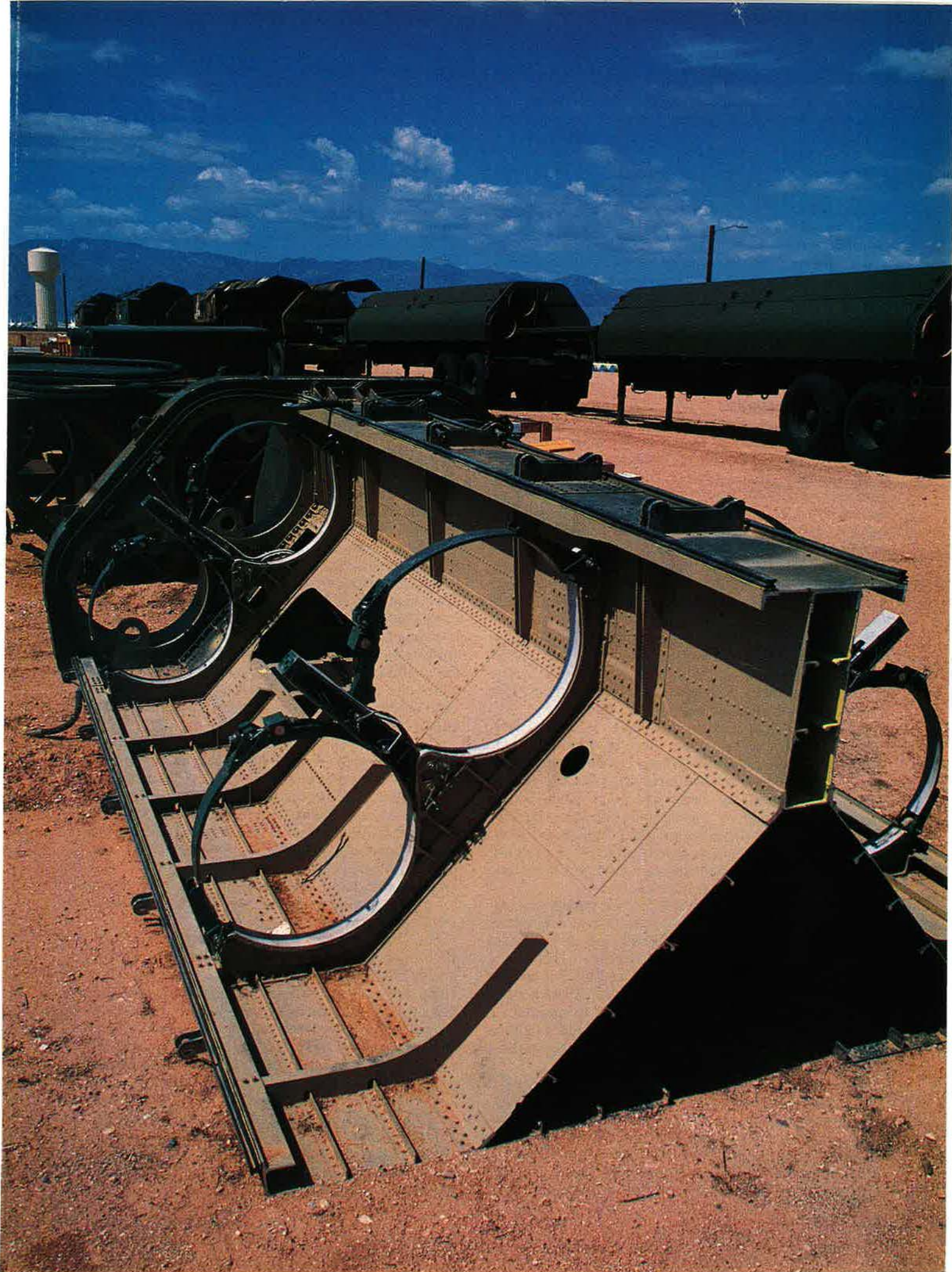
BY GEN. WILLIAM L. KIRK, USAF

THE Intermediate-range Nuclear Forces (INF) Treaty, signed in 1987 by the President of the United States and the General Secretary of the Soviet Union, represents a major milestone in the history of disarmament diplomacy. It is a treaty that, for the first time, goes well beyond the simple balancing of power. In fact, this treaty sets precedents for verification controls and elimination of an entire class of nuclear weapons. The treaty will eliminate all US and Soviet ground-launched ballistic and cruise missiles in the 500- to 5,500-kilometer (300- to 3,400-mile) range and will prohibit their future production or deployment.

Although the treaty will reduce a significant portion of the threat to Western Europe, we should not deceive ourselves that our tasks have been made simpler. The underlying national objectives of the Soviet Union, the staggering size of its military forces, and the threat it represents remain extremely formidable. We must move carefully into the next decade with our eyes wide open to the potentially disastrous effects that would follow a perceived loss of Western resolve to maintain a strong defense in every category, especially in conventional forces.

In effect, the treaty has forced us to place greater reliance on our remaining forces at the very time our nation's military establishment faces extensive budget reductions that could spell less deterrent and defense capability. Force modernizations that have been on drawing boards for years are now being scrutinized as candidates for budget cutting. Conventional force modernization, for instance, is long overdue and—in the aftermath of the treaty—takes on a new sense of urgency if we are to maintain a credible defense of Europe. At the

With the elimination of an entire class of nuclear weapons under the Intermediate-range Nuclear Forces Treaty, the defense of Europe will rely on existing forces and conventional weapons. The removal of the ground-launched cruise missiles and their transporter/erector/launchers (shown here at Davis-Monthan AFB, Ariz., waiting to be destroyed) from Europe makes force-modernization efforts, such as AMRAAM, LANTIRN, and a solution to the close air support debate, that much more important.



same time, there are new key systems, such as the Advanced Tactical Fighter and the C-17, entering critical phases in the acquisition cycle, as well as continuing requirements to ensure proper support for our people. The budget decisions we will face in the next few years will be difficult and critical.

Even now, the United States Air Forces in Europe (USAFE) and the US Air Force as a whole face further funding reductions. For example, USAFE's Fiscal Year 1988 operations and maintenance budget was almost fourteen percent below that of FY '87. These are our key, day-to-day operating funds. Generally speaking, operating tempo was reduced, but missions have been preserved thus far. Future cuts of any significance will have to be absorbed by reductions in mission areas in order to assure continued high standards of readiness and survivability. We must carefully guard against a return to the "hollow force" of the late 1970s.

Position of Strength

The INF Treaty clearly demonstrates that negotiating with the Soviets produces the best results when approached from a position of strength. The history of disarmament talks is replete with Soviet rebuffs of American proposals. Soviet objectives, however, steadily crumbled in the face of a cohesive NATO commitment to deploy the BGM-109 ground-launched cruise missile and the Pershing II missile. The lesson for all of us is that if we are to enjoy another forty-four years of peace in Europe, NATO must continue to upgrade and modernize its forces with the same level of unified determination.

In light of the INF agreement, we and our NATO allies must examine military priorities with the realization that it will cost more to maintain the same level of deterrence. Critical to a European deterrent strategy is a credible theater nuclear weapons capability.

NATO's dual-capable aircraft, along with ground artillery, will provide the lion's share of theater nuclear capability in the post-INF Treaty environment. Obviously, the Warsaw Pact will intensify efforts to render these NATO assets as ineffective as possible. Soviet efforts are typified by the ongoing modernization of their already formidable integrated air defense system. NATO foresaw these increasingly effective air defense efforts and began preparations to counteract them long before the INF Treaty seemed likely.

With elimination of INF missiles, the penetration capability of our nuclear-capable aircraft now acquires even more importance. One high-priority initiative, in particular, has been highlighted recently. This is the tactical air-to-surface missile. The need for this missile was identified in an early 1980s NATO assessment of nuclear force modernization required to maintain a credible deterrent. Fortunately, this key modernization program was initiated in time to allow the deployment of the missile early in the 1990s.

Even the best nuclear deterrent may be ineffective if the Warsaw Pact can carry out Soviet plans for a lightning-quick conventional campaign. Under Soviet doctrine, such a campaign would be mounted in an attempt to overwhelm NATO before NATO could reach the decision to use its nuclear "prevention tool." To guard against the reality, as well as a Soviet perception, that

such a gambit might be successful, it is critical that NATO maintain effective conventional capability.

The Air Force will continue to give high priority to a core force needed to preserve missions vital to our nation's warfighting capabilities and will cancel other missions and programs to fit within fiscal reality. Our conventional deterrent priorities include the following: deployment of the Advanced Tactical Fighter (ATF), which is the next-generation air-superiority fighter; modernization of fighter aircraft, including production of the F-15E dual-role fighter; acquisition of the AIM-120A Advanced Medium-Range Air-to-Air Missile (AMRAAM) and the Low-Altitude Navigation and Targeting Infrared for Night (LANTIRN) system; development of a follow-on aircraft to replace the close air support A-10; and, finally, improvement to the survivability and sustainability for our fighter force structure.

The ATF represents a major technological leap that will ensure that we retain a substantial qualitative lead over the Soviets. However, the ATF is still several years from production. In the meantime, we might use our ingenuity to update our current aircraft and maximize their effectiveness against new threats.

The Necessary Tools

Acquisition of the F-15E is a high priority. The F-15E, with virtually no technological risk, enhances the basic, combat-proven, air-superiority capability of the F-15 Eagle, while adding to the theater more all-weather, round-the-clock, long-range, surface attack capability. A mission-specialized rear cockpit, improved avionics, LANTIRN, and radar mapping will permit the precision targeting and lethal delivery of large weapon payloads. Automatic terrain avoidance will enhance the F-15E's survivability during deep-penetration missions, during which the planes would attack and destroy enemy nuclear assets, air bases, rear area logistics nets, and other enemy forces.

The AMRAAM will soon enter the USAFE inventory. The greater performance and speed of the AMRAAM over previous radar-guided air-to-air missiles will act as a force multiplier for the theater's F-15s and F-16s. The AMRAAM can exploit current aircraft capabilities and will permit simultaneous engagement of multiple targets by a single defender. The much longer range and the launch-and-leave performance of the AMRAAM increase fighter survivability, while improved resistance to electronic countermeasures increases the probability of target destruction.

LANTIRN, when fully integrated with F-15E and F-16 flight systems, will provide automatic terrain-following and multisystem target designation. This will allow these aircraft to fight in an expanded environment and increase their wartime survivability. The enemy no longer will enjoy sanctuaries for unhindered operation. In spite of darkness and low ceilings, LANTIRN-equipped aircraft, when fully configured, will be able to get into and out of the target area below enemy defenses and deliver infrared-guided Maverick missiles, laser-guided bombs, and other conventional munitions with superior accuracy.

Future success on the conventional battlefield will be greatly affected by how we resolve the difficult problem of finding a successor to the A-10 close air support

(CAS) aircraft. In Europe, the modern battlefield will no longer be characterized by opposing forces facing each other across a relatively straight and well-defined line. Rather, the battlefield will reflect deep penetrations of mobile forces into the opposing side's rear areas. This, in turn, requires an aircraft that can penetrate beyond the forward edge of the battle area to provide close support for our forces operating behind enemy lines. Further, we need to be able to provide that support twenty-four hours a day in all kinds of weather. It is essential that we find highly survivable aircraft with a battlefield punch equivalent to or greater than that of the A-10.

We are taking a hard look at modifying two existing aircraft, the A-7 and the F-16, to provide this capability. The modified A-7, or, as it is now called, A-7F, will have a new, afterburning engine for improved performance and maneuverability, as well as a new avionics suite. However, there are not enough A-7 airframes to cover the CAS requirement completely. A modified F-16,

The next few years, fraught with pitfalls, will be crucial for the Alliance.

called the A-16, is also being pursued. This aircraft will meet all requirements, be cost-effective, and take advantage of existing logistics pipelines. Such force modernization will yield improved firepower for today's highly mobile battlefield as well as increasing conventional deterrent credibility.

Sustaining Operations

In addition to fielding improved weapon systems, USAFE must continue to concentrate on improving the capability of our air bases to sustain operations in a combat environment. The Air Force has established an office, at the assistant-secretary level, to coordinate efforts to improve air base operability. Several initiatives are now being taken to provide active and passive measures to enhance air base operability.

On the active side, improvements are being made in air defense systems protecting our air bases. In England, the Royal Air Force provides air base ground defense and operates Rapier surface-to-air missile (SAM) systems to protect our bases. The West Germans have agreed to provide air base ground defense and operate the Roland SAM systems.

Many passive measures are receiving high priority at main operating bases. Included are several projects designed to harden base facilities and to camouflage and conceal critical assets. Programs to improve our rapid runway repair capability are being emphasized, and a number of chemical defense efforts are under way.

History has demonstrated that an aggressor's use of chemical warfare against an unprepared opponent yields significant military advantages. This history lesson is very clear to the Soviets and their Warsaw Pact

allies. The size of the Warsaw Pact's chemical warfare corps and the volume of equipment Pact nations possess for chemical warfare training indicate more than routine preparation to deter an enemy's use of chemicals.

If we in NATO are to deter chemical warfare, we must be as capable as our adversaries in operating in a chemical environment. Beyond that goal, we must establish a credible capability to retaliate in kind against any adversary who uses chemical weapons. History also shows that an aggressor is usually unwilling to employ chemical weapons when faced with potential response in kind.

From a chemical defensive standpoint, NATO has begun installation of personnel shelters on air bases. These earth-covered structures provide a filtered environment where our troops can rest from combat duties without having to wear hot protective suits or gas masks. Although these shelters are neither roomy nor especially comfortable, they represent a real increase in NATO's ability to sustain an effective combat effort under any conditions. Beyond this step, improved gas masks are being fielded, and research into more effective and comfortable chemical protective suits continues. However, in terms of deterrent potential, these defensive means, as effective as they are, pale by comparison with a credible capacity to retaliate.

NATO's current resources for chemical retaliation have been with us a long time. Unfortunately, the follow-on to these older weapons, Bigeye, is not coming along as fast as desired. Bigeye is a binary chemical weapon. It uses two different chemicals; each is nontoxic until it is combined with the other during delivery. Keeping the weapon affordable, while ensuring the requisite level of safety and reliability, poses a considerable technical challenge. However, this challenge must be met. A credible chemical warfare deterrent must remain an essential element of any Western European strategy.

Crucial Years Ahead

The next few years will be crucial, fraught with pitfalls. We will be faced with growing fiscal constraints, increasingly sophisticated Soviet media campaigns, and natural tendencies to wish the dangers away. We have to strive to ensure Alliance cohesion, work to redress the conventional imbalance, and continue to modernize our nuclear and conventional forces. We must never forget that the process of arms control is only effective if it contributes to improved security. Our objective is not a nuclear-free Europe, but rather a war-free Europe.

Finally, the Alliance's concerns must be faced and resolved by all the participating nations—not just the US, and not just the European members. The past forty-plus years of peace based on a strong defensive alliance, provides a worthy record that Alliance members must strive to extend. ■

Gen. William L. Kirk has been Commander in Chief, United States Air Forces in Europe, and Commander, Allied Air Forces Central Europe, since April 1987. He enlisted in the Air Force in 1951 and has served in Europe, Thailand, and the US, logging more than 6,000 jet fighter flying hours. Before heading USAFE, he was Commander of TAC's Ninth Air Force. General Kirk plans to retire in mid-April.

It's an eye-opener—and sometimes a shock—when industry managers and engineers visit the troops who use their products in the field.

Blue Two

BY SUSAN KATZ-KEATING

IN THE once-obscure Air Force Coordinating Office for Logistics Research (AFCOLR), tucked away at Wright-Patterson AFB, Ohio, telephones ring off the hook these days. The sound may be grating, but it should also be sweet music to the ears of every maintenance man who ever grappled with a weapon of strange, complex, or just plain boneheaded design.

AFCOLR's newly insistent callers are among the premier weapon managers and engineers of the corporate contracting world. Drawn by an unusual program known as "Blue Two," they are queuing up for a chance to "walk a mile" in the shoes of the harried Air Force men and women who must maintain the weapons that the contractors produce. In the process, their eyes are opened to the frustrations and problems that they unwittingly cause.

The Blue Two concept is brutally simple. Weaponeers are taken to the field for a firsthand, down-in-the-grease look at what it's like to maintain their arms in the "real world." No sensibilities are spared. On the

flight line or in the repair shop, participants are expected to roll up their sleeves, don coveralls, or slip into protective gear—then live the life of the enlisted man for a week. Virtually without exception, useful changes result.

Typical, say AFCOLR officers, is the case of one high-ranking manager of a munitions plant. During the executive's Blue Two visit to Hill AFB, Utah, he was approached by an airman with a simple question. Why, the airman wanted to know, do bombs come six to a pallet, when the fuzes for the bombs come packed eight to a box? As a result of the odd configurations, he went on, airmen at Hill find themselves short of fuzes or saddled with leftovers. Why couldn't the two components be packaged logically, in equal numbers?

"That manager asked me to find the nearest phone," remembers CMSgt. Danny Lewis. "He got right on the telephone [to his company] and fixed the problem on the spot." Bombs and fuzes now come packed in equal numbers.

The Genesis of Blue Two

Many such stories are recalled by Chief Lewis, who is known as the originator of Blue Two, so named in recognition of the color of the Air Force uniform and the number of stripes typically worn by the maintenance person. Ask Chief Lewis to explain the genesis of Blue Two, and he'll answer quite simply that the whole thing started by accident. The subject was engines.

The story goes like this. Six years ago, an elite group of designers working on the Joint Advanced Fighter Engine project was in the midst of a seminar. Among those attending was Chief Lewis, who was at that time stationed with AFCOLR. The more he heard the engineers discuss engines, the more uncomfortable he became. As he puts it: "Listening to them talk, I was amazed at how little they actually knew about the real-life world of engine maintenance."

At a break in the seminar, Chief Lewis approached one of the speakers and asked if he would be interested in visiting a flight line to see an engine shop in action. The engineer jumped at the chance. The invitation was expanded to include some of his colleagues, and the whole group of them wound up taking the tour. "You should have seen their reaction," says Chief Lewis. "I knew in five minutes that we were on to something big."

The rest, as they say, is history. In short order, AFCOLR officials put together what it called a "Visit to the Field" program, later renamed "Blue Two" by Lt. Gen. Leo Marquez, Deputy Chief of Staff for Logistics and Engineering at the time. The name change was viewed as symbolic because "it's all oriented toward the two-striper," says MSgt. John Holloway, Blue Two Visit Manager for AFCOLR. "He's the one who gets singled out for all the greasy work."

The program has expanded as rapidly as time and manpower will allow. There are generally six trips per year, each lasting about five days. The visits include walk-throughs at several bases of a major air command, plus an Air Force logistics center. All that is required of participants—other than a willingness to work hard—is a clearance for "Secret" or higher and a pledge

to give AFCOLR a written report at the conclusion of the trip.

For participants, life on the road is far from easy. The first official Blue Two Visit (BTV) tour, in 1983, set the pace for future program schedules. "We were working on the ATF [Advanced Tactical Fighter] program," says Chief Lewis, "and took the prime bidders on a fourteen-day tour of jet engine shops and overhaul facilities. Every step of the way, I saw high-ranking engineers down in the grease, on the floor, crawling under engines, and taking pictures. They were all competitors, but after the first twenty-four-hour period, they were calling themselves 'the Tough Team,' for keeping up with the schedule. I had them up at 3:00 a.m. to do pre-flights, and we'd go on from there."

On a subsequent Blue Two visit, one high-level corporate manager was shocked to discover the kinds of hardships suffered by mechanics in the bitter cold at Minot AFB, N. D. In his follow-up report, the executive told the story this way: "They [BTV tour leaders] issued the [contractor] team cold-weather gloves and asked us to screw a nut on a bolt through a 'C' clamp. This really emphasizes the need for 'ease of maintenance' under these environmental conditions. They pointed out that many of the new airmen, frustrated with the clumsy gloves, sometimes take them off to work on the aircraft on the line. They are found with hands sticking to the metal, and the hands must be freed by use of a heater/blower."

Another high-ranking industry chief on a BTV heard an Air Force technician voice a complaint about a certain type of reconnaissance camera made by the executive's company. "It was a problem with how the lenses were buffed out," says Chief Lewis. Result: "The industry rep got on the phone and fixed it."

Greatest Gripe Gone

The Blue Two program has resulted in the alleviation of one of the engine technician's greatest gripes—the irritating presence of safety wire. This wire is used to hold parts in place, theoretically reducing or eliminating vibrations. "In the past, it was assumed that if an item had a hole in it, it needed

safety wire," says CMSgt. John Nowicki, the Air Force Blue Two Program Manager.

But safety wire is despised by airmen who have to remove it every time it stands in the way of a required maintenance procedure. It is a time-consuming process, causing painful cuts. What's more, the wire itself is a potential hazard because, as a "foreign object," it could damage an engine. The Blue Two program gave airmen a chance to get this message across. A 1986 report from an engine contractor included this on his list of lessons learned:

"Never use safety wire. The only use for safety wire is to hang the engineer that requires its use." As a result of this observation, safety wire will be eliminated in most instances and will be used, says one maintenance chief, "only where it actually has a purpose."

A 1987 BTV to United States Air Forces in Europe (USAFE) resulted in changes in the maintenance procedures for the F-15's engines. Retired Gen. Charles L.

"Listening to them talk, I was amazed at how little they actually knew about the real-life world of engine maintenance."

Donnelly, Jr., who was CINC-USAFA at the time, recalls the incident that led to the change in technical orders.

"There was a required maintenance procedure on one of the parts in the F100 engine," he explains. "The engineers said, 'You must slide the engine out on its rail in order to do this procedure.' One of our airmen said he could do it without sliding the engine out, and he showed us that he could. Within ten days, that procedure was changed throughout the Air Force."

The move had a direct impact on all mechanics assigned to the job. "That particular change probably saves between thirty minutes and an hour per aircraft," says General Donnelly. "Multiply that by the number of engines in the Air Force, and you've saved a lot of man-hours."

Lessons in Tool Design

Budgetary concerns were hammered home on a recent Blue Two "tool" visit. Participants learned of a huge difference in the tool requirements for two different helicopter engines. One required \$1.2 million in special equipment, whereas another needed only ten commercially available tools, at negligible cost.

That and other BTVs emphasized a need for lightweight tools as well. Many female mechanics, in particular, were having trouble handling some of the heavier equipment.

The lessons in tool design were applied by at least one BTV participant corporation—the Pratt & Whitney engine house. "The Blue Two visits," wrote three P&W engineers who made the tour, "made us more aware of the mobility requirements, and, therefore, upon returning from those visits, we established aggressive support-tool goals [for] current fighter engines." The new goal, they explained, is to issue sixty percent fewer tools for their engines, at forty percent lighter average weight.

Participants have found that the Blue Two visits open their eyes to a world they never imagined, even when their own types of designs are involved. Aeronautics engineers visiting Dover AFB, Del., had just such an experience when they came face to face with C-5A operations. Wrote one aircraft engineer: "The

Blue Two visits open participants' eyes to a world they never imagined, even when their own designs are involved.

range of accessibility problems on an aircraft of that size was both amazing and embarrassing to us as designers."

For the engineers and designers, another source of amazement has been the harsh demand placed on maintainers by chemical and biological warfare. Designers concede that, sitting in their offices, they forget that little bolts and awkward angles become nearly insurmountable obstacles to a mechanic suited up in protective gear.

"Chem gear is very bulky and unwieldy," says Sergeant Holloway. "Sometimes we have a bolt that is so small, a guy in chem gear can't even grip it, let alone use it. We try to get the guy who designed it to try to use it in the field, and of course he can't." As a result of BTV, says Sergeant Holloway, some companies now test their own products for use with protective gear.

The list of lessons both learned and applied goes on and on. Meanwhile, the billets for future trips are fast being filled. Even now, AFCOLR is nearly fully subscribed for forays into the world of electronic-warfare software in June, surveillance radar and Pacific Air Forces support in August, and Alaskan Air Command aircraft support in December. The geographic sweep of the tours will range from Germany to the continental US, Alaska, Japan, and the Philippines.

Air Force officials expect no slackening of demand from the contractor community. "Each year, we put out to industry a schedule of our visit sites," says Sergeant Holloway. "We try to limit our number to about thirty from private industry and twenty Defense Department people from the logistics world. We fill up on a first-come, first-served basis. Those companies that feel they have a need to be on a trip will respond very quickly. They pay their own way. We try to accommodate as many as we can, but you wouldn't believe the response we get. As soon as the schedule goes out, it fills."

In recognition of his part in conceiving, developing, and implementing the program, Chief Lewis, now the senior enlisted advisor for the 56th Tactical Training Wing at MacDill AFB, Fla., was honored last year with the Dudley C. Sharp Award for outstanding achievement in logistics. The award is given each year to the individual who makes the most innovative contribution in this area. In bestowing the award, the Air Force predicted that Blue Two will have a beneficial impact on "every Air Force weapon and support system—not just new acquisitions, but also modifications and upgrades to existing systems and support structures."

There is no way to come up with a precise estimate of savings in time and money brought about by Blue Two, but AFCOLR officials think it is significant, and the Air Force knows a good thing when it sees one. General Marquez has called the program "one of the smartest things we've ever done." ■

Susan Katz-Keating, a writer for Insight Magazine since 1985, specializes in military topics. Her most recent article for AIR FORCE Magazine, "The Troops Behind the Trainers," appeared in the December '88 issue.

WAR GAMING AND OPERATIONAL READINESS

SYSCON
and the Joint Staff are working together to apply state-of-the-art technology to all aspects of the war planning process.

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SYSCON is working with the Joint Staff developing computer based decision support tools under the Automated Force Generator Program, the prototype models for the next generation war planning information system.

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The Army wants 2,096 of these light helicopters to perform a range of combat missions.

LHX on the Horizon

BY JEFFREY P. RHODES
AERONAUTICS EDITOR

THE LHX program is a matter of utmost importance to the Army," says Maj. Gen. Ronald K. Andreson, USA, the Light Helicopter Experimental program manager. "We need this new system, we need it in numbers . . . and we have got to have this system in the field."

The Army has a requirement for 2,096 LHX helicopters, which makes it one of the largest aviation programs in any service since the 1950s.

Almost three dozen defense contractors (or divisions thereof) are involved with one of the two teams—Boeing Helicopters paired with Sikorsky Aircraft and McDonnell Douglas Helicopter paired with Bell Helicopter Textron—that have formed to try to win the LHX contract.

LHX is an ambitious program. The winning design has to be lightweight (7,500 pounds empty), low-cost (\$7.5 million flyaway cost per airframe in FY '88 dollars), and able to replace almost 3,000 aging AH-1 Cobra, OH-58 Kiowa, and OH-6 Cayuse attack and scout helicopters. In addition, LHX, which will be armed, will complement the

Army's front-line attack helicopter, the AH-64 Apache.

The primary missions for LHX will be armed reconnaissance, light attack, and air-to-air combat. Armed reconnaissance, which General Andreson describes as "finding the enemy, defining his intentions, and fixing him," also includes selecting attack routes and providing early warning.

LHX will carry most of the same weapons and attack the same targets as the AH-64, so "light attack" refers to size of ordnance load rather than degree of difficulty. As General Andreson says, "Either you kill a tank or you don't." LHX will be assigned to the "light" divisions (infantry, airborne, airmobile) and to the cavalry units of the "heavy" divisions.

The final mission, air-to-air combat, is a new phenomenon in the helicopter world. LHX crews will be able to detect bogies at long range and destroy them with missiles or, conversely, avoid detection through nap-of-the-earth (NOE) tactics and low radar signatures. LHX will use its speed, maneuverability, and internal cannon if the

Two teams are competing for the contract to build the Army's Light Helicopter Experimental. The LHX design of Boeing/Sikorsky (the "First Team") features two-position, retractable weapons "wings" and an enclosed fan-in-flin tail rotor. McDonnell Douglas/Bell Helicopter Textron (the "Superteam") envisions an LHX (bottom) with retractable weapon pylons mounted in fixed sponsons and a NOTAR tail configuration.



air battle gets down to close-in combat. No helicopter pilot wants to get into a dogfight. There is much less room to maneuver close to the earth, for one thing.

Two years ago, the LHX program was threatening to become unmanageable. The Army was planning on building 5,000 LHXs in two versions—a scout/attack and a utility configuration, each of which would be crewed by only one pilot.

Last summer, the Army scaled back the program and brought it into much sharper focus. The difficulty of the night attack mission convinced most observers that LHX would be better served by a crew of two. The Defense Acquisition Board approved the revised plan, and the LHX program entered a twenty-three-month demonstration/validation phase last October 31 with contract awards of \$158 million to each of the two teams.



McDonnell Douglas/Bell's LHX will carry a NOTAR ("no tail rotor") system mounted under a conventional tail. The system, proven in a modified OH-6A helicopter (above), forces low-pressure air through a slotted tailboom to a thruster to counter torque and control direction.

On the Drawing Board

The guidelines the Army gave "The First Team" (as Boeing and Sikorsky call themselves) and "The Superteam" (McDonnell Douglas/Bell) for LHX include a 170-knot dash speed, 2.5-hour endurance, ability to clear a 300-foot-tall obstacle in less than six seconds, and ability to execute a 180-degree hover turn in less than five seconds.

The draft specifications were not limited to performance characteristics, either. They dictate that the LHX helicopter must be hardened

against electromagnetic interference, electromagnetic pulse, and laser weapons. The airframe must also have good ballistic tolerance and protect the crew from chemical weapon attack.

LHX has to be transportable in a C-130, C-141, C-17, or C-5 airlifter and must also be capable of ship-board operation. Ground crews must be able to refuel and rearm the helicopters in no more than fifteen minutes. Finally, the helicopters have to meet demanding crash-worthiness specs and have a design life of no less than 4,500 hours.

While the Army wants the contractors to take no more than a "moderate risk" in any phase of the dem/val effort, "LHX will still be one heck of a technology upgrade," noted General Andreson. Helping to bring about that huge leap in technology is the LHX mission equipment package (MEP).

Formerly, avionics were added to the finished airframe to improve its performance. LHX is one of the new generation of aircraft (the others being the Air Force's Advanced Tactical Fighter and the Navy's A-12 Advanced Tactical Aircraft) whose airframe serves mostly as a truck to transport the avionics to the battlefield.

On LHX, the MEP will account for fifty-five to sixty percent of the cost of each helicopter and for roughly 1,200 pounds of the 7,500 allowable pounds of weight. LHX

will use a derivative of the triservice Pave Pillar architecture, and work is being carried out to determine what modules will be common among LHX, ATF, and A-12. The LHX MEP is also tagged for use in future upgrades of the AH-64's avionics equipment.

The LHX MEP will have to make use of so-called Level III avionics integration in order to accomplish all its designed functions without paying a significant penalty in power usage, space, or weight. Level III integration uses VHSIC (very-high-speed integrated circuit) technology to operate a high-speed fifty-megahertz data bus and the central processor that the bus feeds. The processor relays information to multifunction displays, instead of to individual cockpit instruments.

The MEP hardware covers a stunning number of functions, including communication, navigation, and electronic warfare. Two major systems in the MEP include the Electro-Optical Target Acquisition/Designation System (EOTADS) and the Night-Vision Pilotage Subsystem (NVPS). EOTADS includes a TV, forward-looking infrared sensors, and a laser rangefinder/designator. NVPS includes a wide-field-of-view, helmet-mounted display coupled with a FLIR and image intensification sensors.

In preliminary designs, both LHX teams will house the MEP equipment in two bays behind the cockpit. The racks that hold the individual slide-in modules will be sealed and will be cooled by a coolant or chilled air circulating through the racks. Cooling the racks is expected to increase the reliability of the individual modules by up to 500 percent over current modules.

Module Reliability

The reliability of the modules is the key to another part of the LHX program—the elimination of intermediate-level maintenance. Noted General Andreson, "There will be user- and depot-level maintenance, period."

The Army is using several tools to accomplish this goal. All avionics modules will have a built-in test (BIT) function, relieving the maintainers in the field of the burden of carrying special test equipment. The BIT information will be stored

in nonvolatile memory so that, when the module is pulled from the helicopter, the fault data will not be lost. Then the module will be sent to a depot repair facility either in-theater or in the US. The repaired modules will be shipped to a central storage facility where line mechanics can use them to get their helicopters working again.

While the modules are expected to be highly reliable, those that do fail will be tracked by the helicopter's on-board diagnostic system. The on-board data will be fed to CALS, the Computer-aided Acquisition and Logistics System, which will keep track of what usable module is where in the repair chain and what is available. CALS will also help LHX become the first aircraft to achieve a paperless tech order. Any changes to the TO can be transmitted via the CALS network.

LHX is designed to be fixed easily. By incorporating such features as covers that offer access to the entire engine, integral steps or work platforms, and an airframe that sits low to the ground on its retractable, wheeled landing gear, the Army also hopes to reduce the number of Military Occupational Specialties (MOSs) needed for LHX. Probably ten or fewer MOSs will be needed for LHX, half the number needed for the current AH-1, OH-58, and OH-6 fleets.

The dem/val phase of the LHX competition will end in September 1990 when the two teams submit their proposals to the Army. While the two contractors are now working out their designs, the Army is determining how to decide on a winner. Despite outside pressure to conduct a competitive flyoff, there will be none, due to budget restrictions. The LHX winner will be determined by the results of the dem/val phase and the teams' full-scale development proposals.

Since there will be no "real" LHX until well after the contract is awarded, Boeing/Sikorsky and McDonnell Douglas/Bell have turned to simulation as an engineering tool. Both teams are using moving-base simulators with six degrees of motion, as well as highly realistic, computer-generated image technology for testing various cockpit configurations and airframe parameters.

The simulations for the MEP



Central to the First Team's LHX concept is a two-pilot cockpit whose flexibility will allow one pilot to accomplish most missions. Both teams' designs will use advanced technology to relay information to multifunction displays rather than to individual cockpit instruments.

equipment will use some of the most elaborate test equipment yet devised. Both McDonnell Aircraft Co. and Boeing Military Airplanes, the MEP integrators for their respective teams, plan to conduct breadboard and brassboard simulations of the MEP, both in isolation and with the cockpit configurations. The MEP is so complex that it is being treated almost as a separate development effort.

The results obtained in the simulator will also be applied to LHX training. Both teams have been asked to submit proposals for a turnkey, contract-run training system for LHX that would be similar to the Navy's T45TS. This will be the first total training system for the Army. In addition to training, a contractor-run integrated logistics system is also likely to be included in the LHX contract.

Some Major Differences

Although the two teams' preliminary designs for LHX are similar, there are some major differences between the two entries.

Boeing Helicopters, located in Philadelphia, Pa., and Sikorsky, based in Stratford, Conn., teamed almost a year before the Superteam formed. As a consequence, the First Team's design seems closer to final form. Its design will have an all-composite, five-blade rotor (for noise reduction and vibration reduction) atop an all-composite airframe. Weapons will be mounted on

two-position (drooping for firing and extended for ease of loading) retractable "wings" on the fuselage sides. The First Team has lined up many of the subcontractors building avionics or equipment for current Army helicopters or Air Force aircraft.

The Boeing/Sikorsky design will use an enclosed fan-in-fin tail rotor beneath a T-tail. The fan-in-fin design meets the Army's requirement for a protected tail rotor, and, because the enclosing structure acts as a duct and provides thrust augmentation, a smaller fan can be used. This LHX will be the first helicopter, and one of the first air vehicles, to use fly-by-light (fiber-optic) flight controls.

McDonnell Douglas Helicopter, in Mesa, Ariz., and Bell Helicopter Textron, in Fort Worth, Tex., are still developing a final LHX configuration. The Superteam design will use a four-blade composite rotor blade based on Bell's 680 Rotor System, which has composite yokes and cuffs and, unlike almost every other rotor, contains no bearings. The airframe will also be made of composites. Weapons will be mounted on retractable pylons in the fixed sponsons. McDonnell Douglas Helicopter and Bell build all of the Army's current scout and attack helicopters.

The McDonnell Douglas/Bell design will use MDHC's revolutionary NOTAR (no tail rotor) configuration under a conventional tail. The NO-

The LHX Lineup

Function	First Team	Superteam
Supportability	Boeing Helicopters	McDonnell Douglas Helicopter
Air Vehicle Integration	Sikorsky Aircraft	Bell Helicopter Textron
MEP Integration	Boeing Military Airplanes	McDonnell Aircraft
Processors	TRW; Westinghouse	Texas Instruments; AT&T; Unisys; Hughes Aircraft
EO Sensors/NVPS	Martin Marietta; Westinghouse	Texas Instruments; Hughes Aircraft
Helmet-Mounted Displays	Kaiser; Hamilton Standard	Hughes Aircraft; Honeywell
Flight Controls	Boeing Electronics; Hamilton Standard	General Electric; Honeywell
Controls/Displays	Collins; Boeing Military Airplanes	Litton Canada
Airborne Survivability Equipment	TRW; Westinghouse	Northrop; Eaton
Training Systems	Link Flight Simulation	McDonnell Douglas Helicopter



Advanced flight technologies demonstrated in these aircraft will become part of the Superteam's LHX design. That design includes a four-blade, bearingless rotor blade based on the 680 Rotor System of the Bell 222 (foreground) and an advanced flight control system similar to that of the Army's McDonnell Douglas AH-64A Apache prototype, modified for advanced cockpit technology evaluation.

TAR system uses a variable-pitch fan to force low-pressure air through a slotted tailboom to a thruster for antitorque and directional control. The Superteam's LHX will use fiber-optic links for some functions, but will have fly-by-wire flight controls.

One thing is certain. The winning LHX will be powered by the Allison/Garrett T800 turbine engine. The T800 was picked over two competing designs last October. The T800 is a 1,320-shp-class turboshaft

engine capable of fifty percent growth without changing the frame size.

The T800 has been in development since 1985. Only six simple hand tools are needed to repair it, and no major engine accessory takes more than six minutes to replace. The T800 is highly resistant to foreign object damage because of its integral particle separator. In tests, the T800 ingested twelve pounds of sand without losing more than fifteen percent efficiency.

Another characteristic that is set is the LHX weapons load. Primary weaponry will be the Rockwell/Martin Marietta AGM-114 Hellfire anti-armor missile, with the General Dynamics FIM-92 Stinger shoulder-fired missile adapted to pods for air combat missions. Configuration will vary with mission. The chin-mounted cannon, a single-barrel McDonnell Douglas Chain Gun on the Superteam LHX and a three-barrel General Electric Gatling-type gun on the First Team's helicopter, will be aimed by movement of the pilot's helmet. Both teams will probably use a 20-mm cannon.

It is unlikely that LHX will fly into battle alone. On most missions, at least one LHX will be configured for air combat (eight Stingers, two Hellfires, and 500 cannon rounds) with its partners configured for attack (eight Hellfires, two Stingers, and 500 cannon rounds).

The LHX winner is to be announced in December 1990, with full-scale development to begin then. First flight is expected in 1993, with first deliveries to the Army in March 1996. LHX initial operational capability is scheduled for November 1996. Eventually, both the winning airframe teammates and Garrett and Allison will be split, and the companies will then compete for yearly LHX and engine production. ■

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Competition Is a Mixed Blessing

**BY JAMES W. CANAN
SENIOR EDITOR**

THE Air Force is as determined as ever to demand competitive contracting for everything from fighters and space systems to nuts and bolts. There are signs, however, that the service is tempering its approach in response to contractor complaints that competition may be turning into a counterproductive sacred cow.

In various forms, such complaints were expressed by aerospace industry executives who took part in the "1988 Air Force Competition Advocate Conference" sponsored by the Air Force Association near the end of last year in Arlington, Va. The executives applauded competition in principle and had no philosophical quarrel with the Pentagon's drive to make it the order of the day in contracting.

They warned, though, that the Pentagon's pursuit of lowest possible prices by virtue of competitive contracting has been overly zealous and is fast becoming self-defeating. For one thing, they said, some shoddy products that look good on balance sheets but that sap military strength are beginning to show up.

By and large, the conference speakers from the defense industry

also agreed that the Pentagon's all-out campaign for competition has been a big reason why a growing number of tried-and-true defense contractors have quit doing business with the military. This is depleting the defense industrial base and darkens the prospects for effective industrial competition in the future, the industry spokesmen contended.

Conference panelist Donald A. Hicks, former Under Secretary of Defense for Research and Engineering, now a consultant to the Pentagon and the aerospace industry, appeared to reflect the consensus of the industry. Dr. Hicks declared that "competition does not always make economic sense for the US government," because other factors, such as quality and past performance of contractors, may outweigh it in awarding certain contracts.

Dr. Hicks claimed that the importance now being ascribed to competition in isolation is disproportionate and is "distorting and strangling the system" by which the Pentagon procures its hardware. He called competition "a good thing, because it makes the free-enterprise

system work." But he contended that the defense industry is "more like a public utility than a free-enterprise system" and that its companies cannot show their stuff in a climate of low bidder takes all.

Dr. Hicks declared: "There are times when we need to go to limited competition or to sole-sourcing for the benefit of the government, but it has become incredibly difficult to do that. We've got to take another look at this."

Defending Competitive Contracting

At the conference, Air Force procurement and contracting officers joined with counterparts elsewhere in the government in defending the latter-day emphasis on competitive contracting. They maintained that competition is not being overdone and that other criteria are indeed taken into account in deciding which companies win government contracts.

For example, Lt. Gen. Robert McCoy, Vice Commander of Air Force Logistics Command, declared: "We're looking for quality products, on time, at the best price—I didn't say 'lowest price'—and we're getting them."

Despite such claims of salutary results, the conference brought forth evidence of a subtle shift of emphasis in the Air Force's approach. The word was that USAF will continue to push hard for competition in contracting, but will view competition in broader perspective than it has in the past.

Assistant Secretary of the Air Force for Acquisition John J. Welch, Jr., told the audience: "For this coming year, I plan to exploit our Competition Advocate program to structure a system that will be more compatible with today's acquisition environment.

"Competition will continue to be the catalyst that it is—but we also need to be reminded that it is only one of a number of acquisition tools available to us."

Recognizing past performance and rewarding risk-takers are among such tools to be applied by the Air Force in picking winners among companies vying for contracts, he said.

Citing the Competition in Contracting Act of 1984, Mr. Welch said

its purpose "was not to establish competition for competition's sake," but to foster it as "part of an overall effort to achieve the best value for our taxpayers' dollars."

Accordingly, he said, the Air Force has set out to make competition an integral, but not the dominating, part of "an acquisition system where quality and customer satisfaction are of paramount concern."

This, said Mr. Welch, is in keeping with "total quality management" (TQM), a concept that now guides the Defense Department's acquisition community. He de-

Competition will continue to be a catalyst, but it is only one of many acquisition tools.

scribed TQM as "involving everyone in an organization—management and labor—to improve performance at every level." TQM "focuses on all goals, including quality, cost, schedule, mission need, and suitability," he added.

The Air Force's move to make competition but one element of a more comprehensive acquisition policy should not be construed as a knock on competition, Mr. Welch made clear. He claimed "unparalleled success" for the service's implementation of the Competition in Contracting Act, which resulted in five straight years of increase in the dollar value of contracts awarded on the basis of competitive bidding.

"This demonstrates that the Air Force has woven competition into the fiber of our acquisition process, and we can be proud of what we have accomplished," Mr. Welch declared.

He claimed that "competition has provided an excellent incentive for industry to promote efficiency while giving the services a tool to obtain greater value for our dollar—it has done much to discipline the acquisition process."

Spelling Out Successes

At the conference, Air Force Competition Advocate Anthony J. DeLuca spelled out the successes that Mr. Welch had claimed. He noted that the Air Force in Fiscal Year 1988 had awarded contracts worth \$23.6 billion as a result of competition, or nearly double the \$12.4 billion of such contracts awarded in Fiscal Year 1984.

Mr. DeLuca told the conference that the Air Force is aiming in the current fiscal year to obligate sixty percent of the value of all contracting dollars in contracts awarded as the result of competition. Its goal in the past fiscal year was fifty-seven percent, and it exceeded that to the tune of 60.9 percent.

The service chose not to try to match the 60.9 figure or go beyond that high-water mark in the current fiscal year, because it does not want to overreach.

Noting as much in an interview earlier this year, Mr. DeLuca said that his office will stress competitive contracting in Military Airlift Command through calendar 1989, just as it did in Tactical Air Command through calendar 1988.

"When we go out to the Air Force, we tell them that we don't want them to be zealots," the Competition Advocate declared. "It's hard to beat competition as a motivator, but it isn't always appropriate. We emphasize to our procurement people that they have to understand what it is they're buying before they can have a competition."

He made it clear that there will be no pulling back from competition and that competitive contracting will become more prevalent in such areas as space systems, follow-on production of all sorts of systems—whether initially procured under

competititon or not—and spare parts.

At the AFA-sponsored conference late last year, Air Force Chief of Staff Gen. Larry D. Welch also tipped his cap to competition, crediting it with having contributed to USAF's high state of combat readiness. He declared:

"Competition helps put a quality product in the hands of our troops on the line. We have no room for substandard equipment. We won't accept it. Competition is a highly effective weapon against it."

The Chief of Staff also noted that competition sharpens up the defense industry by driving it "to search for better ways of doing business—and in global economic competition, that drive is an absolute requirement."

But General Welch struck the common theme of the conference in asserting that competition, while a powerful and desirable instrument of acquisition, "is not an end." He continued: "The measure of success is the product. The product is the most combat capability at the lowest possible cost. That is the ultimate objective."

"The Air Force will employ competition in the future as it has in the past—when and where it is the right approach to gaining that objective."

How Competition Helps

This message was expressed another way at the conference by Daniel Rak, Deputy Assistant Secretary of the Air Force for Acquisition Management Policy and the overseer of Mr. DeLuca's shop, as follows:

"Competition must be viewed as helping us get to our objective of acquisition, which is goods and services that are required by the users to provide national security at the lowest cost to the government."

The Air Force measures its success at institutionalizing competition by the degree to which it "eliminates overpricing" and "challenges noncompetitive procurement" at every turn, Mr. Rak explained.

He cited as essential to this process such key steps as "training the work force, developing competition goals, monitoring performance, and recognizing and rewarding achievement," and added: "Having done all this, we now believe we may better

use competition in developing an overall acquisition strategy."

Maj. Gen. Charles Skipton, Commander of Air Force Systems Command's Contract Management Division, defined the importance of competition in broad terms, saying: "America's ability to survive depends on keeping that competitive edge, and not just in our technology, but in the quality of our products."

According to General Skipton, USAF's prime contractors are finding that promoting competition among their subcontractors pays off. Those primes now "compete about one-half of all their sub-

"The measure of success is the product. The product is the most combat capability at the lowest possible cost."

contracts," he said, and added: "Companies with competition advocacy programs have better handles on subcontractors, suppliers, and vendors, and on costs."

But John O'Brien, President and Chairman of the Board of Grumman Corp., took a somewhat different tack.

As the defense industry's keynote speaker at the AFA-Air Force conference, Mr. O'Brien declared right off that "all of us in business subscribe to the principle of competition. Competition is what makes capitalism work." He also noted that the American public and opinion leaders, when polled, have endorsed competition as "the best way

to produce high-level military technology at reasonable costs."

It is also obvious, said Mr. O'Brien, that competition can take at least some of the credit for lower costs and higher quality and reliability of US military hardware. In this context, he cited USAF's dual-sourcing of fighter engines.

"Even the General Accounting Office is giving you good marks," Mr. O'Brien said. He referred to a report by the GAO, which is often critical of Pentagon procurement practices, to the effect that major weapon systems have been costing less in the 1980s than they did in the 1970s. The GAO caveat, said Mr. O'Brien, was that "some of the systems of the '80s are just now entering the high-risk phases of development where costs are most likely to grow."

The Grumman executive acknowledged that his company, in response to government pressure, is "competing more subcontracts, and we've identified over \$50 million of savings to the government as a result. That number will grow as we compete more of our business, which we definitely will do."

A Corporate Misadventure

Then Mr. O'Brien showed the other side of the coin, saying: "But in this devilishly complex world of government contracting, which is by no means an Adam Smith free marketplace, creating competition is also causing some second-order effects that I think we all should pay attention to."

He illustrated this point with a story about a Grumman misadventure.

Grumman decided to reopen for competition a major subcontract for an aircraft structural assembly. It issued five invitations to bid, got back three bids, and—in keeping with the current climate—chose the lowest bidder to pick up where the original supplier, who lost out, had left off.

But the original supplier had contractual obligations elsewhere that precluded its release of 2,400 tools needed by its successor to build its piece of the Grumman aircraft. To make matters worse, drawings of the tools proved to be outdated, and new tools had to be built on the basis of production parts.

"Then," said Mr. O'Brien, "we found that the production parts drawings were also outdated, something that is not unusual in this industry. Now our new supplier was up against the wall, and our entire aircraft line was in jeopardy."

In the end, the new supplier hired away the original supplier's shop superintendent, who was able to update the drawings and translate them into work orders.

Asserted Mr. O'Brien: "The [military] customer got some cost savings, we got a huge headache, and we put an entire aircraft program at risk. . . . If you had my job, how eager would you be to repeat that experience? Where's the incentive for defense contractors to take the risks of disrupting established supplier relationships to introduce greater competition into the procurement process?"

He also cited as counterproductive the cost of making the defense marketplace more competitive. His claim was that DoD "is hiring some 6,000 additional employees to stimulate competition" and that this "will surely cost a couple of hundred million dollars a year, not considering the cost of all the employees the industry will add to produce the reports and answer the questions of all those 6,000 people working hard to do their jobs."

According to the Grumman president, the cost of all defense procurement reforms of recent years, including the drive for more competition, comes to "about eight and a half billion dollars, which is equivalent to fifty percent of the total equity of the major companies in our industry."

In contemplating this cost along with the defense budget crunch, "It's not hard to understand why Eaton, Bendix, Gould, IC Industries, and many others are shifting their investments away from defense and into more attractive businesses," Mr. O'Brien declared.

He insisted that the true cost and productivity of the government's drive for more competition can be accurately calculated only in the overall context of all recent changes in defense procurement policy. He enumerated among such changes the Pentagon's requirement for "huge corporate investments in the competition for new programs, such

as the [Air Force] Advanced Tactical Fighter and the [Navy] Advanced Tactical Aircraft, changes in tax treatment, progress payments, and all other elements of procurement reform in recent years that, taken together, prompted the sour witticism that 'you can make a small fortune in the defense business, but only if you start with a large one.' "

Deploring Distrust

Dana B. Badgerow, Honeywell's vice president for corporate contract management and compliance, questioned whether Pentagon procurement reforms, given their costs

"We've constructed a system that treats competition as a function of the rules and ignores that competition is also a function of the human spirit."

of implementation, "are saving any money." She also deplored the growing distrust and reluctance to take risks, which she claimed the drive for competition and other reforms have induced.

"We have to get away from the single-minded pursuit of administrative perfection," Ms. Badgerow declared. She criticized the Pentagon's "determination to find fault instead of fix mistakes."

A basic problem, the Honeywell executive claimed, is the government's "lack of trust" with respect to its contractors. This, she said, "is chipping away at people's spirit. It's making people throughout the system avoid taking risks, it's reducing

efficiency, and it's taking the fun out of doing valuable and challenging work."

Ms. Badgerow recommended that the government "give self-governance a chance" in the industrial community and abandon its "punitive approach in search of wrongdoers" there.

She also declared: "We've constructed a system that treats competition as a function of the rules and ignores that competition is also a function of the human spirit." She recommended that the government "give competition a chance, but let it work in the marketplace. Don't load it down with onerous requirements and additional remedies."

This view was underscored by Joel Marsh, United Technologies Corp.'s corporate competition advocate. He called competition "a key ingredient of our free-enterprise, market-oriented economy," but declared that "it works best when not encumbered by too many rules and when it allows for risk and innovation."

Mr. Marsh said that "competition is here to stay in DoD contracting," but that its nature must be changed to "deemphasize statistical emphasis based on prices of awards and emphasize quality instead. We need to think through competition and tailor it to good commercial practices. Entrepreneurship is what we're really talking about here."

The UTC executive declared: "DoD needs to understand that the US industrial base is seven to nine tiers deep and is structured on a commercial basis. . . . It is a very delicate house of cards, and it needs to be strengthened if we are to retain technological leadership."

In this vein, D. Blaine Scheide-man, vice president for contracts and estimating with General Dynamics Corp.'s Fort Worth, Tex., division, contended that the first order of business for the Pentagon and the defense industry is "to maintain the technical superiority" of US systems.

He said industry "may have a problem" in building weapon systems at highly competitive prices while meeting the Air Force's stringent standards of reliability and maintainability. "Quality and operational integrity could be compromised," he warned. ■

NATO has not yet come to grips with the unexpected changes of the past year.

New Realities on the European Front

BY STEPHEN P. AUBIN

EACH anniversary of the North Atlantic Treaty Organization typically prompts a certain measure of self-criticism and self-praise. Without fail, a spate of articles discussing "NATO in Crisis" and "NATO at a Crossroads" appears at the same time US and European military and political leaders are dusting off and updating the inspirational and self-congratulatory speeches that traditionally mark the occasion.

To repeat this well-worn ritual in 1989 as NATO's fortieth anniversary arrives would be a big mistake. Indeed, the time has finally come to stop theorizing about perennial problems and to start acting on proposed solutions, to stop singing NATO's praises and to start facing up to the inevitability of change.

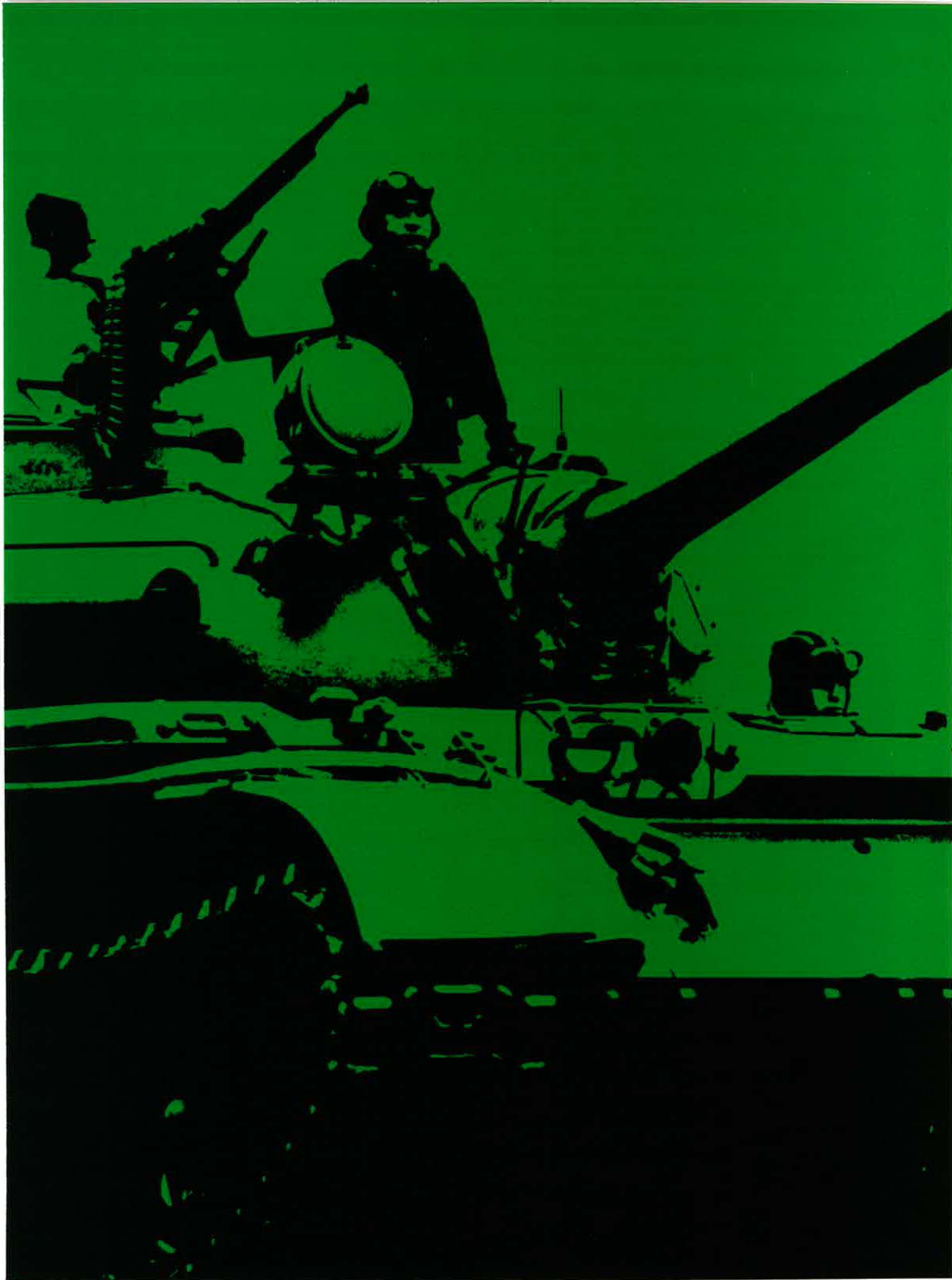
During a conference in October 1987 at the Royal United Services Institute for Defence Studies, NATO Secretary-General Lord Carrington began his speech with this remark: "My first reaction, when asked to make an inaugural presentation for your study on 'NATO and the Warsaw Pact: The Next Fifteen Years,' was perhaps a predictable one. I spend a good deal

of my time worrying about what just one of those organizations is going to be doing in the next fifteen weeks."

Unwittingly, the Secretary-General may have hit upon one of NATO's biggest problems: its inability to look to the future with any sense of grand strategy. While it would be naïve to suggest that the task of imposing a grand strategy on an inherently political alliance is an easy one, recent changes in the international political, military, and economic spheres indicate that NATO may no longer have a choice—if its members want to be around to celebrate the next forty anniversaries.

It is probably safe to say that even the most prescient Western leader could not have accurately predicted the startling events of 1988. Recall that at the end of 1987 the world was busy pondering the dramatic consequences of the signing of the first treaty between the United States and Soviet Union to actually reduce the number of nuclear weapons. In hindsight, that was the crossroads for NATO. In one fell swoop, the Intermediate-range Nuclear Forces (INF) Treaty eliminated a whole

The question of how best to cope with the threat of Soviet military power—in particular, armored forces like those shown at right—continues to bedevil NATO as the Alliance enters its fifth decade. Gorbachev's charm offensive, slackening Western defense budgets, fierce economic rivalries, and the intensifying Western nuclear allergy are all undermining the old ways. What the West should do to replace them, however, is far from clear.



class of nuclear missiles from NATO's arsenal.

The treaty also punched a hole in NATO's "Flexible Response" doctrine. By removing NATO's premier theater weapons, the INF Treaty brought renewed attention to the state of NATO's conventional defenses and the cost of maintaining adequate conventional defense in the face of an overwhelming Warsaw Pact advantage.

Nevertheless, the INF Treaty had been in the making for some time. The real surprise came one year later when, on December 7, 1988, Soviet leader Mikhail Gorbachev announced unilateral cuts in Soviet troops and equipment facing NATO. Since then, Czechoslovakia and Bulgaria have followed suit, announcing military cuts in troops and equipment that represent fifteen percent and twelve percent, respectively, of their military budgets.

Add to these developments shrinking Western defense budgets in the face of plans for costly conventional modernization, an increasingly competitive international defense marketplace where supply is exceeding demand, and such thorny political issues as burden-sharing, short-range nuclear missile modernization, and the toll that training exacts on the West German populace. Suddenly, the term "crisis" becomes far less theoretical.

Revision of Strategy Needed

One of the reasons that the word "crisis" is appropriate is NATO's unwillingness to look change squarely in the eye.

In the fall of 1988, months after the signing of the INF Treaty and the Soviet announcement of its new "defensive" military doctrine, NATO Secretary-General Manfred Wörner addressed the same forum as had Lord Carrington the year before. "Certainly," Wörner said, "we do not wish future historians to accuse us of wasting our opportunities either by hasty overreaction or labored tardiness in determining the real options on the negotiating table. What is needed is an alliance which is at peace with itself and united in a clear sense of its collective purpose.

"In this respect," he continued, "I do not believe that any changes

are called for in the twin aspects of NATO strategy: the military doctrine of Flexible Response, based on credible nuclear and conventional components, and the Harmel Doctrine of 1967 with its dual emphasis on defense and dialogue."

This is exactly the kind of statement members of the Alliance do not need to hear. Rather than continuing to enshrine the doctrine of Flexible Response, NATO leaders on both sides of the Atlantic need to get on with a serious reevaluation of current NATO military strategy, framed in a much broader international Western strategy encompassing current political and economic realities.

After Gorbachev's surprise announcement of military cuts last December, Sen. Sam Nunn, the Georgia Democrat who chairs the Armed Services Committee, wrote in the December 18 Washington *Post*, "General Secretary Gorbachev's announcement of major Soviet force reductions has altered the political landscape upon which the United States and its allies must formulate NATO military posture and arms-control proposals in the months and years ahead."

Former NATO Commander Gen. Andrew J. Goodpaster told *Post* reporters on December 8 that Gorbachev's proposed cuts were "the most significant step since NATO was founded" in 1949. He was right. If Gorbachev carries through in deed what he has expressed in word, NATO will never be the same again.

Whether or not NATO leaders recognize it, change is all around them. In fact, the INF Treaty provided renewed impetus for changes that were already under way. By the fall of 1988, the French and West German armies had formed a joint brigade. This prompted speculation about a future Euro-army. By the end of 1988, an all-European multinational airborne strike force had been formed, including units from Britain, West Germany, the Netherlands, and Belgium. These developments, though somewhat symbolic, point to an increasing awareness of the role that conventional defense must play in the future.

Last summer, Canada decided to consolidate all its forces in the Central Region, including the Canadian

Air Sea Transportable (CAST) Brigade, which had been designated to reinforce Norway. But Gen. John Galvin, Supreme Allied Commander Europe, succeeded in establishing a NATO Composite Force to assume that role. Though smaller than the Canadian brigade, the new force conformed better to the needs of the Commander of Allied Forces, North. He wanted more helicopter mobility and more artillery, among other things.

On the political front, the end of 1988 witnessed a greater awareness of reality even among some of the more pacifist elements in Europe. For instance, one newspaper reported that more than sixty percent of the Dutch population believes that the INF Treaty would not have occurred if NATO had not deployed new theater nuclear missiles in Europe starting in 1983. Moreover, seventy-eight percent indicated that the Netherlands should stay in NATO. Fifty-eight percent said that the Warsaw Pact must reduce its conventional force superiority before any further nuclear arms negotiations can take place. Yet in the same poll, forty-seven percent of respondents said they oppose increased spending on conventional forces.

A European Pillar?

Talk of a European pillar in NATO has seemed to breathe new life into the once-moribund Western European Union (WEU). Lately, the WEU has provided a forum for the coordination of security policy by European members of NATO. Just last November, Spain and Portugal were formally admitted to the WEU. Of course, Europeans are careful to say that the WEU can in no way substitute for NATO and the US protection that NATO affords them.

At the first European defense conference of the WEU last November, French Prime Minister Michel Rocard emphasized the need to build a European defense pillar within NATO and presented four proposals aimed at promoting closer defense cooperation: creating an armament field coordinating group linked to the Independent European Programme Group (IEPG); creating a European center for collecting, exchanging, and interpret-

ing disarmament information; reactivating European cooperation on development of an observation satellite; and creating a European institute of higher studies attached to the WEU that would be designed to foster a European security culture.

Overshadowing these modest proposals, however, is sharp disagreement over the fundamental issue now confronting the Alliance—how much military and political utility to ascribe to nuclear arms. This intra-European nuclear debate, no less than its transatlantic counterpart, has exposed deep and possibly unbridgeable divisions.

The argument has produced divergent conceptions of the nature of a new European pillar. British Prime Minister Margaret Thatcher maintains that nuclear weapons offer unparalleled deterrent power and therefore should be the hallmark of any European defense entity. Other nations—West Germany especially, but also smaller allies—appear to see nuclear weapons as having limited military value and high political costs. Thus, these nations seek to raise the profile of West European conventional forces while preserving a credible nuclear posture.

In arms-control matters, the nuclear policy disagreements produce a similar lineup of friends and foes. London agrees that Washington should resist Soviet calls for a negotiated ban on its short-range, "battlefield" arms in Europe. Arrayed against them are West Germany, where most such weapons are based, Belgium, and a few other countries that favor a new round of talks.

John G. Tower got a taste of future problems when he attended a NATO conference at the end of January. It was clear that the Gorbachev announcement in December had reinvigorated leftist movements in Western Europe. Convincing them now that modernization is necessary to maintain a credible deterrent will not be easy. Apparently, the lessons of the INF Treaty have quickly faded from memory.

Even as Europeans grapple with the idea of a European pillar and just what its creation would mean, the problem of the nuclear-conventional balance in NATO strategy has taken on more importance than ever. In the face of unilateral con-

"Limping along with symbolic changes on the conventional level and reinvigorating political-military structures . . . is not enough."

ventional force cuts by the Soviet military, many Europeans are choosing to ignore the remaining imbalances that will persist even if Gorbachev follows through on his promise. In fact, not only will NATO still be heavily outgunned in the conventional arena, but it will also not be able to rely on land-based intermediate-range nuclear missiles as an insurance policy.

If modernization of short-range missiles does not take place, the only way for NATO to shore up its forces will be to invest heavily in new conventional technologies. That, however, will not come cheap.

These realities point out the need to think through current NATO strategy and make the necessary revisions. Limping along with symbolic changes on the conventional level and reinvigorating political-military structures such as the WEU is not enough. One positive sign involves recommendations under review to establish a process for long-range planning in conventional weaponry. The Conventional Arma-

ments Planning System (CAPS), which would be designed to eliminate redundancies and improve coordination, is clearly a step in the right direction.

"Reinforced Deterrence"

On the topic of strategy, one top American analyst of NATO, Thomas A. Callaghan, Jr., has said that a revision of NATO's Flexible Response doctrine is overdue. Callaghan, an advisor to the Pentagon on NATO affairs, proposes to replace Flexible Response with a strategy he has dubbed "Reinforced Deterrence."

"The doctrine of Flexible Response," Callaghan writes, "has come to mean all things to all governments. Almost anything any government does—or does not do—can be justified as supporting Flexible Response."

According to Callaghan, NATO's Military Committee should undertake the revision of NATO document MC 14/3, which outlines Flexible Response, and substitute Reinforced Deterrence: credible, collective, conventional defense, reinforced by adequate Euronuclear Forces, reinforced by intercontinental nuclear parity.

Callaghan's concept is not all that revolutionary, but it goes much further in recognizing current realities than does the ambiguous doctrine that now governs NATO strategy. Some Europeans, too, are beginning to admit the need to rethink conventional defense.

In a *Strategic Review* article last fall, Dr. Hans Rühle, former director of the planning staff of the German Ministry of Defense, wrote, "In the new strategic environment, the Alliance faces squarely and inescapably the challenge of building up its conventional force posture. What it must aspire to is the attainment of levels of capabilities that will allow not merely a 'conventional pause' in a potential conflict—or simply a prelude to the introduction of nuclear weapons—but a protracted conventional defense capable of safeguarding the territorial integrity of the member NATO nations, while affording a realistic chance for war-termination without nuclear escalation."

The changes Callaghan and Rühle suggest make even more sense in

light of developments in NATO and the Warsaw Pact during the 1980s. For the first time, in the early 1980s, the West became convinced of Soviet planning for a conventional-only theater offensive against NATO. The man behind these changes in Soviet strategy was Marshal Nikolai V. Ogarkov, at that time Chief of Staff of the Soviet Armed Forces. Marshal Ogarkov recognized the increased lethality of new high-tech conventional weapons.

Some analysts of Soviet affairs even suggest that the sudden emphasis on the so-called "smart" conventional weapons represented a "third revolution in military affairs" in the Soviet Union (the first being mechanization and the second being the advent of nuclear weapons).

At the same time, US doctrine writers had been working on the US Army's AirLand Battle doctrine. This revised doctrine also took into account advances in technology and represented a greater focus on offensive operations and striking deep into the Soviet military's rear echelon. The Europeans, however, were conditioned to the more passive defensive doctrine that was more of a tripwire and less of a credible approach for checking any Soviet conventional attack.

Grudgingly, NATO adopted the Follow-on Forces Attack (FOFA) doctrine, which, in essence, contained most of the operational concepts of AirLand Battle doctrine.

With these changes in mind, and with the planned removal of intermediate-range nuclear missiles, a conventional defense, using high-tech weaponry reinforced by the remaining battlefield nuclear weapons (which should be modernized unless the Soviet military drastically reduces its conventional forces far beyond Gorbachev's Christmas proposal), further reinforced by the strategic nuclear parity discussed by Callaghan, makes sense.

How to Pay for It?

Over the past few years, the Department of Defense has been quietly pursuing a radical change in its approach to integrating new weapons into strategy. The doctrine is called "competitive strategies." Competitive strategies provides a national strategic framework for

buying weapons. Though a radical departure from past practices of buying weapons based on each service's perception of what it needed, competitive strategies is a common-sense approach that should have been incorporated long ago.

Essentially, it involves pitting US strengths against Soviet weaknesses. One example often cited is the development of stealth technology that renders Soviet air defenses obsolete. Stealth technology costs far less than the billions of rubles the Soviets have invested in air defense. The same logic applies to offsetting numerical advantages in Warsaw Pact tanks by equipping NATO forces with relatively cheap anti-tank weapons. Beyond that, it represents a disciplined approach to buying only those weapons that fit into overall strategy. One *Wall Street Journal* columnist called it "perestroika for the Pentagon."

The concept of competitive strategies has been embraced by President Bush. The services, however, have fought it each step of the way. The fate of competitive strategies may have a profound impact on how effectively scarce defense dollars are spent during the current administration.

The other dimension to the problem of resources involves the question of whether NATO members can successfully pool resources and eliminate wasteful redundancies. Here, too, NATO may have little choice.

Callaghan points out that Western Europe and the United States, though they have larger and more technologically advanced economies, are being outproduced and outdeployed in virtually every weapons area by the more backward economies of the Warsaw Pact.

Much of the problem, Callaghan contends, can be traced to NATO's structure. NATO, he says, is not a collective defense force; rather, it is a collection of defense forces. He identifies the need to shift from the idea of cooperative projects under-

taken by distinct national armed forces to the creation of cooperative structures that would allow the Alliance to pool resources effectively.

There is little doubt that the West would be capable of creating a high-tech conventional defense if a true division of labor were established. But it would have to be equitable, and the political problems would have to be tackled one at a time.

Callaghan calls "pooling resources" the most effective competitive strategy of all.

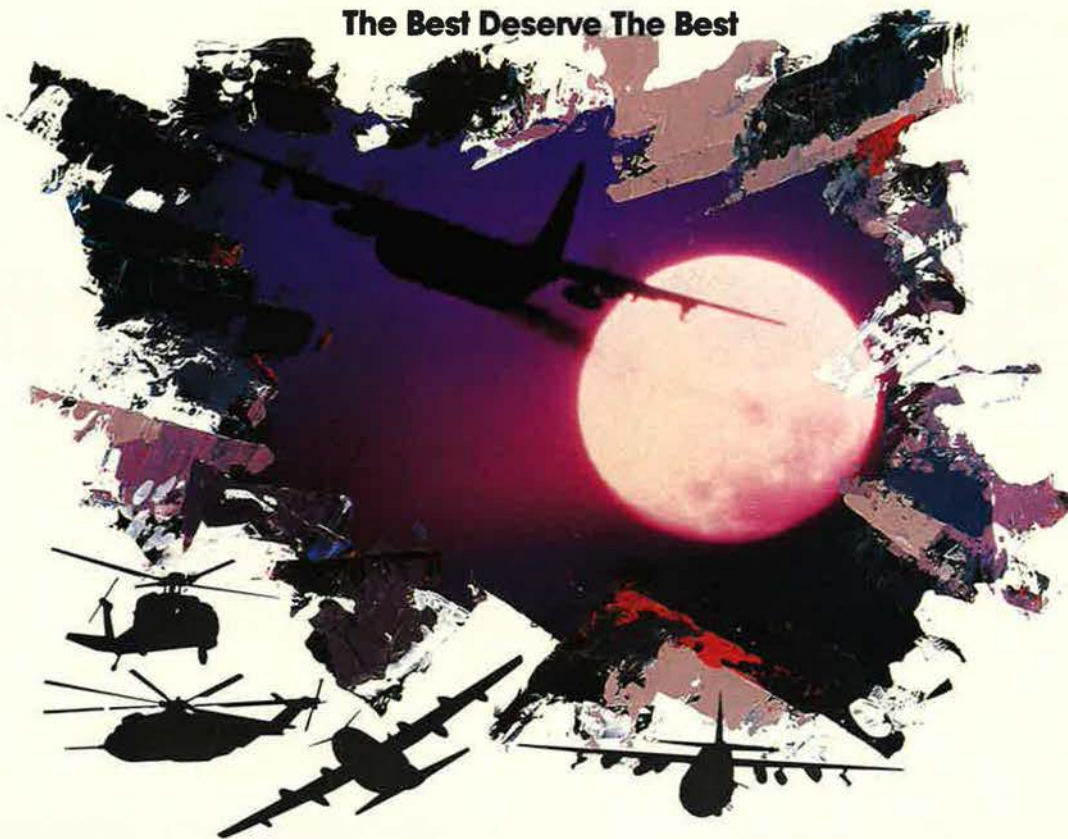
The occasion of the fortieth anniversary of NATO may give more meaning than ever to the terms "crisis" and "crossroads." The Soviet Union has clearly taken the initiative in the domain of grand strategy. Henry Kissinger recently stated that the degree to which Gorbachev's proposals "have taken hold without challenge—especially in West Germany—marks an astonishing success for Soviet policy at a time of maximum Kremlin weakness."

The reason for this can be put succinctly: The Soviets have a grand strategy and NATO doesn't. Moreover, there are more potential dangers for NATO on the horizon. How will the United States and Western Europe pool resources and construct an effective division of labor if the integrated European market of 1992 becomes a vehicle for protectionism? Similarly, the recent US-Canada trade agreement raises the possibility of the creation of an integrated North American trade bloc—in fact, if not in name. What impact would this development have on economic relations with Europe? What new tricks does Gorbachev have up his sleeve as the conventional stability talks (now known as the CAFE talks, for Conventional Armed Forces in Europe) get under way?

Clearly it's time for NATO to start thinking beyond the next fifteen weeks. It's also time to start facing the prospect that change is inevitable. Such are the new realities on the European front. ■

Stephen P. Aubin is currently an Olin fellow at Boston University's Center for Defense Journalism. He is managing editor of the Center's newsletter, Defense Media Review. Mr. Aubin previously served as a researcher and ghostwriter for Secretary of Defense Caspar Weinberger and as editor of Military Intelligence, an Army journal. His most recent article for AIR FORCE Magazine was "An Industry Without Frontiers" in the October '88 issue.

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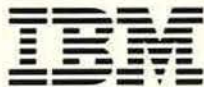
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Peacekeeper Challenge is a competition, but it's also a demonstration of what Security Police could do if they had to.

A Show of Security

**BY JEFFREY P. RHODES
AERONAUTICS EDITOR**

USUALLY, when Security Policemen are doing their job well, nothing happens. Quiet is good. At its best, a Security Police presence is felt more than it is seen.

That's what makes Peacekeeper Challenge, the annual competition of the Air Force Office of Security Police (AFOSP), unique. It features security work at its most active and demanding as SPs show their stuff in combat readiness. The meet, held at Kirtland AFB, N. M., includes the "top cops" from the major commands, the Air National Guard and Air Force Reserve, and Britain's Royal Air Force Regiment in a series of seven team and individual events.

The first competition, held in 1967 at Vandenberg AFB, Calif., was strictly a shooters' meet. SP teams shot .38-caliber revolvers on a pistol course and M16 machine guns on a combat rifle course. Renamed Peacekeeper Challenge in 1981, the competition was revised to include other small arms and events for law enforcement and physical fitness, all skills required of SPs.

The latest Peacekeeper Challenge, held last fall, was revised



Peacekeeper Challenge gives the Air Force's "top cops" a chance to showcase their skills. SRA. David K. Woolrich from the US Air Force Academy takes aim with his M9 9-mm handgun (used in the worldwide SP competition for the first time last fall) while SSgt. Christian Fernandez, a combat arms training and maintenance technician from Clark AB, the Philippines, looks on.

—USAF Photo by MSgt. David N. Craft

In the combat rifle event, teams shoot first at targets on a 1,000-meter course, then at different targets while crossing a ravine. MSgt. Barry Brown, SrA. John Fulton, and SrA. Scott Noble, members of the Air Force Logistics Command team, await instruction before proceeding on the tactical portion of the course.



—USAF photos by MSgt. David N. Craft

even further. As a result of the Air Force's increased emphasis on air base ground defense, the competition's emphasis shifted to proficiency in combat-related tasks.

Strength and Stamina

The demanding life of an SP requires strength and stamina, so physical fitness plays an important part in Peacekeeper Challenge. The entire team runs a 2.4-km course strewn with nineteen obstacles. What makes this course especially difficult is that Kirtland is more than 5,000 feet above sea level.

The same obstacle course is used for the meet's final event, The Inspector General (TIG) Challenge. The fastest runner on each team runs the course against other team winners for individual honors. The Air Force's IG, Lt. Gen. Buford D. Lary, presented the trophy to the winner, SSgt. Rodney L. Potter from Sembach AB, West Germany, representing Electronic Security Command.

All of the weapons used in the meet—handgun, combat rifle, light machine gun, and grenade launcher—are employed in a realistic tactical environment.

The latest Peacekeeper Challenge marked the first use of the new US standard sidearm, the Beretta M9 9-mm pistol. First, competitors fired the pistol from a standing position at steel silhouette knock-down targets at a range of fifteen meters. In the next phase of the event, the SPs made their way down a wilderness trail where they met friend-or-foe targets, making snap judgments on whether or not to fire.

During the first part of the combat rifle event, two four-member patrols from each team fired 5.56-mm M16 machine guns from standing, kneeling, prone, and foxhole positions on a 1,000-meter course. Pop-up targets at ranges between fifty and 300 yards were exposed individually or in sequence at five- to ten-second intervals. The patrol then engaged another set of targets while traversing a ravine.

Each two-man team competing in the machine-gun event carried its 7.62-mm M60 machine gun and ammunition to four firing locations. There, both gunner and assistant fired the gun at both point and area targets at distances of from 300 to 500 yards. The gun had to be mounted on both a bipod and a tri-



SSgt. Christopher Clay of ATC takes up a defensive position during the defender challenge event. The MILES box on the end of his M16 adds realism by "shooting" intruders with laser beams.

Peacekeeper Challenge Box Score

Team Physical Fitness

1. Strategic Air Command (13:00)
TSgt. Vincent A. Dougan, Malmstrom AFB, Mont.;
SSgt. Marc J. Black, Ellsworth AFB, S. D.
SSgt. Randall E. McCormick, Grand Forks AFB, N. D.
A1C Louis F. Fleming, Malmstrom AFB, Mont.
2. Pacific Air Forces (13:04)
3. Alaskan Air Command (13:13)

Combat Rifle

1. Pacific Air Forces (388 points)
1st Lt. Terry L. Morgan, Kunsan AB, Korea
SSgt. Walt Lilley, Hickam AFB, Hawaii
SSgt. Harry D. Zimmerman, Kunsan AB, Korea
A1C Israel Reyes, Clark AB, Philippines
A1C Warren D. Neiswender, Clark AB, Philippines
A1C Charles Rosa, Clark AB, Philippines
A1C Seth E. Ross, Clark AB, Philippines
A1C Christopher K. Aderhold, Suwon AB, Korea
2. Alaskan Air Command (376 points)
3. Strategic Air Command (360 points)

Machine Gun

1. Electronic Security Command (270 points)
Gunner Sgt. Thomas G. Williams, Kelly AFB, Tex.
Ass't. SSgt. Rodney L. Potter, Sembach AB, Germany
2. Military Airlift Command (265 points)
3. Royal Air Force Regiment (205 points)

Handgun

1. Strategic Air Command (904 points)
1st Lt. Stephen W. Dirito, Ellsworth AFB, S. D.
SSgt. Marc J. Black, Ellsworth AFB, S. D.
SSgt. Douglas R. Westbrook, Malmstrom AFB, Mont.
A1C Jabe R. Huntsman, Vandenberg AFB, Calif.
2. Tactical Air Command (894 points)
3. Air Training Command (865 points)

Grenade Launcher

1. Strategic Air Command (210 points)*
TSgt. Vincent A. Dougan, Malmstrom AFB, Mont.
2. Alaskan Air Command (210 points)*
3. Air Force District of Washington (160 points)

*Tie broken on the higher score at the furthest target.

Defender Challenge (Combat Tactics)

1. Air Force Logistics Command (532 points)
MSGT. Barry R. Brown, Kelly AFB, Tex.
SSgt. Kenneth M. Devries, Kelly AFB, Tex.
SSgt. Gerald J. Delebreaux, Kelly AFB, Tex.
Sgt. Carl E. Patterson, Kelly AFB, Tex.
Sgt. Jackie D. Green, Robins AFB, Ga.
SrA. John M. Fulton, McClellan AFB, Calif.
SrA. Scott E. Noble, Tinker AFB, Okla.
A1C John R. Curtis, Wright-Patterson AFB, Ohio
2. Royal Air Force Regiment (517 points)
3. Pacific Air Forces (508 points)

TIG Challenge (Individual Physical Fitness)

1. Electronic Security Command (11:02)
SSgt. Rodney L. Potter, Sembach AB, Germany
2. Alaskan Air Command (11:14)
3. Strategic Air Command (11:25)

Special Awards

RAF Regiment Commandant General's Award

(Given for displaying the highest qualities of leadership, professionalism, and teamwork during the competition)

MSGT. Barry P. Brown, Kelly AFB, Tex. (AFLC)

Air Force Sergeants Association Chief Master Sergeant of the Air Force Award

(Given to the meet's outstanding enlisted competitor)

Sgt. Robert J. Lauderdale, Maxwell AFB, Ala. (AU)

Noncommissioned Officers Association Chief's Award

(Given to the team that showed the best spirit, enthusiasm, and unity of effort)

Air Force Reserve Team

Albuquerque Chamber of Commerce Logistics Support Award

(Given to the individual who provided the most outstanding support to the competition)

A1C Michael Halliwill, Kirtland AFB, N. M.

—USAF photo by MSGT. David N. Craft



Close teamwork is required between the gunner and his assistant during the machine gun event. Here, SSgt. Edward L. Davis (firing) and SrA. Delano L. Jewell shoot at a target with a 7.62-mm M60.

pod at different times during the event.

The grenade-launcher event tested individual skills at acquiring, identifying, and engaging both point and area targets up to 250 yards away. This was done while the grenadier navigated a 325-yard course.

The Capstone Event

The capstone event in the competition—the defender challenge—brought together all of the SP teams' combat skills. The patrols had to demonstrate their knowledge of air base ground defense techniques, field craft (such as land navigation), and tactics in order to complete the 3,000-yard course successfully. The teams used the Multiple Integrated Laser Engagement System (MILES), a laser-designator device, to "shoot" at intruders with beams of light.

While Peacekeeper Challenge is a competition, no overall winner is

named. The meet is actually a kind of status check for the security police profession. As a result of better training and better weapons, the scores for the events have risen steadily over the past few years. In fact, scores that would have won three years ago would not have placed in the 1988 meet.

The lessons learned, especially in the area of tactics, are the major benefit of this meet. The best of what is gleaned from each Peacekeeper Challenge is incorporated into the SP training curriculum.

Each of the teams at this meet is composed of all-stars, picked from a number of each command's units. So, instead of the tips picked up at Peacekeeper Challenge going back to one base, then slowly disseminating to the Air Force at large (as often happens with other competitions), the information goes out to almost all of the locations where SPs are assigned. ■

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These stations made history by helping GIs call home from remote locations—and that achievement was only their sideline.

Our Affiliates From MARS

BY DR. LARRY R. MORRISON

MOST of us think of the Military Affiliate Radio System (MARS) as a provider of phone patches and a handler of messages between servicemen overseas and their families and friends back home.

That image is especially strong for those who served during the Vietnam War. They will remember how—with commercial telephone service limited and costly—MARS patched them through to friends and relatives at home. In 1969 alone, thirty Air Force MARS stations in Vietnam and Thailand, working with 200 stations in the United States, put together 210,000 phone patches.

Grand as it is, however, morale-building is a pleasant fringe benefit. The primary MARS mission is operational.

At its inception in 1948, the MARS program sought to stimulate the interest of amateur radio operators in military communications and to provide the nation with a pool of trained people it could call on in an emergency.

MARS still does that, but its mission is now global. Under Department of Defense sponsorship, it provides emergency communica-

tions—local, national, or international—as an adjunct to normal channels. The work covers crash sites, earthquake areas, and war zones.

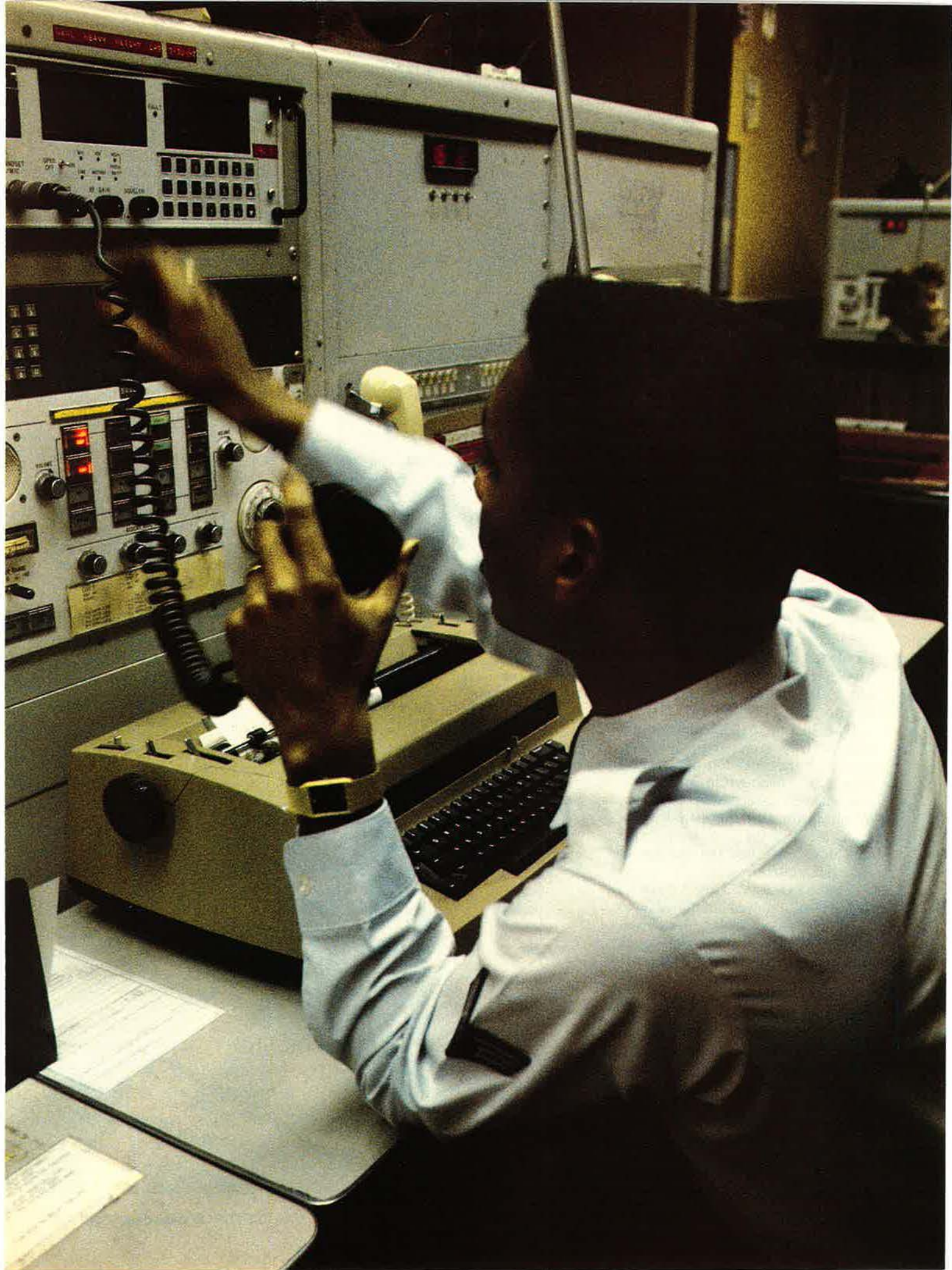
The network is a high-frequency backup to defense communications as well, so MARS has a specified role in various emergency and contingency plans. The Air Force Emergency High Frequency Network is currently in the planning stages. It will use mostly MARS assets and create a reliable contingency communications system.

Emergency Connections

Throughout its existence, the Air Force MARS program has provided communications assistance during military operations and emergencies. MARS played a prominent part in the evacuation of American dependents during the Middle East Crisis of 1967, and it demonstrated its value again in the Iranian emergency of 1979.

During the first attack by Iranian militants on the United States Embassy in Tehran, on the morning of February 14, 1979, normal communications with the United States and the western world were severed. At

The main mission of the Military Affiliate Radio System (MARS) is to provide emergency communications as an adjunct to normal channels. These units train by handling messages from service members overseas and relaying them to families and friends. Here, SrA. Warren L. Parham of the 2045th Communications Group, Andrews AFB, Md., patches an overseas call.



The Amateur Origins of MARS

Military amateur radio operations were first organized in 1925 as the Army Amateur Radio System. Networks of radio stations were established, and civilian amateur members were given intensive instruction in Army radio procedures and practices. By the beginning of World War II, about 8,000 amateur operators had been trained.

The network was disbanded on December 8, 1941, when the Federal Communications Commission terminated all amateur radio operations in the United States. The MARS system as we know it today dates back to 1948. The advantages of having a cadre of trained radio operators on call for emergencies were not lost on military planners. Both the Army and the newly created Air Force wanted to maintain such a capability. Thus the two services jointly formed the Military Amateur Radio System.

Originally, MARS membership was restricted to military personnel and reservists, but in 1950 membership was opened to other radio amateurs.

The MARS mission was expanded in 1952. MARS networks were authorized to transmit quasi-official communications and messages originated by the American Red Cross. MARS was now recognized as a supplementary system for regular communications networks and was to handle official Air Force message traffic when established systems were not operational. It was also agreed that MARS stations could assist in civil defense emergency communications networks so long as that did not interfere with their essential military functions.

Meanwhile, it had become apparent that the word "amateur" no longer described the operation adequately. Everyone agreed that "affiliate" was a better term, so the name was changed in 1952 without loss of the MARS acronym.

In 1959, MARS was tasked to provide back-up for USAF communications circuits and to respond to domestic emergency plans of numbered air forces in the United States. Soon thereafter, MARS stations began acquiring transportable units for mobile radio communications.

When the Air Force Communications Service (now Air Force Communications Command) became a major command in 1961, it became the single manager of the Air Force MARS program.

—L.R.M.

7:00 a.m., the National Military Command Center in the Pentagon requested the Andrews AFB, Md., MARS station to make contact with any radio station in Iran it could reach.

By 8:30 a.m., MARS had contact with an Iranian amateur radio station. For the next two and a half hours, this connection provided a link between government officials in Washington and the situation in Iran. Most of the communications that day concerned the welfare of American citizens.

The next day, the Andrews MARS station was finally able to establish contact with a MARS station in Tehran. For almost a week this channel augmented vital communications with Iran.

In Southeast Asia, MARS showed the other—and better known—side of its worth. In Vietnam in 1965, commercial telephone facilities were exceedingly limited. At most, they could handle thirty calls to the United States a day from servicemen. With the holiday season approaching, the military command in Vietnam appealed for help.

High costs and shortages of both equipment and manpower prohib-

The MARS station at Andrews was one of the first to be completely computerized.

The new system greatly improves productivity and increases the speed at which messages can be received and sent. Here, SrA. Stewart G. Smith of the 2045th Communications Group works on the computerized communications equipment.



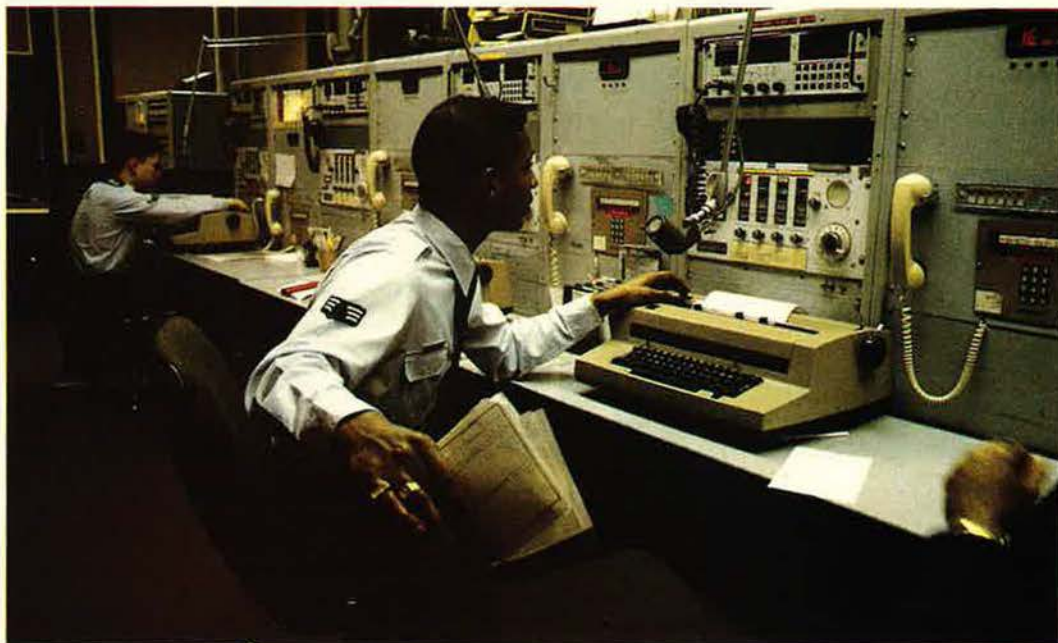
—Staff photo by Guy Acello

ited installation of additional telephone facilities, but the Chief of Air Force MARS offered a solution. Portable MARS radio stations could be—and were—airlifted to Vietnam. By December 14, seven Vietnam MARS stations were operating, and more than 15,000 messages were processed during the 1965–66 holiday season. By May 1966, Air Force Communications Service (AFCS) had begun action to airlift five packaged MARS stations to Thailand.

During 1966, more than 14,000 telephone calls were placed via MARS from Vietnam personnel to friends and relatives in the States. The MARS network reached its peak that year, with 450 military stations and more than 11,000 affiliate members.

MARS operations between Southeast Asia and the United States continued to increase. Alaska became a major relay for written traffic. Alaskan stations operated twelve to eighteen hours daily, using volunteer assistance, and passed thousands of messages monthly.

While many MARS stations are only open eight hours a day, the one at Andrews AFB is open around the clock, since it is one of the key stations. More and more MARS stations are taking over base emergency communications, though. Here, Airmen Smith (left) and Parham man the consoles to make phone patches during their shift.



—Staff photo by Guy Aceto

Phone patches from the combat zone averaged more than 10,000 per month.

As the war went on, MARS handled a lot more phone patches—more than 200,000 of them in 1970, for example. In addition to its morale-boosting work in Southeast Asia, MARS had a significant role in Operation New Life, the evacuation of refugees in the spring of 1975. The Hickam AFB, Hawaii, MARS station relayed US-bound messages by radio teletype through March AFB, Calif., the network control station for the refugee operation. From April 25 through April 30, the Hickam MARS station handled 497 radio-teletype messages and 114 phone patches related to the evacuation of refugees.

Amid Natural Disasters

Since MARS began operations in 1948, it has often assisted during natural disasters. When an Atlantic storm devastated coastal areas of Delaware and New Jersey in March 1962, a MARS van provided mobile communications between search parties. MARS also proved useful following an Alaskan earthquake in 1964. Civilian and off-duty military operators began relaying news of the earthquake soon after it happened. The network further enabled Alaskans to communicate with concerned friends and relatives in the continental United States.

More recently, MARS operated under emergency conditions when

hurricane Elena struck the Gulf Coast in September 1985. The hurricane passed directly over Keesler AFB, Miss., causing some \$25 million in damage. Throughout the storm, however, the base MARS station continued to function.

Later that same month, the first communications link between Mexico City and the United States following a major Mexican earthquake was established by the manager of the Robins AFB, Ga., MARS station, who picked up an emergency call from a MARS radio operator in Mexico City. Once he realized what the situation was, the MARS manager began transmitting and reached the American Embassy in Mexico City. Because of the severity of the earthquake, all telephones in the city were out. The first word of the disaster to reach the US State Department came from the Robins MARS station.

MARS stations fall into two general categories. The first is the base or unit station, located on a military reservation. Normally, military personnel operate these stations during duty hours, using military equipment.

In the second category are those stations operated by MARS mem-

bers, known as affiliates, participating in the Individual Member program. They are licensed radio amateurs who volunteer their time and services to MARS. They augment the military stations by operating the communications networks when the duty-hour stations are closed. Using their own equipment, they provide service on voice, continuous-wave, and radio-teletype circuits on radio frequencies assigned for MARS use.

Air Force Communications Command today manages 300 military MARS stations; approximately 3,000 volunteer affiliates complete the Air Force MARS network. There are ten MARS regions worldwide: six in the continental United States, one in Alaska, one in Central America, one in the Pacific, and one in Europe.

At present there are four round-the-clock stations, responsible for the ten MARS regions. These stations are located at Scott AFB, Ill., Andrews AFB, Md., Travis AFB, Calif., and Rhein-Main AB, Germany. AFCC is now studying the feasibility of operating a twenty-four-hour station in each MARS region to provide more effective coverage. ■

Dr. Larry R. Morrison has been with the Air Force Communications Command's history office since 1983. He was previously a professor of history at the University of Nebraska and at Virginia Tech. He earned his B.A. degree in history at DePauw University and his doctorate in American History at the University of Virginia. An Army draftee in 1967, he had his first contact with MARS while serving in Vietnam, when he "called home" via MARS.

With pierced steel planking, you could have a runway where you needed one. Even the holes in it were functional.

Marston Mat

BY RICHARD K. SMITH

IT WAS ten feet long, fifteen inches wide, covering 12.5 square feet with a surface resembling Swiss cheese stamped out of steel, and it weighed 66.2 pounds. Locked together, 60,000 of them created a durable all-weather surface 5,000 feet long and 150 feet wide that routinely accepted punishment from airplanes weighing up to 60,000 pounds thumping down at speeds of ninety miles an hour. This is the material that provided the quickly built platforms from which American combat aviation was projected around the world during World War II.

During 1941-45, the material was generally known as "Marston mat." This led many to believe that it was invented by someone named Marston. Or maybe it was a British invention, manufactured near Marston Moor, England. The truth is more prosaic. The name comes from a whistle-stop on the Seaboard Coast Line Railway, thirty-five miles west of Fort Bragg, N. C.

Here on a low hill a mile east of US Route 1 and two miles northeast of Marston, N. C., the material was first put to practical use. That was

during the Army's Carolina Maneuvers of November 1941, just before Pearl Harbor. The novel steel mat gave an eminently satisfactory performance—one fraught with epochal consequences.

Gen. H. H. "Hap" Arnold, Chief of the Army Air Forces, visited the "Marston strip" and hailed it as "the year's greatest achievement in aviation."

The "Marston strip," 150 feet by 3,000 feet, was operational for only a few weeks. When the maneuvers ended, the runway was dismantled, loaded into eighteen railroad gondola cars, and hauled away to Langley Field, Va.—taking with it the name of Marston. Thus, the "Marston strip," as it was called, entered Army vernacular, and the material became known as "Marston mat."

Years later, when memories of World War II had faded and acronyms took charge of military vocabularies, the village of Marston lost its claim to fame as bureaucrats reduced the material's name to "PSP"—pierced steel planking. A quarter of a century after 1945, the generation that laid hundreds of



By itself it's not much (right), but stick a few together and you have a well-drained, dust- and mud-controlling, instant runway capable of supporting heavy bombers. This versatile material became the footprint of Allied airpower in World War II.



thousands of tons of Marston mat throughout South Vietnam had no idea who or what Marston might have been or that a Marston existed. The material was simply "PSP."

Anglo-French Inspiration

In the spring of 1939, the Army Air Corps took note of operations in Britain and France where air forces were experimenting with steel grids for unimproved airfields. Unlike the situation in the United States, on the eve of World War II there were few concrete runways among European airports, but their turf airfields were among the best in the world. They were carefully sited, well tiled for drainage, often having collecting points and pumping stations installed, and were carefully planted with various species of grass whose root systems absorbed moisture. However, this was a technology not susceptible to rapid improvement.

With war imminent, the Anglo-French air forces required hundreds of airfields for dispersal, and the casual pastoral expedients of World War I could not serve airplane weights of 1939. A Sopwith Camel fighter of 1918 weighed 1,950 pounds, a Hawker Hurricane of 1939, 6,600. Furthermore, unlike the flying machines of 1918, the airplanes of 1939 had brakes. Nothing tears up an airfield's turf like the

frequent use of brakes by heavy airplanes.

British runway mat was similar to heavy-duty chicken wire. Shipped in huge rolls weighing tons, it was difficult to handle. Once in place, it was difficult to repair, and it seemed inadequate for medium bombers. The more versatile French type was a heavy steel chevron gridwork similar to that used in bridge decks or industrial catwalks. But each section weighed more than a hundred pounds, installation was complex, and much of the runway had to be taken apart to repair just one section.

The Air Corps required something more versatile, much lighter, and given to mobility. The specification is summed up by an old saying of the American aircraft industry: "Simplicate and add a bit of lightness."

In 1939, the gross takeoff weight of a typical single-engine fighter plane was 7,000 pounds; a medium bomber weighed 35,000 pounds. But the Air Corps required a surface also capable of supporting 55,000-pound heavy bombers, such as the Boeing B-17 Flying Fortress or the Consolidated B-24 Liberator. Furthermore, in 1939 the Air Corps was already getting ready for bombers like the B-29 Superfortress weighing more than 125,000 pounds.

Adaptable to Global Logistics

Besides being able to support airplanes, the mat had to occupy minimum space for ocean shipment. This was of small consequence to Europeans, but everywhere Americans looked they were standing on the water's edge.

One piece of Marston mat fit neatly inside another; a bundle of thirty pieces stood less than twenty-eight inches high. Packed for shipping, the mat for a 150-foot by 5,000-foot runway weighed 1,986 tons and occupied 41,600 cubic feet. The lower hold of #3 hatch, the largest space in World War II's ubiquitous Liberty ship, had a bale capacity of 59,793 cubic feet.

Distinct from its cubic dimensions, the weight of this single runway constituted twenty-one percent of a Liberty ship's payload. The material was distributed among a ship's lower holds, like flooring. Bulkier and lighter cargoes were loaded on top of it. With combat loading, such low-density items as bulldozers, graders, trucks, rollers, and other vehicles were needed first; the high-density runway mat was the last material required.

For shipping and convenience in the field, five mats were wired into subbundles; six of these were banded into a full bundle. Each full bundle contained twenty-nine full-length mats and two half-lengths—a total of 375 square feet. With the mats laid in staggered brickwork fashion, the half-lengths were used to piece out the edges of a runway.

The material also had to be easy for its installers to handle. Installation had to be simple, even in darkness. The Air Force specified a material of no more than seven pounds per square foot; Marston mat was 5.3 pounds. Its unit weight was 66.2 pounds. One man could handle a section with ease; two men could pick up a piece and run with it. As a rule, the only tool necessary for its installation was a sledge to beat it into the earth.

As inventions go, Marston mat ranks among the simplest. Although its function was to serve motion, it had no moving parts. A single mat consisted of a steel sheet with two ribs dividing its length into three flat channels. Each channel had twenty-nine holes punched along its length—eighty-seven holes per mat. The



Marston mat's compact dimensions and relatively light weight made it easy to ship and to carry. Wired into bundles and subbundles, 375 square feet of runway surface stood only twenty-eight inches high. Two men could pick up a piece and run with it. Here, a Guadalcanal airfield is improved with Marston mat after the island's capture from the Japanese.

holes were flared to increase the mat's rigidity.

These holes not only contributed to strength and reduced weight but also helped a section adhere to the earth. The holes also served drainage and helped dry out the terrain on which the mat rested. Vegetation could grow through the holes, reducing the problem of dust and making a small contribution to camouflage. The holes also made it possible for backfill to be poured into small soft spots in the earth.

Along each edge of a mat's length were thirty slots and thirty L-shaped hooks cut and bent from the mat's edges. Having hooks and holes in each mat made the mats interchangeable. The hooks of one mat were dropped through the slots of the adjacent mat, and then shoved forward two inches, locking the hook into the slot. Mats were further locked together by easily removed U-shaped steel spring clips that limited vertical motion.

For ease of removing a damaged mat, it was practice to install one course of mat with its hooks pointed in one direction, and the next course with its hooks pointed in the other. When a runway was complete, a single mat could be removed by two men with pry bars.

Design and Manufacture

The Marston mat owes its design to Gerald G. Greulich of the Carnegie Illinois Steel Co. and to many contributions by the Army Corps of Engineers. When first tested at Langley Field, Va., in the summer of 1940, the ribbed steel plank was solid sheet. Later, buttons were pressed into the flat channels to create a nonskid surface, but they didn't seem to make much difference. During the winter of 1940-41, it was decided that a solid surface was unnecessary, and holes were punched along the channels, giving the mat its distinctive appearance and reducing unit weight by 17.5 percent.

There were five steps in its manufacture: (1) the longitudinal ribs were pressed or cold-rolled into a blank sheet of 10-gauge low-carbon steel; (2) the slots and hooks were punched out; (3) the holes were punched and flared; (4) the hooks were bent ninety degrees to the mat; and (5) the mat was cleaned, de-



Marston mat's simple design facilitated easy repair as well as easy installation. Locked together by a hook-and-slot design, beaten into the earth with sledge hammers, and secured by steel spring clips, sections of runway could be removed with a pry bar. Here, troops repair bomb-damaged portions of Henderson Field, Guadalcanal.

greased, and painted. By December 1941, two factories had already manufactured some four million square feet of the material. A year later, twenty-nine factories were producing Marston mat.

At the dawn of 1944, more than 180,000,000 square feet (some 477,000 tons) had been shipped overseas. This was enough for 240 runways 150 by 5,000 feet. By the end of the war, almost two million tons had been produced, representing enough steel to build 600 Liberty ships.

Sooner or later it is "General Mud" who commands too many battle situations. Mud does not occur in nature when rain only wets the earth; but given intensive use by heavy airplanes and a week of rain, the best turf airfield will degenerate into a crazy-quilt of badly rutted mud. Marston mat performed well on soft ground, overcoming most of the problems.

Similarly, Marston mat controlled dust. The airplane is an incorrigible dust maker, and on a busy airfield dust can be an operational nightmare. Dust ingested by engines shortens the time between overhauls—never mind the general wear and tear on an airplane and its interior parts.

In dusty North Africa, airplane engines had only half the life be-

tween overhauls compared with those operated from the well-prepared airfields of England. More frequent overhauls require more spare parts, more manpower, and more facilities to serve the work. In North Africa, the total increase in logistics requirements often became horrendous. Meanwhile, aircraft availability suffered.

Dust also creates operational and tactical hazards. After two or three airplanes take off from an arid, dirt runway, visibility is reduced to zero. Since airplanes take off into the wind, the dust they generate blows back among the planes waiting to take off. With each takeoff the dust becomes thicker. Precious minutes are lost before the next plane can get into the air.

In the worst conditions, it could take half an hour to get a squadron off the ground, an operation that normally took five minutes. Tank trucks sprayed water over the runway to hold down dust, but this created only a thin patina that evaporated quickly. The pressure of airplane tires broke the thin crust, and prop blasts blew away what remained.

Each hole in a piece of Marston mat provided a small reservoir for runway watering, retaining its moisture for fifteen minutes or more. It was soon discovered that if



This Marine Corps photo from World War II shows an AAF B-17 Flying Fortress resting securely on a Marston mat runway on Guadalcanal. Basically unchanged some twenty-five years later, the material became known as "PSP," for "pierced steel planking," and hundreds of thousands of tons of it were laid throughout South Vietnam to support far heavier aircraft.

you covered the runway area with local flora—leaves, small branches, palm fronds, or, if it could be found, hay—and laid the mat on top, you greatly reduced the dust problem. Even after these materials dried out, they maintained barriers between the mat and the dust, retaining hygroscopic qualities that made runway watering more effective.

After experience was gained, it was not unusual to have an area cleared and graded, the mat down, and airplanes operating within seventy-two hours. Creating an elevated subgrade was desirable and often necessary before laying the mat, although it added a few days to the job. The mat ordinarily was laid lengthwise, across the runway. Laying started from the middle and worked toward the sides and both ends. By 1943, a technique had been developed for laying mat from both ends and from the middle simultaneously, and everything usually came out right. A misalignment was corrected by having bulldozers drag the runway section into place. Any hundred yards of locked Marston mat always had some stretch in it.

Universal Footprint

Marston mat created a universal footprint of Allied airpower in World War II. Everywhere the mat was laid, Allied airpower was pro-

jected forward—with speed. The Germans and Japanese had nothing remotely similar to it. Neither did the Russians until they received Marston mat via American Lend-Lease.

By the end of the war, Marston mat was being manufactured in an aluminum alloy. Otherwise identical to steel mat, its unit weight was 32.5 pounds. It was intended for special airborne operations, but the war ended before it saw combat.

Inevitably, Marston mat became damaged by use, but it was not discarded. Field engineers developed machinery for its rehabilitation. The diesel-powered unit weighed fourteen tons and reprocessed 250 mats per hour. The mats were straightened, cleaned, given a chemical bath, repainted, and made good as new.

This small industrial plant could be broken down for air transport among units in the field. Six C-47s were needed to move it. This airlift may seem excessive, but a C-47's cargo space was only 22.5 feet long within a tube ninety-two inches wide enclosing a usable 1,200 cubic feet. A C-47's maximum payload

was 4,900 pounds. In 1944, a unit operating out of Australia airlifted its remanufacturing plant throughout the South Pacific, rehabilitating some fifty million square feet of runway mat.

When the 150-foot-by-3,000-foot pioneer strip was laid at Marston in November 1941, it took eleven days, including the time to clear and grade an area 350 feet by 3,800 feet and move some 50,000 cubic yards of earth. This was regarded as breathtaking speed, but during the war years, it was exceeded many times and in circumstances beyond any imagination in 1941.

Almost a half century after World War II, a tourist wandering the back roads of rural Algeria, Italy, Sicily, southern France, the Philippines, or a host of South Pacific islands may still find evidence of Marston mat. It is not laid flat, but sometimes stands vertically with one end buried a few feet in the earth, the other pointing skyward—coincidental monuments symbolizing an original function.

After 1945, thousands of farmers or rural householders collected the abandoned runway mat, pressing its hooks and slots together to create fences and walls that are still standing today. They are the hilt of a terrible sword that has been transformed into the proverbial plowshare: silent memorials to an air war of long ago.

Perversely, one place where a sample of Marston mat will not be found is among the World War II exhibits of any aviation museum. Here will be found the stuff of "aces" and airplanes and almost no end of sentimental ephemera. But there is nary a word about, much less a sample of, this dramatically simple invention that with minimum effort and maximum speed carried American combat aviation to the ends of the earth.

During 1941–45, Marston mat created the footprint of global airpower. Although not possessed of glamor or the mystique of "breakthroughs," Marston mat nevertheless ranks as one of the most subtle, versatile, and ultimately devastating "secret weapons" of World War II. ■

*Richard K. Smith is the author of *The Airships Akron and Macon: Flying Aircraft Carriers of the US Navy and the prizewinning First Across! The US Navy's Transatlantic Flight of 1919*, both published by the US Naval Institute. This is his first article for AIR FORCE Magazine.*

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Airman's Bookshelf

Hurrah for Schirra

Schirra's Space, by Walter M. Schirra, Jr., with Richard N. Billings. Quinlan Press, Boston, Mass., 1988. 230 pages with photos. \$16.95.

"Space" is the operative word in this autobiography of the only astronaut to fly in each of America's Mercury, Gemini, and Apollo programs. Wally Schirra talks about "outer space," the place where much of his career occurred, and he also takes "space" to voice his opinions on a number of topics, including where he thinks manned spaceflight is heading.

Although his father, the barnstorming son of a concert cornetist, wanted Wally to go to West Point, the younger Schirra had wanted to "go Navy" since childhood. His class at Annapolis was on an accelerated schedule because of World War II, and he graduated in three years. After a tour as a "real" sailor, Schirra earned his wings of gold in 1948.

He flew a combat tour in Korea, where he shot down a pair of MiGs while an exchange pilot with the Air Force. An assignment at the Naval Weapons Center at China Lake, Calif., gave Lieutenant Schirra the chance to be the first aviator to launch a Sidewinder missile. He was then sent to NAS Patuxent River, Md., where he became a test pilot.

During his stay at Pax River, Schirra, along with several others, was sent to Washington for initial astronaut screening. Schirra initially viewed the space program as an interruption of his Navy career, but the lure of being the "first"—man in space, man on the moon, whatever—was too great.

Schirra assumes that most of his readers either have read the book or seen the movie version of Tom Wolfe's *The Right Stuff*. Throughout his text, Schirra makes references to where Wolfe was either dead-on target or where he was wide of the mark in his descriptions of the trials and tribulations of the seven Mercury astronauts.

Schirra talks at length about train-

ing and what actually happened on his missions, but he doesn't confine the discussions to his own experiences. He also gives an insider's view of what went on at NASA and with the space program in general. To his credit, Schirra lists the not-so-outstanding with the good.

The book, however, is not a litany of training sessions or technical details. Schirra also proves that while the astronauts were America's straitlaced heroes on the outside, they were mostly a good-natured lot who liked to have fun. Schirra, particularly, while "Mr. Business" from 9:00 to 5:00, was also "King of the 'Gotcha'" (practical joke) and a noted, horrible punster after hours.

In addition to his tales of the "gotchas," Schirra also talks about the friendships he formed inside and outside the space program.

His friendship with astronaut Virgil I. "Gus" Grissom was cemented after Schirra splashed down on his *Sigma-7* flight in 1962. Grissom had not been formally accused of pushing the plunger to jettison the escape hatch on his July 21, 1961, *Liberty Bell-7* mission (which resulted in the loss of the spacecraft), but that was the consensus.

Schirra elected to stay inside *Sigma-7* until after he was brought aboard the recovery ship. He blew the escape hatch while on the deck of the *USS Kearsarge*, and the resulting recoil from the plunger tore a hole in his metal-reinforced glove. Grissom had had no tears or rips in his spacesuit when he was recovered, nor did he have any bruises, so Wally had vindicated Gus. Schirra later became executor of Grissom's estate, fulfilling that task after Grissom died in the *Apollo-1* fire of January 27, 1967.

The story doesn't end with Schirra's successful *Apollo-7* mission. He also talks about his failed business dealings, his days as a TV commentator and pitchman, and what he is doing now.

Throughout the book, Schirra doesn't mince words. He didn't much like X-15 pilot Scott Crossfield when they first met, but the pair later be-

came good friends. Chuck Yeager was never on Schirra's top ten list of friends. Schirra also doesn't quibble in criticism of NASA today. He comes out squarely in favor of a permanent space station, and he says that the space agency has lost its sense of direction. He is strongly in favor of returning more control to the astronauts.

The author gets a little simplistic at times, and there are a few instances where his information on subjects outside the space program isn't correct (his erroneous explanation of the aircraft designation system is the most glaring, but that's a trifling thing), but neither flaw slows the book's flow. Whether you're a space buff or not, this is a good read.

New Books in Brief

Airbridge to Berlin: The Berlin Crisis of 1948, Its Origins and Aftermath, by D. M. Giangreco and Robert E. Griffin. The blockade of Berlin by the Soviets was the first major test of American resolve in the post-World War II era. The US, Britain, and France responded to the blockade with the most extraordinary humanitarian airlift in history. Despite many hurdles—bad weather and Soviet fighters among them—the food and fuel got through. The authors do a good job describing how the crisis came about, how the massive airlift was organized and run, and what resulted. A number of interesting sidebars emphasizes the human side of the airlift. The more than 200 photographs, though, are the book's real treasure. These pictures, many heretofore unpublished, put an entirely new perspective on all phases of the airlift. Presidio Press, Novato, Calif., 1988. 247 pages with photos, notes, and index. \$14.95.

1001 Flying Facts & Firsts, by Joe Christy. In every profession there are "givens" that are constantly debated over drinks at the bar. Accountants argue Generally Accepted Accounting Principles. Doctors debate the latest findings in medical journals.

Physicists go point-for-point on whatever it is they do. This book is for the aviation enthusiasts out there. If ever a primer had just about any fact or figure on mainstream aviation stuff, this is it. There is a chronology, a listing of the major records, basic specifications on significant military and civilian aircraft, a manned spaceflight record, and other similar lists. A highly useful genealogy of aircraft manufacturers is included, as is a quiz section to test your knowledge. A fun book. Tab Books Inc., Blue Ridge Summit, Pa., 1989. 220 pages with photos and diagrams. \$15.95.

The U. S. Intelligence Community (Second Edition), by Jeffrey T. Richelson. This updated edition presents everything about US intelligence-gathering operations that can be known without having a security clearance. Compiled from a variety of unclassified documents, this book describes the organizational structure of the Central Intelligence Agency, the National Security Agency, and more than twenty other military and civilian intelligence agencies. In addition to exploring "standards" such as signals and imagery intelligence, the text also includes chapters on "environmental intelligence" (weather, mapping, and geodesy) and outside governmental oversight institutions. It also takes a look at recent covert actions and changes in American intelligence operations since the death of CIA Director William Casey. Ballinger Publishing Co., Cambridge, Mass., 1988. 512 pages with glossary, charts, photos, notes, and index. \$39.95.

War and Peace in the Nuclear Age, by John Newhouse. This companion book to the excellent Public Broadcasting Service documentary series that aired earlier this year is quite an achievement in itself. Author Newhouse looks at the subject from all angles—technological, military, and political—and analyzes each in isolation and as they relate to one another. The book ranges from the explosion of the first test device at Trinity site in New Mexico in 1945 to today's removal of ground-launched cruise missiles from Europe. It also offers a concise history of the people and events of the nuclear age up to the signing of the INF Treaty. In addition to being a first-rate reference, it is also a good story. Alfred A. Knopf, Inc., New York, N. Y., 1989. 486 pages with photos, notes, bibliography, and index. \$22.95.

—Reviewed by Jeffrey P. Rhodes, *Aeronautics Editor*.

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Forces for the Lesser Wars

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

We will almost surely keep enough strategic power to deter the big war. It is not so certain that we will be prepared for smaller conflicts.



A certified deep thinker once observed that war had become a luxury that only poor nations can afford. He was alluding, of course, to the awful finality of any all-out

conflict between superpowers. The twenty years since that statement was made have seen a lot of wars, including one of the bloodiest in history between Iraq and Iran, and none of them between first-class military powers, but the dictum does need a slight modification.

War, or at least armed conflict, continues to be an option for major powers in their dealings with lesser ones. The Falklands War, Vietnam, Afghanistan, and our occasional instructive lessons to Libya come to mind.

The strategic stalemate has almost produced a feeling of complacency to supplant the anxiety of thirty years ago. In those days, nuclear war seemed a distinct possibility. SAC bombers flew airborne alert, backyard shelters stocked with food were in vogue, and most of the overseas tactical forces were tied to a nuclear role, however inadequate the fighters of that era were for the task. For added emphasis, strategic forces dominated the annual budget. There was no talk of competitive strategies, only of how to support the overriding strategy of preparing for nuclear war.

The shadow of that kind of war has never gone away, but with the increasing capability of both sides to inflict precise obliteration, it has receded. Even if the Gorbachev peace offensive leads to a conclusive START negotiation, the remaining weapons must have the credible power and survivability to forestall a Soviet attack.

Survivability of our nuclear weap-

ony is going to be the subject of one big argument. The Air Force scheme to put Peacekeeper missiles aboard trains that, on warning, will deploy onto the main railroad network, will cost about \$12 billion. Midgetman, the single-warhead mobile missile favored by such powerful advocates as Rep. Les Aspin (D-Wis.) and National Security Advisor Gen. Brent Scowcroft, may run \$40 billion or more. Then there is SDI, with the reduced and more realistic mission of defending missile sites.

Land-based tactical air, as a complement or alternative to sea-based air, should figure heavily in our contingency planning.

In the years ahead, money for defense will be tight. Even a modest two percent growth projection is now discounted as beyond expectation. With the big war budgeted for and thus, we hope, made unaffordable, there remains the question of how to deal with the lesser fracas.

The Navy, its credentials in good order after recent forays in the Mediterranean and Persian Gulf, has nominated itself as the logical agent. Floating air bases, with their attendant flotillas, are relatively free of the hassles that sometimes affect air bases around the world—not that carriers don't require land bases, but the need is not so obvious. The carrier is an impressive, visible display of US power, and it is also a useful instrument for dealing with people like Qaddafi and Khomeini without third-nation entanglements.

On the other hand, it's a big world, and the Navy can't do it all. Under different circumstances, even the

Med would be a doubtful area for carrier operations.

Land-based tactical air, as a complement or alternative to sea-based air, should figure heavily in our contingency planning. Air refueling, perhaps the single most important development in the employment of land-based air forces, performs the same basic task as the carrier: It increases the striking radius of the airplane. At their new base in Calabria, F-16s with air refueling will have the run of the Med, provided that the Italians do not become so bemused by Gorbachev's peace offensive that they cancel the deal. But because tankers and F-16s at 20,000 feet don't have the visible impact of a carrier, the capability goes largely unnoticed.

The Air Force tactical forces, equipped and trained as never before, are in a difficult situation. For many years, NATO has provided the justification for a substantial share of the tactical force structure. During that time, these forces have become indelibly marked as the property of SACEUR. This, to an extent, has also been the case with certain squadrons based in the United States. Meanwhile, the Navy has kept away from precisely designating ships to NATO, or even from guaranteeing the detailed makeup of the Sixth Fleet. If the forthcoming conventional arms-reduction talks result in tactical air reductions, what then will be the justification for these NATO-designated forces? There is a justification, but it needs to be developed in terms of worldwide mobility, supported by tankers and airlift, and the ability to operate from austere airfields. Fixed permanent bases are far more efficient, not to mention more comfortable, but they will rarely be where the trouble is.

Because of the long years of static deployment to NATO, these tactical air forces have assumed an identity that cannot be easily changed. In anticipation of possible European force reductions, however, that identity should at least be altered to reflect the broader mission of contingency response. ■

First Over Tokyo

Hap Arnold picked Jimmy Doolittle, "a man who could impart his spirit to others," for a seemingly impossible mission.

BY JOHN L. FRISBEE

JIMMY Doolittle, first President of AFA, instrument-flying pioneer, winner of many major aviation awards, World War II commander of the Eighth and Twelfth Air Forces, is perhaps best remembered as architect and leader of the Tokyo Raid of April 18, 1942. Adm. William Halsey, commander of the task force that launched Doolittle's sixteen B-25 bombers from the aircraft carrier *Hornet*, called that historic mission "one of the most courageous deeds in military history."

For his brilliant planning and inspiring leadership of the raid, General Doolittle, then a Reserve lieutenant colonel (he had resigned his Regular commission in 1930), was awarded the nation's highest decoration for valor, the Medal of Honor.

Why this extraordinary mission that challenged military orthodoxy and the logic of aircraft design? After a series of military disasters in the Pacific following Pearl Harbor, President Roosevelt believed a badly shaken America needed some symbol of ultimate victory, one that also would explode the Japanese myth of their islands' invulnerability. He directed his military leaders to bomb Japan at the earliest time. But there were no bases in China available for a heavy bomber attack, and Navy carrier aircraft lacked both range and bomb load. Then Navy Capt. Francis Low came up with the fantastic idea of flying AAF bombers from a carrier.

Lt. Gen. Hap Arnold greeted the idea enthusiastically. He called on Jimmy Doolittle, who had voluntarily left an executive position with

Shell Oil, to organize and train a force for the task. Arnold had no thought of allowing his indispensable forty-five-year-old troubleshooter to actually lead the mission. Doolittle thought otherwise and, as usual, won.

Jimmy Doolittle had ten weeks to work out the myriad details of an operation that had never before been considered and would not be repeated. Crews were volunteers from the 17th Bombardment Group and the 89th Reconnaissance Squadron—two early B-25 outfits. Many experts thought that flying medium bombers at above gross takeoff weight from 500 feet of carrier deck was sheer madness. But if anyone could do it, it was Jimmy Doolittle, supreme pilot and doctor of aeronautical engineering, whose biographer, C. V. Glines, called him "master of the calculated risk."

The plan was to launch from the carrier 400 miles off Japan's coast at dusk on April 19. Crews would bomb independently at night and recover early the next morning at Chuchow, China. Doolittle calculated they could make it to China if launched on plan, possibly from 500 miles off Japan, but definitely not from 650 miles.

Early on the morning of April 18, patrol planes from the accompanying carrier *Enterprise* sighted Japanese picket ships ahead. Admiral Halsey ordered the B-25s to launch immediately, thirty hours ahead of schedule and 620 miles from the coast. First off the rolling, pitching deck into a thirty-knot wind, rain, and low clouds was Colonel Doolittle, proving to his crews that it could be done. All knew that Japanese defenses, including an estimated 500 fighters, had been alerted. They also knew that they probably would have to ditch at night, short of the China coast, with no hope of rescue.

Despite warning from a picket ship, the Japanese were taken by surprise, expecting a strike by carrier planes the following day. There



Aboard the Hornet, Jimmy Doolittle wires a Japanese medal to the fin of a 500-pounder destined for Tokyo.

was little opposition from fighters and flak. With Jimmy Doolittle first over Tokyo, all but one B-25 bombed its target, then all headed for China, except Capt. Ed York's crew, which, low on fuel, landed near Vladivostok and was interned by the Soviets.

The fifteen China-bound bombers picked up an unexpected tailwind that helped them reach the coast in darkness, rain, and low clouds. They were unable to contact Chuchow, which had not been informed of their early launch. Lost and running out of fuel, all fifteen bailed out, ditched near the shore, or crash-landed. Eleven crewmen were injured, three lost their lives, and eight who landed in Japanese-occupied territory were captured, three of them subsequently executed.

As reports of the crews' fates filtered in, the usually ebullient Doolittle was overwhelmed by the thought that, although they had hit their targets, he had failed the men who trusted his leadership. He didn't know that when word of the raid reached home, it was greeted wildly as the first American victory in the Pacific. The raid had achieved President Roosevelt's objective, a fact that Jimmy Doolittle had still not fully accepted when, on May 20, the President presented newly promoted Brigadier General Doolittle with the Medal of Honor, the first awarded to an airman in World War II. ■



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By J. R. "Doc" McCauslin, CHIEF, FIELD ORGANIZATION DIVISION

In the Field

The **Cheyenne Cowboy (Wyo.) Chapter** held its annual banquet at the Hitching Post Inn in Cheyenne, with former Secretary of the Air Force Thomas C. Reed as guest speaker. Previous guests of Chapter President Irene Johnigan and the Chapter's banquet planning committee have included several representatives of NATO and Col. John A. Gordon, Commander of the 90th Strategic Missile Wing at Francis E. Warren AFB, Wyo.

The 19th Annual Celebrity Golf Tournament hosted by the **Riverside County (Calif.) Chapter** raised \$15,000 to benefit several charities, the Junior AFROTCs at Arlington, Moreno Valley, and Canyon Springs high schools, and recreational activities for enlisted people at nearby March AFB. Among the 380 supporters who turned out for the tournament and banquet were entertainers Bob Hope and Pat Boone, former Los Angeles Rams Frank Corral and Preston Dennard, California Angels pitcher Terry Clark, pro golfer Nancy Robin, and Fifteenth Air Force Commander Lt. Gen. Richard Burpee.

The **Donald W. Steele, Sr., Memori-**

Kathleen Buck, Defense Department General Counsel, was recently guest speaker at a luncheon meeting of the General Charles A. Gabriel (Va.) Chapter. Here, Chapter Vice President Heikki Joonsar, on behalf of the chapter, makes her an AFA member.



al (Va.) Chapter recently honored the Air Staff with a luncheon meeting. USAF Chief of Staff Gen. Larry D. Welch was guest speaker. Among those attending was AFA Executive Director Chuck Donnelly. Chapter President Mary Anne Thompson presented General Welch with a \$100 do-

nation to the Air Force Aid Society in his name.

The **Chattanooga (Tenn.) Chapter** held its chapter meeting in collaboration with the Chattanooga Kiwanis Club. More than 250 people turned out to hear an outstanding address by Brig. Gen. Thad A. Wolfe, Deputy Director, National Strategic Target List Division, Hq. SAC. In his speech, which attracted considerable media coverage, General Wolfe told his largely civilian audience that "the United States is at a serious crossroads with what I consider vital modernization in combat materiel."

The **General Lauris Norstad (Brussels) Chapter** cosponsored the Annual Air Force Ball at Supreme Headquarters Allied Powers, Europe (SHAPE). Former AFA Executive Director Gen. Russell Dougherty, USAF (Ret.), was guest speaker. Among more than 300 blue-suiters and guests attending from the SHAPE and NATO/Brussels area were Gen. John Shaud, USAF, SHAPE Chief of Staff, and Col. Frank Evangelist, USAF, Lauris Norstad Chapter President.

Awards and Recognition

The **Carl Vinson Memorial (Ga.) Chapter** held an awards luncheon/



AFA's elected leaders and top staff members paid a courtesy call on a charter member of AFA, President Ronald Reagan, before Mr. Reagan left office. Shown here in the Oval Office are, from left, Executive Director Charles L. Donnelly, Jr.; National President Jack C. Price; Mr. Reagan; National Chairman of the Board Sam E. Keith, Jr.; and Assistant Executive Director Ken Goss.



Gen. Robert E. Huyser, USAF (Ret.), was guest speaker recently at a banquet given by the chapter that is named for him in Grand Junction, Colo. Drafted in April 1943, he earned his pilot wings and flew B-29s during World War II. Before retirement, he commanded Military Airlift Command. Shown here, from left, are Chapter President Jim Hall, National President Jack Price, General Huyser, Chapter Treasurer Ted Sparr, Colorado State President Bill Croom, and former National President and former Board Chairman Vic Kregel.

meeting recently at Robins AFB, Ga. Among the 300 AFAers and base personnel attending were Maj. Gen. Richard F. Gillis, Commander of Warner Robins Air Logistics Center; Dr. Kirby Godsey, President of Mercer University; Dr. C. B. Gambrell, Dean of the Mercer University Engineering School; and Ralph Johnson, Mayor of Warner Robins.

Dr. Godsey was presented with an Aerospace Education Foundation Ira Eaker Fellowship in recognition of his special efforts to establish an engineering school in order to meet a critical need for engineers at Robins AFB and in the mid-Georgia area.

Also at the luncheon, Capt. Raymond S. Craft was named SAC Outstanding Member of the Year, and AFA Medals of Merit were awarded to Bill Powell, a newscaster for WMAZ-TV, and to H. Thomas Reed, Vice President/General Manager of the Warner Robins *Daily Sun*.

The Carl Vinson Memorial Chapter also held a POW/MIA Recognition Day; more than 300 people attended the moving ceremony. General Gillis presented FOW medals to fifty-eight POWs, two widows of POWs, and the families of four POWs. Among the honorees was William Freeman, who thirty-five years ago that day had been released from a North Korean prison camp.

The Freedom (Pa.) Chapter presented its chapter Certificate of Merit to the Valley Forge Group 90 Civil Air Patrol Cadet of the Year, 2d Lt. Peter C. Hower. Chapter President Peter Ardzizzi made the presentation during an

annual chapter awards luncheon recognizing the achievements of cadets. Cadet Hower, who will join the Air Force this summer, is Cadet Commander of the 902d Search & Rescue Squadron, NAS Willow Grove, Pa.

The Tidewater (Va.) Chapter, Congressman Owen Pickett (D-Va.), and Virginia Beach Mayor Meyera Obendorf joined other veterans' and active-duty organizations in dedicating a \$500,000 Vietnam Veterans Memorial in Virginia Beach. The project was financed mostly through private donations. Congressman Pickett, a mem-

ber of the House Armed Services Committee, gave a lively address. More than 1,000 people attended the ceremonies.

The General Ira C. Eaker (Ark.) Chapter recently held its annual awards banquet. Guest speaker Brig. Gen. Stephen B. Croker, SAC Deputy Chief of Staff for Plans and Programs, discussed the USAF budget. Following the general's presentation, AFA Hq.'s J. R. "Doc" McCauslin formally presented the chapter's name change—from Blytheville to General Ira C. Eaker—to Chapter President



Riverside County (Calif.) Chapter recently presented \$1,000 to the Jerry L. Pettis Memorial Veterans Hospital, Loma Linda, Calif. Pictured here, from left, are Marian Cooney, Director of Services at the hospital; Chapter President Bob Parks; John Hickman, Director of the hospital; and Duane "Monk" Asmodt, Past Chapter President.



National President Jack C. Price (left) presents the National Security Affairs/Force Employment Award to SMSgt. Todd P. Wilmore during graduation ceremonies for Class 89-2 at the USAF Senior NCO Academy, Gunter AFB, Ala. Sergeant Wilmore is assigned to the 2101st Communications Squadron at Eaker AFB, Ark.

CMSgt. Ron Dawson, USAF (Ret.). When General Croker was Commander of the 97th Bomb Wing at Blytheville AFB, Ark., Sergeant Dawson was his Senior Enlisted Advisor.

An AFA Special Citation was presented to General Croker for his continuous staunch support of the Association. National Vice President (South Central Region) Everett E. Stephenson and Arkansas State President "Bud" Walters presented an AFA Medal of Merit to 1st Lt. Nima Reavis, an AFA Exceptional Service Award to Tommy Sylvester, and an AFA Gold

Community Partner Membership Award to the Chapter. SSgt. Randy Green provided the music for the banquet.

The **Tacoma (Wash.) Chapter** held its annual awards banquet recently at McChord AFB, Wash. During the evening, "Big John Anderson" scholarships of \$750 were presented to University of Puget Sound AFROTC cadets Stephanie L. Kop and Steven E. Kriese. After thirty-eight years, the University of Puget Sound ROTC detachment is being closed.

Chapter President Robert E. Balt-

zell presented \$2,000 to the McChord Youth Activities Program; AFA National Director Sherman W. Wilkins and Washington State President A. R. "Dick" Lewis presented an AFA Medal of Merit to R. I. Powell and Exceptional Service Awards to Virginia M. Leitch and Jack E. Gamble.

Entertainment for the banquet was provided by the Air Force Band of the Pacific Northwest.

Outstanding State AFAs

Congratulations to the following organizations, named "Outstanding State Air Force Association Organization of the Year": 1977—New Jersey; 1978 and 1979—Oklahoma; 1980—Pennsylvania; 1981—New Jersey; 1982—California; 1983—Florida; 1984—Texas; 1985—California; 1986—Florida; 1987—New Jersey; 1988—Florida and Texas.

New Senior Enlisted Advisors

Congratulations to these new senior enlisted advisors: **CMSgt. Robert W. Hall**, Seventh Air Force, Osan AB, Korea; **CMSgt. Thomas S. Bruno**, 17th Reconnaissance Wing, RAF Alconbury, United Kingdom; **CMSgt. Thomas Taylor**, Sheppard Technical Training Center, Sheppard AFB, Tex.; **CMSgt. Jerry B. Whitten**, Air Forces Iceland, NAS Keflavik, Iceland.

How to Have Your Say

Contributions to "Intercom" should be sent to J. R. "Doc" McCauslin, AFA Headquarters, 1501 Lee Highway, Arlington, Va. 22209-1198. ■



The Nathan F. Twining (Fla.) Chapter recently heard from the Senior Enlisted Advisor of the 56th Tac Training Wing, MacDill AFB, Fla. CMSgt. Danny Lewis (center) discussed enlisted perceptions and today's Air Force. At left is Chapter President Robert F. Cutler. Chapter member John G. Murphy, a retired lieutenant general, is at the right.



AFAers everywhere joined to wish him many happy returns when Jimmy Doolittle approached his ninety-second birthday last December. He's shown here with an old friend, Col. Art Ragen, USAF (Ret.). General Doolittle and the April 18, 1942, raid by B-25s on Tokyo are the subject of this month's "Valor" article, on p. 93 of this issue.

AFA State Contacts



Following each state name are the names of the communities in which AFA chapters are located. Information regarding these chapters or any of AFA's activities within the state may be obtained from the appropriate contact.

ALABAMA (Birmingham, Gadsden, Huntsville, Mobile, Montgomery): **H. R. Case**, P. O. Box 16625, Mobile, Ala. 36616 (phone 205-639-0168).

ALASKA (Anchorage, Fairbanks): **William L. Pair**, 2517 Riverview Dr., Fairbanks, Alaska 99709 (phone 907-456-6891).

ARIZONA (Green Valley, Phoenix, Sierra Vista, Sun City, Tucson, Verde Valley): **Robert A. Munn**, 7042 Calle Bellatrix, Tucson, Ariz. 85710 (phone 602-747-9649).

ARKANSAS (Blytheville, Fayetteville, Fort Smith, Hot Springs, Little Rock): **Bud A. Walters**, 903 Dixie Dr., Blytheville, Ark. 72315 (phone 501-763-1825).

CALIFORNIA (Apple Valley, Camarillo, Edwards, Fairfield, Fresno, Los Angeles, Merced, Monterey, Novato, Orange County, Pasadena, Riverside, Sacramento, San Bernardino, San Diego, San Francisco, Sunnyvale, Vandenberg AFB, Yuba City): **John W. Lynch**, 336 S. California St., Orange, Calif. 92666 (phone 714-639-8188).

COLORADO (Boulder, Colorado Springs, Denver, Fort Collins, Grand Junction, Greeley, Pueblo): **William D. Croom**, 31 N. Tejon, Colorado Springs, Colo. 80903 (phone 719-550-5059).

CONNECTICUT (Brookfield, East Hartford, Middletown, Storrs, Stratford, Torrington, Waterbury, Westport, Windsor Locks): **Brad Day**, 16 Hemlock Trail, Trumbull, Conn. 06611 (phone 203-386-7221).

DELAWARE (Dover, Milford, Newark, Rehoboth Beach, Wilmington): **Horace W. Cook**, P. O. Box 1555, Dover, Del. 19903 (phone 302-674-1051).

DISTRICT OF COLUMBIA (Washington, D. C.): **Denny Sharon**, 1501 Lee Highway, Arlington, Va. 22209-1198 (phone 703-247-5820).

FLORIDA (Avon Park, Broward County, Cape Coral, Daytona Beach, Fort Walton Beach, Gainesville, Homestead, Jacksonville, Leesburg, Miami, New Port Richey, Ocala, Orlando, Palm Harbor, Panama City, Patrick AFB, Port Charlotte, Redington Beach, Sarasota, Spring Hill, Tallahassee, Tampa, Vero Beach, West Palm Beach, Winter Haven): **Roy P. Whitton**, P. O. Box 1706, Lake Placid, Fla. 33852 (phone 813-465-7048).

GEORGIA (Athens, Atlanta, Columbus, Dobbins AFB, Rome, Savannah, St. Simons Island, Valdosta, Warner Robins): **Homer N. Childs**, P. O. Box 2189, Warner Robins, Ga. 31093 (phone 912-923-2623).

GUAM (Agana): **Michael C. Wilkins**, Box CV, Agana, Guam 96910 (phone 671-646-5259).

HAWAII (Honolulu, Maui): **John F. O'Donnell**, McDonnell Douglas Corp., P. O. Box 6283, Honolulu, Hawaii 96818 (phone 808-422-9015).

IDAHO (Boise, Mountain Home, Twin Falls): **Chester A. Walborn**, P. O. Box 729, Mountain Home, Idaho 83647 (phone 208-587-7185).

ILLINOIS (Belleville, Champaign, Chicago, Elmhurst, Moline, Peoria, Rockford, Springfield, Decatur): **Glen W. Wensch**, R. R. #1, Box 54, Champaign, Ill. 61821 (phone 217-352-2777).

INDIANA (Bloomfield, Fort Wayne, Grissom AFB, Indianapolis, Lafayette, Marion, Mentone, South Bend, Terre Haute): **Don McKellar**, 2324 Pinehurst Lane, Kokomo, Ind. 46902 (phone 317-455-0933).

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 Dr., Louisville, Ky. 40207 (phone 502-897-7647).

LOUISIANA (Alexandria, Baton Rouge, New Orleans, Shreveport): **Paul J. Johnston**, 1703 W. Medalist Dr., Pineville, La. 71360 (phone 318-640-3135).

MAINE (Bangor, Loring AFB, North Berwick): **Richard F. Strelka**, 54 Country Rd., Caribou, Me. 04736 (phone 207-492-4381).

MARYLAND (Andrews AFB area, Baltimore, Rockville): **Vince duCellier**, 6637 Eleanore, Duncirk, Md. 20754 (phone 301-855-7661).

MASSACHUSETTS (Bedford, Boston, East Longmeadow, Falmouth, Florence, Hanscom AFB, Lexington, Taunton, Worcester): **William J. Lewis**, 33 Bedford St., No. 11, Lexington, Mass. 02173 (phone 617-863-8254).

MICHIGAN (Alpena, Battle Creek, Calumet, Detroit, East Lansing, Kalamazoo, Marquette, Mount Clemens, Oscoda, Petoskey, Southfield): **William L. Stone**, 7357 Lakewood Dr., Oscoda, Mich. 48750 (phone 517-724-6266).

MINNESOTA (Duluth, Minneapolis-St. Paul): **Doyle E. Larson**, 13509 York Ave., South, Burnsville, Minn. 55337 (phone 218-890-9140).

MISSISSIPPI (Biloxi, Columbus, Jackson): **Henry W. Boardman**, 10 Bayou Pl., Gulfport, Miss. 39503 (phone 601-896-8836).

MISSOURI (Kansas City, Richards-Gebaur AFB, Springfield, St. Louis, Whiteman AFB): **Garrett R. Crouch**, P. O. Box 495, Warrensburg, Mo. 64093 (phone 816-747-6141).

MONTANA (Bozeman, Great Falls): **Ronald Glock**, 321 N. 17th, Bozeman, Mont. 59715 (phone 406-586-5455).

NEBRASKA (Lincoln, Omaha): **Ralph Bradley**, 1221 N. 101st St., Omaha, Neb. 68131 (phone 402-554-6220).

NEVADA (Las Vegas, Reno): **Emery S. Wetzel**, Jr., 2938 S. Dunneville St., Las Vegas, Nev. 89102 (phone 702-362-1767).

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, Forked River, Fort Monmouth, Jersey City, McGuire AFB, Middlesex County, Newark, Old Bridge, Trenton, Wallington, West Orange, Whitehouse Station): **Robert W. Gregory**, R. D. #2, Box 216, Wrightstown, N. J. 08562 (phone 609-758-2973).

NEW MEXICO (Alamogordo, Albuquerque, Clovis): **Louie T. Evers**, P. O. Box 1946, Clovis, N. M. 88101 (phone 505-762-1798).

NEW YORK (Albany, Bethpage, Brooklyn, Buffalo, Chautauqua, Griffiss AFB, Hudson Valley, Nassau County, New York City, Niagara Falls, Patchogue, Plattsburgh, Queens, Rochester, Rome/Utica, Suffolk County, Syosset, Syracuse, Westchester, Westhampton Beach, White Plains): **Gerald V. Hasler**, P. O. Box 5254, Albany, N. Y. 12205 (phone 518-785-5020).

NORTH CAROLINA (Asheville, Charlotte, Fayetteville, Goldsboro, Greensboro, Greenville, Havelock, Kitty Hawk, Littleton, Raleigh, Wilmington): **Robert C. Newman, Jr.**, 3037 Truitt Dr., Burlington, N. C. 27215 (phone 919-584-7069).

NORTH DAKOTA (Concrete, Fargo, Grand Forks, Minot): **George Christensen**, 15 Fairway, Minot, N. D. 58701 (phone 701-857-4750).

OHIO (Akron, Cincinnati, Cleveland, Columbus, Dayton, Mansfield, Newark, Youngstown): **Cecil H. Hopper**, 537 Granville St., Newark, Ohio 43055 (phone 614-344-7694).

OKLAHOMA (Altus, Enid, Oklahoma City, Tulsa): **Aaron C. Burleson**, P. O. Box 757, Altus, Okla. 73522-0757 (phone 405-482-0005).

OREGON (Eugene, Klamath Falls, Portland): **Barbara M. Brooks**, 7315 N. Curtis, Portland, Ore. 97217 (phone 503-227-7648).

PENNSYLVANIA (Allentown, Altoona, Beaver Falls, Bensalem, Coraopolis, Drexel Hill, Erie, Harrisburg, Homestead, Indiana, Johnstown, Lewistown, Mon Valley, Philadelphia, Pittsburgh, Scranton, Shiremanstown, State College, Willow Grove, York): **S. Ron Chromulak**, 126 Phillips St., Charleroi, Pa. 15022 (phone 412-864-7220).

PUERTO RICO (San Juan): **Fred Brown**, 1991 Jose F. Diaz, Rio Piedras, P. R. 00928 (phone 809-790-5288).

RHODE ISLAND (Warwick): **Thomas R. Portesi**, 102d Tactical Control Squadron, North Smithfield ANG Station, Slatersfield, R. I. 02889 (phone 401-762-9100).

SOUTH CAROLINA (Charleston, Clemson, Columbia, Myrtle Beach, Sumter): **George J. Thom**, 25 Calhoun Dr., Sumter, S. C. 29150-4738 (phone 803-775-6256).

SOUTH DAKOTA (Belle Fourche, Rapid City, Sioux Falls): **Jan M. Laitos**, 2919 Country Club Dr., Rapid City, S. D. 57702 (phone 605-394-6203).

TENNESSEE (Chattanooga, Knoxville, Memphis, Nashville, Tri-Cities Area, Tullahoma): **Ben Cole**, 5361 Egypt Central Rd., Memphis Tenn. 38135 (phone 901-372-7237).

TEXAS (Abilene, Amarillo, Austin, Big Spring, College Station, Commerce, Corpus Christi, Dallas, Del Rio, Denton, El Paso, Fort Worth, Harlingen, Houston, Kerrville, Lubbock, San Angelo, San Antonio, Waco, Wichita Falls): **M. N. Dan Heth**, P. O. Box 748, MZ 6214, Fort Worth, Tex. 76101 (phone 817-777-4458).

UTAH (Bountiful, Clearfield, Ogden, Salt Lake City): **Glenn M. Lusk**, 2144 West 4000 South, Roy, Utah 84067 (phone 801-731-3366).

VERMONT (Burlington): **Ralph R. Goss**, 8 Summit Circle, Shelburne, Vt. 05482 (phone 802-985-2257).

VIRGINIA (Alexandria, Charlottesville, Danville, Dulles Airport Corridor, Harrisonburg, Langley AFB, Lynchburg, McLean, Norfolk, Petersburg, Richmond, Roanoke): **Don Anderson**, Box 54, 2101 Executive Dr., Hampton, Va. 23666 (phone 804-838-7980).

WASHINGTON (Seattle, Spokane, Tacoma, Yakima): **A. R. "Dick" Lewis**, 7435 Cooper Point Rd., Olympia, Wash. 98502 (phone 206-866-7135).

WISCONSIN (Madison, Milwaukee, Mitchell Field): **Gilbert M. Kwiatkowski**, 8260 W. Sheridan Ave., Milwaukee, Wis. 53218 (phone 414-463-1849).

WYOMING (Cheyenne): **Irene G. Johnigan**, 503 Notre Dame Court, Cheyenne, Wyo. 82009 (phone 307-775-3641).

The National Air Force Salute Foundation, Inc., recently presented \$38,000 to the USAF Assistance Fund. Taking part in the presentation were, from left, Salute Foundation Board Chairman Denis R. Brown, AFA National Secretary Thomas J. McKee, AFA Director of Protocol Dottie Flanagan, Secretary of the Air Force Edward "Pete" Aldridge, National Air Force Salute Coordinator Dorothy L. Welker, and USAF Chief of Staff Gen. Larry D. Welch.



Coming Events

April 14-15, **South Carolina State Convention**, Shaw AFB; April 21-22, **Washington State Convention**, Tacoma; April 28-30, **Alabama State Convention**, Montgomery; May 6, **Connecticut State Convention**, Meriden; May 12-13, **Tennessee State Convention**, Nashville; May 19-20, **Mississippi State Convention**, Biloxi; May 19-21, **New York State Convention**, Buffalo; June 16-17, **Louisiana State Convention**, Bossier City; June 16-18, **New Jersey State Convention**, Cape May; June 23-24, **Maine State Convention**, Bangor; June 28-30, **Alaska State Convention**, Fairbanks; July 7, **Montana State Convention**, Bozeman; July 14-15, **Arkansas State Convention**, Blytheville; July 14-15, **Colorado State Convention**, Pueblo; July 21-23, **Pennsylvania State Convention**, State College; July 21-23, **Texas State Convention**, South Padre Island; July 22-23, **North Carolina State Convention**, Seymour Johnson AFB; July 29-30, **Florida State Convention**, Daytona Beach; August 4-6, **North Dakota State Convention**, Grand Forks; August 11-12, **Utah State Convention**, Wendover; August 11-13, **Arizona State Convention**, Sedona; August 12, **Indiana State Convention**, West Lafayette; August 12-13, **Delaware State Convention**, Dover AFB; August 24-26, **California State Convention**, San Francisco; September 18-21, **AFA National Convention and Aerospace Development Briefings and Displays**, Washington, D. C.

Unit Reunions

Air Commando Ass'n

The Air Commandos of World War II (2d and 3d Air Commando Groups) will hold a reunion October 5-8, 1989, in Indianapolis, Ind. **Contact:** W. Robert Eason, Rte. 1, Box 28, Orange, Va. 22960. Phone: (703) 672-4074.

Air Forces Escape & Evasion Society

Air Forces Escape and Evasion Society will hold a reunion May 26-29, 1989, in Pittsburgh, Pa. **Contact:** Ralph K. Patton, 720 Valley View Rd., Pittsburgh, Pa. 15243. Phone: (412) 343-8570.

Aviano AB, Italy

Civilian and military personnel who were assigned to Aviano AB, Italy, are planning to hold a reunion October 4-8, 1989, in Tampa, Fla. **Contact:** Art Voisard, 1310 Cornwall Cr., Ocean Springs, Miss. 39564. Phone: (601) 875-9522.

Bradley Field

World War II veterans who served at Bradley Field in Windsor Locks, Conn., will hold a reunion on August 26, 1989, along with the 103d Fighter Squadron. **Contact:** Helen Snyder, 1463 Boulevard, West Hartford, Conn. 06119. Phone: (203) 561-3096.

CBI Hump Pilots Ass'n

China-Burma-India Hump Pilots and support personnel will hold a reunion August 23-27, 1989, at the Sheraton Spokane Hotel in Spokane, Wash. **Contact:** Jan Thies, 808 Lester St., Poplar Bluff, Mo. 63901. Phone: (314) 785-2420.

International Bird Dog Ass'n

The International Bird Dog Association

will hold its annual meeting and fly-in June 23-25, 1989, at the Shangri-La, an aviation resort near Afton, Okla. **Contact:** Phil Phillips, Jr., International Bird Dog Association, 3939 C-8 San Pedro N. E., Albuquerque, N. M. 87110. Phone: (505) 884-4822.

F-4 Phantom Society

The F-4 Phantom Society will hold a reunion June 29-July 1, 1989, at the Holiday Inn in Fairborn, Ohio. **Contact:** Paul Collins, 3381 Apple Tree Lane, Erlanger, Ky. 41018. Phone: (606) 342-9039.

6th Weather Squadron Alumni Ass'n

Members of the 6th Weather Squadron (Mobile) will hold a reunion August 3-6, 1989, in Oklahoma City, Okla. **Contact:** Donald L. Garbutt, 204 W. Ercoupe Dr., Midwest City, Okla. 73110.

7th Bomb Wing Ass'n

The 7th Bomb Wing (B-36) will hold a reunion April 28-30, 1989, at the Green Oaks Inn in Fort Worth, Tex. **Contact:** Richard S. George, P. O. Box 330279, Fort Worth, Tex. 76163.

15th/20th Weather Squadrons

Members of the 15th and 20th Weather Squadrons will hold a reunion May 18-20, 1989, in Oklahoma City, Okla. **Contact:** Hercul V. "Zed" Shultz, 620 Main St., El Centro, Calif. 92243. Phone: (619) 352-0853 (work) or (619) 352-6720 (home).

Class 39-B

The Air Corps Flying Cadet Class 39-B will hold a fiftieth anniversary reunion May 25-29, 1989, at the Mansion del Rio Hotel in San Antonio, Tex. Widows and children of deceased classmates are also invited to

Unit Reunions

attend this event. **Contact:** Joe Kelly, 1306 Mayhill Dr., Memphis, Tenn. 38116. Phone: (901) 332-1300.

39th Troop Carrier Squadron

Members of the 39th Troop Carrier Squadron, 317th Troop Carrier Group, will hold a reunion in May 1989, in Louisville, Ky. **Contact:** John H. Reiley, Rte. 2, Box 123, Westport, Ind. 47283.

P-40 Warhawk Pilots Ass'n

P-40 Warhawk Pilots will hold a reunion October 6-8, 1989, at the Quality Inn/High Q in Orlando, Fla. **Contact:** Bob Williams, 600 Valley Forge Rd. East, Neptune Beach, Fla. 32233. Phone: (904) 246-6093.

Pilot Class 43-D Ass'n

Pilot Class 43-D will hold a reunion April 26-30, 1989, at the Holiday Inn/Waterside in Norfolk, Va. **Contact:** Jack Carlson, 3045 Silverview Dr., Stow, Ohio 44224.

44th Bomb Group/Bomb Wing

Veterans of the 44th Bomb Group and Wing will hold a reunion in conjunction with the fiftieth anniversary celebration of the B-24 May 17-21, 1989, at the Hyatt Regency Hotel in Fort Worth, Tex. **Contact:** William H. Topping, 1426 Vadera Ct., Fenton, Mo. 63026. Phone: (314) 225-7030.

P-47 Thunderbolt Pilots

P-47 Thunderbolt Pilots (Western Division) will hold a reunion July 21-22, 1989, at McClellan AFB, Calif. **Contact:** James Fos-

Reunion Notices

Readers wishing to submit reunion notices to "Unit Reunions" should mail their notices well in advance of the event to "Unit Reunions," AIR FORCE Magazine, 1501 Lee Highway, Arlington, Va. 22209-1198. Please designate the unit holding the reunion, a time and location, and a contact for more information.

ter, 8665 Florin Rd., #89, Sacramento, Calif. 95828. Phone: (916) 383-7129.

48th Troop Carrier Squadron

The 48th Troop Carrier Squadron, 313th Troop Carrier Group, will hold a reunion July 27-29, 1989, in Clymer, N. Y. **Contact:** Felix Pulinski, P. O. Box 276, Sherman, N. Y. 14781. Phone: (716) 761-6466.

P-51 Mustang Pilots Ass'n

P-51 Mustang Pilots will hold their annual reunion June 30-July 5, 1989, at the Hyatt Regency Tech Center Hotel in Denver, Colo. **Contact:** Col. Mathias J. "Mickey" Martin, USAF (Ret.), 7403 E. Jamison Dr., Englewood, Colo. 80112. Phone: (303) 721-7844.

55th Weather Recon Squadron

The 55th Weather Reconnaissance Squadron will hold a reunion in conjunc-

tion with the fiftieth anniversary celebration of the B-24 May 17-21, 1989, in Fort Worth, Tex. **Contact:** David T. Jenkins, 392 Tulip St., Fairfield, Calif. 94533. Phone: (707) 422-6541.

56th Fighter Group

Members of the 56th Fighter Group will hold a reunion June 22-25, 1989, in Colorado Springs, Colo. **Contacts:** Leo Lester, 600 E. Prospect St., Kewanee, Ill. 61443. Phone: (309) 856-6826. John McClure, 2674 Leslie Dr., N. E., Atlanta, Ga. 30345. Phone: (404) 939-6420.

62d Troop Carrier Wing/MAW Ass'n

Members of the 62d Troop Carrier Wing/62d Military Airlift Wing (McChord/Larson AFBs, Wash.) will hold a reunion August 9-13, 1989, in Tacoma, Wash. **Contact:** Bill Schwehm, P. O. Box 4220, McChord AFB, Wash. 98438. Phone: (206) 582-1904.

66th Fighter-Interceptor Squadron

Members of the 66th Fighter-Interceptor Squadron who served in Alaska are planning to hold a reunion in July or September 1989. **Contact:** Mike DiBernardo, 12366 Cone St., Utica, Mich. 48087. Phone: (313) 739-4149.

70th Bomb Squadron

Members of the 70th Bomb Squadron who were stationed in the Southwest Pacific in 1942-43 are planning to hold a reunion May 7-10, 1989, in San Francisco, Calif. **Contact:** Edward H. Morrison, 2380 Hyde St., San Francisco, Calif. 94109.

74th Bomb Squadron

Members of the 74th Bomb Squadron who were stationed in Guatemala City, Guatemala, from 1943 through 1945 will hold a reunion September 10-13, 1989, in Las Vegas, Nev. **Contact:** M. L. Crabb, Box 85, Killeen, Tex. 76540-0085.

79th Airdrome Squadron

The 79th Airdrome Squadron, Fifth Air Force (World War II), will hold a reunion June 1-4, 1989, at the Westgate Hotel in San Diego, Calif. **Contact:** Fred Hitchcock, 29 Blueberry Hill Lane, Sudbury, Mass. 01776. Phone: (508) 443-6679.

94th Bomb Group Ass'n

The 94th Bomb Group, Eighth Air Force (World War II), based in Bury St. Edmunds, England, with the 331st, 332d, 333d, and 410th Bomb Squadrons and attached units, will hold a reunion October 12-15, 1989, in Minneapolis, Minn. **Contact:** Col. Robert H. Voss, USAF (Ret.), 26 Fawn Meadows Dr., Belleville, Ill. 62221. Phone: (618) 277-1509.

97th Bomb Group Ass'n

Members of the 97th Bomb Group will hold a reunion October 18-22, 1989, in Clearwater Beach, Fla. **Contact:** Harry Alsaker, 1308 Jackson St., Missoula, Mont. 59802. Phone: (406) 543-5388.

246th Signal Operations Company

Members of the 246th Signal Operations



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Reunions

Greater Omaha Convention & Visitors Bureau
1819 Farnam Suite 1200
Omaha, NE 68183

Company (World War II) will hold a reunion August 4-5, 1989, in Charlotte, N. C. **Contact:** Johnnie Huggins, Jr., 30031 S. W. 169th Ave., Homestead, Fla. 33030. Phone: (305) 247-0150.

RAF 156 Pathfinder Squadron

The RAF 156 Pathfinder Squadron, formed at RAF Station Alconbury, England, in 1942 and operated during World War II, will hold a reunion in September 1989. Eighth Air Force veterans' organizations with Alconbury connections from 1942 through 1945 are welcome to attend this event. **Contact:** Flt. Lt. Robert Trotter, DFC RAF (Ret.), 17 Beech Dr., Nailsea, Bristol BS19 1QA, England.

314th Composite Wing

The 314th Composite Wing, Fifth Air Force, will hold a reunion June 21-25, 1989, in Gettysburg, Pa. **Contact:** Bob Kendall or Mel Hiller, Box 35372, Louisville, Ky. 40232.

385th Bomb Group Ass'n

The 385th Bomb Group will hold a reunion August 24-27, 1989, in Fargo, N. D. **Contact:** Sam Lyke, 4992 S. E. Princeton Dr., Bartlesville, Okla. 74006. Phone: (918) 333-4939.

388th Bomb Group Ass'n

Members of the 388th Bomb Group (World War II) will hold a reunion August 23-27, 1989, at the Marriott Hotel in Salt Lake City, Utah. **Contact:** Edward J. Huntzinger, 1925 S. E. 37th St., Cape Coral, Fla. 33904-5035. Phone: (813) 542-4807.

391st FBS/TFS

The 391st FBS/TFS, assigned to England AFB, La., from 1954 through 1959, will hold a reunion April 21-23, 1989, in Alexandria, La. **Contact:** John Halton, 507 Vicksburg Dr., Belleville, Ill. 62221. Phone: (618) 235-6619.

425th TFTS/4441st CCTS

Members of the 425th Tactical Fighter Training Squadron and 4441st Combat Crew Training Squadron "Skoshi Tiger" will hold an F-5 Freedom Fighter twenty-fifth anniversary reunion May 26-28, 1989, at Williams AFB, Ariz. **Contacts:** Lt. Col. "Griz" Nelson, USAF, 425th TFTS, Williams AFB, Ariz. 85240. Phone: (602) 988-6828. AUTOVON: 474-5383. Maj. Douglas C. Lea, USAF (Ret.), 916 E. 9th Pl., Mesa, Ariz. 85203. Phone: (602) 835-6109.

454th Bomb Squadron Ass'n

The 454th Bomb Squadron, 323d Bomb Group (World War II), will hold a reunion September 6-10, 1989, in Las Vegas, Nev. **Contact:** Joe Havrilla, 1208 Margaret St., Munhall, Pa. 15120-2048. Phone: (412) 461-6373.

455th Bomb Group

The 455th Bomb Group will hold a reunion in conjunction with the fiftieth anniversary celebration of the B-24 May 17-21, 1989, at the Arlington Hilton Hotel in Arlington, Tex. **Contacts:** Col. James W. Shumard, Jr., USAF (Ret.), 5738 Oak Valley Rd., Kettering, Ohio 45440. Phone: (513) 434-8793. Col. Louie O. Hansen, USAF (Ret.), P. O.

Box 6125, Spencer, Iowa 51301. Phone: (712) 262-7237.

465th Service Squadron

The 465th Service Squadron, stationed in Northern Ireland and England from 1943 through 1945, and the 354th Airdrome Squadron are planning to hold a reunion in August 1989. **Contact:** William T. Butts, 8215 White Oak, San Antonio, Tex. 78230.

474th Fighter Group Ass'n

Members of the 474th Fighter Group (World War II) will hold a reunion August 31-September 3, 1989, at the Red Lion Inn in Colorado Springs, Colo. **Contact:** Lloyd Wenzel, 204 Turtle Creek Dr., Tequesta, Fla. 33469. Phone: (407) 747-2380.

483d Bomb Group Ass'n

The 483d Bomb Group (World War II) will hold a reunion October 3-8, 1989, in Omaha, Neb. **Contact:** Harry Whye, 1508 Gregg Rd., Bellevue, Neb. 68005. Phone: (402) 293-1508.

622d Air Refueling Squadron

Members of the 622d Air Refueling Squadron will hold a reunion May 3-6, 1989, in Alexandria, La. **Contact:** Dan Sloan, 1507 Hwy. 1204, Pineville, La. 71360. Phone: (318) 640-4208.

1600th QM Car Company

The 1600th QM Car Company of the Twentieth Air Force, stationed in Guam during World War II, will hold a reunion June 23-25, 1989, in Harrisburg, Pa. **Contact:** John P. Skinskis, 23 S. Mann Ave., Box 312, Yeagertown, Pa. 17099. Phone: (717) 248-0986.

Class 60-C

For the purpose of organizing a reunion, I would like to hear from members of Class 60-C.

Please contact the address below.

Ronald J. Lang
6206 Foxcroft Rd.
Alexandria, Va. 22307

Phone: (703) 329-1575

81st Fighter Wing

For the purpose of preparing a comprehensive history and organizing a reunion, I would like to hear from members of the 81st Fighter Wing.

Please contact the address below.

Lt. Col. Stewart S. Stabley, USAF (Ret.)
1543 Mahie Pl.
Honolulu, Hawaii 96818
Phone: (808) 422-1314

330th/331st FIS

I would like to hear from members of the 330th/331st Fighter Interceptor Squadrons, F-86 "Dog" pilots, E-4, E-5, and E-6 radar technicians, crew chiefs, and staff who were stationed at Stewart AFB, N. Y., from 1954 through 1959.

Please contact the address below.

Ronald V. Regan
340 Sandpiper Dr.
Casselberry, Fla. 32707

Phone: (407) 695-0461
(407) 356-8134

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5. Up to 30 days per year (to a 60-day life-time maximum) for each insured person receiving care through a CHAMPUS-approved Special Treatment Facility.
6. Up to five visits per year for each insured person to Marriage and Family Counselors under conditions defined by CHAMPUS.

And the New 'Expense Protector' Benefit

While CHAMPUS Supplement coverage was originally intended to cover the cost of medical services not provided by CHAMPUS, practitioners and service institutions may charge fees that are considerably greater than those approved for payment by CHAMPUS. And, because Supplement policies traditionally base their payments on the amount paid by CHAMPUS, the insured can be left with sizable out-of-pocket expenses. AFA's ChamPLUS® coverage includes a special feature which places a limit on these out-of-pocket expenses.

Called the 'Expense Protector' Benefit, this program limits out-of-pocket expenses for CHAMPUS covered charges in any single calendar year to \$1,000 for any one insured person

(or \$2,000 for all insured family members combined). Once those out-of-pocket expense maximums are reached, ChamPLUS® will pay 100% of CHAMPUS covered charges for the remainder of that year.

An example of the way the 'Expense Protector' works follows. Assume you are hospitalized for 35 days, that the hospital charges you \$330 per day and that this is \$75 per day *more* than allowed by CHAMPUS. This would mean that you have an out-of-pocket expense of \$2,625. With AFA's 'Expense Protector' benefit, your cost would be limited to \$1,000. All covered costs over this amount—for the whole

calendar year—would be paid by ChamPLUS®!

It's an important benefit that can mean significant savings to you and your family.

CALIFORNIA and HAWAII RESIDENTS—If you would like details on AFA's supplement to CHAMPUS Prime, please contact AFA's Insurance Division at 1/800/858-2003.

Who Is Eligible?

1. All AFA members under 65 years of age who are currently receiving retired pay based upon their military service and who are eligible for benefits under Public Law 89-614 (CHAMPUS their spouses under age 65 and their unmarried

AFA ChamPLUS® Benefit Schedule

Care	CHAMPUS Pays	AFA CHAMPLUS® PAYS
For Military Retirees Under Age 65 and Their Dependents		
Inpatient civilian hospital care	CHAMPUS pays the balance of the Diagnostic Related Group (DRG) allowance after the beneficiary's cost share* is deducted.	CHAMPLUS® pays the 25% of allowable charges not paid by CHAMPUS . . . plus 100% of covered charges after out-of-pocket expenses exceed \$1,000 per person (or \$2,000 per family) during any single calendar year.
Inpatient military hospital care	The only charge normally made is a daily subsistence fee, not paid by CHAMPUS.	CHAMPLUS® pays the daily 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 paid by CHAMPUS after the deductible has been satisfied . . . plus 100% of covered charges after out-of-pocket expenses exceed \$1,000 per person (or \$2,000 per family) during any single calendar year.
For dependents of Active Duty Military Personnel		
Inpatient civilian hospital care	CHAMPUS pays all covered services and supplies furnished by a hospital less \$25 or the total of daily subsistence fees, whichever is greater.	CHAMPLUS® pays the greater of the total subsistence fees, or the \$25 hospital charge not paid by CHAMPUS
Inpatient military hospital care	The only charge normally made is a daily subsistence fee, not paid by CHAMPUS.	CHAMPLUS® pays the daily 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 paid by CHAMPUS after the deductible has been satisfied . . . plus 100% of covered charges after out-of-pocket expenses exceed \$1,000 per person (or \$2,000 per family) during any single calendar year.

NOTE: Outpatient benefits cover emergency room treatment, doctor bills, pharmaceuticals, and other professional services. There are some reasonable limitation and exclusions for both inpatient and outpatient coverage. Please note these elsewhere in the plan description.

*The beneficiary cost share is the lesser of 25% of CHAMPUS-allowable billed charges or a daily fixed amount. For fiscal year 1989, the daily limit is \$210.

New 'Expense Protector' Benefit!

dependent children under age 21, or age 23 if in college.

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.")

Renewal Provision

As long as you remain eligible for CHAMPUS benefits and the Master Policy with AFA remains in force, termination of your coverage can occur only if premiums for coverage are due and unpaid, or if you are no longer an AFA member. Your certificate cannot be terminated because of the number of times you receive benefits.

Exceptions and 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 of active duty members over age 21 (age 23 if in college) will continue to be eligible if they have been declared incapacitated and if they are insured under CHAMPLUS® on the date so declared. Coverage for these older age children will only be provided upon a) notification to AFA and b) payment of a special premium amount.

Plan 1 For Military Retirees and Dependents

QUARTERLY PREMIUM SCHEDULE

In-Patient Benefits Only

Member's Attained Age*	Member	Spouse	Each Child
Under 50	\$22.97	\$ 45.12	\$16.34
50-54	\$34.33	\$ 56.21	\$16.34
55-59	\$50.32	\$ 60.17	\$16.34
60-64	\$62.98	\$ 69.27	\$16.34

In-Patient and Out-Patient Benefits

Under 50	50-54	55-59	60-64
\$33.90	\$46.59	\$64.41	\$77.38
\$ 61.02	\$ 69.87	\$ 96.11	\$102.15
\$40.84	\$40.84	\$40.84	\$40.84

*Note: Premium amounts increase with the member's attained age

Plan 2 For Dependents of Active Duty Personnel

ANNUAL PREMIUM SCHEDULE

In-Patient Benefits Only

All Ages	Member	Spouse	Each Child
	None	\$ 9.68	\$ 5.94

In-Patient and Out-Patient Benefits

All Ages	Member	Spouse	Each Child
	None	\$38.72	\$29.70

Coverage After Age 65

Upon attainment of age 65, the coverage of members insured under CHAMPLUS® will automatically be converted to AFA's Medicare Supplement program so that there will be no lapse in coverage. Members not wishing this automatic coverage should notify AFA prior to their attainment of age 65.

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)

APPLICATION FOR AFA CHAMPLUS®

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 \$21 for annual AFA membership dues (includes subscription (\$18) to AIR FORCE Magazine).

PLAN & TYPE OF COVERAGE REQUESTED

- Plan Requested (Check One) AFA CHAMPLUS® PLAN I (for military retirees & dependents) AFA CHAMPLUS® 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 CHAMPLUS-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.

4-89

Application must be accompanied by a check or money order. Send remittance to:
Air Force Association, Insurance Division, 1501 Lee Highway, Arlington, VA
22209-1198

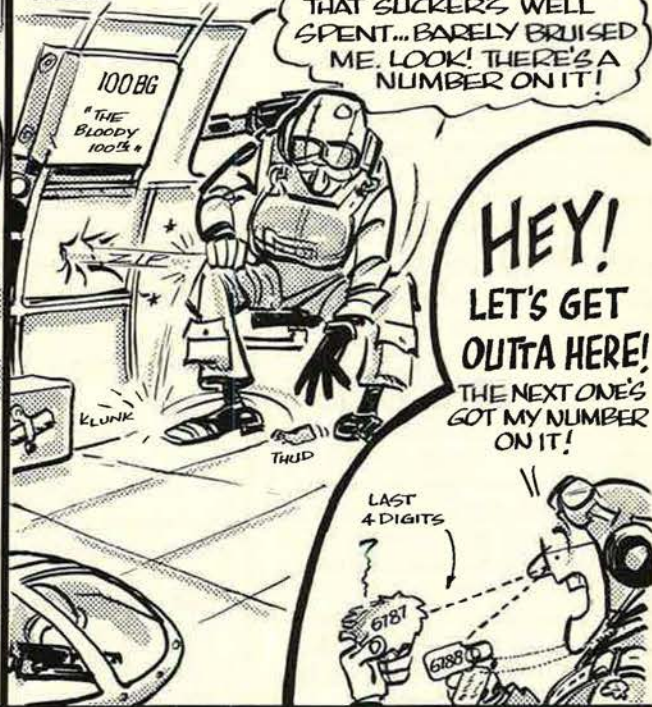
Bob Stevens'

"There I was..."

AFTER A BIG RAID IN WWII, **QUEEN BEE** "OLD 185" WAS SO BADLY SHOT UP SHE BARELY MADE IT BACK TO HER 94TH BG BASE...



THEN THERE WAS THE CLASSIC CASE COVERED IN JABLONSKI'S "FLYING FORTRESS" -



THE HAIRIEST FLAK STORY HAS TO BE THE TAIL GUNNER WHO -TRAPPED IN THE SEVERED TAIL- "FLEW," ALA FALLING LEAF, 20,000 FT. TO THE DECK!



(VARIOUS SOURCES SAY HE LANDED IN A TREE, OTHERS-A SNOWBANK) -THE POINT IS: HE LIVED!

THE PIÈCE DE RESISTANCE IS THE STORY OF A SHOT-UP NIGHT INTRUDER (IN KOREA) BEING PARKED TOO CLOSE TO THE SALVAGE YARD AFTER A MISSION -



MILSTAR



IF THEY'RE OUT OF TOUCH, THEY'RE OUT OF ACTION.

Satellite communications are essential for keeping some U.S. military forces connected to their chain of command. If those communications were ever cut off, some of our forces would be impaired.

That's why it is imperative that we move ahead with the deployment of Milstar, the next-generation military satellite communications system. Milstar will provide all branches of the U.S. military with the jam-resistant, worldwide, two-way communications capability that they need. And it will go on meeting this need well into the next century.

Milstar's design puts special emphasis on survivability. Now ready for Low Rate Initial Production, the system uses extremely high frequency (EHF) and other state-of-the-art technologies to withstand electronic warfare and attack.

It's as simple as this. Our forces can't be effective if they can't communicate. By providing secure and survivable communications, Milstar will help ensure that a breakdown like this never takes place. That's why America needs Milstar. Few other programs are so vital to our national defense.

For more information contact: Collins Defense Communications, 3200 East Renner Road, Richardson, Texas 75081, (214) 705-3950.



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**NATION'S MILITARY LEADERS
AGREE ON URGENT NEED FOR
NEW DIRECT-DELIVERY AIRLIFTER.**

In the view of the Commanders-in-Chief, as stated in congressional hearings, the C-17 represents a major way to achieve the strategic and tactical airlift our armed forces require. The C-17 is starting production. When operational, it will be supporting the CINCs in their national defense missions.

**MCDONNELL
DOUGLAS**



C17

*"C" as in
CINCS*

