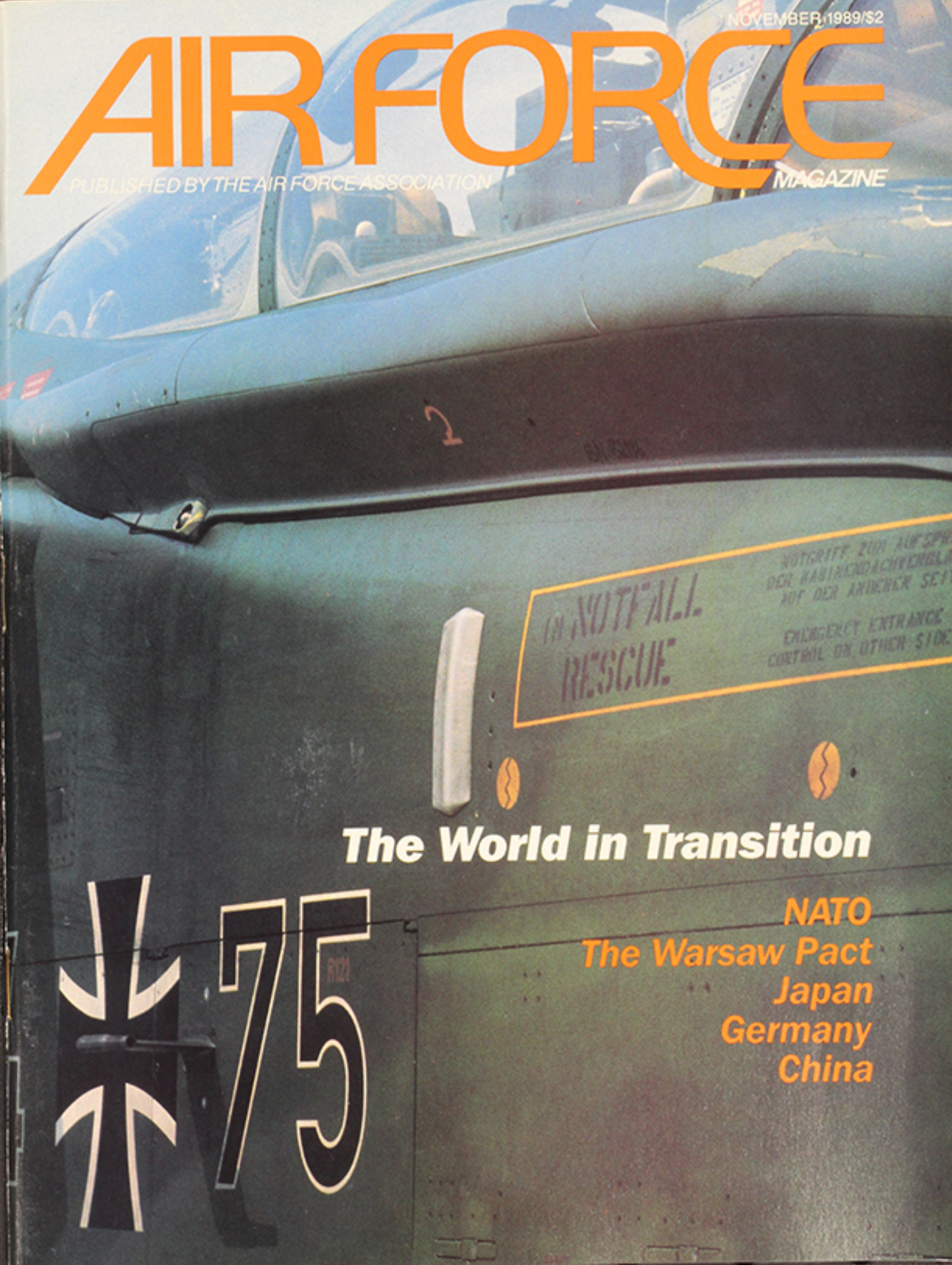
NOVEMBER 1989/$2

AIR FORCE

PUBLISHED BY THE AIR FORCE ASSOCIATION

MAGAZINE



The World in Transition

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The Warsaw Pact
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–B-2 Chief Test Pilot

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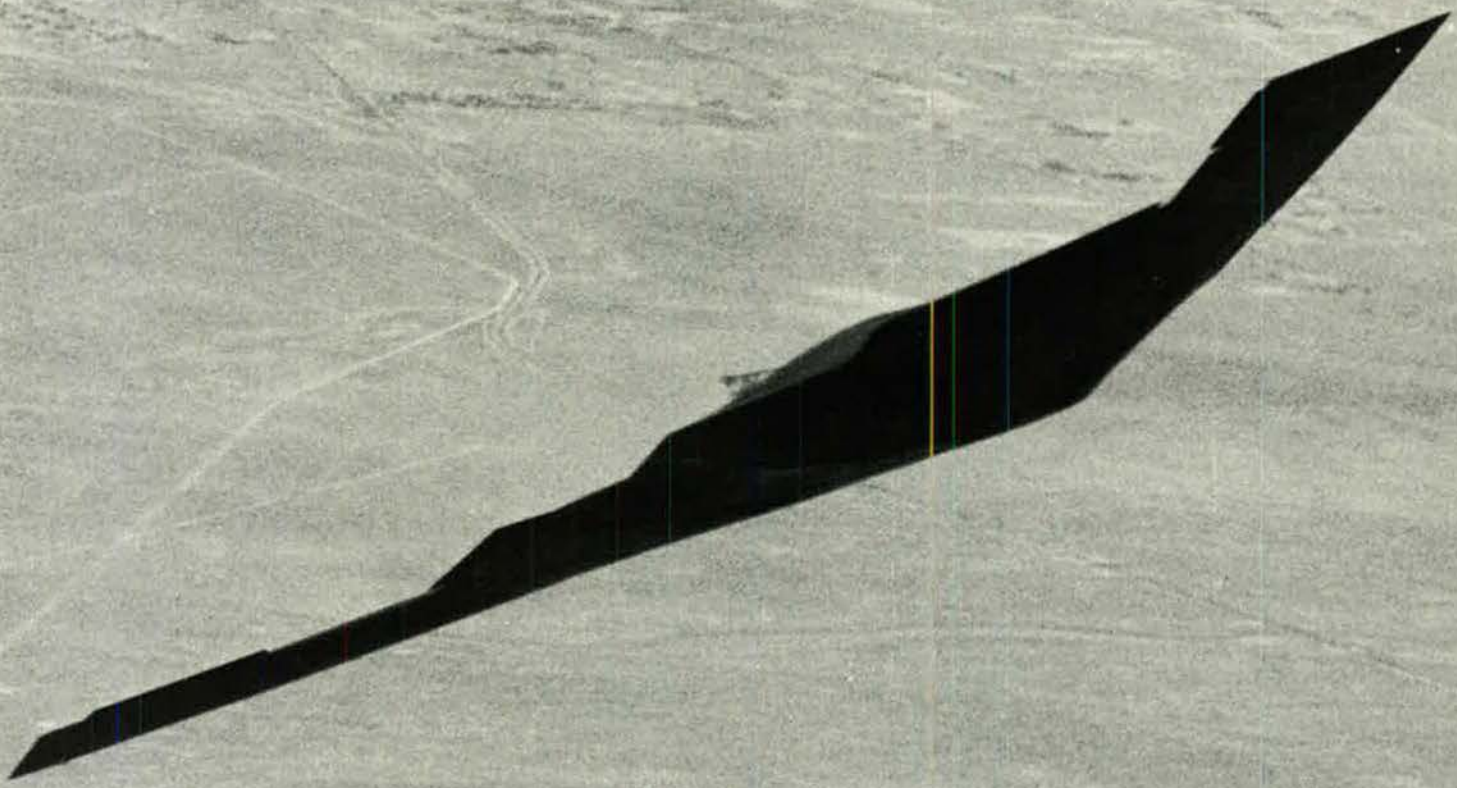

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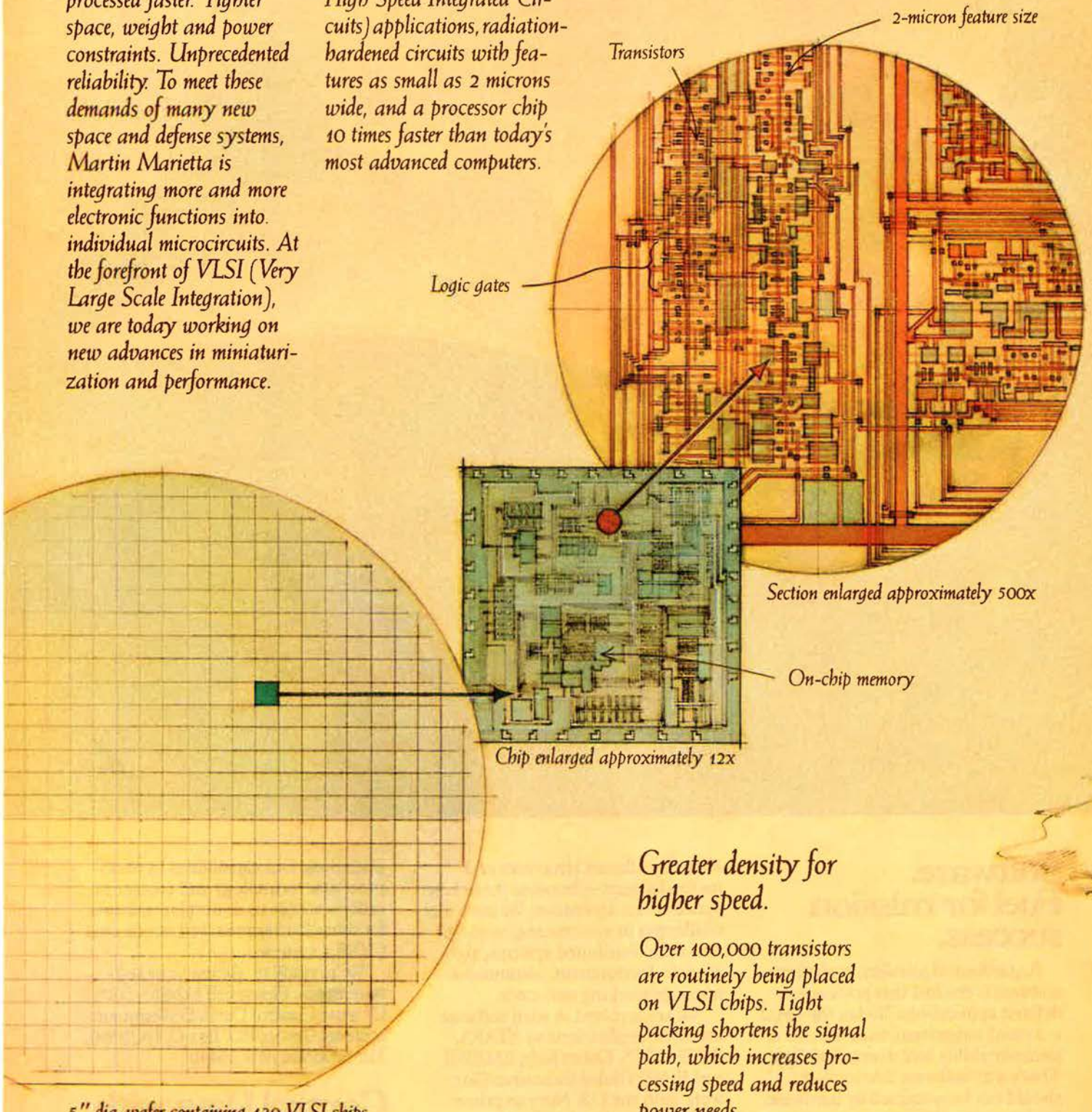

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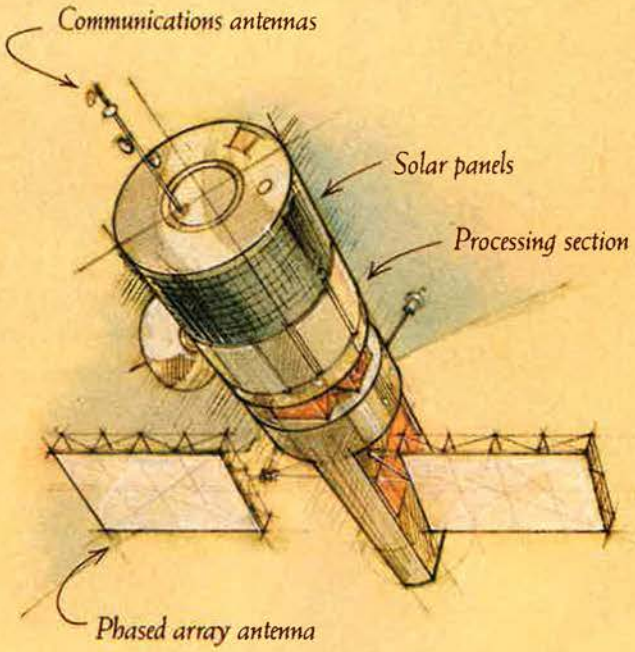

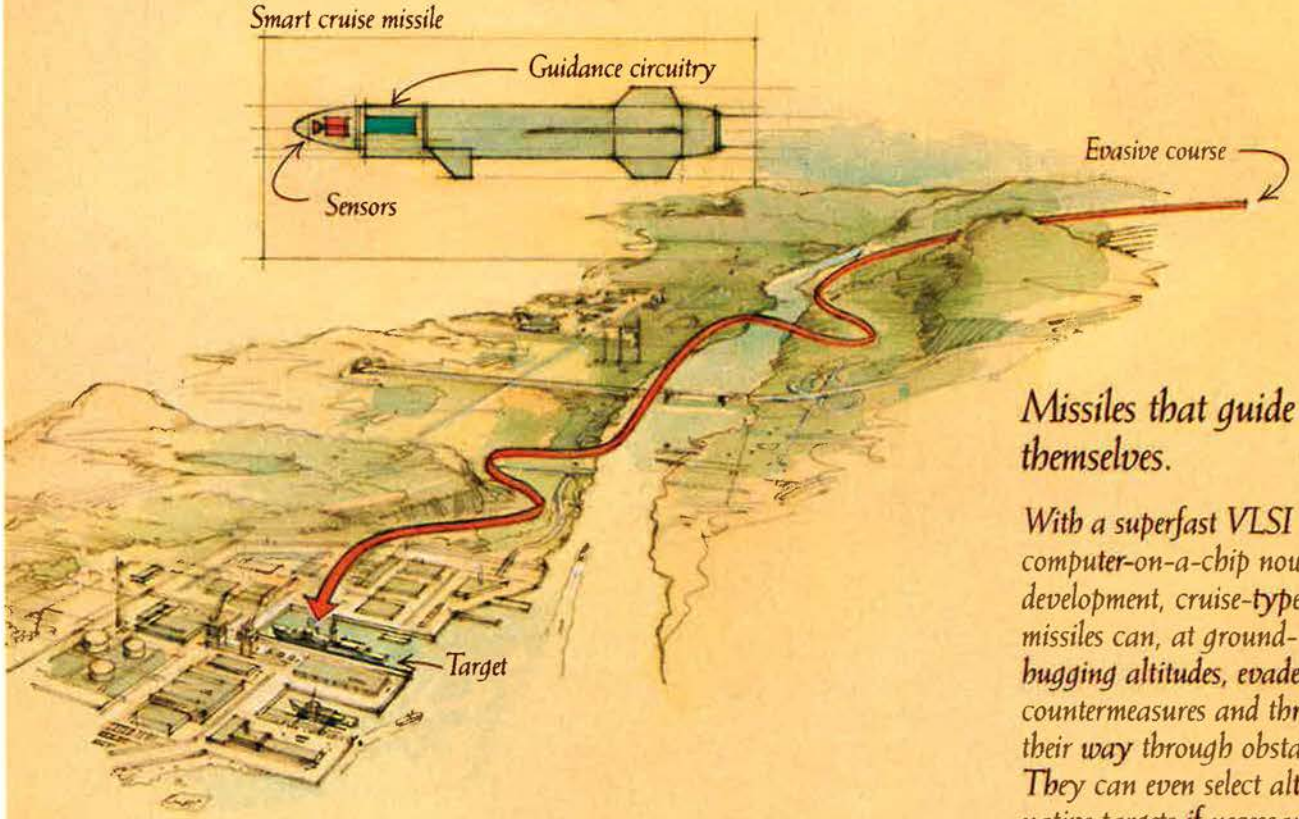

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NOVEMBER 1989
VOLUME 72, NUMBER 11

AIR FORCE MAGAZINE
PUBLISHED BY THE AIR FORCE ASSOCIATION

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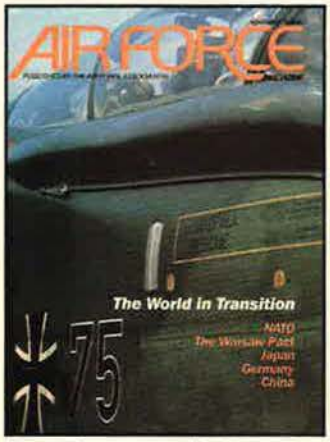

About the cover: This Tornado fighter/ground-attack aircraft is part of the first-rate equipment of the West German Air Force. West Germany is changing its view of major East-West issues, much to NATO's chagrin. Photo by Paul Kennedy.

The World In Transition: NATO, The Warsaw Pact, Japan, Germany, China

Departments

AIR FORCE Magazine (ISSN 0730-6784) November 1989 (Vol. 72, No. 11) is published monthly by the Air Force Association, 1501 Lee Highway, Arlington, Va. 22209-1198. **Phone** (703) 247-5800. Second-class postage paid at Arlington, Va., and additional mailing offices. **Membership Rate:** $21 per year; $48 for three-year membership. **Life Membership:** $300. **Subscription rate:** $21 per year; $25 per year additional for postage to foreign addresses (except Canada and Mexico, which are $8 per year additional). Regular issues $2 each. Special issues (Soviet Aerospace Almanac, USAF Almanac issue, and Anniversary issue) $5 each. **Change of address** requires four weeks' notice. Please include mailing label. **POSTMASTER:** Send change of address to Air Force Association, 1501 Lee Highway, Arlington, Va. 22209-1198. Publisher assumes no responsibility for unsolicited material.

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the ALQ-184.

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The ALQ-184 jamming pod is being deployed on U.S. Air Force F-4s and F-16s.

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Where quality starts with fundamentals

An Editorial

A Sunny Day In January

By John T. Correll, EDITOR IN CHIEF

CONTINUING along its well-advertised path toward peace and enlightenment, the Soviet Union has begun deploying the Mod V variant of its SS-18 heavy ICBM. It is more accurate and lethal than the Mod IV variant, which was sufficient by itself to target every US ICBM silo (allocating two warheads against each of them) and command facility, with about 1,000 warheads left over.

The Mod V is the third new ICBM the Soviets have introduced since General Secretary Mikhail Gorbachev's ascension to power in 1985. Also deployed on his watch have been the rail-mobile SS-24 and the road-mobile SS-25. In the past year alone, twenty SS-24s and sixty-five SS-25s have entered service.

US Secretary of Defense Richard Cheney finds it exasperating that many Americans believe the Soviet military threat has vanished. "If anything, the United States is facing a *more* formidable offensive strategic arsenal than before Mr. Gorbachev took power," he says.

Soviet conventional forces are not withering away either. *The Military Balance*, published October 5 by the International Institute of Strategic Studies in London, concludes that Soviet forces possess significantly more manpower, tank strength, and surface-to-air missiles than was estimated previously. The Institute now figures that the Soviets have 60,000 main battle tanks, up by 6,700 from last year's estimate.

The chart below is derived from *Soviet Military Power 1989*, published September 27 by the Pentagon. It shows clearly enough that Mr. Gorbachev's diplomacy has not interfered with his production of military goods.

Lest anyone think these numbers are a Western propaganda trick, the Soviets acknowledge that their military spending did not decline during Mr. Gorbachev's first three years. Five months ago, Premier Nikolai Ryzhkov explained that "when forming plans for 1986–90, because of the international situation prevailing at the time and our military doctrine, we were compelled to envision a traditional growth of defense expenses at a pace exceeding the growth of national income." Mr. Gorbachev's admirers may take comfort nevertheless from his forecast of a fourteen percent reduction in military spending "as early as 1990–91."

The Soviet "Slowdown"
(Average annual production)

	Pre-Gorbachev (1982–84)	Gorbachev (1986–88)
Tanks	2,800	3,400
Other armor	5,400	4,600
Self-propelled artillery	900	900
Submarines	9	9
Surface warships	9	9
Bombers	40	47
Fighters	950	680
Military helicopters	580	450
ICBMs	116	116
Sea-launched cruise missiles	1,000	1,100
Surface-to-air missiles	15,000	16,000

It is little wonder that Western strategists turn no cartwheels about Mr. Gorbachev's peace offensive. Ironically, the United States, which has cut its defense spending by twelve percent in four years and which has not gotten its own ICBM modernization program beyond the first fifty Peacekeepers, is often accused of being unresponsive to Mr. Gorbachev's overtures.

If the Soviets have adopted a defensive doctrine, Mr. Cheney asks, why did they push ahead with the SS-18 Mod V, a powerful missile based in fixed silos? The Mod V, Mr. Cheney charges, "would seem by its basic design to be a use-it-or-lose-it weapon—one that would make sense only for a preemptive first strike."

Available evidence indicates that preemptive attack remains the preferred nuclear employment option in Soviet strategy. In the Pentagon's assessment, "the Soviets will likely maintain adequate weapons even under START [Strategic Arms Reduction Talks] constraints to cover current and anticipated future target sets."

Similarly suspect are Soviet claims that their conventional forces have switched to the defensive. To the extent that anything has changed, US planners say, it is because the Russians are worried that NATO's Follow-On Forces Attack concept will upset their battle plans for reinforcement and resupply. While there have been some adjustments to protect rear echelons, Soviet theater forces are still tailored for offensive operations.

The reduction of Soviet tank forces in Europe, announced with fanfare last December, seems to have gone astray, too. It now appears that the troops and equipment have been assigned to other units rather than disbanded and that the infrastructure of the units remains intact. "What Gorbachev said at the UN is that six tank divisions would be withdrawn and disbanded," Rep. Les Aspin (D-Wis.), Chairman of the House Armed Services Committee, observes. "That is not what is going on."

Mr. Gorbachev has convinced most of the world that his force-reduction proposals are an unprecedented act for a Soviet leader. Not so, says the Department of Defense: "Thirty years ago, Khrushchev made significant unilateral cuts that were even more drastic than those announced by Gorbachev. He reduced the size of the Soviet armed forces by over 1,000,000 men, which accounted for over thirty-six divisions." It did not take his successor, Leonid Brezhnev, long to build back what was lost and then some.

Unfortunately, the hard facts seem to influence public opinion less than does public relations puffery. Americans are too quick to assume the danger is gone, Mr. Cheney warns.

"They have seen *some* changes and apparently believe *everything* is now just fine," he says. "It is if they had decided to give away their overcoats on the first sunny day in January." ■

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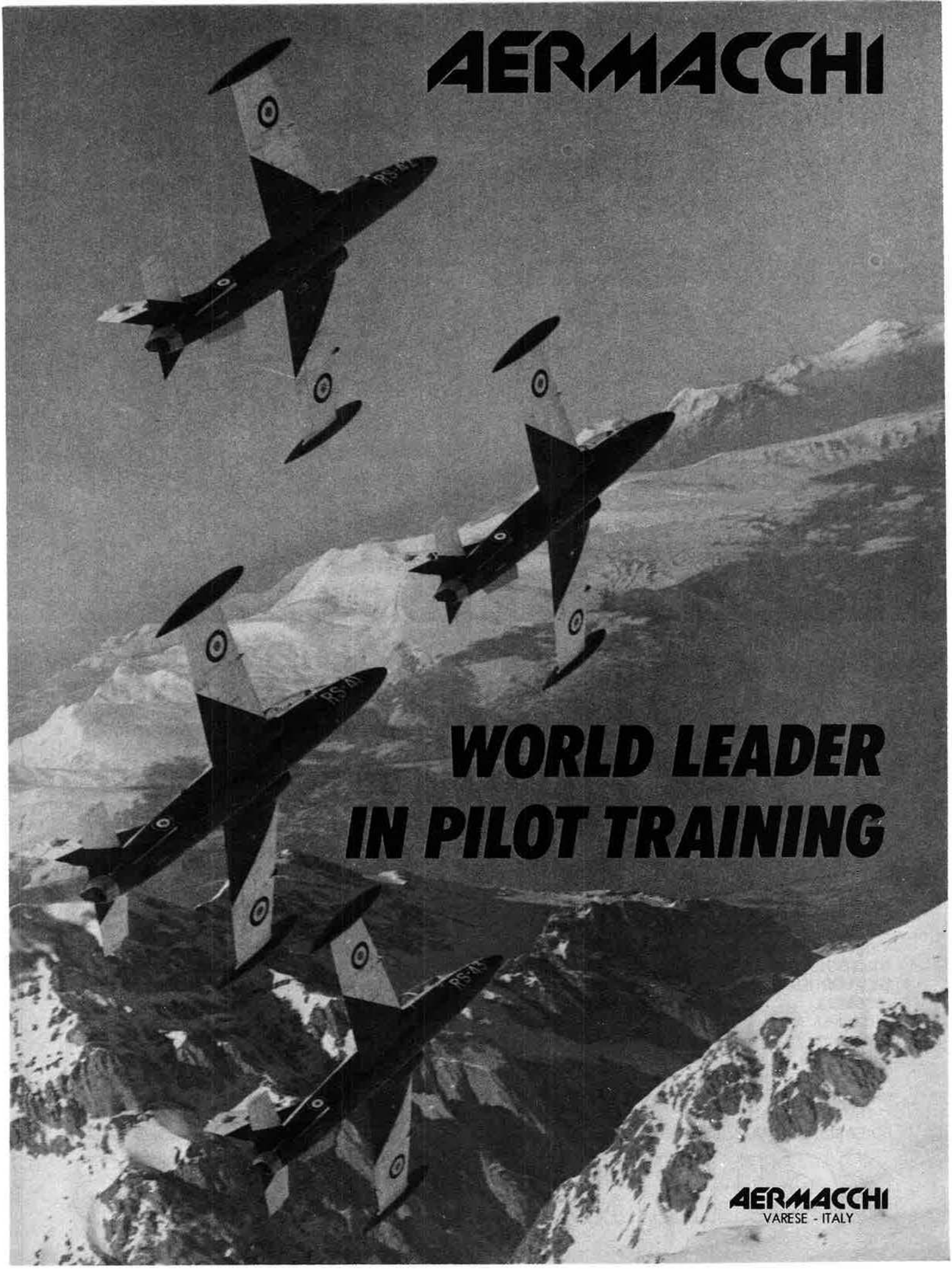
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Classic Controversy

Being an aviation enthusiast and in particular a collector of aviation memorabilia, including aircraft engines, I was especially interested in "A Gallery of Classics" *[by Jeffrey P. Rhodes, September '89 issue, p. 102]*. However, several errors were apparent in the descriptions of the aircraft. In the bomber section, the B-26 Marauder was described as being powered by Wright R-2600-9 Cyclones; the B-26 was powered by Pratt & Whitney R-2800-43s.

In the fighter section the Spad XIII is described as having a Hispano-Suiza 8-Be rotary of 220 hp. The manufacturer is correct, but Hispano-Suiza never manufactured a rotary, or a radial for that matter. The Spad was powered by a Hispano-Suiza BEc, which was a water cooled, ninety-degree V-8.

The P-38 is described as having Allison V-1710-111s or -113s. The P-38L actually used both of these engines. The left engine turned in a clockwise direction, the right engine turned in a counterclockwise direction (viewed from the front of the aircraft). Therefore, two different dash numbers were required to differentiate the engines.

The P-47D was powered by a Pratt & Whitney R-2800-59, not a -21. In the P-61 Black Widow profile the Pratt & Whitney R-2800s are described as Twin Wasps; in fact, the R-2800 was given the name "Double Wasp" by Pratt & Whitney. In the attack, observation, and amphibious section, the A-26 is really an Invader, not an Intruder.

Graham White
Boca Raton, Fla.

On p. 118 of the September issue, you briefly describe the military uses of the C-47. I believe you should have mentioned the several thousand C-47s that participated in all the major land battles in Europe during World War II. For example, a train of 1,200 C-47s in forty-five-ship formations dropped the 82d and 101st Airborne Divisions during the early morning darkness of D-Day in the Normandy invasion. They followed up by towing in gliders, dropping supplies by parapack, and landing in cow-pasture airfields at the various fronts to carry in ammunition, gasoline, and other supplies and to evacuate wounded from the front-line aid stations. Similar operations involving thousands of C-47s and gliders were employed against enemy targets in the invasions of North Africa, Sicily, Southern France, and Holland and during the relief of Bastogne and the Rhine Crossing. Specially equipped C-47s were used to snatch gliders off the ground after a battle to return them to their bases.

Col. William H. Parkhill,
USAF (Ret.)
San Jose, Calif.

"A Gallery of Classics" is excellent, but there is an omission and an error.

The omission first: While I was at Randolph Field, San Antonio, Tex., in 1941, we were flying BT-9s and BT-14s by North American. These would be real classics today, if you could find one.

Next the error: As a B-26 Marauder pilot in the 320th Bomb Group in World War II, I can assure you that the B-26 did not have two Wright R-2600-9 Cyclone engines as stated on p. 103. It was powered by two Pratt & Whitney R-2800 radials of 2,000 hp.

Lt. Col. Leland S. Ford,
USAF (Ret.)
Horicon, Wis.

I enjoyed the review of Air Force aircraft from the past; however, the B-57 and the T-29 should have been included. The B-57's seven variants (A–G) performed a wide range of missions in more than twenty years of Air Force service. To my knowledge, none remains active, though a few may still be used at Edwards AFB. In several models, the only method of starting the engines was with starter cartridges. This was but one of its many unique features. For many years, the T-29 was where Air Force navigators "sprouted their wings" until the plane was replaced by the T-43 in the 1970s. It was also widely used for staff transportation and proficiency training. The T-29 was a very reliable aircraft with an enviable safety record and was an important part of many Air Force aviators' careers.

Ronald M. Kautz
Austin, Tex.

As a B-29 central fire-control technician with the 20th Air Force on Saipan in World War II, I was interested in the armament stats given for the B-29 Superfortress. Ten or eleven .50-caliber machine guns plus a 20-mm cannon are listed. Not so. *Our* B-29s (869th Squadron, 497th Group, 73d Wing) carried one 20-mm cannon and twelve .50-caliber machine guns arranged as follows: four in the upper forward turret, two in the upper rear turret, two in the tail turret (plus the cannon), two in the lower rear turret, and two in the lower forward turret. Early models of the B-29 may have had only two guns in the upper forward turret, but the ones used in combat over Japan had four.

The 20-mm cannon was removed from all of our airplanes after the first few missions because it had a nasty habit of malfunctioning at critical times over the target areas.

Gerald D. Coke
Sonora, Calif.

What happened to the C-133 in your "Gallery of Classics"? Surely this aircraft, which served with distinction for more than a decade, which played a significant airlift role in the Vietnam War, and which, for much of its life, was *the* outsized cargo carrier in the USAF inventory, deserved more than a

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

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PUBLISHED BY THE AIR FORCE ASSOCIATION

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BPA Circulation audited by Business Publication Audit

passing comment in the C-124 text.

Lt. Col. Kenneth Furbush,
USAF (Ret.)
Cincinnati, Ohio

Was the B-66 overlooked, or was it not important enough to be included?

For many years the B-66 was USAFE's vest-pocket bomber, and it created fear among the Soviets, who demanded its withdrawal from NATO.

The B-66s at RAF Sculthorpe (47th Bombardment Wing, TAC) were one of the major problems that President John Kennedy had to deal with upon his inauguration in January 1961.

Later, when this unit was abolished, the sleek planes minus their very powerful two jet engines went under the Big Blade, chopped up right there at Sculthorpe.

Perhaps that's why no one cares to remember that phase of Air Force history!

CMSgt. Harold L. Barbin,
USAF (Ret.)
Houston, Tex.

In "A Gallery of Classics" you state that the BT 13A/B Valiant was dubbed the "vibrator" because "its canopy had a tendency to rattle." Having spent several years around the old Vultee, I recall the nickname "vibrator" came from her purposely built-in tendency to vibrate severely just before reaching stalling speed. So severe was it that sometimes it was difficult to read the instruments! In any event, she was a good old girl and did her job well.

Am I correct?

Maj. B. W. Heath,
USAF (Ret.)
Newport Beach, Calif.

• *Many readers pointed out the error about the B-26's engines, which were indeed P&W R-2800-43s. As to the specific points, Reader White is correct that the SPAD's 220-hp engine was an inline. However, Hispano-Suiza did build a rotary engine (its first-ever powerplant) and several types of radial, including the Wright Whirlwinds, under license. Of course the A-26 was an Invader (we should have caught that one). To reply to Colonel Parkhill: A complete list of the C-47's accomplishments has already filled several books, and a line had to be drawn somewhere. There were several variations to the B-29's armament, so Reader Coke is probably correct. Major Heath is correct, but the article is also correct. To the many readers who mentioned aircraft that were not included: Space for the article was at a premium, limited to 100 aircraft and missiles. The final roster came down to aircraft that were the most well-known and that best represented the specific class of aircraft.*—JEFFREY P. RHODES

Hegenberger's Contribution

At the risk of being accused of hero-bashing, historical accuracy and pride prompt me to comment on C. V. Glines's article "Flying Blind." *[See September '89 issue, p. 138.]* When writing about heroes, it may be natural to assume that every contribution they make is a great one, when, in fact, occasionally it may only be a modest one. It is to be hoped that some writer on the subject of instrument flying will research the original source material that was donated to the Air Force Academy Library in 1986. He will find, among many other items, technical reports and memoranda dating back to 1920, correspondence on the subject by many notables including Doolittle, Holloman, and Billy Mitchell, and foreign patents covering the instrument landing system developed by the Army.

For the record, the first solo flight relying solely on instruments from takeoff through landing was made on May 9, 1932, by Albert F. Hegenberger. For this achievement and the development of the first operational instrument landing system, he received the Distinguished Flying Cross from Secretary of War George H. Dern and the Collier Trophy from President Franklin D. Roosevelt. Not only was the Hegenberger system made standard by the Air Corps, but in 1934 it was selected by the Bureau of Air Commerce in preference to a system developed by the Bureau of Standards that was based on the Guggenheim/Doolittle approach of 1929.

A realistic perspective of Doolittle's involvement would be that of a man who took a year out of his very productive career to flight-test an instrument landing system consisting of flight instruments and radio nav-aids developed elsewhere. In this case, the "elsewhere" was the Air Service/Air Corps and civilian industry, who were trying to meet requirements usually set by Hegenberger. Except for three years in Hawaii, Hegenberger served from 1919 until 1935 as the officer responsible for instrument and nav-aids development and testing. The Guggenheim system required more skill than most pilots possessed, whereas the Air Corps system incrementally reduced the pilot's work load as he

proceeded toward touchdown. Research will also reveal that in spite of Doolittle's 1929, work Hegenberger remained the most popular source of instrument-flying expertise. It was after Doolittle's other achievements that his instrument-flying activities were resurrected, practically to the exclusion of others.

Hegenberger readily acknowledged that Doolittle's contributions far exceeded his own except in the cases of transoceanic navigation and instrument flying. When Hegenberger was to be inducted into the Aviation Hall of Fame, the respectful relationship between these old friends prevailed when Hegenberger's request for Doolittle to be his sponsor was enthusiastically accepted.

Col. Robert F. Hegenberger, USAF (Ret.)
Colorado Springs, Colo.

Vance's Base

Upon reading the "Valor" article on Lt. Col. Leon Vance's Medal of Honor *[by John L. Frisbee, September '89 issue, p. 166]*, I noticed one error. You indicate that the 489th Bombardment Group moved to the Molesworth airfield in the spring of 1944. As a former 303d Bomb Group (H) pilot based at Molesworth, I know this was incorrect. The 489th was based at Halesworth from April 22, 1944, through November 29, 1944—the sole English base of this distinguished B-24 Bomb Group.

Lt. Col. Harry D. Gobrecht, USAF (Ret.)
San Clemente, Calif.

On Foreign Bases

I note with interest your September issue, which extensively covers the B-2, and, in particular, General Milton's article.

General Milton states the B-2 is a long-range bomber, "free of the need for foreign basing." We are also informed that the B-2 can hit any target in the world from Diego Garcia, Guam, or Missouri. Mr. Truman's home state's forty-nine neighbors do not include British-administered territory [Diego Garcia]. Who knows how long we will be able to use this island outpost? If Maggie Thatcher leaves and Labour returns to power, who believes the island will be ours to use as we currently see fit? Foreign bases are apparently still necessary for land-based bombers. Perhaps it is also worth noting that several new nations have appeared in the South Pacific during the 1980s. Who is to say that Guam will not also struggle for its independence? Successful or not, the attempt could draw concessions or temporarily derail US policy.

It appears that what the General is truly arguing about is not foreign basing or even the B-2, but the old saw of Navy/Marine Corps vs. the Air Force. This is no way to win or deter war. An argument about the B-2 should not be framed only in terms of F-14 or Osprey offsets, but in terms of the threat. Since the B-2 does cost in excess of $500 million a copy (even though $225 million of this is sunk cost, it is still money), it must be prepared to contribute to the defense effort against Qaddafi or any other fruitcake. We must not frame the argument in strategic vs. tactical terms. The Air Force must convince the country that the Joint Chiefs of Staff will *use* the B-2 to save American lives combating terrorists, not just in the big one (God forbid it should come). Most weapons of the past have had to be used across the spectrum of conflict; the era of shrinking defense budgets demands no less of the B-2.

The primary argument about the B-2 is not one of basing or strategy, but whether the technology works. If radar waves are to be deflected or converted into other emissions (heat, for example), the Soviets already have the fix in production, and will just continue to build the Mainstay/Su-27 combination. It is time we began to work together on the total defense problem; as a Naval intelligence of-

U.S. Postal Service
STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION
Required by 39 U.S.C. 3685)

1A. Title of Publication	1B. PUBLICATION NO.	2. Date of Filing
AIR FORCE MAGAZINE	0 7 3 0 6 7 8 4	Sept. 25, 1989
3. Frequency of Issue	3A. No. of Issues Published Annually	3B. Annual Subscription Price
MONTHLY	TWELVE	$21.00

4. Complete Mailing Address of Known Office of Publication *(Street, City, County, State and ZIP+4 Code) (Not printers)*
1501 LEE HIGHWAY
ARLINGTON, VA 22209-1198

5. Complete Mailing Address of the Headquarters of General Business Offices of the Publisher *(Not printer)*
1501 LEE HIGHWAY
ARLINGTON, VA 22209-1198

6. Full Names and Complete Mailing Address of Publisher, Editor, and Managing Editor *(This item MUST NOT be blank)*

Publisher *(Name and Complete Mailing Address)*
JOHN O. GRAY -- PUBLISHER
1501 LEE HIGHWAY, ARLINGTON, VA 22209-1198

Editor *(Name and Complete Mailing Address)*
JOHN T. CORRELL -- EDITOR IN CHIEF -- 1501 LEE HIGHWAY, ARLINGTON, VA 22209-1198

Managing Editor *(Name and Complete Mailing Address)*
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A. Total No. Copies *(Net Press Run)*	228,457	220,952
B. Paid and/or Requested Circulation 1. Sales through dealers and carriers, street vendors and counter sales	1,700	200
2. Mail Subscription *(Paid and/or requested)*	220,940	212,937
C. Total Paid and/or Requested Circulation *(Sum or 10B1 and 10B2)*	222,640	213,137
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E. Total Distribution *(Sum of C and D)*	225,216	218,960
F. Copies Not Distributed 1. Office use, left over, unaccounted, spoiled after printing	3,241	1,992
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ficer, I would like to "welcome aboard" General Milton.

Lt. Stephen E. Rollins, USN
Lemoore, Calif.

Son of Packard

I was intrigued by the "Son of Packard" editorial of September *[by John T. Correll, p. 4]*. Having spent twenty years in government procurement (half in the Air Force and half in aerospace), I agree there should be concern. It should be obvious that the procurement system has been growing in complexity just as the equipment being procured has done. Of course good management entails appropriate change and not change for the sake of change. If I recall, the first step in problem-solving techniques is to define the problem.

Having retired for good in 1978, I have relied on the media for news relating to my old career field. It was obvious that the media were being used for several years to highlight "horror stories" relative to "Pentagon Procurement" and wrongdoing. . . . My conclusion: The media, which know practically nothing about the defense procurement system and the laws that govern it, helped create an atmosphere for our government to act unwisely—change for the sake of change.

If I understand, there are plans for an academy to train civilians for acquisition careers. I graduated from the Air Force Institute of Technology's two-year Industrial Administration course at Wright-Patterson AFB, Ohio in 1951. Is that the type of schooling planned? I hope not, as I would consider it too general. I fail to see the acquisition corps concept as being realistic. . . .

Let's face it (perhaps Mr. Cheney should also), procurement is a support function. Do you think any of our lawmakers have any idea of the impact that the Armed Services Procurement Act, the Truth in Negotiations Act (Public Law 87-653), and the Cost Accounting Standards Act have on those involved in the acquisition business?

As for Mr. Cheney's cost-reduction program, I wish him luck. Under McNamara, I remember having to report normal and expected negotiated cost reductions as "savings." I know of one R&D activity that changed at the time to using labor-hour contracts at a firm fixed price, in lieu of cost types, in order to report the so-called theoretical savings. I admit I didn't care for the games being played, as there was pressure to shorten the procurement cycle, yet the complexity was increasing. With the wreath on my wings giving me a clue, I opted for retirement at twenty.

While in the military procurement business, I lived by a code that called for turning down a contractor for a free lunch unless it would prove embarrassing. In my opinion, the ethics for those in contracts should be applicable to other related functions in the acquisition field. As for those at the upper echelons, particularly political appointees, there is a need for a code of conduct for the good of the Pentagon and the military.

As a military man, I've always known the civilians were in control. As a taxpayer, I'd rather those in control would quit playing politics. With years of experience as a procurement analyst in aerospace, I suspect the Packard Commission Report would make interesting reading, but I wouldn't want to see it. With my mentality, the worst "horror story" relating to procurement that I can think of has

to be the Wedtech story. I find it hard to believe that the military can be blamed for that one.

Lt. Col. Wendell D. Bundy,
USAF (Ret.)
Orange, Calif.

Flareships in Korea

I read "Blind Bat" by Sam McGowan *[see July '89 issue, p. 82]* a second time just to let it all soak in. I had the feeling I had been there before in another war and at another time.

Perhaps your readers are unaware that the idea of flareships in conjunction with night fighters used to deny the enemy use of their road and railway systems at night was not new to Vietnam. It was done quite successfully during the Korean War from 1950 through 1952, to my knowledge.

The only major difference was the equipment. We used C-47s as flareships, and the "fighters" were B-26s at first, then later F4Us and F7Fs from the 1st Marine Air Wing. One thing we did not have to contend with, however, was the possibility of hostile intercept. The Chinese Air Force of that day had no night capability.

Our system worked like this: We put two flareships on station from dark until midnight, then two for relief from midnight until dawn. Each flareship carried 150 flares, which I suspect were exactly like those used in Blind Bat operations. The fighters could stay on station for about an hour, or until their ammo and napalm were gone. On a busy night, each flareship could usually work with four different fighters.

Originally, this concept was contained within the Base Flight section of Third Bomb Wing at MCAS Iwakuni in southern Japan. Later, a decision was made to get closer to the action by attaching the entire operation to the 67th Tactical Reconnaissance Wing at K-2 [near Taegu in central South Korea]. The use of B-26s was discarded shortly thereafter. Several were lost while strafing roads and railroad yards when the flares went out. They were faced with mountainous terrain on almost every side while attempting to escape. This did not seem to present a problem for the Marines, however. It seemed they could come out almost straight up if necessary.

I can recall on one occasion having the last fighter of the night escort our flareship home when daylight found us not too far west of Hamhung. He had to use one-quarter flaps to stay with us, but he didn't complain—it had been a good night!

Col. William H. Ramsey,
USAF (Ret.)
N. Little Rock, Ark.

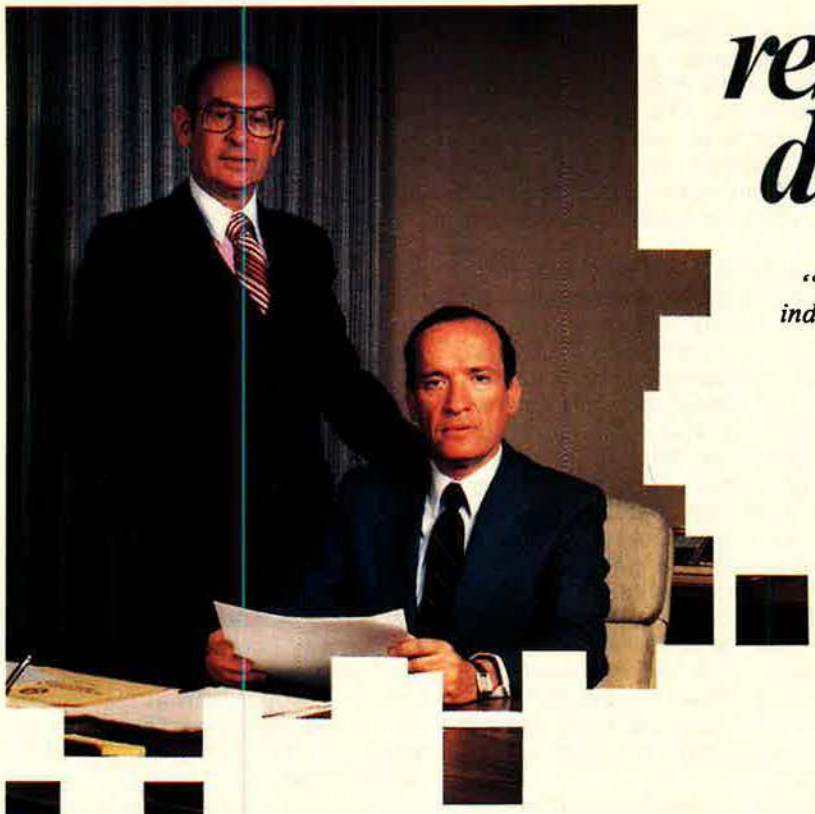
Crisis Management

I recently read "The Quiet Crisis in Civilian Personnel." *[See July '89 issue, p. 60.]* I agree with the overall analysis of the problem. Something must be done to build and maintain the civilian work force. The Palace Agenda plan, however, appears to miss one important possible initiative.

One program widely used in industry is the summer-intern program for college students. This accomplishes two objectives. It allows the companies to "pre-recruit." They can test potential job candidates in actual job situations. The other advantage is that it may increase the likelihood of the summer interns to seek employment with that company after graduation. This would help in the recruitment of college graduates. Summer interns can be used temporarily to fill critical areas.

I feel this is an important option, which was not mentioned in the closing paragraph of the article.

Michael Kolessar
East Windsor, N. J.



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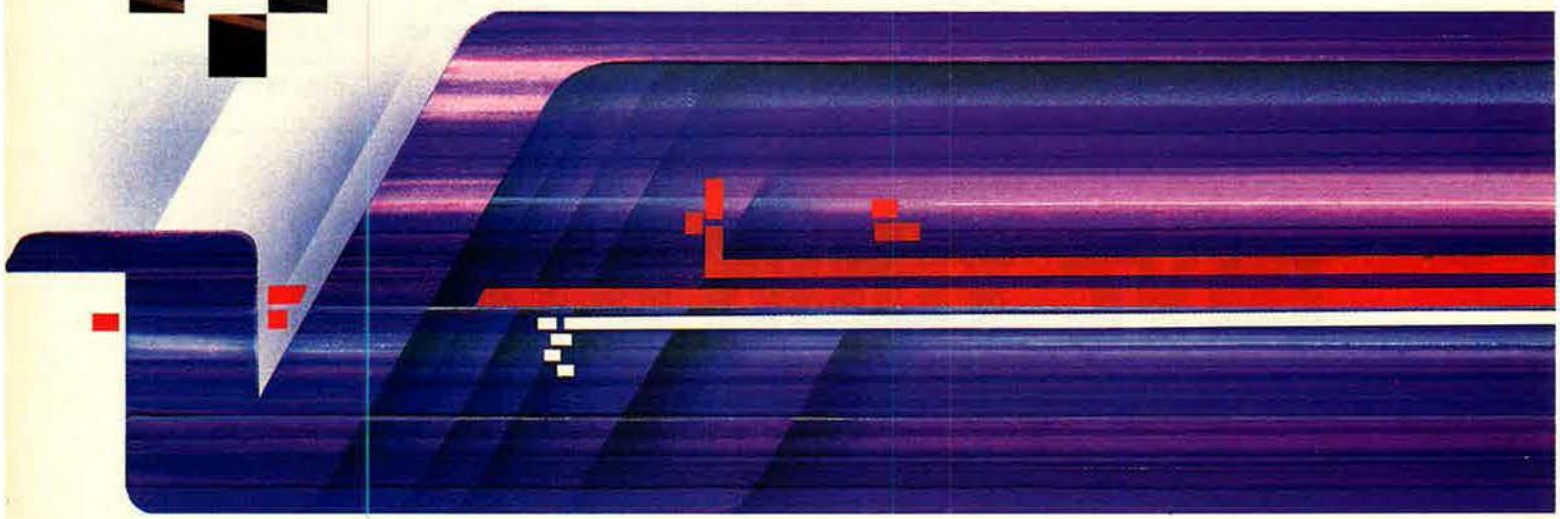

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The Chart Page

Edited by Colleen A. Nash, ASSOCIATE EDITOR

America's Living Military Veterans

(in thousands)

YEAR AND STATE OR OTHER AREA	Total veterans [1]	WAR VETERANS							Service between Korea and Vietnam only	Post-Vietnam [6]
		Total [2]	World War I	World War II [3]	Korean conflict		Vietnam era			
					Total [3,4]	No service in World War II	Total [4]	No service in Korean conflict		
1970	26,976	23,160	1,425	13,887	5,440	4,167	4,100	3,618	3,173	—
1980	28,640	23,965	461	11,720	5,434	4,331	8,118	7,453	3,086	1,120
1981	28,563	23,716	404	11,491	5,393	4,308	8,175	7,513	3,076	1,320
1982	28,399	23,421	348	11,241	5,346	4,280	8,210	7,551	3,064	1,479
1983	28,202	23,109	297	10,978	5,294	4,249	8,238	7,584	3,051	1,623
1984	28,027	22,782	250	10,700	5,237	4,215	8,263	7,616	3,037	1,803
1985	27,732	22,274	206	10,346	5,135	4,143	8,215	7,578	3,009	2,058
1986	27,682[5]	22,017[5]	171	10,076	5,105	4,134	8,264	7,636	3,004	2,263
1987, total	**27,469**	**21,646**	**140**	**9,765**	**5,034**	**4,089**	**8,270**	**7,652**	**2,987**	**2,473**
United States	**27,344**	**21,551**	**140**	**9,736**	**5,000**	**4,058**	**8,236**	**7,619**	**2,975**	**2,456**
Alabama	406	319	2	142	84	67	122	108	43	36
Alaska	71	56	*	14	11	9	34	32	9	6
Arizona	407	324	2	154	75	55	129	113	39	39
Arkansas	267	208	2	98	47	36	80	71	28	27
California	2,844	2,281	14	1,017	574	428	905	820	309	211
Colorado	398	313	2	115	75	58	154	139	44	37
Connecticut	393	314	2	150	74	62	104	99	46	28
Delaware	78	61	*	28	14	11	23	21	8	8
District of Columbia	58	46	*	22	12	9	15	14	5	6
Florida	1,477	1,201	11	654	282	195	404	341	125	124
Georgia	651	500	2	198	121	94	231	206	69	72
Hawaii	101	80	2	32	21	16	37	32	11	9
Idaho	117	91	1	38	20	16	39	36	13	11
Illinois	1,254	986	6	451	218	193	345	336	147	105
Indiana	647	490	3	206	111	98	189	183	75	74
Iowa	335	265	3	110	58	53	102	100	35	32
Kansas	286	230	2	103	52	43	89	82	31	22
Kentucky	368	291	2	129	67	57	110	103	40	31
Louisiana	432	337	2	148	76	61	137	126	46	42
Maine	154	121	1	54	28	23	47	44	16	15
Maryland	530	415	2	183	105	81	164	149	60	49
Massachusetts	685	547	4	275	125	104	172	163	76	55
Michigan	1,023	782	5	326	168	152	306	299	117	113
Minnesota	495	386	3	155	86	76	156	152	60	44
Mississippi	234	183	1	88	46	36	66	58	24	22
Missouri	633	498	4	221	117	98	186	175	68	59
Montana	106	84	1	34	18	15	36	34	12	9
Nebraska	186	147	1	62	36	31	57	53	21	17
Nevada	137	109	*	46	29	22	47	41	17	11
New Hampshire	141	110	1	46	26	21	46	43	16	14
New Jersey	887	706	4	357	164	141	214	204	104	64
New Mexico	172	135	1	57	32	24	59	53	16	18
New York	1,858	1,462	10	731	322	287	444	433	205	163
North Carolina	682	538	3	244	127	104	207	187	69	65
North Dakota	72	56	*	21	12	11	24	23	9	7
Ohio	1,302	1,007	6	458	217	191	365	353	144	136
Oklahoma	401	322	2	136	74	57	138	126	41	32
Oregon	350	278	2	117	57	46	118	112	39	29
Pennsylvania	1,524	1,209	7	601	262	225	389	375	171	125
Rhode Island	120	97	1	49	22	18	32	30	11	10
South Carolina	351	275	1	120	68	52	118	101	36	35
South Dakota	79	62	1	26	15	14	22	21	9	8
Tennessee	524	410	2	177	92	77	167	154	56	51
Texas	1,785	1,401	7	574	322	249	632	572	191	169
Utah	154	124	1	51	28	22	53	50	17	12
Vermont	64	48	*	20	11	9	20	19	7	7
Virginia	669	523	2	229	144	103	225	189	71	66
Washington	591	469	3	188	113	83	217	195	66	50
West Virginia	224	178	1	83	38	32	66	62	23	20
Wisconsin	565	432	4	180	93	83	169	165	72	56
Wyoming	59	47	*	16	10	9	23	22	7	5
Puerto Rico	125	95	*	30	35	32	35	33	12	17

*Fewer than 500. [1]Beginning 1980, includes peacetime veterans not shown separately, who served only between World War I and World War II, and those who served only between World War II and the Korean conflict. [2]Veterans who served in both World War II and the Korean conflict, or in both the Korean conflict and the Vietnam war, are counted only once. [3]Includes 945,000 who served in both World War II and the Korean conflict. [4]Includes 618,000 who served in both the Korean conflict and the Vietnam war. [5]Service only after May 7, 1975. [6]There are also 3 living Spanish-American War veterans, whose median age is 102 years, and 60 living Mexican Border conflict veterans.

Source: Statistical Abstract of the United States 1989.

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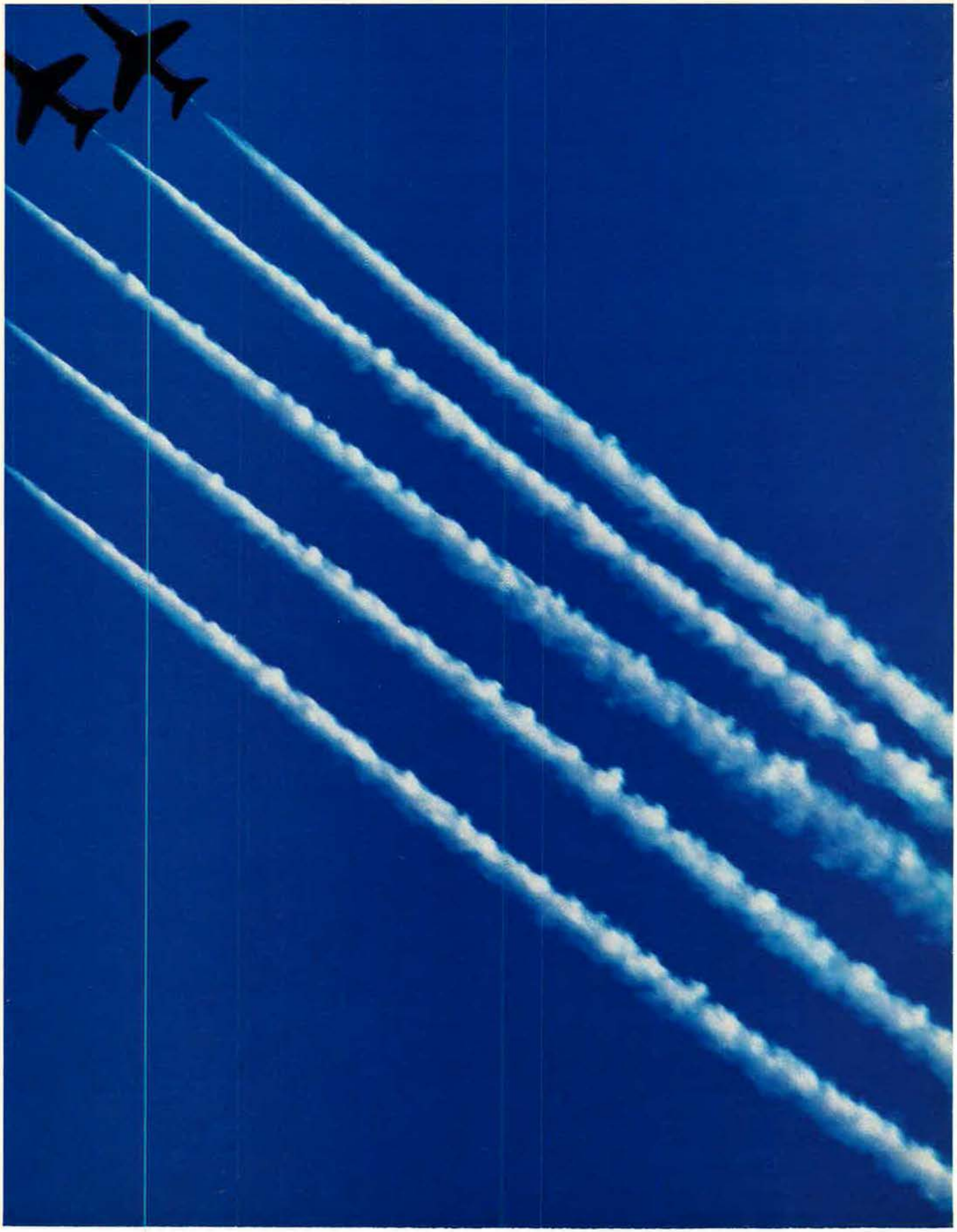

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Capitol Hill

By Brian Green, CONGRESSIONAL EDITOR

Washington, D. C.

Authorization Conference Stalls

The long-running House-Senate conference to finalize a Fiscal Year 1990 (FY '90) defense authorization bill stalled throughout September and much of October over serious disagreements on strategic modernization programs. The House-approved bill proposed to terminate the Small ICBM, cut the Peacekeeper rail-garrison program by $500 million, slash $1 billion from the B-2 Stealth bomber program, and cut SDI from the requested $4.9 billion to $3.1 billion. The Senate bill fully funded both ICBM programs, cut the B-2 program by a comparatively modest $300 million, and provided SDI with $4.6 billion. The White House threatened to veto any defense bill that too closely resembled the House version.

House politics further complicated efforts to resolve the disputes. Some sources speculated that House Armed Services Committee (HASC) Chairman Les Aspin (D-Wis.) would be removed as chairman by the House Democratic Caucus if he were seen as agreeing to too many of the Senate provisions. Some expressed doubt about whether the differences could be bridged at all. Failure to produce a bill could reduce the influence of the Armed Services Committees, often the bodies in Congress most inclined to support Pentagon requests in the congressional budget process.

Senate Appropriations

The Senate approved an FY '90 defense appropriations bill that provides full funding for the rail-garrison Peacekeeper and Small ICBM, reduces the B-2 Stealth bomber request by $300 million to $4.4 billion, and matches the $4.6 billion Senate authorization level for SDI.

The full Senate passed an amendment cosponsored by Sen. Howell Heflin (D-Ala.) and Sen. Ted Stevens (R-Alaska) to add $600 million to the $4.0 billion the Senate Appropriations Committee (SAC) approved for SDI. The Senate had earlier rejected a comprehensive amendment that included an additional $298 million for SDI, but reversed itself after appeals to provide additional funds as bargaining leverage to oppose the House-approved SDI level of $3.1 billion. The Senate also rejected, by a vote of 71 to 29, an amendment by Sen. Patrick Leahy (D-Vt.) to stop B-2 bomber production after completion of thirteen aircraft.

The Senate SDI amendment adds to a long list of serious differences between the House and Senate appropriations bills. The House appropriations bill matched the House authorization cuts in strategic programs, eliminated funding for the Advanced Tactical Fighter (ATF), terminated the Tacit Rainbow long-loiter antiradiation cruise missile and the C-27 short takeoff and landing aircraft, and cut the C-17 airlifter program by $422 million. The SAC bill approves the funding requests for the ATF, Tacit Rainbow, and the C-27, but matches the House cut for the C-17. The SAC report "disagrees strongly" with the House recommendation to terminate the ATF program, noting that termination now would "squander previous investment and . . . deny the Air Force and the Navy the potential to develop the advanced fighter aircraft they may need . . . to counter the Soviet threat."

The House and Senate bills differ on several other important programs:

Pilot Bonuses. The House bill provides for an increase in Aviation Career Incentive Pay (ACIP). The SAC bill eliminates funding for the ACIP increase, although the SAC report states that "if authorized, the increases should be paid."

National Aerospace Plane (NASP). The House bill provides $285 million for the program to develop a hypersonic, single-stage-to-orbit aerospace vehicle. The Senate bill zeros the funding because "the affordability of even a [more modest] NASP program is open to question," but the Senate approved a nonbinding amendment supporting continued development.

F-14D. The Administration wants to terminate production of new Navy F-14D fighters. The House provides funding for twenty-four new aircraft. The Senate bill supports the Administration position.

Both the House and Senate passed a short-term continuing resolution (CR) to fund the government for about a month after the start of the new fiscal year. The continuing resolution provides program funds at the same level as in FY '89. The CR was made necessary by the failure of the House and Senate to approve their appropriations bills by October 1.

More Procurement Reform

A HASC subcommittee concluded that a defense acquisition system based on the centralized French or British acquisitions systems would not work in this country. HASC Chairman Aspin and Rep. Nick Mavroules (D-Mass.), however, intend to introduce more acquisition reform legislation later this session.

According to the HASC Investigations Subcommittee report, the vast size of the US acquisition systems (ten times bigger than either the French or the British system) and the US military's more decentralized means of planning, budgeting, and defining requirements indicate that copying the European systems would not be successful. Representatives Aspin and Mavroules argue, however, that the French and British systems "separate the buyers and users." This provides built-in "checks and balances" that encourage realism in planning and budgeting and discourage duplication. They also note "unmistakable evidence that a better trained, more professional, more experienced corps of acquisition specialists could pay dividends."

Drug Bill Scrapes Defense

An $8.8 billion antidrug bill that chops $1.3 billion out of FY '90 defense budget authority has passed the Senate. The bill imposes a .4 percent across-the-board cut on all discretionary federal programs to pay for an increase in funding for antidrug activities in the next fiscal year. No specific DoD programs are cut by the bill. ■

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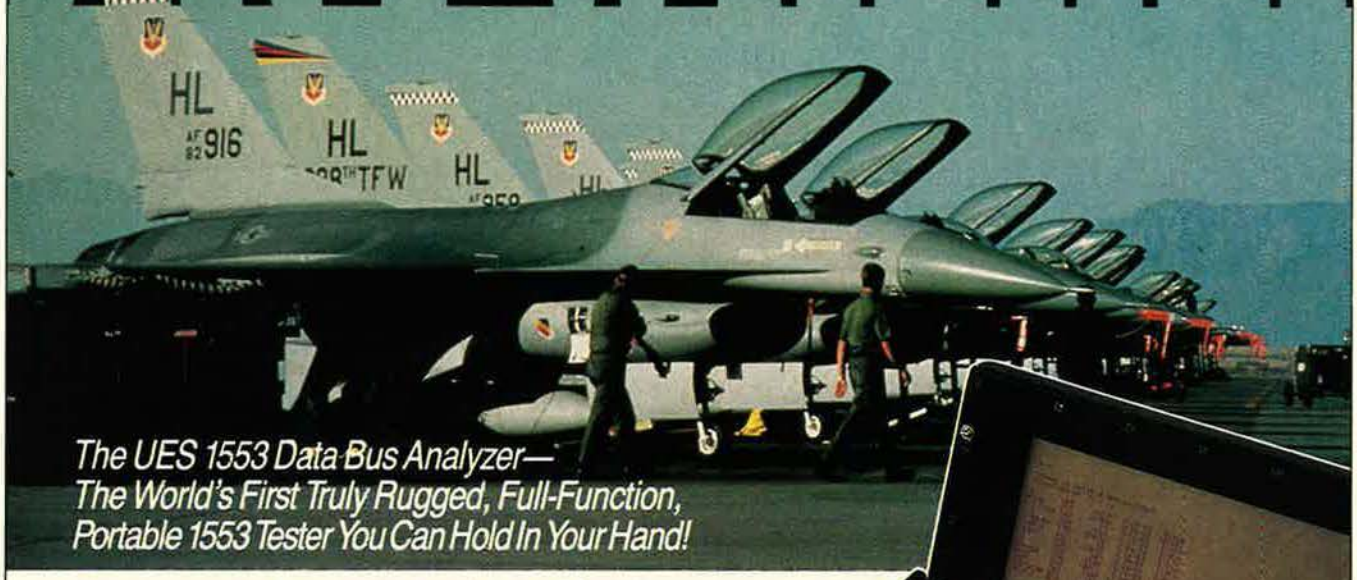

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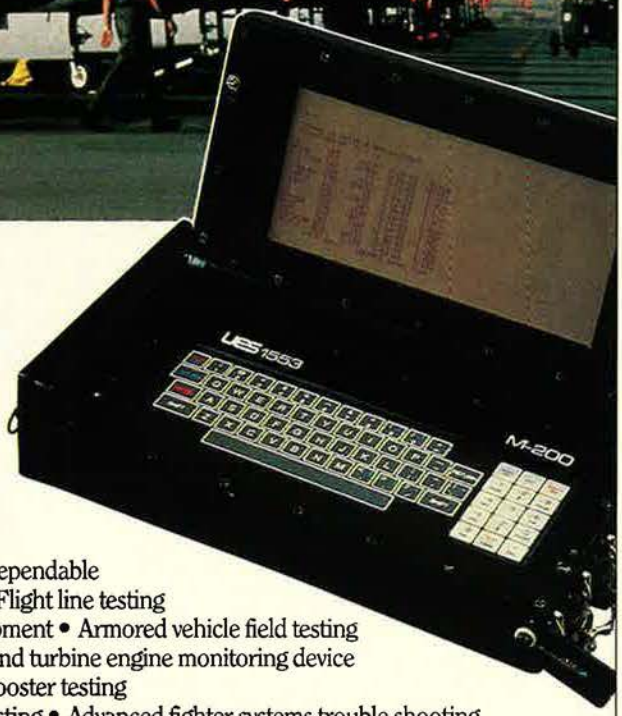

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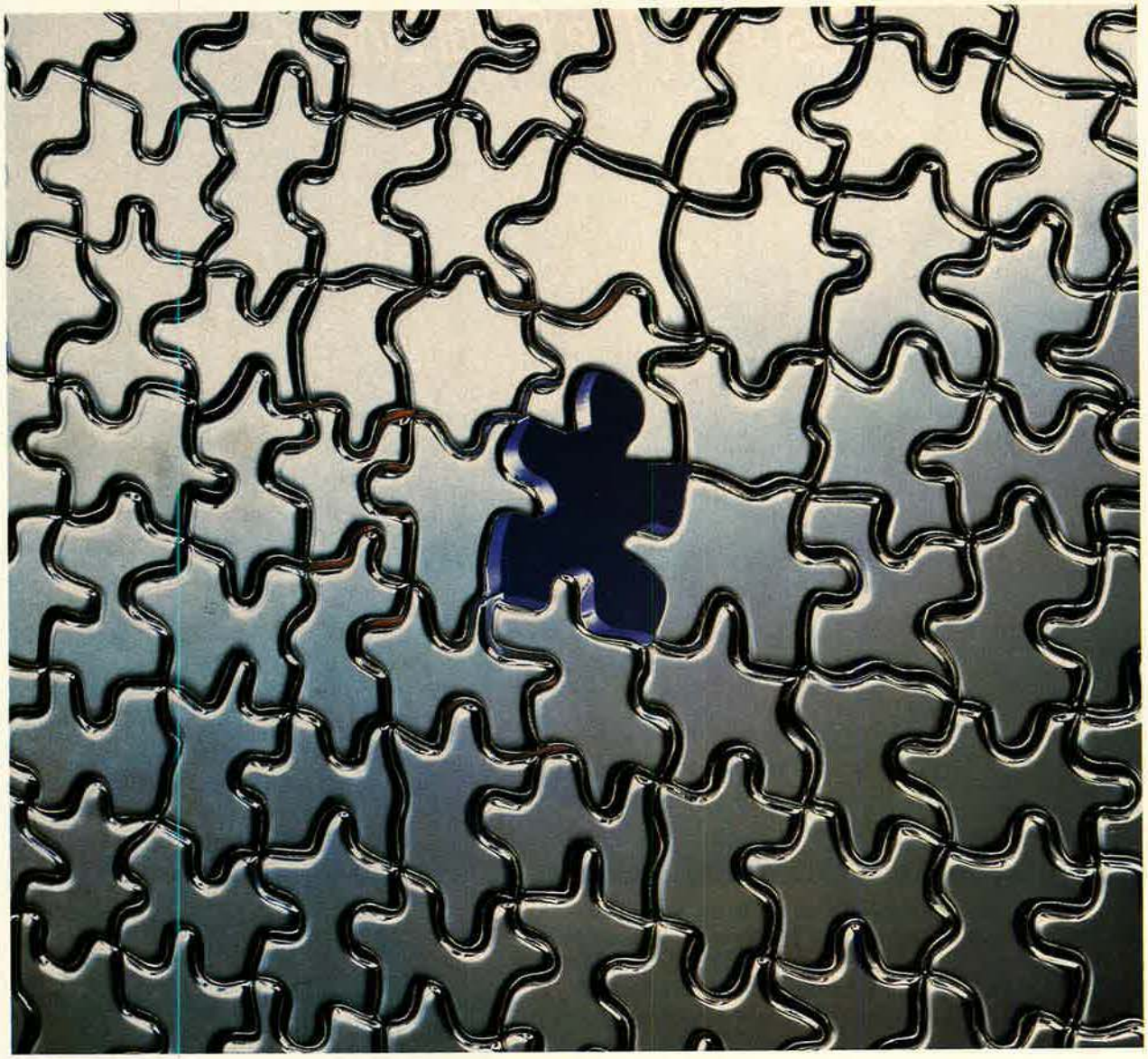

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Aerospace World

By Jeffrey P. Rhodes, AERONAUTICS EDITOR

Washington, D. C.

★ A Media General/Associated Press poll taken on the eve of the fiftieth anniversary of the start of World War II finds that forty-nine percent of the 1,163 Americans surveyed think there will be another world war. Additionally, fifty-four percent of all the people surveyed believe that if another world war did come, it would escalate into an all-out nuclear conflict.

Somewhat startlingly, thirty-five percent of those who think there will be another war believe it will start within the next ten years. (Six percent of these people believe that it will happen within the next five years.) An additional twenty-six percent of those who say there will be another war say it will happen by 2009.

One-third of the total number of respondents were aged thirty to forty-four, while twenty-four percent fell between the ages of eighteen and twenty-nine. Forty-two percent of the people who answered the phone poll were old enough to have lived through World War II, with twenty-seven percent falling between the ages of forty-five and sixty-four and the remaining fifteen percent over sixty-four.

Sixty-nine percent of the total were "very familiar" or "somewhat familiar" with the events of World War II. Eighty-two percent of the total sample felt that the European allies would have lost the war to Germany had the US not joined the war. Sixty percent of the respondents felt that the US did the right thing by dropping the atomic bomb on Japan near the end of the war, while thirteen percent didn't know or had no answer.

Asked if they felt Germany and Japan were still our enemies because of the war, a vast majority of people (eighty-four percent for Germany and seventy-four percent for Japan) thought "it was all behind us." Fifty-five percent of those surveyed said the US did enough to rebuild Germany after the war, while forty-two percent said the US did enough to rebuild Japan. A significant minority in both cases said the US did too much.

The survey also found that seventy percent of those who answered supported the reunification of West and East Germany. Another significant finding: Of the ninety-five percent of the people who had heard of the Holocaust, sixty percent said it could happen again. The data project to 161,000,000 adults.

The Northrop B-2A Stealth bomber completed its first series of flight tests on September 23. The five flights were designed to expand the flight envelope, check the function of the aircraft's subsystems, and, as shown here, demonstrate the aircraft's handling qualities while flying in a position to be air refueled. Northrop test pilot Bruce Hinds and Lt. Col. John Small are flying the B-2 underneath a KC-10.

★ By garnering an average of eighty-six percent of the available points in each of five areas, the team from the 2d Bombardment Wing at Barksdale AFB, La., claimed the Barrentine Trophy, given to the winner of Strategic Air Command's "Giant Sword" combat weapons loading competition, held in mid-August at Fairchild AFB, Wash.

The Barksdale unit scored 2,664 of 3,000 points to edge the team from Pease AFB, N. H., by only 128 points for top honors. Sixteen teams competed for the Barrentine Trophy. This fourteenth Giant Sword competition marked the first time the four B-1B wings participated in all aspects of the competition, as well as the first time the base teams' tanker crew chiefs, transportation sections, and fuels sections competed.

Other award winners included: Best Munitions Maintenance Unit, Best Combined Weapons Load, and Best Air-Launched Cruise Missile Load Crew—2d BMW, Barksdale AFB, La.; Best B-52 Clip-In Load and Best Confidence Course Performance—5th BMW, Minot AFB, N. D.; Best Munitions Load Crew—509th BMW, Pease AFB, N. H.; Best Short-Range Attack Missile Load Crew—319th BMW, Grand Forks AFB, N. D.; Best Transportation Vehicle Maintenance Diagnostic Team and Best Vehicle Maintenance Diagnostic Event—92d BMW, Fairchild AFB, Wash.; Best Vehicle Maintenance Testing—93d BMW, Castle AFB, Calif.; Best Security Police Tactics Exercise—96th BMW, Dyess AFB, Tex.; and Best SP Combat Marksmanship Course—380th BMW, Plattsburgh AFB, N. Y.

★ The latest from the "Necessity Is the Mother of Invention" file: Planning a low-level, pop-up attack in a fighter is an imprecise science at best. The problem is that there is often no single source for all of the information needed to plan the attack, and during an Operational Readiness Inspection or a war, there is very little time to plan an attack correctly.

Most of the plotters supplied by the

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Workers attach underfloor bulkheads to the cargo floor of the first C-17A airlifter, now in production at the Douglas Aircraft plant in Long Beach, Calif. After the ribs and lower skin are attached, the entire assembly will be turned upright to finish the center fuselage. The aircraft is scheduled to roll out next August.

Air Force are too big to carry, are too thick, and are intended primarily for navigation. Putting route and target information on a map often comes down to using coffee cups (the standard styrofoam cup is actually a pretty gooc approximation of a 5,200-foot turn radius on USAF's standard-scale maps) or quarters.

Once airborne, the attack often comes down to "at three miles from the target, check thirty degrees and pop." This works, but it tends to result in excessive exposure time.

Maj. Mike Brandt, a former Fighter Weapons School instructor who now flies with the Air National Guard's 131st Tactical Fighter Wing, Lambert Field, St. Louis, Mo., has developed a single plotter that remedies most of the problems in planning a pop-up attack.

The plotter is 7.5 inches long and 2.5 inches wide, with a semicircular end that is exactly the right size for a 5,200-foot turn radius at 540 knots true airspeed and 5+ Gs for 1:50,000-foot and 1:250,000-foot scale maps. The same turn radius is also true for the combinations of 480 knots and 4+ Gs or 420 knots and 3+ Gs, making the plotter aircraft-independent. It has die-cut templates for mission symbols and is made of 20-mil-thick Lexan plastic that bends and can be stuffed in a flight-suit pocket (or, as Major Brandt says, it can also be used to spread mayonnaise on a sandwich).

The plotter provides information on headings; timing; distance in miles for three map scales; 100- and 1,000-foot indications for 1:50,000-foot maps and 1,000-foot indications for 1:250,000-foot maps; turn angles; cosines for ten, twenty, and thirty degrees; indications for true airspeed in ft/sec, nm/min, and sec/nm; and formulas for eight basic necessities including climb angle and minimum-attack parameter.

Through word-of-mouth advertising among pilots, the plotter is now in use with several F-4, F-16, and F-111 units, and even a Navy F/A-18 unit, but it is not listed in the GSA catalog because there has not been a demonstrated demand for it.

—Staff photo by Guy Aceto

Col. Lawrence Ernst, having landed his F-4G on September 25, gets the traditional hosing down from the 37th Tactical Fighter Wing Commander. His flight marked the end of operations of the 563d Tactical Fighter Squadron at George AFB, Calif. The 563d TFS was deactivated as the 37th TFW was consolidated into the 35th TFW, also at George.

★ **HONORS**—Retiring **Gen. Duane H. Cassidy,** Commander in Chief of US Transportation Command and Military Airlift Command, **was inducted into the MAC Order of the Sword** on August 18. The Order of the Sword is the highest honor the enlisted force can bestow on a senior officer or civilian. General Cassidy was cited for establishing new standards for leadership while serving as CINCMAC. He is the forty-first inductee into the MAC Order of the Sword.

The Voyager spacecraft scientific team and Dr. Edwin Land received the 1989 National Air and Space Museum Trophy in ceremonies on October 20. The Voyager team was honored for its contributions to space science, while Dr. Land was cited for his longstanding contributions to the American overhead reconnaissance program and the space program. The trophy is awarded annually for achievement in managing scientific or technical projects, executing such projects, and chronicling the history of air and space science and technology. It is also awarded for attainment of distinction through a career of service in the field of air and space technology.

★ **PURCHASES**—On August 25, Air Force Logistics Command's San Antonio Air Logistics Center at Kelly AFB, Tex., awarded **Sabreliner Corp.** a $15,641,421 contract for **the T-37B Service Life Extension Program** (SLEP). The SLEP is needed to keep the Air Force's primary trainer fleet flying until a replacement aircraft can be procured, which is expected after the year 2000. Sabreliner will design, test, and produce kits to modify or replace critical structural components on all of the more than 600 Cessna T-37Bs in the fleet. The SLEP calls for replacing or modifying the wing forward spar lower cap, banjo fittings, wing carry-through structure, horizontal stabilizer, and fuselage front spar fitting. Sabreliner is scheduled to deliver a prototype kit next January, with production kits to be delivered from 1991 to 1993. A decision has not been made on whether a contractor or the Air Force will install the kits.

The Oklahoma City Air Logistics Center at Tinker AFB, Okla., recently awarded **Boeing Military Airplanes** two contracts for **engine modifications to the KC-135 tanker fleet.** The August 21 award is a $185 million fol-

low-on purchase of fifty KC-135R re-engine kits, which include new struts, nacelles, and other components, but do not include the General Electric/SNECMA F108-CF-100 turbofan engines that are bought directly from CFM International. Deliveries will start in 1991. Boeing is now contracted for 306 R-model mod kits. The September 7 award of $57,784,711 is to reengine fourteen more Air National Guard and Air Force Reserve KC-135s with refurbished Pratt & Whitney JT3D engines taken from commercial 707 airliners. Delivery of the reengined tankers, called KC-135Es, is scheduled for completion in September 1990. In all, 161 KC-135s have already been brought up to E-model standard.

NASA's Marshall Space Flight Center in Huntsville, Ala., awarded **Martin Marietta** a $1.797 billion contract modification for **sixty additional space shuttle external tanks.** The 154-foot-tall tanks will be produced at the plant at Michoud, La. The first of the additional tanks, which are the only nonreusable part of the Space Transportation System, will be delivered in 1991 and the sixtieth in 1997. They will be used on shuttle missions STS-60 through STS-119.

GTE Government Systems Corp. received a $6.4 million contract from Air Force Space Command **to acquire, install, and integrate the automated data-processing system for the Joint Space Command Intelligence Center** at Peterson AFB, Colo. GTE will also be responsible for operation and maintenance of the system hardware and software. The computer system will give US Space Command an improved capability to analyze foreign space objects. The contract includes four one-year options that could bring the total value to $44.6 million. Ground was broken for the $4.6 million, 28,000-square-foot Intelligence Center building on August 30. It is scheduled to open in 1991.

★ **DELIVERIES**—The **first five F-16C aircraft that will be used for adversary training by the 26th Aggressor Squadron** at Osan and Kunsan ABs, Korea, were delivered in late August. The other five aircraft will be delivered by early fall. The ten aircraft are the last Block-30 F-16Cs to be built by General Dynamics in Fort Worth, Tex. The aircraft will eventually be assigned to Kadena AB, Japan, when the 26th AS relocates there from Clark AB, the Philippines.

IBM delivered an **early version of the data-management system that will be used on the US space station Freedom** in early September. The data-management system will be the primary on-board computing and communications system for the orbiting laboratory when it is built in the mid-1990s. Engineers from NASA and the other contractors will use this system to test their designs for the space station's other subsystems, and programmers will use it as a working model to write and test software programs. The breadboard system uses commercially available hardware (as will the production system on the space station) to reduce acquisition, operation, and maintenance costs.

Air Force Systems Command's **Aeronautical Systems Division** at Wright-Patterson AFB, Ohio, **dedicated the most powerful carbon dioxide, electric-discharge laser ever built in the US** on August 28. The thirty-two-foot-long, 100-kilowatt laser, called LHMEL II (taken from its location, the Laser-Hardened Materials Evaluation Laboratory), will be used to test the laser responsiveness of large samples of protective materials, outer skins, and other structural components of many types of aerospace vehicles to support USAF and Strategic Defense Initiative Organiza-

tion programs. The laser was christened by burning through a plexiglas "ribbon" at the ceremony. The $23 million laser was built by Acurex.

★ **MILESTONES**—The **second Grumman E-8A Joint STARS** (Joint Surveillance and Target Attack Radar System) aircraft **made its first flight** on August 31. The 2.5-hour flight out of Melbourne, Fla., a basic airframe and avionics check, was made a day ahead of schedule. The second aircraft will become the primary test aircraft after the installation and test of some additional mission equipment.

In a related note, on August 23, the **first test of the first Joint STARS aircraft's data link to its Ground Station Module (GSM) was successfully carried out.** During the three-hour flight off the coast of Florida, the on-board system monitored automobile traffic nearly 100 miles away in Orlando and sent the encrypted data to the truck-mounted GSM at Grumman's Melbourne facility. The data appeared on terminals that Army commanders would use to manage a land battle.

Purdue University seniors **Thomas Emmolo and Eric Palmer recently became the first cadets to complete Air Force ROTC's new Private Pilot License Screening Program** (PPLSP). The program was initiated by headquarters Air Force ROTC (Reserve Officer Training Corps) to screen cadet pilot candidates more economically. In order to reach ROTC's goal of 850 pilot candidates for 1990, at least 700 candidates must complete pre-undergraduate pilot training. The Flight Screening Program at Hondo, Tex., has a maximum capacity of 500 AFROTC cadets per summer, so flight schools near twenty selected AFROTC units were contracted to teach the cadets. Eight more schools are expected to join the program soon. The two Purdue cadets completed the program in about one month, well ahead of schedule.

The **Air Force launched its final Martin Marietta Titan 34D space**

November Anniversaries

- *November 3, 1909:* Lt. George C. Sweet becomes the first Navy officer to fly, a passenger in the Wright Military Flyer.
- *November 23, 1929:* After visiting Robert Goddard, Charles Lindbergh arranges a grant of $50,000 from the Guggenheim Fund for the Promotion of Aeronautics to support Dr. Goddard's work with rockets.
- *November 29, 1929:* Navy Cmdr. Richard E. Byrd, Bernt Balchen, Ashley McKinley, and Harold June make the first flight over the South Pole. Mr. Balchen was the pilot of the Ford Trimotor, nicknamed *Floyd Bennett.*
- *November 1, 1944:* A Boeing F-13 (photoreconnaissance B-29) crew makes the first flight over Tokyo since the 1942 Doolittle Raid. The first XXI Bomber Command raid is made on November 24, as eighty-eight B-29s bomb the city.
- *November 3, 1944:* The Japanese start their "Fu-Go Weapon" offensive against the United States. These balloon weapons are carried across the Pacific on the jetstream and release their bomblets over the US.
- *November 18, 1949:* A crew flying a Douglas C-74 Globemaster I, nicknamed *The Champ,* lands at RAF Marham, England, after a twenty-three-hour flight from Mobile, Ala. On board are a transatlantic-record 103 passengers and crew.
- *November 2, 1954:* Company test pilot J. F. Coleman, flying in the radial tail-sitting Convair XFY-1, makes a vertical takeoff, changes to horizontal flight, and then returns to vertical for a landing in San Diego, Calif.
- *November 7, 1954:* The Air Force announces it is planning to build a $15.5 million research laboratory for atomic aircraft engines. To be built in Connecticut, the plant is to be run by Pratt & Whitney and will be finished in 1957.
- *November 16, 1959:* Air Force Capt. Joseph W. Kittinger, Jr., after ascending to an altitude of 76,400 feet in *Excelsior I,* an open-gondola balloon (setting three unofficial altitude records on the way), makes the longest free-fall parachute jump in history (64,000 feet) in two minutes and fifty-eight seconds at White Sands, N. M.
- *November 3, 1969:* The Air Force issues a Request for Proposal for a new bomber to meet its Advanced Manned Strategic Aircraft requirement. Its designation will be "B-1."
- *November 14–24, 1969:* Apollo 12 gets off to a rocky start as it is hit by lightning on liftoff, but "Pete" Conrad and Alan Bean make the second manned lunar landing with pinpoint accuracy. The lunar module *Intrepid* touches down 1,000 yards from the Surveyor 3 probe, on the moon since 1967. The all-Navy Apollo 12 crew, which also includes Richard Gordon, is recovered in the Pacific by the USS *Hornet* (CVS-12).
- *November 1, 1984:* The first of eighteen Shorts C-23A Sherpas is handed over to the Air Force. Based at Zweibrücken AB, West Germany, the aircraft make up the European Distribution System, a rapid delivery service for spare parts and engines.

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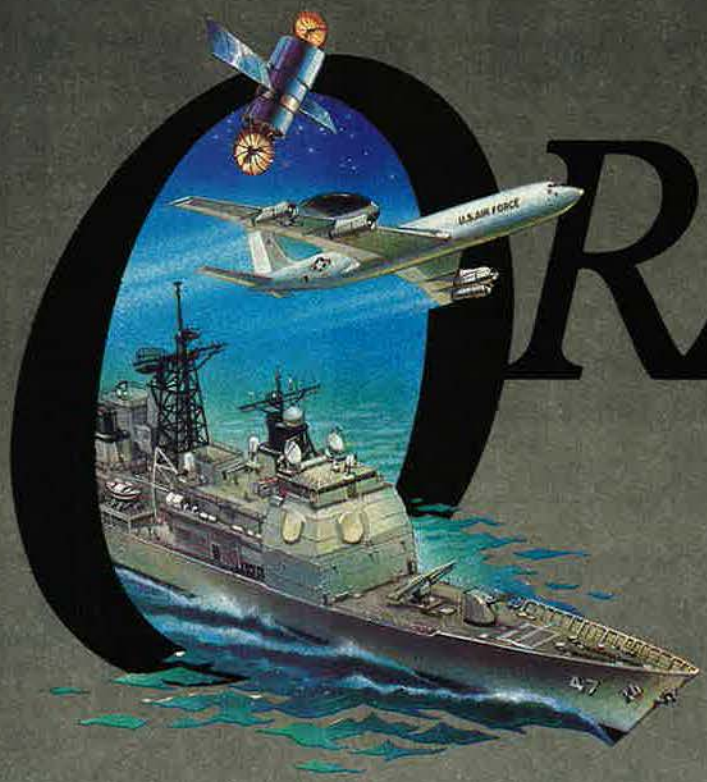

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booster at 1:54 a.m. on September 4 from Launch Complex 40 at Cape Canaveral AFS, Fla. The sixteen-story-tall booster, which can lift a 31,650-pound payload to low-earth orbit or 4,200 pounds to geosynchronous orbit, carried a classified payload. This was the last of the sixteen Titan 34Ds the Air Force ordered in 1982. The previous 34D launch, from Vandenberg AFB, Calif., occurred in November 1988. The 1989 liftoff marked the 135th success in 141 attempts for the Titan III series. In a related note, the Air Force successfully launched the second Titan II intercontinental ballistic missile, reworked as a space booster, from Vandenberg on September 5. It too carried a classified payload.

The **last two operational LTV A-7D Corsair II attack aircraft in the active Air Force inventory were transferred to the Air National Guard** in late August. The two aircraft were formerly assigned as proficiency trainers with the 4450th Tactical Group, the unit that flies the Lockheed F-117A Stealth Fighter, based at the Tonopah Test Range Airfield in Nevada. All of the SLUFs (as the pilots call the A-7s) are now in the Guard or are used as test and special-duty aircraft. The first modernized and reengined A-7, the YA-7F, was completed in late summer and was expected to fly in the fall.

The **first privately owned space booster to carry a commercial satellite was successfully launched** from Launch Complex 17 at Cape Canaveral AFS, Fla., on August 27. The payload, the United Kingdom's first direct-broadcast satellite, was boosted aboard a McDonnell Douglas Delta rocket. Hughes built the satellite, called Marcopolo I, and was also responsible for purchasing the launch vehicle and insurance (functions normally handled by the customer) and certifying the satellite in orbit before the British Satellite Broadcasting Company took control. The launch team consisted of McDonnell Douglas employees and Air Force personnel. The Air Force will be paid about $1 million for use of the launchpad. The twenty-four-foot-high satellite reached geosynchronous orbit in early September.

The **Pratt & Whitney F100-PW-229 engine successfully completed the 4,000-cycle Accelerated Mission Testing** (AMT), a key test element leading to Air Force qualification. The AMT included 23,900 throttle transients and 8,236 afterburner lights to simulate conditions the engine would find in more than seven years of actual flight operations. The 29,000-pound-thrust engine completed F-15 testing in May 1988, and is now undergoing tests in an F-16 at Edwards AFB, Calif. The first production F100-PW-229 engine will be delivered late this year.

★ **NEWS NOTES**—In September, the **Soviet Union restarted operations on its space station Mir,** vacant since April, with the successful launch of Soyuz TM-8. The crew of Alexander Viktorenko and Alexander Serebrov lifted off from the Baikonur Cosmodrome on September 5 and had to dock manually with the space station when its automatic system failed. The crew is scheduled to remain aloft for about six months and will oversee the addition of two new modules, including a docking port for the *Buran* space shuttle.

The **US and Canadian NATO Industrial Advisory Groups** (NIAGs) met in Ottawa on August 10 and **adopted a joint resolution concerning the European Commission's proposal to terminate the European Economic Community member states' practice of waiving duty on defense-related goods.** The EC also plans to impose a common external tariff on a wide range of defense-type products and electronic goods. The US and Canadian NIAGs agreed that the EC's proposal threatens to undermine NATO cooperative armament projects by increasing procurement costs and discouraging participation by North American industry. NIAGs were established in 1968 to advise on ways to improve research, development, and production among NATO members.

The Bell-Boeing V-22 Osprey achieved its most significant milestone to date on September 14 as the aircraft achieved full conversion from helicopter mode to airplane mode while in flight. The aircraft was flown at an altitude of 6,000 feet and a top speed of 155 knots. The V-22 reached the forty-five-degree point in the conversion process during a flight on September 6.

Air Force Logistics Command began a sixty-day pilot program on October 1 to **eliminate intermediate-level maintenance on aircraft avionics.** Under the present system, broken avionics parts that can't be repaired on the flight line are sent to an intermediate maintenance shop, where a battery of tests is run. The part is either fixed there or sent to an air logistics center for depot-level repair. Under the test program, technicians at K. I. Sawyer AFB, Mich., will send broken B-52H and KC-135A avionics parts that can't be fixed on the flight line directly to the depot at the Warner Robins ALC at Robins AFB, Ga. Important to the test is how the new operation affects "pipeline" time between the flying unit and the ALC. The spare-parts stockpiles at K. I. Sawyer will also be monitored closely.

As of August 30, **fifty-six percent of the US and Soviet missiles covered by the Intermediate-range Nuclear Forces Treaty have been destroyed.** The On-Site Inspection Agency says that the Soviets have destroyed 1,184 of 1,846 treaty-mandated missiles, while the US has destroyed 326 of its 846 INF-covered missiles. Of the US

total, 130 of 443 BGM-109G Gryphon ground-launched cruise missiles have been cut up and crushed, and all 169 MGM-31 Pershing 1A missiles and twenty-seven of 234 Pershing II missiles have been bench-fired and crushed.

The **first A-6E Development, Test, and Evaluation (DT&E) launch of** the Northrop AGM-136A **Tacit Rainbow** loitering antiradiation missile **was successful.** The test was conducted at the Naval Weapons Test Center range at China Lake, Calif., on August 17. The missile, which is just over eight feet long, was launched from the Intruder on a multiple ejector rack shoulder station for the first time. The missile then executed an autonomous flight profile and hit the target. A safe separation test flight was conducted on August 4. This was the fourth of twenty-five planned, combined DT&E/IOT&E (Initial Operational Test and Evaluation) test flights.

★ **DIED—Minoru Genda,** the Japanese naval commander who planned the December 7, 1941, attack on Pearl Harbor, of heart ailments in Tokyo on August 15, the forty-fourth anniversary of the end of World War II. He was eighty-four. A brilliant tactician and theorist, he not only did detailed planning for the attack, but also solved the problem of using torpedoes in Pearl Harbor's shallow waters. He was kept from flying in the raid because of illness. He later became Chief of Staff of the Japanese Air Self-Defense Force and became an accomplished jet pilot. He served as a member of the Japanese Diet until 1986. He also championed kindness to animals.

Ernst H. Krause, nuclear physicist and aerospace executive, of heart failure at his home in Newport Beach, Calif. He was seventy-six. While at the Naval Research Laboratory, Mr. Krause conducted developmental research on radar. He was sent to interrogate the German V-2 rocket scientists after World War II and was later involved with the atomic tests in the Pacific. He served as a director at Lockheed before starting Systems Research Corp. in 1954. When he retired in 1978, he was a vice president for research and development at Ford Aerospace. ■

Senior Staff Changes

PROMOTIONS: To be **Lieutenant General:** Joseph W. **Ashy;** Robert L. **Rutherford.**

RETIREMENT: Gen. Alfred G. **Hansen.**

CHANGES: M/G (L/G selectee) Joseph W. Ashy, from DCS/Ops., and Dep. Dir., Ops, TACOS, Hq. TAC, Langley AFB, Va., to Vice Cmdr., Hq. TAC, and Vice CINC, USAFLANT, USLANTCOM, Langley AFB, Va., replacing M/G (L/G selectee) Henry Viccellio, Jr. . . . **L/G Michael P. C. Carns,** from Dep. CINC and C/S, Hq. PACOM, Camp Smith, Hawaii, to Dir., Joint Staff, JCS, Washington, D. C., replacing L/G (Gen. selectee) Hansford T. Johnson . . . **B/G Timothy D. Gill,** from Spec. Ass't to CINCPACAF, Hq. PACAF, Hickam AFB, Hawaii, to Dep. Dir., Ops., J-3, Hq. PACOM, Camp Smith, Hawaii, replacing B/G Charles F. Luigs . . . **M/G (L/G selectee) Robert L. Rutherford,** from Cmdr., 17th AF; Cmdr., Allied Sector Three; and Cmdr., ATOC, USAFE, Sembach AB, Germany, to DCS/P&R, Hq. USAF, Washington, D. C., replacing L/G (Gen. selectee) James P. McCarthy.

SENIOR EXECUTIVE SERVICE (SES) RETIREMENTS: Francis R. **Flinn;** Donald E. **Rellins.**

SES CHANGES: Roy C. Gay to Dep. Dir., Personnel Mgmt., Hq. AF/DPC, Washington, D. C. replacing John R. Graham . . . **John R. Graham** to Dir., Civilian Personnel, Hq. USAFE, Ramstein AB, Germany, replacing retired Francis R. Flinn . . . **Elizabeth J. Keefer** to Dep. Under Secretary International Affairs, OSAF, Washington, D. C. . . . **Maurice LeBlanc** to Dep. Dir., Directorate of Maintenance, San Antonio ALC, Kelly AFB, Tex., replacing William E. Daley.

SCIENTIFIC AND PROFESSIONAL (ST) RETIREMENT: Dr. Donald **Reynolds.**

ST CHANGE: Dr. James J. Olsen to Chief Scientist, Flight Dynamics Lab (SES), WRDC/FI, Wright-Patterson AFB, Ohio. ■

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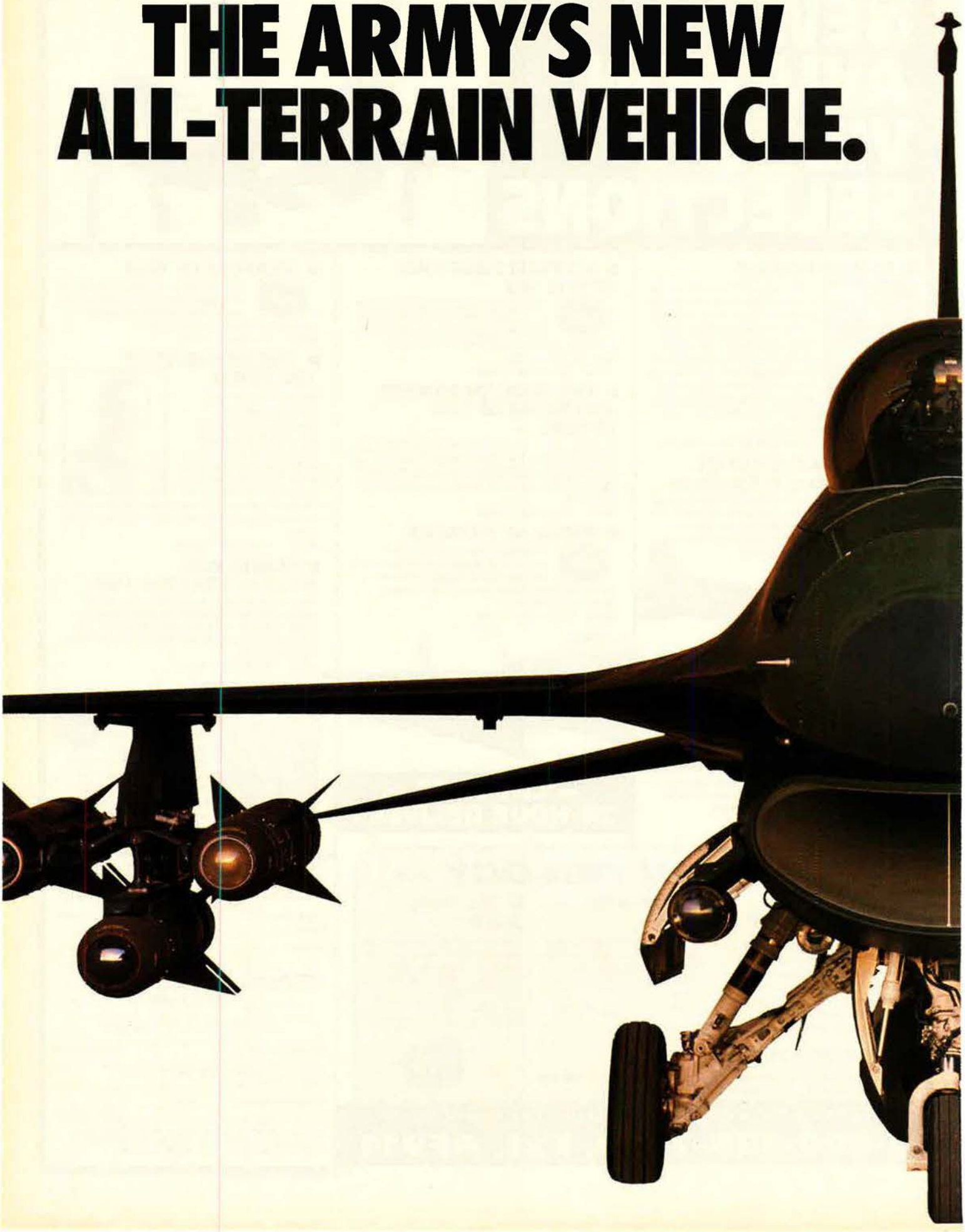

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GENERAL DYNAMICS

NATO is reeling, beset by doubts and other problems—but the Warsaw Pact is even closer to internal crisis.

Alliances in Turmoil

BY JOHN T. CORRELL, EDITOR IN CHIEF

On a training exercise, a US Army M113 armored personnel carrier—in a setting symbolic of the Alliance itself—approaches a crossroads in Germany.

THE world's two most important military alliances have been rocked hard by the changes now sweeping through Europe.

Some analysts say that both NATO and the Warsaw Pact are disintegrating already, but that is too speculative an assessment. Neither alliance has actually begun to break apart. In each, however, conditions for disintegration are riper than they have been since the 1950s.

The cracks in the two alliances developed for different reasons.

NATO, which observed its fortieth anniversary earlier this year, is unlikely to disband, but changes seem inevitable in the scope and configuration of its military program.

Americans and Europeans alike believe that the military threat to western Europe is over. The West, weary from forty years of Cold War, has been swept off its feet by Soviet leader Mikhail Gorbachev, who talks peace and promises to reduce Soviet military power. It does not seem to matter much that he has not made his reductions yet.

The resurgence of arms control further adds to the West's comfortable feeling. Under a 1987 agreement, the United States and the Soviet Union are removing their intermediate-range nuclear missiles from Europe.

The focus now is on the Conventional Armed Forces in Europe (CAFE) proposal, which would draw down tanks, troops, and airplanes by big percentages in both NATO and the Pact. If that succeeds, negotiations will turn next to short-range nuclear weapons.

NATO is also beset with old arguments about defense budgets and about how member nations share the financial burden. At their last meeting, Alliance defense ministers reaffirmed their "guidelines" of three percent real growth in NATO defense budgets. In reality, the Western nations are inclined to cut back their military spending instead, no matter what happens in arms control.

Many Americans—including influential members of Congress—think some of the US troops in Europe should come home. They are especially rankled by the fact that other NATO nations spend far less on defense than the US does.

Europeans say that the burden is not measured by GNP percentage alone. Europe supplies most of the in-place aircraft, armor, and combat manpower. Europeans also run the more immediate risk. The first battlefields would be on their territory.

Some Europeans agree with their American critics on one thing: They also feel it may be time for the Americans to go home.

Wavering Convictions

Budgets and burden-sharing are secondary issues, though. The United States and Europe can afford defense if they are convinced they need it. NATO is unstable mainly because its convictions are wavering.

Perceptions to the contrary, the threat has not disappeared. Mr. Gorbachev says he would like to divert some of the resources consumed by the military to other uses. That is probably true, but he has been saying the same thing for several years. Nevertheless, Soviet military spending rose by its usual three percent, after inflation, in 1988, and currently accounts for something near one-fourth of the Soviet GNP.


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Mr. Gorbachev told the United Nations last December that he plans to reduce his armed forces by 500,000 troops. If he makes good on that promise, the Soviet Union would still have 4,600,000 troops. "In terms of combat power that can be brought to bear on the battlefield—even after the proposed reductions—the Warsaw Pact will continue to outnumber NATO 2.5 to one in tanks, 2.4 to one in artillery, and nearly two to one in combat aircraft," says Gen. John R. Galvin, Supreme Allied Commander, Europe.

This year, General Galvin says, the United States will produce 610 tanks. The Soviet Union will produce between 3,000 and 3,400 top-of-the-line T-72s and T-80s. "If you withdraw 10,000 tanks in two years but you are producing 3,000 new tanks per year, your withdrawals turn out to be modernization," General Galvin says.

Those numbers are disputed by the Soviets and others, but by any count, NATO must expect that massive military power will be deployed just over the border for some time to come.

Mr. Gorbachev's Problem

The Warsaw Pact, for its part, is probably closer to internal crisis than NATO is. Dissent and disruption are flaring all along the Soviet periphery. On paper, General of the Army Peter Lushev, Commander in Chief of the United Armed Forces of the Warsaw Pact, can mobilize the armies and air forces of six east European nations without consulting anyone outside of Moscow. In practice, he must wonder how reliably those forces would respond to Soviet control.

Mr. Gorbachev has no easy choices. If he uses traditional Soviet methods to reimpose discipline, he risks alienating his admirers in the West and reawakening fear of Soviet military power. If he lets matters drift, he encourages more internal dissent, further weakening Moscow's grip on its empire. Few Russians will take it lightly if he loses control of the western approaches to the Soviet homeland, now guarded by the east European client states and the Soviet forces stationed there.

"Before this, we were faced with a Soviet Union that was big but predictable," General Galvin says. "Now they are just big."

Mr. Gorbachev no longer holds a monopoly on breathtaking offers. President Bush's CAFE proposal, adopted by the NATO summit in May, calls for sweeping reductions of armies and air forces in Europe.

Both sides would drop back to equal ceilings of 20,000 tanks, 28,000 armored troop carriers, and 16,000 artillery pieces. Land-based combat aircraft and helicopters would be reduced to levels fifteen percent below the present NATO total. These limits would apply to the Pact and NATO in aggregate. All of the withdrawn equipment would be destroyed.

The United States and the Soviet Union would each limit their combat manpower, outside of national territory from the Atlantic to the Urals, to 275,000. The troops withdrawn—30,000 by the US, 350,000 by the Soviets—would be demobilized.

The first problem is that NATO and the Warsaw Pact disagree by wide margins on the number of troops, tanks, and aircraft in place now. They also disagree on the definition of combat aircraft and about whether naval forces should be included in the negotiations.

MiG-29s Are Pure Defense?

"We consider totally unjustified the inclusion by the US of a purely defensive weapon, fighter-interceptor aircraft, into the category of aircraft slated for reduction," says Victor Karpov, Soviet Deputy Minister of Foreign Affairs.

General Galvin says he has difficulty swallowing the idea that such aircraft as the MiG-25 Foxbat, the MiG-29 Fulcrum, and the Su-27 Flanker should be excluded. Like the American F-16, the Soviet MiG-25 and MiG-29 are multirole aircraft, perfectly capable of ground attack. The Su-27's primary duty is escorting deep-interdiction strikes—not exactly a "purely defensive" mission in itself—and it probably has a secondary role of ground attack.

"Although frequently assigned as interceptors, these aircraft have the capability aboard to become strike aircraft," General Galvin says. "It is a common characteristic of air forces that they are flexible, and that an aircraft is built to do one thing one day and something else another."

It will be to the advantage of the Soviets, who are not dependent on sealift for resupply, if they can pull naval forces into the CAFE discussions.

—Photo by Erik Simonsen

One issue in the CAFE talks will be deciding what the "combat aircraft" category includes. The Soviets contend that Su-27 Flankers like this one are purely defensive. The Flanker's primary mission is escorting deep interdiction flights, and it is thought to have a ground-attack capability as well.

According to General Galvin, seventy-five percent of the Warsaw Pact equipment moves forward by rail, and most of the remainder moves by road. The Soviets have 3,500 heavy-equipment transporters, on which they can carry ten divisions' worth of tanks in a single haul.

By contrast, ninety percent of NATO's reinforcement moves by sea and requires protection against the 200 or so killer submarines the Soviets could unleash against allied shipping.

If the negotiators can agree on definitions, base numbers, and terms of a treaty, the next problem is how to verify compliance with the agreement. As nuclear arms-control efforts have demonstrated, keeping track of big, hard-to-hide weapons is difficult enough. Monitoring troops, tanks, and artillery would require surveillance capabilities that do not now exist.

Since 1967, NATO's strategy has been Flexible Response/Forward Defense. "Flexible Response" means fielding a conventional force adequate to deter or defeat an attack without early reliance on nuclear weapons. "Forward Defense" means repelling an attack at the border instead of conceding territory (unacceptable to the West Germans), falling back, and conducting a defense in depth.

"Force-to-space ratios and the dictates of terrain mean there are certain force levels below which the West cannot reduce," General Galvin wrote in the British magazine *Survival* last spring. "Currently, NATO has twenty-two divisions deployed in the central region of Allied Command Europe, covering a frontage of more than 1,000 kilometers."

Under NATO doctrine, a division defends forty-six kilometers of front, he explained. The Alliance does not have enough forces for an adequate reserve now, and if reductions cut too deep, they would make the strategy impossible.

"In order to cover the front and carry out the defensive mission, Allied Command Europe would be forced to conduct more mobile operations, giving ground to gain time and to discover the main attack of the enemy while holding onto a strong mobile reserve for counterattack," he said. "This is not the current NATO strategy. Deep cuts in forces would compel a change."

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A GR.3 Harrier jump jet operates in close proximity to ground troops. Low-level flying, an essential part of Allied exercises and training, has become a controversial issue in Germany. NATO air commanders are exploring ways to reduce the noise and disruption while preserving aircrew proficiency.

Low-Level Flying

Forward Defense also means a large military presence on German soil. Seven foreign nations station 400,000 troops in Germany. They, along with German forces and additional allied units on training deployments, conduct thousands of exercises there each year.

"In the Federal Republic of Germany, a country the size of Oregon with the population density of the Eastern seaboard, there are nearly 900,000 men and women in uniform, training at high operating tempos," Gen. Thomas C. Richards, Deputy Commander in Chief of US European Command, told the Senate Armed Services Committee in April.

The level of training activity—the low-level flying in particular—has become a controversial issue. Anti-defense critics in Germany lead complaints about the disruption. They also charge that such flying is the result of NATO's Follow-On Forces Attack (FOFA) concept, which they denounce as too aggressive.

In wartime, Allied airmen would be required to penetrate enemy defenses to attack the rear echelons. To survive the radar-directed fire from the ground, they would have to fly low and fast.

"The only way to avoid that kind of flak is to fly in the weeds," General Galvin says. "We don't even fly as low [in training] as we would fly in combat, but we have to fly low in order to penetrate."

NATO has cut back sharply on low-level flying in Germany. Tactical units deploy elsewhere for considerable portions of their training.

"The average amount of time that a pilot gets today to practice [at low level] is rather small, considering the difficulty of the operation," General Galvin says. "It is often a matter of less than half an hour a week for a crew."

Under a concept called "Right Mix," General Galvin and the NATO air chiefs are exploring less

disruptive options, including simulation, to ensure adequate training.

General Galvin cautions Americans against jumping to conclusions about the training controversy. In a June 6 speech to the Columbus, Ohio, Rotary Club, he said that recent polls show that West Germans are still in favor of the Alliance.

"Eighty percent of the Germans are for NATO, and seventy-five percent are for the deployment of Allied forces within their country," he said. "The Germans don't like low-level flying. It scares the chickens and all that. And they don't like tanks in their backyard. But they sure like NATO. I wouldn't worry about the Germans."

Money and Other Upsets

Since its inception in 1967, the weakest aspect of the Flexible Defense strategy has been that it is not really flexible. The Western nations have never been willing to pay for sufficient conventional forces. This led to excessive reliance on tactical nuclear weapons, with US strategic nuclear forces as the ultimate backup. In turn, the nightmare of a nuclear shootout became a staple of the European antidefense movement.

The unwillingness to spend more on conventional defense is at the heart of the burden-sharing issue. The United States, Greece, Britain, and Turkey allocate between four and six percent of their respective Gross Domestic Products to defense. The other allies spend less. West Germany is conspicuously low at three percent of GDP.

In its annual report to Congress on Alliance burden-sharing, the Pentagon says that GDP percentage alone is not a valid measure of a nation's contribution. It lists thirteen other factors, such as host nation support, that should be considered. It also notes that nations with a military draft get more manpower for their money than the United States does with its all-volunteer force.

Congress does not buy that argument. The burden-sharing panel of the House Armed Services Committee, chaired by Rep. Patricia Schroeder (D-Colo.), expresses a strong view: "The US and its allies do not agree on the immediacy or level of the threat, [but] a high level of US defense spending provides them with a no-cost insurance policy if our threat assessment turns out to be right and their assessment wrong."

Sen. Sam Nunn (D-Ga.) and Sen. John McCain (R-Ariz.) of the Senate Armed Services Committee also call for the Europeans to do more. "If our NATO Allies are not serious about conventional defense, then we do not need all of the 325,000 American troops deployed in western Europe," they said in August. "If the only function of our armed forces in Europe is to make our allies confident that we will use nuclear weapons to defend the continent, we can make do with substantially fewer US troops there."

New Record for Peace

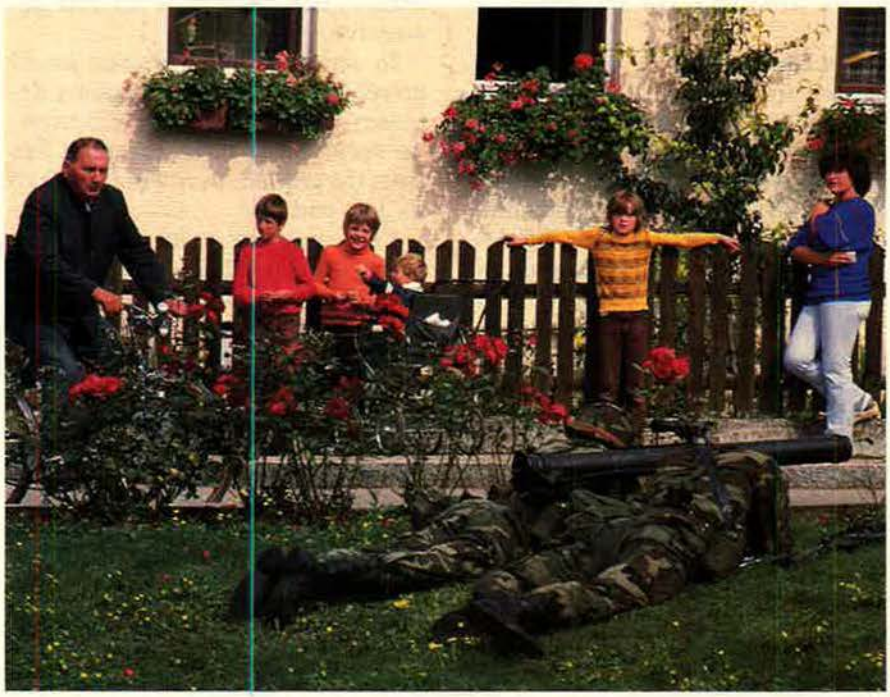
Europeans have a keen sense of history, and this has been a big year for anniversaries in Europe. NATO celebrated its fortieth birthday April 4. World War II began fifty years ago in September. In August, more than a million Latvians, Lithuanians, and Estonians timed their anti-Soviet demonstration to coincide with the fiftieth anniversary of the pact between Hitler and Stalin that cost the Baltic nations their independence.

On the occasion of the NATO observance, British Foreign Secretary Sir Geoffrey Howe pointed out that "four months ago, another milestone was reached which attracted little notice at the time. It was the surpassing of the previous record for the period when Europe had been at peace, forty-three years and seven months between January 1871 and August 1914. The forty years of NATO's existence has, I am sure, been a primary reason why that record has been broken."

NATO, an alliance of sixteen sovereign nations with considerable experience at resolving their differences, has more options for continued vitality than the Warsaw Pact does.

If Mr. Gorbachev makes major reductions to his armed forces and forgoes centralized control from Moscow, the Warsaw Pact is essentially defunct. If he reasserts control and maintains his force structure, the success of his international public relations campaign will be at an end, and he will become the catalyst that pulls NATO back together.

As a free alliance of free nations, NATO has room for organizational maneuvering. It can change its military size and configuration as well as the internal alignments of power and still have a functioning alliance left. ■



As this shot from Reforger shows, NATO training exercises often get up close and personal for the West Germans. There have been complaints, but there are also many reports of German citizens greeting the troops with encouragement and offers of refreshments. NATO still gets high marks in opinion polls.

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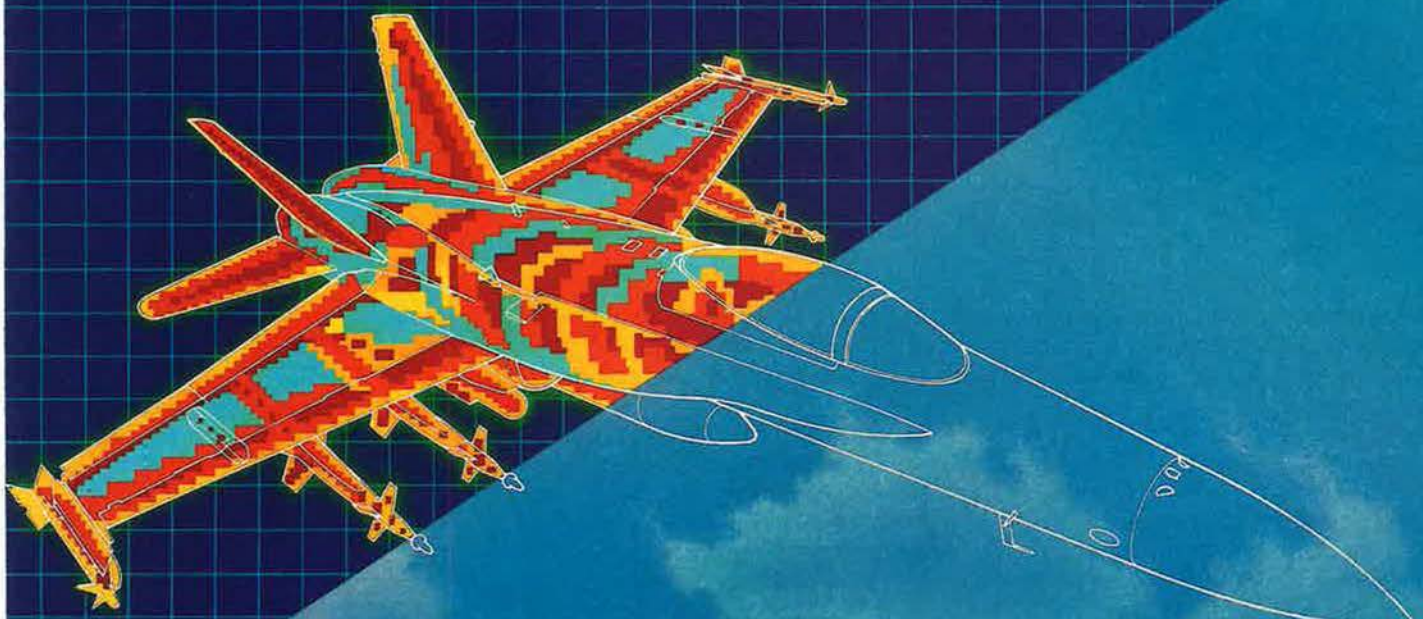

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The economic superpower can no longer duck an expanded military role in the Pacific, but the controversy is not over.

Japan Steps Up to a Stronger Defense

BY ROBERT S. DUDNEY, EXECUTIVE EDITOR

JAPAN'S military buildup, once dismissed by many as a project doomed to fail, is proving to be a surprising success at a time of mounting problems for Western defense.

When Tokyo unveiled its plan in 1986, numerous analysts wrote it off as unlikely to go very far. Japanese advances, however, are forcing a reassessment of military prospects for the island nation of 123,000,000 citizens.

Impressive strides have been made in overcoming an acute lack of modern arms that has hampered the 245,000-man Japanese Self-Defense Forces. The SDF, though small, will possess some of the world's most advanced aircraft, warships, ground combat weapons, and communications equipment.

Among these systems are F-15 interceptors, Patriot air-defense missiles, AEGIS-equipped destroyers, Yushio-class submarines, new tanks, sophisticated communications, and advanced SX-3 fighters.

Japanese defensive capabilities are growing steadily. The judgment of the Pentagon now is that by 1991, Japan will achieve a minimum force level required to carry out fundamental defense missions. Previously, Japan fell far short of that goal.

Expanded defense budgets, high-technology prowess, and—until recently—strong domestic political stability all have contributed to the Japanese turnabout on defense.

For the US, Japan's progress is a boon as Washington confronts pressures to cut Pentagon budgets and signs emerge that military efforts will decline sharply in West European nations. Events in Japan shape up as a singularly positive development.

One thing has not changed. US protection, codified in a 1960 defense treaty, remains the bedrock of Japan's security.

Also, Japan's involvement with military power still stirs controversy. Asian neighbors harbor concern about how far Japan may go. In Congress, by contrast, Tokyo is condemned as a piker, free-riding on the back of the United States.

Tokyo's new military effort comes as an addition to a broader Japanese thrust that is expanding its influence. Japan's $2.5-trillion

The Air Self-Defense Force is essential to protection of Japanese airspace and sea-lanes. Japan performs airborne reconnaissance with a fourteen-plane squadron of RF-4EJ aircraft (right). Japan's air arm, soon to reach a level of 400 aircraft, also boasts nine squadrons of US-designed, Japanese-produced F-15J air-superiority fighters and F-4EJ multirole fighters.


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economy has helped make it the world's greatest supplier of capital. Japan is set to become the largest foreign-aid donor. Even on the diplomatic front, Tokyo has begun to make waves.

A "Major Military Power?"

Surveying Tokyo's defense plan, Henry Kissinger declared not long ago that "Japan will emerge as a major military power in the not-too-distant future."

Well, maybe, but the former Secretary of State might have been laying it on a bit thick. Japan has no plans to acquire the long-range strike aircraft, missiles, or offensive naval forces of a conventional great power. Nuclear weapons are proscribed. But Kissinger was right about the determination with which Japan would pursue its modest goals. The 1986–90 Mid-Term Defense Program projected spending of $132 billion (at prevailing exchange rates in 1987); it has been fully funded in each of its first four years, and the same is virtually certain in 1990. Spending will top $31 billion in 1989.

With one year left in the MTDP, notes a recent Pentagon report, Japan has now achieved eighty-eight percent of its goal for tanks, eighty-two percent for artillery, eighty-nine percent for destroyers, eighty percent for submarines, seventy-five percent for interceptors, and 100 percent for transports.

Nowhere is the impact of the Japanese effort more apparent than in the 45,000-strong air force.

The Japanese Air Self-Defense Force (ASDF), with 340 front-line combat aircraft, can put aloft more planes than the US has permanently based in the Far East. By the end of 1990, Japan will deploy 400 warplanes in ten interceptor squadrons, three fighter-support squadrons, and other units.

Today, nine squadrons of US-designed, Japanese-built F-15s and F-4Es form the backbone of Japan's air defense interceptor force. In a crisis, the ASDF could call on 130 new F-15DJ jets and another 129 F-4EJ Phantom II planes. These forces are armed with AIM-7 Sparrow III and AIM-9 Sidewinder missiles.

Plans call for Japan to form a tenth full fighter squadron by 1993 with new-production F-15s.

Today, most ASDF missions entail intercepting Soviet fighters and reconnaissance aircraft entering Japanese airspace to the north of the island of Hokkaido. Japan confronts several hundred of these intrusions each year.

The Mitsubishi F-1, a made-in-Japan support fighter, will be replaced by advanced SX-3s in the 1990s. Deliveries of the single-seat, supersonic F-1s began in 1977. Powered by two Rolls-Royce engines, it can carry two air-to-surface missiles, 750-pound bombs, and four AIM-9 Sidewinder missiles.

In war, Japan's air force would also be charged with providing support to ground and naval forces. The mainstay of the interdiction mission today is the fleet of about seventy-five Japanese-built F-1 fighter-bombers, organized into three squadrons. These are armed with Japan's Type-89 air-to-surface missile and with conventional ordnance.

A World-Class Fighter

The F-1 force is a weakness. Thus, two years ago, the US and Japan announced plans to jointly develop a new support fighter in a project to cost more than $8.2 billion, based on a projected production run of at least 130 planes. The fighter, known in the US as the FSX and in Japan as the SX-3, is to be based on the General Dynamics F-16, but with heavy infusions of Japanese technology.

Under current plans, a prototype of the SX-3, expected to be one of the world's finest fighters, will fly in 1993. The ASDF will organize a new wing to operate the SX-3. The first squadron will be in place in 1998, with two more to come soon after.

The ASDF is undergoing a modernization program to improve its reconnaissance and early warning capabilities. Today, Japan's reconnaissance mission is based on the fourteen-plane squadron of RF-4EJ planes. The fleet is scheduled to get upgraded reconnaissance packages. The first prototype is to reach operational status next year. ASDF's fleet of eight E-2C Hawkeye airborne early warning craft will expand to ten by 1991.

Japan's navy, the Maritime Self-Defense Force, has come far.

In a crisis, Tokyo would rely on the 44,000 men of the Japanese fleet to keep open critical sea-lanes or to blunt seaborne attack. Five regional naval commands defend specific geographic areas. A high-seas fleet would operate further from home.

Already, the MSDF could go to sea with fourteen attack submarines, fifty destroyers, seventeen frigates, forty-six amphibious craft of various sizes, thirty-seven mine-warfare ships, and fourteen small patrol combatants. The MSDF operates about 100 support, training, and survey ships.

By 1991, Japan plans to reach its goal of deploying sixty destroyers—

twice the number in the US Seventh Fleet, which operates across the entire western Pacific. The attack-submarine fleet will probably level off at sixteen or seventeen boats when the program is complete. Some 100 P-3C Orion submarine-hunter aircraft, assembled in Japan by Kawasaki Heavy Industries, will be flying.

For antiair warfare, Japan is to build at least three, and perhaps four, destroyers outfitted with the US-developed, ultrahigh-capacity AEGIS air-defense system. The first of the class will be launched in 1991. The ships will greatly strengthen fleet defense against missile and aircraft attack.

Japan's ability to wage antisubmarine warfare against Soviet undersea craft will improve. Aging Japanese Uzushio-class boats are being replaced with Yushio- and Improved Yushio-class submarines. Japan wants a sophisticated sonic depth-finder vessel for ASW. Also on tap: more and better equipment useful in tracking USSR naval movements, plus new ASW helicopters.

Japanese Landpower

Less conspicuous but no less important has been Japan's modest upgrading of its army, referred to as the Ground Self-Defense Force, or GSDF.

Goals that will soon be met include deployment to specific regions of twelve active divisions, with between 7,000 and 9,000 troops each, and three composite brigades; one armored division and additional armored, helicopter, and airborne brigades for mobile warfare; and eight antiaircraft artillery groups.

The Army, responsible for ground combat, amphibious landings, some ground-based air defense, and close air support, stands at only 156,000 troops, below the authorized level of 180,000. Even so, Japan's Army has embarked on several weapon-update programs to be completed in the 1990s.

Foreign acquisitions include the American Patriot air-defense SAM system and the US 227-mm Multiple Launch Rocket System.

Japan plans to produce Type-90 THX main battle tanks to replace its aging inventory of Japanese Type-61 models. The GSDF's units possess a total of nearly 1,200 main battle tanks, half of them Type-61s, and 700 armored vehicles of all classes.

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Japan's army, the Ground Self-Defense Force, possesses some 1,200 main battle tanks, many of them aging. Tokyo's planned production of new Type-90 THX tanks is intended to strengthen the force's ability to repel a small-scale amphibious or airborne invasion of the home islands.

Overall, notes a recent General Accounting Office assessment, Japan is now close to meeting all its defense goals. There is progress in lower-profile areas, such as more coordination between the various services. US military officers applaud Japan for coming so far in a short time.

Says one Pentagon study: "Japan is making rapid progress towards the military capability to fulfill its agreed mission—*i.e.*, the defense of its territory, including air and sea lanes to an offshore distance of 1,000 nautical miles."

No one, however, thinks even that limited task would be easy. Soviet forces also have improved. Adm. Huntington Hardisty, US Pacific Commander, points out that in the past four years Moscow has deployed to the Pacific advanced *Akula* submarines, MiG-31 fighters, and long-range bombers with cruise missiles.

With an 8,485-mile coastline, Japan naturally focuses its attention on maritime and coastal defense operations. Heavy concentrations of Soviet airpower around Vladivostok make air defense an additional concern.

Japanese forces would be called on to repel a limited assault on the home islands. Japan would also face the tasks of combating Soviet submarines and airpower in its vicinity and monitoring the passage of Soviet submarines and other warships through straits connecting the Sea of Japan with open ocean.

For all its improvement, say analysts, the GSDF's ability to undertake such sustained combat leaves much to be desired.

Radars and vital air bases, for example, still go undefended. The Air Force, lacking refueling capabilities, can't provide air defense cover or strike support for ships at more than moderate distances. Day-to-day readiness and combat sustainability are problematic. Survivability of critical installations is doubtful. Command control and communications would be tenuous at best.

Such weaknesses presumably will be addressed in Japan's next defense plan, covering the years 1991–95 and due next fall. The Japan Defense Agency already has begun work on it. The government has affirmed its intent to seek long-term real growth in funding.

The Pentagon maintains that it is important that the next defense plan continue improvements in air de-

fense, anti-invasion and antisubmarine warfare, and C³I capabilities, as well as combat sustainability and infrastructure.

Japan evidently will do so. The GAO investigation of the Japanese program reports that Tokyo is giving serious thought to acquiring an over-the-horizon radar system, three to four new squadrons of interceptors, eighteen to twenty refueling aircraft, twelve to sixteen long-range early warning aircraft, and fifteen to twenty large air transports, plus readiness improvements.

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"The Minimum Necessary"

Japanese politicians, however, will face some hard questions. One of the most important, Japanese observers maintain, will be whether to set a new force goal for the SDF. Some believe that a larger military is in order, but any move in that direction is sure to cause a political uproar.

Another major question concerns extending the range of Japan's aircraft. Building a modest refueling capability is one option. Tokyo is also evaluating the use of small aircraft carriers with updated AV-8B Harrier II jump jets on board. Either scheme could run afoul of domestic politics. To many in Japan, range-extension would make the aircraft "offensive" military equipment, prohibited by Japan's pacifist constitution.

Domestic opinion is not the only constraint. Japan must satisfy its Asian neighbors—in particular, China, South Korea, and the nations of Southeast Asia—that its power will remain nonthreatening.

Some nations worry that Japan is on the road to becoming a military power again, despite Pentagon assurances that "Japan is still doing the minimum necessary to meet its defense goals, goals which are clearly limited."

Japan openly professes, in fact, that US military power remains and will continue to remain the ultimate guarantor of its national survival. Prime Minister Toshiki Kaifu, on his recent visit to Washington, emphasized the need to "ensure the effective operation of US-Japan security arrangements."

A Pentagon report is more direct: "The Japanese force structure requires the presence of complementary US forces to remain viable."

The American presence in and around Japan is substantial, about 65,000 US troops on Japanese ter-

—Staff photo by Jeffrey P. Rhodes

The F-15J (above), a Japanese-made version of the US-designed F-15 fighter, is the backbone of indigenous Japanese air defense. Japan has 130 F-15Js now and plans for another full F-15J squadron by 1993. Working in tandem with Japan's force in a wartime crisis would be three squadrons of USAF F-15C/D aircraft (below) assigned to the 18th TFW at Kadena AB on Okinawa.

ritory or waters. The largest segment, a 38,000-man Marine Expeditionary Force, is based on the island of Okinawa. USAF maintains in Japan some 16,200 personnel and three squadrons of F-15C/Ds, two squadrons of F-16s, and eighteen of RF-4Cs. The Navy has a major presence in the Western Pacific and a major facility at Yokusuka.

In recent years, cooperation between US and Japanese forces has improved markedly. Japanese naval forces, for example, now exercise with Pacific Fleet and other friendly Pacific navies.

A Sense of Grievance

Even so, the Tokyo-Washington relationship is becoming a troubled one, for reasons that have more to do with domestic politics and economies than with security matters.

The most fundamental problem causing friction between the two allies is the lopsided economic relationship between Japan, the world's biggest creditor nation, and the US, the largest debtor. Last year, Japan's trade surplus with the US fell by $8 billion, but it still came to $52 billion.

In addition, Americans and Japanese alike have been wounded by bitter disputes over technology exports. On the US side, Americans felt betrayed when it was revealed that Toshiba Corp. illegally sold the Soviet Union sensitive milling technology, which was then used to manufacture quiet propellers for Soviet nuclear attack submarines.

Japan's sense of grievance was fueled by the Bush Administration's reopening and modification of the US-Japan SX-3 agreement after Tokyo thought a deal had been struck. Japan believed it was being made into a scapegoat for US economic weakness and mismanagement.

Compounding the tensions is an increasingly sharp dispute over "burden-sharing." Japan resents congressional charges that it is shirking its defense obligations. Tokyo points out that it no longer holds defense expenditures below one percent of its gross national product, as it did officially for ten years. It points to the fact that Japan now has the third largest defense budget in the world, surpassed only by the two superpowers.

© Koku Fan/Arms Communications

The Japanese fleet is now expected to patrol and secure Japanese waters out to a distance of 1,000 nautical miles from the home islands. Air-defense destroyers, antisubmarine-warfare destroyers and patrol aircraft, attack submarines, and communications are high priorities.

$45,000 per American

Host-nation support for US bases and troops in Japan is higher than ever. When all factors are considered, says Tokyo, it contributes the equivalent of $2.7 billion annually to upkeep of American forces based in Japan. That works out to about $45,000 per US serviceman.

Many members of Congress remain distinctly unimpressed by these arguments. They note that, though the one-percent limit no longer is official policy, defense budgets remain only slightly above that level. The US outlay is closer to six percent of GNP. They add that much of the growth in Japan's arms spending, calculated in US dollars, stems not from new commitments but from the spectacular rise in value of the yen compared to the performance of the US dollar.

"The Japanese have a long way to go on the burden-sharing front," charges Rep. Pat Schroeder, a Colorado Democrat who sits on the House Armed Services Committee. "Their support of US forces in Japan is generous, but considering they only spend one percent of their [GNP] on defense, they can afford to be much more generous."

A recently completed Defense Department report on burden-sharing supports Schroeder's charge. In its analysis of the defense performances of the US, Japan, and America's NATO allies, Japan receives the lowest possible rating in six of the nine areas in which it can be judged. West Germany, by comparison, rates high or highest in eight of fourteen areas in which it can be judged and medium in another three.

GNP per capita in Japan is $19,500, compared to that in the US of $18,200. Even so, the average Japanese spends only $200 on defense, vs. $1,200 for the average American.

Congress voted overwhelmingly in 1987 to urge Japan to triple defense spending to three percent of GNP. The question is where Tokyo would spend it all. Richard Armitage, the former Assistant Secretary of Defense for International Security Affairs, estimated that Japan could buy everything on its wish list for the equivalent of two percent of its GNP. A significantly higher level of spending, he implied, would transform Japan into a truly formidable military power.

Japan's military effort has made strong progress against heavy odds. The trick for Tokyo now will be to navigate between the insistent demands of a superpower patron and the dangers of military excess. ■

Three powerful factors—military security, trade opportunities, and *Ostpolitik*—are shaping West German attitudes toward the Soviet bloc.

—Photos by Paul Kennedy

Germany at the Pivot

BY VINCENT P. GRIMES

ON ONE critical issue after another—arms control, East-West trade, modernization of NATO nuclear weapons, policy toward eastern Europe—West Germany is now exerting a major and perhaps decisive influence.

The nation of 61,000,000 seems increasingly ready to place itself at odds with key allies on the basic security issue of how to respond to Soviet power. Bonn consistently outpaces both the US and Britain in supporting Soviet leader Mikhail Gorbachev and in calling for Western military concessions.

Bonn's actions reflect a desire for a larger role in eastern Europe, a region where the Kremlin faces vast problems and where German influence has long been a sensitive issue. Even talk of a reunified Germany is back in style.

The Federal Republic, in short, is moving toward a leading role on fundamental issues going to the heart of East-West rivalries. US leadership in NATO, reform in eastern Europe, and the future of the German nation are sure to be affected.

What is kindling the new assertiveness in West Germany's international approach are West German economic and military power within NATO and the German perception that a historic opportunity exists to ease national problems.

The rise of a powerhouse economy in the Federal Republic, far from concentrating German attention on internal affairs, has fed German readiness to play a more prominent international role.

After World War II, Germany lay destroyed, and the lines of occupation became the frontiers of a divided Europe. From this prostrate condition, the West German state has risen to become a worldwide industrial giant and the dominant economic force on the Continent.

Its Gross National Product now exceeds $1 trillion and continues to expand. West Germany, once a recipient of US aid, now provides its own assistance to some allies.

Within NATO's military assistance program, West Germany has been supporting moves by Greece, Turkey, and Portugal to modernize their forces. Included are funds for Hellenic Army and Air Force programs, Turkish aircraft, and Portuguese Type-209 submarines.

The West German Air Force's first-rate equipment includes 165 Tornado fighter/ground-attack aircraft. This Tornado and crew recently visited Andrews AFB, Md., as part of a West German and Rockwell Corp. joint effort to develop the Tornado as the next-generation US Wild Weasel aircraft.


DANGER

—Photo by Erik Simonsen

The multinational European Fighter Aircraft program will give the Luftwaffe a new primary combat aircraft in the late 1990s. The twin-engine, single-seat EFA will be very agile and will boast advanced avionics. West Germany plans to buy 250 EFAs in the late 1990s, along with other weapon systems modernizations.

West Germany's military achievement has been less spectacular but equally critical to its emergence as a power in European affairs. Today, the highly professional German force of 485,000 active servicemen and 800,000 reservists is viewed as a key to NATO conventional defense on the Continent.

This is true despite restrictions imposed on West German military power. Under provisions of the Paris agreements of 1954, which cleared the way for West German rearmament, all forces except a Territorial Army are under direct command of NATO's Supreme Allied Commander, Europe. German law bans production of nuclear, biological, or chemical arms.

German Force Lineup

The West German Air Force, 109,000 strong, comprises ten wings of fighter/ground-attack aircraft, two wings of air defense fighters, and two wings of reconnaissance aircraft. The Luftwaffe possesses excellent personnel.

In addition, much of its equipment is viewed as first-rate. Included in the German inventory are 165 relatively new Tornado fighter/ground-attack aircraft, 160 F-4 Phantom interceptor and fighter/ground-attack aircraft, sixty RF-4 Phantom reconnaissance aircraft, and 175 older and soon-to-be-replaced AlphaJet fighter/ground-attack planes. The swingwing Tornado is the backbone of the German fighter/bomber force.

On land, West Germany boasts the largest standing army in western Europe, one numerically larger than US Army forces in Europe and with more main battle tanks.

West Germany's Army, or Bundeswehr, today has 345,000 troops, 170,000 of them conscripts serving active-duty terms of eighteen months. Of the total, about 266,000 are assigned to the Field Army committed to NATO defense, 49,000 to the Territorial Army, and the balance to various support units and headquarters. In addition, there are 710,000 Army reservists.

The Bundeswehr, until recently, was organized into twelve divisions: ten mechanized, one airborne, and one mountain. Long-term problems, however, have forced the service to reorganize. This reorganization, carried out under a plan known as "Force Structure 2000," calls for a force of ten mechanized and two airmobile divisions, plus another thirteen brigades of the airmobile, lift infantry, and mechanized infantry type. The new setup will require fewer active-duty troops.

At the heart of the Bundeswehr is its large force of some 5,100 main battle tanks. Of these, 1,800 are of the Leopard II type. The older Leopard I numbers some 2,400. There are also 900 or so older US-made M48 tanks.

While Germany's tank force is dwarfed by Soviet armor holdings, it is nevertheless larger than that used by the German Army to overwhelm France in 1940 and invade Russia in 1941.

The Bundeswehr is facing some sharp peacetime challenges, the greatest of which is a demographic downturn in West Germany. With the pool of draft-age men shrinking, Bonn is experiencing growing difficulties finding servicemen in sufficient numbers. The Army also has problems retaining second-term NCOs.

West Germany's Territorial Army, organized into five divisions, is intended for rear-area duties such as home defense, base-area security, and reserve training. Also under the Territorial Army command are German battalions assigned to a joint Franco-German brigade, based at Böblingen, which falls outside NATO supervision.

Germany's Navy, the Bundesmarine, has only 38,500 officers and sailors, including 6,800 naval aviators. Even so, efforts over the past two decades to increase German seapower have been largely successful. The fleet, deploying 150 ships in 1970, now operates some 180 vessels. The total includes twenty-four diesel submarines and eighteen surface combatants. Delivery of the last of eight Bremen-class frigates will soon be complete. These 3,750-ton ships are armed with Harpoon antiship missiles and NATO Sea Sparrows.

Modest Modernization Plans

The services are due to benefit from modest modernization programs. The most conspicuous, the multinational European Fighter Aircraft (EFA) program, will provide the Luftwaffe with a new primary combat aircraft in the late 1990s.

The EFA is to be a twin-engine, single-seat design with a delta wing and canard configuration, making it very agile, and with advanced avionics. Luftwaffe plans call for buying 250 EFAs. Also on tap are sixty

additional multipurpose Tornado fighters and up to 3,000 Advanced Medium-Range Air-to-Air Missiles.

Though it has run into development problems, the new PAH-2 attack helicopter is expected to increase German Army capabilities substantially in the 1990s. This aircraft is being developed jointly with France at a cost to West Germany of $4.5 billion. The Bundeswehr will get 200 of the PAH-2s, which are slated to perform many of the same tasks that the US Army's new LHX will perform.

Four ships of a new, all-German frigate class are about to be ordered at a cost of $1.5 billion. Twelve Type-206-class subs are being modernized to operate in high-threat waters. These will be equipped with the Krupp-Atlas SLW-83 combat information system, built around an upgraded DBQS-21D sonar, and the DM2A3 antiship, antisubmarine torpedo. The Bundesmarine will purchase at least twelve new, long-range, maritime-patrol ASW aircraft, variants of the US Navy Long-Range Air ASW Capability Aircraft, the Lockheed P-7A.

Taking into consideration Germany's economic power and formidable defense contributions, Bonn's allies now are demonstrating what experts say is new attention to West German views on strategic affairs.

For example, analysts point to slow and cautious development of SACEUR's Follow-On Forces Attack concept for the conventional defense of western Europe. FOFA's more aggressive features have been toned down to allay German political concerns.

Just as the realities of German national power have kindled a new purposefulness in Bonn, long-standing German vulnerabilities and weaknesses impart a new sense of urgency on many issues.

Today, the most obvious and by far most significant manifestation of new German assertiveness concerns Bonn's reaction to Kremlin initiatives under Gorbachev. "Gorbymania," present to some degree in all Western nations, is epidemic in the Federal Republic. While it is still possible in Washington, London, and Paris to regard the Soviet leader's peace overtures skeptically, many Germans have embraced his arms-control, disarmament, and trade ideas almost without reservation.

Three Motivations

Three factors account for mounting West German insistence on striking an independent pose on this critical East-West issue.

The first is a military security problem like none other. Gen. Eberhard Eimler, when he was Chief of Staff of Germany's Air Force, described the situation vividly:

"Two-thirds of all Soviet forces are stationed in Central Europe or in the western part of the USSR. There is no other part of the globe where so many military bases, troops, weapon systems, and nuclear warheads are concentrated as at this line dividing the two power blocs. The Federal Republic of Germany extends from south to north over 625 miles, . . . the longest common border with the Warsaw Pact. The average width of the Federal Republic of Germany from east to west is not more than 135 miles, a distance any modern aircraft can cover in less than fifteen minutes. About eighty percent of our industries are situated in a strip no more than 100 miles deep along the Iron Curtain."

The West German public and major politicians alike are preoccupied with the need to reduce this threat to German security. Gorbachev is widely viewed as the best chance for peace and worthy of strong Western support.

Foreign Minister Hans-Dietrich Genscher has maintained that the West must move swiftly to help Gorbachev in his avowed effort to change Soviet society. In June, West Germany and the Soviet Union pledged in an East-West document to strive for disarmament and intensify cooperation. Signed by Gorbachev and West German Chancellor Helmut Kohl, the statement commits their nations to seek "a peaceful European order or a common European home."

This preoccupation with the promise of peace held out by Gorbachev accounts, in part, for lukewarm German support for modernization of short-range nuclear missiles in Germany. In April, the two strongest supporters of the plan, the US and Britain, gave in to Bonn's demands that NATO put off a decision on deploying a new, longer-range version of the Lance missile. Many Germans view the step as needlessly provocative.

Then Bonn surprised Washington by calling for immediate negotiations on the missiles despite prior

—USAF photo by SrA. Nancy Smelser

The West German team was the overall winner of Airlift Rodeo '87—a testament to the quality of training and motivation of the Luftwaffe's 109,000 highly professional personnel. Here, a German Transall C-160 taxies off after making its assault landing during the competition.

The fate of NATO and reform in eastern Europe are sure to be affected by the Federal Republic's growing role in East-West affairs. West Germany's independent stance is motivated by military security considerations, economic factors, and the "German Question": Can and should the two Germanies be reunited?

US and British calls for the Soviet Union to reduce its conventional superiority in advance of any new missile negotiations. The Allies papered over their dispute at the May NATO summit in Brussels, agreeing to postpone the decision until 1991. While the argument has been pushed to the back burner until after German elections next year, it seems virtually certain to move to the forefront again.

On the question of military spending, West Germany once again is at odds with Washington. In the view of West Germans, the Soviet threat is fading fast and will continue to dissipate unless Gorbachev is backed into a corner by a Western buildup. Some experts note a growing German desire for what they call "burden-shedding," rather than burden-sharing. That notion contrasts with the US government view that Soviet power has not declined much, if at all.

The Factor of Trade

The second reason that West Germans are more enthusiastic than others about pursuing détente with Gorbachev is economic.

In Germany, there is conviction that economic prospects are emerging not only in Russia but also in east European markets. Germans are understandably loath to sacrifice their potential economic stake in East-bloc trade.

West Germany, Russia's top trading partner in the West, exports billions of dollars worth of goods to the Soviet Union each year; two-way trade fluctuates between $7.5 billion and $10 billion. Even so, exports to the Soviet Union account for only a small percentage of West Germany's total exports. Gorbachev has claimed that Soviet-German trade is lower than it should be, and he is seeking to expand it.

On a visit to Germany last June, Gorbachev issued a strong appeal to German business leaders to step up investment and trade with the Soviet Union. To help the process along, he signed a new accord expanding guarantees to German firms operating in Russia.

In the "satellite" nations of eastern Europe, West Germany is even more anxious to encourage developing political trends and to establish itself as an economic force. For several years now, Bonn has been promoting investments and trade in the region. One goal was to raise hopes in eastern Europe and defuse potential political explosions. The lure of economic advantage, however, is undeniable and growing more intense.

Western leaders encourage Bonn's initiatives—up to a point. The concern is whether Germany, perceiving national opportunities in the East, could one day find that its interests conflict with those of NATO as a whole.

The Pull From the East

The third reason for West Germany's unprecedentedly robust support for the Soviet leader is political. Over the past two decades, Bonn's policy of promoting better relations with Moscow and the East has enabled hundreds of thousands of Germans in the East to reach the West. West Berlin also has enjoyed relative tranquility.

Germans see in Gorbachev's reformist attitude a possibility to achieve progress on the central and most sensitive "German Question"—how to overcome the postwar division of the German state into capitalist West and Communist East.

Few expect early reunification of the two Germanies; slow development of greater cross-border ties is viewed as the maximum change allowable, given the concerns that a reunified Germany would arouse all across Europe.

Even so, long-term reunification has become the subject of the most widespread discussion in years. The Alliance's most recent policy document, for example, restates its view that true peace "will require that the unnatural division of Europe, and particularly of Germany, be overcome."

In Germany recently, US Ambassador Vernon A. Walters declared that the flight of East Germans to the West in recent months indicates that the Germanies may be reunited in the not-too-distant future. Diplomatic observers said it marked the first time a senior diplomat spoke of reunification as anything other than a theoretical, long-range possibility.

The sum of these factors is recognition, inside Germany and out, that Bonn is destined to play a key role in the unfolding of East-West affairs. At least for the next few years, the nation to watch is West Germany. ■

Vincent P. Grimes is Managing Editor of National Defense *Magazine. This is his first article for* Air Force *Magazine.*

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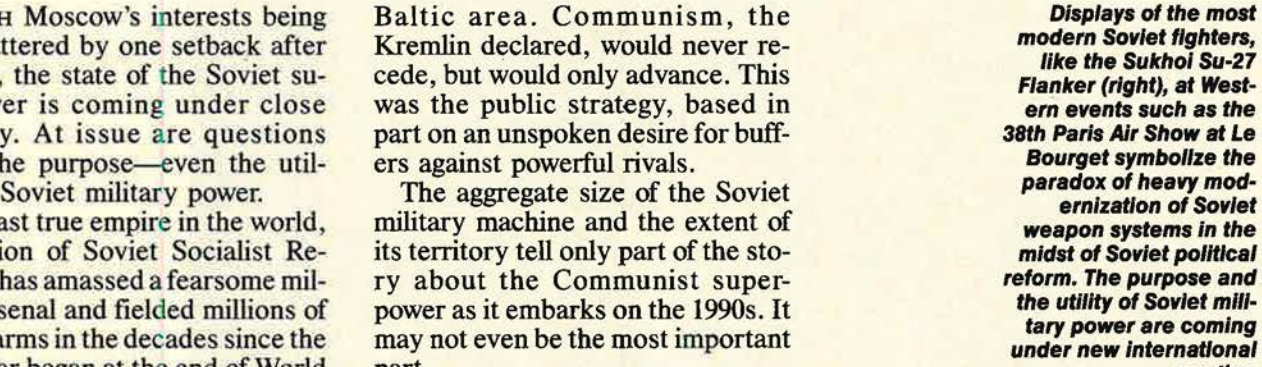
The net result of Mr. Gorbachev's reform is unclear. The USSR has become even more of a military powerhouse on his watch.

The Soviet Empire Seeks a Course

BY THOM SHANKER



—Photo by Erik Simonsen

Displays of the most modern Soviet fighters, like the Sukhoi Su-27 Flanker (right), at Western events such as the 38th Paris Air Show at Le Bourget symbolize the paradox of heavy modernization of Soviet weapon systems in the midst of Soviet political reform. The purpose and the utility of Soviet military power are coming under new international scrutiny.

WITH Moscow's interests being battered by one setback after another, the state of the Soviet superpower is coming under close scrutiny. At issue are questions about the purpose—even the utility—of Soviet military power.

The last true empire in the world, the Union of Soviet Socialist Republics has amassed a fearsome military arsenal and fielded millions of men at arms in the decades since the Cold War began at the end of World War II. Depending on who is doing the talking, the Soviet Union is conceded to have either the first or the second mightiest military force on earth.

As the partner of the ruling Communist Party, the Soviet military has been aided by internal militia and KGB secret-police shock troops in maintaining order and securing cohesion in a land that is really many nations within a common border, spanning eleven time zones and encompassing more than 100 ethnic groups.

Since 1917, Soviet forces have taken small nibbles and big gulps from Central Asia, the Caucasus, Finland, eastern Europe, and the Baltic area. Communism, the Kremlin declared, would never recede, but would only advance. This was the public strategy, based in part on an unspoken desire for buffers against powerful rivals.

The aggregate size of the Soviet military machine and the extent of its territory tell only part of the story about the Communist superpower as it embarks on the 1990s. It may not even be the most important part.

Economic and Political Rot

The other reality of today's USSR is political rot. The German strategist Clausewitz noted long ago that physical aspects of military power—troops and weapons—"seem little more than the wooden hilt" of the sword of war, "while the moral factors are . . . the real weapon, the finely honed blade." At no time in memory has the hilt of Soviet military arms been so tenuously attached to the sword of public will.

When Mikhail Gorbachev came to power in March 1985, he inherited a nation that could not feed itself, had suffered years of zero economic growth, and faced the pros-

pect of being relegated to Third World status by 2000 in every realm save military power. He has preached radical restructuring of society, with particular emphasis on the economy and intellectual life.

Things aren't going very well. Democracy, as Gorbachev now knows, is messy. The move toward openness and diffusion of power has prompted minorities in Kazakhstan, Armenia, and Georgia to take to the streets. Baltic states seek national autonomy, even independence. Even full-blooded Russians are rebelling; witness the coal miner strikes this past summer.

Discontent within Warsaw Pact nations resulted in the appearance in Poland of the first non-Communist prime minister in forty-five years. Similar ferment is visible in Hungary. Stalinist hard-liners in East Germany, Romania, and Bulgaria, meanwhile, hope for a quick retreat from *perestroika,* Gorbachev's catchall name for his social and economic restructuring.

In short, the empire shows signs of crumbling. The Kremlin certainly retains the capacity to retract *perestroika* and return to business as usual. However, as matters stand, Western military experts see both dangers and opportunities in the growing turbulence that now has become the hallmark of Soviet politics.

The central criterion used by the USSR when judging the correlation of forces was provided by dictator Joseph Stalin. Hearing that the Vatican might play a useful role in defeating the Nazis, Stalin is said to have sneered: "The Pope? How many divisions does the Pope have?" Today, in Washington and Moscow and other capitals around the globe, a new twist on Stalin's formulation is being posed as the real test of whether the Cold War can come to an end: How many divisions will Gorbachev have?

Reasonable Sufficiency

Gorbachev has broken the back of Soviet Communist Party orthodoxy, shocking the world and his own generals by calling for unilateral military cutbacks and by redefining Soviet military policy. He has attempted to rewrite Soviet military doctrine with a ground-breaking theory of "reasonable sufficiency," accompanied by pledges to reduce Soviet forces and lessen the importance of military power as a tool of foreign policy.

Gorbachev first raised the banner of reasonable sufficiency during the 27th Communist Party Congress in Moscow in 1986. He declared, "We can never be secure while the United States feels insecure." Three years later, he elaborated on his planned changes in Soviet strategic posture during a landmark address to the United Nations. "It is clear today that the increase of military force does not make any single power all-powerful. A one-sided emphasis on military force, in the final analysis, weakens other elements of national security."

In principle, he seemed to say, the concept of reasonable sufficiency would set concrete levels of manpower and weapons such that neither superpower could mount a surprise attack or launch offensive operations, but which would allow both to possess adequate troops and armament to rebuff an attacker.

The underlying logic of reasonable sufficiency can be traced directly to the stagnant Soviet economy and Gorbachev's desire to bring his country to superpower status in some way other than measurements of military power.

Depending on whose figures are used, militarization continues to devour anywhere from fourteen to twenty-five percent of the USSR's annual gross national product, compared to only about six percent in the US. The Brezhnev era, now denounced as "the period of stagnation," left as its legacy a tottering technological base that even conservative Politburo members are forced to admit is unable to compete with the West in sophisticated weaponry and computers or civilian industrial and consumer goods.

The Central Intelligence Agency, in conjunction with the Defense Intelligence Agency, prepared a recent study in which top Sovietologists report that Gorbachev's plan produced poor results in its first four years, the span of a US president's first term in office. The intelligence report noted that, although Gorbachev "remains committed to his original vision of a revitalized Soviet economy, he has apparently concluded that he cannot realize this vision as rapidly as he once thought possible, nor proceed directly along the path he initially planned to follow."

In an ominous note, the agencies said Gorbachev has plotted a "midcourse correction" because of "growing popular discontent" over empty market shelves and a standard of living that refuses to improve despite the dust being kicked up by *perestroika.*

—TASS/Sovfoto

Having fought an unpopular war in Afghanistan, this young Soviet soldier may find alienation at home similar to that encountered by US veterans of Vietnam. A Supreme Soviet committee has been formed to help young veterans readjust in the face of civilian guilt and ambivalence regarding USSR's Afghan involvement.

—TASS/Sovfoto

Warsaw Pact reactions to Soviet President Gorbachev's policies have varied. In Poland, political discontent, encouraged by the changes in the USSR, resulted in the election of Poland's first non-Communist prime minister in forty-five years. Here, Gen. Wojciech Jaruzelski greets the Gorbachevs at the Warsaw airport in July 1989—just before the election.

Born of economic crisis, the concept of reasonable sufficiency is, in theory, a watershed in Soviet military thought. For decades, the Soviets have felt compelled to maintain a force vast enough to mount an offensive or counteroffensive capable of sweeping Europe, to build an awesome nuclear force, to back surrogates such as Libya and Syria, and even to intervene directly, as they did in Hungary, Czechoslovakia, and Afghanistan. If Gorbachev is to be believed, those policies no longer apply.

US Hopeful but Wary

Washington remains wary. The Bush Administration has countered Gorbachev at Vienna with the Conventional Armed Forces in Europe (CAFE) plan to cut NATO and Warsaw troops to equal and much-reduced levels. At the same time, President Bush and the Pentagon leadership adopted a cautious approach, applauding Gorbachev's reforms while stating that more proof of long-lasting military restructuring is required.

Nowhere is the high-level uncertainty in Washington more evident than in the tentative assessments of Secretary of Defense Richard Cheney. Initially, he predicted that Gorbachev "would ultimately fail" and would be "replaced by somebody who will be far more hostile" to the West. Later, he softened his tone, saying there is no question that "we may—I would emphasize may—be on the verge of fundamental shifts . . . in US-Soviet relations. I think it would be fair to say that the likelihood of war between the US and Soviet Union is probably less today than at any time in the postwar period." When once again confronted with Gorbachev's peace and public-relations offensives, Cheney again altered his tone. The new view was expressed in a major speech to the Veterans of Foreign Wars.

"I wish I could stand before you and say that the Soviet strategic threat has been reduced over the past five years," Cheney said, noting that Soviet arms spending has continued to grow under Gorbachev. "But it has not. If anything, the United States is facing a more formidable offensive strategic arsenal today than before Mr. Gorbachev took power."

The negative US responses rankle military commentators in the USSR, who stress that Gorbachev remains firmly in control and who point to what they describe as historic, unilateral steps taken by Moscow to alter its strategic footing and prove that reasonable sufficiency is more than hot air.

Andrei Kokoshin, the number two analyst at Moscow's prestigious Institute for the Study of the USA and Canada, has a ready list of Gorbachev's accomplishments in curbing the Soviet military. He cites withdrawal of Soviet troops from Afghanistan, support for an agreement to remove Cuban troops from Angola, abolition of the rank of marshal in peacetime, and the thin-out of forces along the Sino-Soviet border to reduce tensions with China.

However, it is the Central Front in Europe, where NATO and Warsaw Pact forces come face to face, that is the prime focus of US military strategy. Gorbachev's announcements of prospective unilateral cuts in Europe have crystallized the debate over Soviet military power.

In his United Nations address, Gorbachev promised to cut 500,000 troops from the Soviet military, almost ten percent of his men in uniform. Six tank divisions are to be withdrawn from East Germany, Czechoslovakia, and Hungary, Gorbachev pledged. In all, 10,000 tanks, 8,500 artillery pieces, and 800 combat aircraft will be removed from eastern Europe and Soviet territory west of the Ural Mountains, the dividing line between the European and Asian regions of the Soviet Union.

The unspoken agenda of Gorbachev's speech came through loud and clear: Once these cutbacks have been completed, the USSR and its Warsaw Pact allies will no longer be able to conduct a blitzkrieg across Western Europe.

Unequal Cuts

A blemish was discovered on these attractive developments last August when a congressional panel touring East Germany was told by a Soviet general that not all elements of the six tank divisions would be withdrawn under the unilateral pullback. Important hardware, including air defense weapons, artillery, and armored personnel carriers, would remain in eastern Europe under new assignments to existing units said to be undergoing restructuring to a more defensive posture.

Startling Western Kremlin-watchers who count rubles in the Soviet defense budget, Gorbachev told a visiting delegation last January that military spending will be cut by 14.2 percent over the next two years and that a number of defense factories will be converted to production of consumer goods.

Gorbachev's promise to cut military spending also remains somewhat ambiguous. Soviet officials, including Premier Nikolai Ryzhkov and Defense Minister Dmitri Yazov, have given breakdowns of the Soviet military budget. Senior Pentagon and intelligence officials argue that these figures do not include a full accounting of rubles spent on research and development, repairs and overhaul—or the huge sums spent to procure new weapons.

Even former Marshal of the Soviet Union Sergei Akhromeyev, the principal military advisor to Gorbachev, concedes that statistics issued by his colleagues do not tell the full story. In an unprecedented appearance before the House Armed Services Committee last summer, the bemedaled veteran of World War II and the Afghan conflict conceded that Defense Ministry officials in Moscow would be unable to tabulate military spending accurately until there is a loosening of state controls that place absurdly low, fixed prices on raw materials and finished goods.

In fact, Akhromeyev recently reported that the newly empowered Committee on Defense and Security, part of the Soviet Union's new parliament, will soon conduct the first-ever, full-scale hearings into the USSR's defense budget.

In Washington, there continues to be healthy skepticism. "We think that cuts are coming," explains Paul Wolfowitz, the Pentagon's new Under Secretary of Defense for Policy. "But I think even [Soviet leaders] are not so clear about what they are cutting or how far and how fast. Remember, too—the Soviets are cutting from extraordinarily high levels to begin with."

—TASS/Sovfoto

Air Force Gen. Robert Herres, Vice Chairman of the Joint Chiefs of Staff, said he believes the ultimate goal of Gorbachev's military reforms would be to trim the fat from a wasteful defense bureaucracy to "make their forces more capable and effective and professional." The reason, he says, is that the Kremlin's military leaders have come to understand that Soviet armed forces are a "hollow instrument" without a strong, vibrant economy to underpin them.

"If restructuring can be used to streamline their military posture," he said, "I'm sure they will try to do that. Clearly, Mr. Gorbachev is not doing anything that he does not think is in the interest of the Soviet Union."

General Herres then said that the analysts who work for the Joint Chiefs of Staff will be looking for specific signs in Gorbachev's military restructuring to prove that the Soviet leader is transforming his forces to a defensive posture. These include the reduction of bridging equipment, which would be used to cross rivers in Germany in a European offensive; cuts in spare parts, fuel, and ammunition stored in Po-

—TASS/Sovfoto

Almost everyone agrees that Soviet force cuts will be made, but no one agrees on what that will mean. Gorbachev has promised to withdraw six tank divisions from eastern Europe, for example, but much important hardware will be reassigned to units left behind. Above, Soviet main battle tanks; top right, a MiG-29 Fulcrum.

—TASS/Sovfoto

Gorbachev first aired his theory of reasonable sufficiency during the 27th Communist Party Congress in Moscow in 1986. He discussed it further in an address to the United Nations in late 1988: "The increase of military force does not make any single power all-powerful. A one-sided emphasis on military force . . . weakens other elements of national security."

land and East Germany, vital to sustaining an offensive; and demobilization of mobile radar and air-defense units, needed to protect land forces from air attack.

Moving Back From the Brink

Despite lingering uncertainties and ambiguities, congressional leaders and civilian military analysts are redefining national security to respond adequately to Gorbachev's new military thinking.

Rep. Les Aspin (D-Wis.), Chairman of the House Armed Services Committee, says the US must prepare for the possibility that its relationship with the USSR will someday reflect a step back from direct confrontation. "The question is how to respond to Gorbachev's initiatives, fashion a defense budget to protect against changes in the Soviet Union, and still be prepared for other things that can go wrong in the world," Aspin said.

The moderate Democrat has his own ideas of how to do this. Advocating a defense program for "this time of promise, this time of uncertainty," Aspin laid out a strategy for military spending on national defense whose "first phase makes cuts that can quickly be reversed if things in the Soviet Union take a U-turn." Initial reductions should trim readiness, operations, and maintenance spending. Only in subsequent budgets, when American policymakers are convinced that military reform has taken hold in the USSR, should personnel and weaponry be reduced, Aspin said.

This back-from-the-brink theme is echoed by Richard Perle, the hawkish Assistant Secretary of Defense for International Security Policy during the Reagan arms buildup. He maintains that it is crucial for military planners to take advantage of the warming East-West climate to funnel more money into "generic technologies."

"We now are in a period of relative tranquility," Perle said. "We might be better advised to take risks in the short term—like cutting the standing army—in order to protect America's technological base for the turn of the century, which more likely will be a period of uncertainty."

Analyst James Blackwell of Washington's Center for Strategic and International Studies calls for "a fundamental reassessment of the roles and missions" of the US military. This review, he claims, should be prompted not only by the glimmer of reduced tensions with the USSR, but by the fact that America's security interests will more likely be threatened in future years by terrorism, low-level violence in the Third World, and the buildup of ballistic missiles, nuclear warheads, and chemical weapons in developing countries.

Blackwell said Pentagon planners should be reviewing the need for more flexible and mobile forces to better deal with such crises as American hostages in Iran, the mining of the Persian Gulf, or keeping a cease-fire in Beirut.

Though the Soviet empire may be fraying at the edges, most strategic analysts are quick to make a critical point. So long as Moscow retains a sizable nuclear armory and a large, well-equipped conventional force—and no one believes that the Kremlin will do otherwise—the USSR will continue to rate as a military superpower and an exceptionally dangerous adversary. The Soviet Union may well be fated to remain a one-dimensional superpower, and the political utility of its military power may be on the wane, but the basic military problem that has long confronted the West isn't solved just yet, and likely won't be for some time. ■

Thom Shanker, who covers defense and national security for the Chicago Tribune *was the* Tribune's *correspondent in Moscow from 1985 to 1988. His most recent article for* Air Force *Magazine was "Inside Gorbachev's Russia" in the March '89 issue.*

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Chinese troops, stunned by their orders, performed badly. The people no longer trust them, and that's only the beginning of the PLA's problems.

The Losses in Tiananmen Square

BY HARLAN W. JENCKS

WITH its June massacre of 3,000 civilians in Beijing, the People's Liberation Army betrayed a special trust that the people of Communist China had always placed in their armed forces.

The loss of popular faith in the PLA—the single most profound effect that the massacre has had on China's civilian-military relations—has significant strategic implications. In the aftermath of the shootings, the PLA faces not only worsening morale but also new barriers to further professionalization of the Chinese officer corps and acquisition of modern weapons.

When PLA units approached Tiananmen Square late on June 3, they were prepared to shoot, although few in China on that night could have guessed that the troops would use deadly force.

Faith in the PLA was evident to anyone in China at the time. In Nanjing on May 21, the day after China's hard-line leaders declared martial law in Beijing and ordered the PLA to clear Tiananmen Square, banners could be seen declaring "Long Live the Liberation Army!"

The PLA had not resorted to bloodshed, and everyone agreed it would not. It was, after all, the *people's* army.

Thus, it came as a huge shock when PLA armored units brutally crushed the Beijing student demonstration. Chinese leader Deng Xiaoping perceived a serious threat to his regime and used the only tool powerful enough to defeat it: military force.

When civilian leaders use military force, military leaders do not always achieve new political influence. In China, the signs are that they have not.

While PLA soldiers patrol the streets, it is the People's Armed Police (PAP) and Security Police who are entrusted with conducting arrests and executions.

Authorities have moved soldiers into some government agencies deemed to have been too "bourgeois liberal" during the demonstrations. Shao Huaze, Director of the Propaganda Department of the PLA General Political Department, has taken over as editor of *People's Daily,* the leading national newspaper.

The Type-69 tanks faced by this demonstrator probably belong to the "pro-democratic" 38th Army. To deflect public resentment from troops still occupying Beijing, Deng Xiaoping and the PLA have encouraged confusion as to which units actually suppressed the "counterrevolutionary" demonstration.

—Reuters/Bettmann Newsphoto

At the national-elite level, however, the military's power has changed remarkably little. The new ruling Politburo, elected in late June by the Central Committee of the Communist Party, contains no new military men. Even President Yang Shangkun and Defense Minister Qin Jiwei, Politburo members with PLA backgrounds, are both career political commissars.

—Reuters/Bettmann Newsphoto

Beijing residents offer bread to PLA soldiers after barring them from reaching Tiananmen Square. Chinese citizens believed that the people's army was on the side of the people. Now the PLA faces disastrous morale problems and formidable barriers to officer professionalization and weapons modernization.

Over the past decade, foreign observers have noted a tremendous increase in professionalism within the Chinese officer corps. There has been modest but significant modernization of its hardware and logistics. Also noted were improvements in doctrine, training, and—especially—the personnel and educational systems.

Back to Politics

This trend saw a major decline in PLA political indoctrination and a marked reduction in the influence of Chinese political commissars over professional commanders.

From the perspective of the hardliners, however, one of the major shortcomings of the PLA during the Tiananmen crisis was that it was not politicized enough. The massacre and the return of the PLA to the center stage of Chinese politics have turned back the clock on the past decade's military reforms. Within the uniformed military, political indoctrination and commissar influence have risen.

Defense Minister Qin and three military region commanders reportedly were arrested on August 15. So far, however, post-massacre purges within the PLA have been mild. Deng, Li Peng, and Yang Shangkun have lost too much face to rule without the support of professional senior officers, and economic reforms cannot continue without senior civilian moderates. But the growing demand for political orthodoxy is clear.

The military high command avoided taking sides in the internal political debate that preceded the massacre and seemed to hesitate about whether to obey orders from authorities other than the Central Committee. There were instances of military and police commanders refusing orders from supposedly retired Party elders ("proletarian revolutionaries of the older generation") who took *de facto* control of the government.

In late May, reports circulating in China had it that one senior PAP commander in Beijing refused to suppress the student demonstrations because, in his view, the order was illegal. Partly for the same reason, the Commander of the prestigious 38th Group Army, Beijing's elite garrison unit, demurred and then resigned when ordered to crush the demonstrations.

A decade ago, raising the issue of legality would not have occurred to a Chinese officer. During the crisis in the spring and summer, it was one of several ways senior soldiers tried to keep the military out of the political arena.

On May 21, the day after the declaration of martial law, the two surviving Marshals of the PLA, Xu Xiangqian and Nie Rongzhen, published statements which, while calling for civil order, warned that the PLA should not resort to bloodshed.

Then 150 active and retired commanders submitted a cautionary letter to Deng and the Central Military Commission. Signatories reportedly included Defense Minister Qin and Chief of the General Staff Chi Haotian, as well as senior retired soldiers. They declared that the PLA should not kill protesters. This was an explicit rejoinder to Deng's earlier injunction that the PLA must be willing "to spill some blood" to restore order.

The PLA's disinclination to crush the demonstrations does not mean it supported the students' ideas. Many officers who opposed violent suppression also opposed the political reforms. There may be some liberals among junior and field-grade officers, but there are few, if any, in the high command. For the most part, the generals and senior officers want law and order. They opposed violent repression principally because they knew it would lead to new problems.

In the end, few commanders disobeyed. Despite their reservations, the vast majority of officers fell in line once the "gang of elders" gained control and gave unambiguous orders. PLA officers believe that a unified army, even one enforcing bad policy, is still preferable to a divided army at war with itself.

Spreading the Involvement

In the US, there is a popular notion that President Yang Shangkun is installing a "Yang family dynasty" at the helm of the Chinese military establishment. This is a clear overstatement.

President Yang has close ties to the Chinese military. His brother Yang Baibing, who is Director of the PLA's General Political Department, also sided with the hard-liners. Even so, the "Yang dynasty" thesis rests mainly on the belief that the 27th Group Army, commanded by the President's nephew, Yang Jianhua, singlehandedly rescued the regime and suppressed the demonstrators after the 38th Group Army refused.

In fact, the 27th Army was not the only force in the streets. By June 3, Deng had brought elements from all over China into the capital, probably to prevent any one army or regional commander from dominating Beijing. Some 200,000 troops, representing fourteen of the PLA's twenty-four Group Armies, were in the area.

Most of the carnage was wrought by tanks and mechanized infantry. In the now-famous news footage, a lone unarmed student demonstrator faced down a column of new Type-69 tanks. The 27th Army has few armored vehicles and no Type-69s. The tanks probably belonged to the "pro-democratic" 38th Army. The regime and the PLA have encouraged the misperception. This deflects popular resentment away from troops occupying city streets and bolsters President Yang's side in political infighting.

The troop buildup in Beijing in May was smooth and professional, but troop behavior and fire discipline during and after the massacre were terrible. The troops, who never expected to be in such a situation, were confused. So, it appears, were military leaders at all levels. Command and control was inadequate.

Neither the troops nor their officers had any idea how to suppress a civil disturbance with minimum bloodshed, and there is little indication that they tried to minimize it once the shooting started. There was very little tear gas in evidence and no shields, batons, water cannons, or other riot-control equipment. Nor was there any indication of riot-control training or tactics.

Soldiers had been kept ignorant about the demonstrations, forbidden access even to official national news media. They were told there was a "counterrevolutionary rebellion" in Beijing, but they found only common people demonstrating. The hard-line leadership took steps to prevent the troops from talking to citizens. Troops in the lead were ordered to advance rapidly and shoot anyone in their way. Those in the rear were ordered to fire on any troops in front who hesitated.

It seems that once they had blood on their hands, the soldiers became committed to their work. Old revolutionaries like Yang and Deng had exploited this psychological dynamic decades before in Communist campaigns against internal rivals. In fact, one reason for bringing in units from all over China may have been Deng's desire to bloody the hands of senior commanders.

Many soldiers, especially those turned back by the citizenry before June 3, probably realize now that the senior leaders lied to them. In any case, the high command quickly withdrew from the city those troops that did the shooting. A current campaign praising the PLA for "defending the capital" is intended as much to repair military morale as to fool the people.

Even before the spring crisis, the PLA had serious morale problems. Military modernization was assigned the lowest priority among the nation's "Four Modernizations." The official 1988 defense budget was the equivalent of $5.87 billion. That is about six percent of China's national economic output, down from a high of fifteen percent. The PLA cut manpower levels from 5,000,000 in 1979 to 3,000,000 today.

Because of the low budget levels, most PLA units went into business in the mid-1980s, creating what the *Economist* has termed an "entrepreneurial army." Units are expected to "operate at a profit" by

—Reuters/Bettmann Newsphoto

A worker is helped through the crowd in Tiananmen Square after a clash with soldiers outside the Great Hall of the People last June 3. He is carrying one of the soldiers' helmets, perhaps as proof of the PLA's active role in suppressing the protest.

—Photo by Erik Simonsen

US development of electronic upgrades for the Chinese F-8II (above) has been suspended. PLA weapons and training programs continue to suffer as a result of post-massacre international economic sanctions. International financing and contacts have also been lost to Chinese power, transportation, and industrial development.

peddling various kinds of commercial production and services.

The Policy Backfires

This policy is backfiring. Soldiers are routinely shunted aside in favor of paying customers by the PLA's own hostels, transportation units, and even hospitals. An Army photographic unit is reported to have sold pictures revealing state secrets. Some soldiers have been allowed to take more profitable civilian jobs, provided they forfeit their military pay and funnel kickbacks to the unit.

Waste and corruption are growing. The pay of officers and soldiers was raised in 1988, for the first time in years, but even officers' pay still lags behind that of Chinese factory workers. Soldiers are impoverished, deprived of food, lodging, and basic services. Units conduct scant training because they spend most of their time and energy on self-sufficiency production and commercial enterprises. This lowers the prestige of the Army and hampers recruiting and retention. PLA units are vulnerable to local authorities and state enterprises, which extort illegal taxes and fees for goods, services, and real estate.

PLA regulations prohibit individuals from engaging in business but encourage units to do so. The boundaries are unclear, and the legal guidance is vague. Discipline and morale suffer in a climate of semiofficial bribery, profiteering, and "bureaucratic racketeering." Corruption almost certainly extends to the highest levels of the military.

For PLA professional commanders, the trend is worrisome. "If we permit such phenomena to develop," *Liberation Army News* recently stated, "what will happen to our PLA's discipline, style, and order of life? Is such a military worthy of its name? Will there be any combat effectiveness at all?"

The international community's post-massacre economic sanctions are already hurting PLA weapons programs and are going to hurt worse.

In the United States, electronic upgrades for China's F-8II have been suspended, as have sales of AN/TPQ-37 counterbattery radars, artillery-shell manufacturing technology, Mk 46 antisubmarine torpedoes, and CH-47 helicopters.

Grumman Aircraft has suspended work on an engineering feasibility study on upgrading the F-7 (based on the MiG-21) to a "Super-7" with American engineering and components. Chinese engineers working on the F-8II and Super-7 projects were excluded from Grumman facilities within days of the massacre.

China had been importing military electronics, missile technologies, naval guns, and automotive technologies from Switzerland and many NATO countries. All of this has been indefinitely suspended. Britain has banned further shipments of GEC head-up displays and weapon computers for the Chinese F-7M Airguard export fighter-interceptor. F-7M sales, a significant source of foreign exchange, will be lost. So will sales of the A-5M attack aircraft, for lack of French or Italian components.

A likely arena for further China-bashing is COCOM, the sixteen-member committee on control of exports to Communist countries. COCOM, whose membership includes all NATO members except Iceland, plus Japan, had liberalized restrictions on technology exports to China for ten years, but will likely tighten them again.

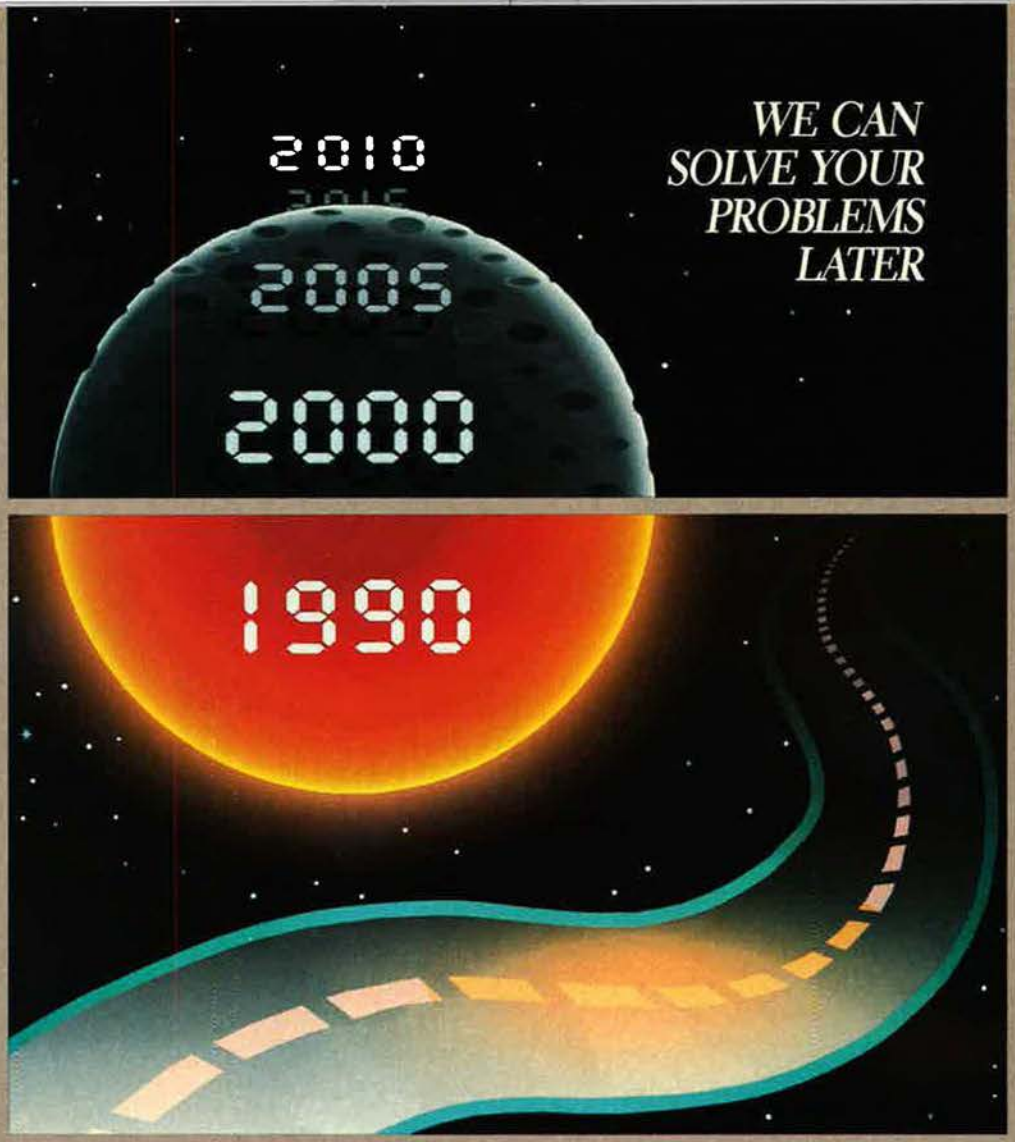
Financing and Contacts Lost

International financing is drying up. World Bank loans worth the equivalent of $780.2 million have been suspended, as has a $5.8 billion aid program from Japan. All that money was earmarked for Chinese power, transportation, and industrial development.

Contacts between the PLA and the US military have been suspended, cutting off training and educational and technical help. Two years ago, the PLA activated a major training range modeled on the National Training Center at Fort Irwin, Calif. A US Air Force training delegation visited the PLA and influenced Chinese pilot training.

In sum, the events of June were a disaster for the Chinese military. The PLA hoped that, within a decade, the economy and industrial base would be sufficiently modernized to permit improvement of weapons and equipment. The Beijing massacre changed that. The PLA will have to wait longer now, and things will never again be the same. ■

Harlan W. Jencks, a colonel in the US Army Reserve, is a research associate of the Center for Chinese Studies at the University of California, Berkeley. He last visited China in May of this year. This is his first article for AIR FORCE *Magazine.*



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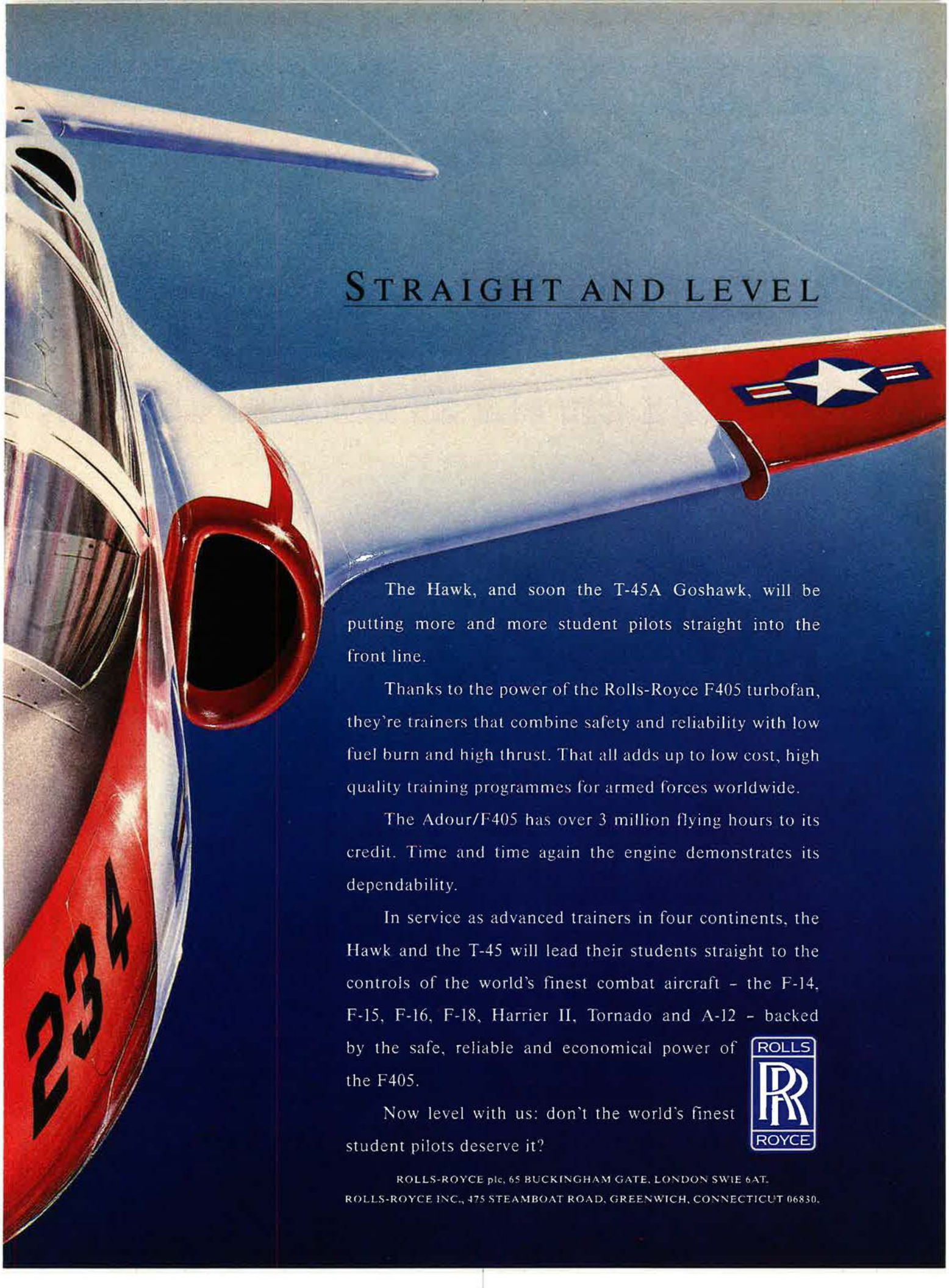

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More than 8,000 took part in the week's activities.

Accenting Youth and the Future

THE accent was on youth and the future at AFA's forty-third National Convention, held September 18–21 in Washington, D. C. In the keynote address, 2d Lt. Carl J. W. Long II set the tone for the Convention theme, "Youth of Today—Leaders of Tomorrow."

Lieutenant Long told the delegates that he and his colleagues particularly like three things about the Air Force: the responsibility, the camaraderie, and the pride they take in serving. He said that his own experience in the Air Force makes him feel that he stands a little taller, and "considering that I'm only five-seven, I need every inch of height I can get."

The keynoter is the son of AFA charter member and longtime National Director Carl J. Long of Pittsburgh, Pa. Lieutenant Long brought regards from his father, who for health reasons was absent from the AFA Convention for the first time since 1948.

Also addressing the Convention was 2d Lt. Kenneth Plaks, who ranked first in academics in the Air Force Academy graduating class of 1989. Short of money for college after he graduated from high school, Lieutenant Plaks enlisted in the Air Force instead, applied for the Academy while he was in tech school at Keesler AFB, Miss., and was stationed at Hahn AB Germany when he learned of his acceptance.

"Here I was, this twenty-year-old freshman, which is ancient by Academy standards, trying to compete against these geniuses," he told the Convention. "Fortunately, I had an ace in the hole. . . . My enlisted time had instilled in me a sense of duty. . . . Once I figured out that academics was now my duty, I threw myself into it."

The result was that he finished at the top of the class and the Air Force is sending him to MIT for graduate study.

Adding further to the emphasis on youth, the Aerospace Education Foundation presented a major report, "America's Next Crisis: The Shortfall in Technical Manpower," at a roundtable program on Wednesday of Convention week.

Election of Officers

Jack C. Price of Clearfield, Utah, was reelected for a second term as

— Photos by Paul Kennedy

Delivering the keynote address at the Opening and Awards Ceremony was 2d Lt. Carl J. W. Long II. He is the son of AFA charter member and longtime National Director Carl J. Long.

"America Sings!" performed at the Air Force Anniversary Dinner Dance. The group was right in sync with this year's Convention theme, "Youth of Today—Leaders of Tomorrow."

National President of the Air Force Association. Sam E. Keith, Jr., of Fort Worth, Tex., was reelected Chairman of the Board. Thomas J. McKee of Arlington, Va., was reelected National Secretary, and William N. Webb of Midwest City, Okla., was reelected National Treasurer.

Though the top AFA national officers will continue for another term, it was a year of major change for AFA's affiliate, the Aerospace Education Foundation. George Hardy, who at one time or another over the past forty years has held just about every office it is possible to hold in AFA and AEF, stepped down as Chairman of the Foundation Board. The incumbent AEF President, James M. Keck of San Antonio, Tex., was elected Chairman, replacing Mr. Hardy.

Gerald V. Hasler of Albany, N. Y., a former National President of AFA, was elected President of the Foundation. Reelected were Vice President Edward M. Crane, Jr., of New York, N. Y., Treasurer John R. Alison of Washington, D. C., and Secretary Walter E. Scott of Dixon, Calif.

Arthur C. Storz, Sr. Membership Awards

AFA's most prestigious membership awards are named after Arthur C. Storz, Sr., a former permanent AFA National Director, Life Member, and principal founder of Omaha's Ak-Sar-Ben Chapter. The Storz Membership Award, made possible through a generous endowment to the Association by his son, Art Storz, Jr., has been awarded for membership excellence based on criteria approved by AFA's Board of Directors for the year ending June 30, 1989.

Storz State Award

Virginia State AFA
R. Donald Anderson, President

An Active Week

More than 8,000 individuals took part in one or more of the Convention-related activities at the Sheraton Washington Hotel. The 383 registered delegates, representing forty-six states, Guam, and the District of Columbia, were joined by a host of others, including senior military and government officials, for the Aerospace Development Briefings and Displays program, featured speeches, and social events. On hand to cover the Convention were more than 220 journalists and other news media representatives.

President Bush sent AFA a letter expressing his best wishes for a "most productive and enjoyable meeting." The President noted that AFA members "not only help keep our nation strong but also serve as role models for young people. . . . AFA members recognize the importance of helping our nation's young people to grow in knowledge and character."

Evening highlights included a dinner honoring the Air Force's twelve Outstanding Airmen of the Year. The Air Force Anniversary Dinner Dance featured the group

Air Force Association's 1989 Unit Activity Awards

Donald W. Steele, Sr., Memorial Award
AFA Unit of the Year

Thomas B. McGuire, Jr., Chapter, New Jersey

Outstanding State Organization

North Carolina State Organization

Outstanding Chapters

Ak-Sar-Ben Chapter, Nebraska (more than 900 members)
Paul Revere Chapter, Massachusetts (401–900 members)
Roanoke Chapter, Virginia (151–400 members)
Panhandle Chapter, Texas (20–150 members)

Exceptional Service Awards

Charles A. Lindbergh Chapter, Connecticut (Aerospace Education)
Central Florida Chapter, Florida (Best Single Program)
Cape Canaveral Chapter, Florida (Communications)
Carl Vinson Memorial Chapter, Georgia (Community Relations)
Scott Memorial Chapter, Illinois (Overall Programming)

"America Sings!" and the USAF Band.

Meeting concurrently with the Convention were trustees of the Aerospace Education Foundation and USAF's command senior enlisted advisors, as well as AFA's Junior Officer Advisory Council, Civilian Personnel Council, Enlisted Council, Veterans and Retiree Council, and Reserve Council.

• *AFA Statement of Policy.* In a statement of policy entitled "Uncertainty, Flexibility, and Continuity," the Convention declared that "peace with freedom rests on a foundation of strength" and that the "underlying continuities" of uncertainty, flexibility, and preparation are the basis of a time-proven strategy—peace through strength—that has served the nation well.

The delegates recognized the currents of political change now taking place in the world, particularly in the Soviet Union, but cautioned that "the nation must be awake and alert, not only to the promise of international change but to the dangers as well."

The statement said that "flexible, responsive military strength has always been the underpinning of successful diplomacy. That will not change soon, regardless of the uncertainties of international politics. The capabilities of potential US adversaries have not changed, except to grow in more ominous ways."

• *Congressional Activity.* Twenty-two state delegations sponsored congressional breakfasts on Tuesday and Wednesday of Convention week. Fifty members of Congress attended. Among them were Sen. Sam Nunn (D-Ga.), Sen. J. James Exon (D-Neb.), and Sen. Jeff Bingaman (D-N. M.) of the Senate Armed Services Committee and Sen. Bob Kerrey (D-Neb.), Sen. Dennis DeConcini (D-Ariz.), Sen. Phil Gramm (R-Tex.), Sen. Jake Garn (R-Utah), and Sen. Don Nickles (R-Okla.) of the Senate Appropriations Committee.

Attending from the House Armed Services Committee were Rep. Andy Ireland (R-Fla.), Rep. Earl Hutto (D-Fla.), Rep. John Rowland (R-Conn.), Rep. Robert Davis (R-Mich.), Rep. Martin Lancaster (D-N. C.), Rep. Herbert Bateman (R-Va.), Rep. Owen Pickett (D-Va.), Rep. Norman Sisisky (D-Va.), Rep. James Hansen (R-Utah), and Rep. Dave McCurdy (D-Okla.) Attending from the House Appropriations Committee were Rep. Jim Kolbe (R-Ariz.), Rep. John Murtha (D-Pa.), Rep. Bob Livingston (R-La.), and Rep. Lindy Boggs (D-La.).

• *New in Office.* Five new National Vice Presidents were elected. They are R. Donald Anderson of the Central East Region, Alwyn T. Lloyd of the Northwest Region, Robert A. Munn of the Far West Region, Raymond W. Peterman of the Midwest Region, and Roy P. Whitton of the Southeast Region. Robert A. Fisette of Brussels, Belgium, was announced as Vice President for Europe.

Eight new National Directors—including several who have served in years past—will take their place

Named in Memorial Tribute

These are the names of the USAF and AFA leaders and supporters and aviation pioneers who died during the last year: Kathryn L. **Ahern;** Brig. Gen. (Msgr.) John F. **Albert,** USAF (Ret.); John B. **Allyn;** Maj. Howard K. **Austin,** USAF (Ret.); Col. William R. **Berkeley,** USAF (Ret.); Lt. Col. Hatfield C. **Brubeck,** USAF (Ret.); Jack N. **Burge;** Brig. Gen. Oscar F. W. **Carlson,** USAF (Ret.); CMSgt. Mark **Carter;** Rep. Bill **Chappell,** Jr.; Edna **Coward;** Rev. Robert D. **Coward;** Maj. Gen. Don O. **Darrow,** USAF (Ret.); Alan V. **Davies;** Brig. Gen. Clinton W. **Davies,** USAF (Ret.); Maj. Gen. Matthew K. **Deichelmann,** USAF (Ret.); Joe **Doolittle;** Lt. Col. Robert **Doyle,** USAF (Ret.); CWO Robert J. **Dunn,** USAF (Ret.); Gen. Richard H. **Ellis,** USAF (Ret.); Lt. Col. Jack A. **Flaig,** USAF (Ret.); Col. Edmund **Gosnell,** USAF (Ret.); Lt. Gen. Harold W. **Grant,** USAF (Ret.); Douglas E. **Graves;** Lt. Gen. Francis H. **Griswold,** USAF (Ret.); Joseph M. A. **Gumb;** Jim **Gump;** Marian S. **Haggerty;** CMSgt. Rod **Ham;** Maj. Gen. Haywood S. **Hansell,** USAF (Ret.); Col. Melvin L. **Harmon,** USAF (Ret.); Maj. Gen. W. Scott **Harpe,** USAF; Francis J. **Hicks;** Gloria **Hicks;** Maj. Gen. Donald R. **Hutchinson,** USAF (Ret.); Teresa **Jenkins;** Vernon A. **Johnson;** Carlyle H. **Jones;** Glendon **Jones;** Col. Richard K. **King,** USAF (Ret.); Charles J. **Klima;** Lee C. **Lingelbach;** John **Long;** Jan **Martowicz;** TSgt. T. D. **McCord,** USAF (Ret.); Rep. Bill **Nichols;** John P. **Nichols;** Bradley H. **Ostrow;** Maj. Gen. Jerry D. **Page,** USAF (Ret.); Tony **Panzarella;** Susan **Perini;** Gerald G. **Probst;** Col. Earl T. **Reichert,** USAF (Ret.); Brig. Gen. A. A. **Riemondy,** USAF (Ret.); Charles **Sattan;** Brig. Gen. Laverne G. **Saunders,** USAF (Ret.); Lt. Col. Clyde L. **Sawyer,** Jr., USAF (Ret.); Brig. Gen. Eugene D. **Scott,** USAF (Ret.); Brig. Gen. Tom W. **Scott,** USAF (Ret.); Maj. Gen. Albert A. **Shiely,** Jr., USAF (Ret.); Francis D. **Spaulding;** Col. Marvin M. **Stanley,** USAF (Ret.); Maj. Gen. Kenneth **Stiles,** USAF (Ret.); Jess W. **Sweetser;** Hon. W. Stuart **Symington;** Larry **Taylor;** Maj. Gen. Manning E. **Tillery,** USAF (Ret.); Elizabeth Whitney **Tippett;** Col. Bianca D. **Trimeloni,** USAF; William Thayer **Tutt;** Col. David **Van Poznak,** USAF (Ret.); Brig. Gen. George A. **Vaughn,** Jr., USAF (Ret.); Matthew C. **Walters;** Col. William T. **Whisner,** Jr., USAF (Ret.); Brig. Gen. Erskine **Wigley,** USAF (Ret.); Maj. Gen. Evelle J. **Younger,** USAF (Ret.).

Air Force Association's 1989 Community Partner Membership Awards

President's Award

This award was created to recognize the chapter that has recruited the greatest percentage of Community Partners (in terms of chapter membership). Chapters must have a minimum of fifteen Community Partners to be eligible for this award.

Lloyd R. Leavitt, Jr., Chapter, Michigan

Gold Awards

These awards were created to recognize chapters that have recruited a total number of Community Partners equal to or greater than two percent of their overall chapter membership. Chapters must have a minimum of ten Community Partners to qualify.

Ark-La-Tex Chapter, Louisiana
Cape Canaveral Chapter, Florida
Del Rio Chapter, Texas
Enid Chapter, Oklahoma
Fairbanks Midnight Sun Chapter, Alaska
Florida Highlands Chapter, Florida
General David C. Jones Chapter, North Dakota
General Ira C. Eaker Chapter, Arkansas
Inland Empire Chapter, Washington
Joe Walker Chapter, Pennsylvania
Langley Chapter, Virginia
Morgan S. Tyler Chapter, Florida
Ogden Chapter, Utah
Pope Chapter, North Carolina
Scott Berkeley Chapter, North Carolina
South Georgia Chapter, Georgia
Tennessee Valley Chapter, Alabama
Total Force Chapter, Pennsylvania
Ute Chapter, Utah

Achievement Awards

These awards recognize chapters that have recruited a total number of Community Partners equal to one percent of overall chapter membership. Chapters must have a minimum of five Community Partners to qualify.

Admiral Charles E. Rosendahl Chapter, New Jersey
Anchorage Chapter, Alaska
Barry Goldwater Chapter, Arizona
Burlington Chapter, Vermont
Cape Fear Chapter, North Carolina
Carl Vinson Memorial Chapter, Georgia
Central Florida Chapter, Florida
Central Missouri Chapter, Missouri
Central Oklahoma (Gerrity) Chapter, Oklahoma
Charleston Chapter, South Carolina
Colorado Springs/Lance Sijan Chapter, Colorado
Delaware Galaxy Chapter, Delaware
Eagle Chapter, Pennsylvania
Freedom Chapter, Pennsylvania
Golden Triangle Chapter, Mississippi
Guam-Arc Light Chapter, Guam
High Point Chapter, New Jersey
John C. Stennis Chapter, Mississippi
Lubbock Chapter, Texas
Major John S. Southrey Chapter, Massachusetts
Mid-Ohio Chapter, Ohio
Quad Cities Chapter, Illinois
Roanoke Chapter, Virginia
Robert H. Goddard Chapter, California
Tacoma Chapter, Washington
Tallahassee Chapter, Florida
Thomas B. McGuire, Jr., Chapter, New Jersey
Tucson Chapter, Arizona
Wright Memorial Chapter, Ohio

at the next meeting of the AFA Board. Charles G. Durazo and Jan M. Laitos were elected for three-year terms. Edward J. Monaghan, Donald D. Adams, and Daniel F. Callahan III were elected for two-year terms, and James E. Smith, Mary Ann Seibel, and Paul D. Straw were elected for one-year terms.

Two new Under-Forty Directors joining the AFA Board are Shelly D. Larson of Jamestown, N. Y., and Stephen M. Mallon of Hampton, Va.

For a complete list of National Vice Presidents and Directors, including those reelected, see "This Is AFA" on page 114.

• *Membership Report.* At a delegates' reception on Sunday of Convention week, National President Jack Price announced that while total membership had declined in the past year, the number of life members and patrons had increased by more than five percent, and that community partnerships were up by more than twenty-five percent.

• *Aerospace Education Foundation.* An artwork entry on "Why We Serve" won the Foundation's annual contest for presentations by Air Force Junior ROTC cadets. The winning entry was from Scotch Plains-Fanwood High School, Scotch Plains, N. J. Dr. Ben P. Millspaugh of Littleton, Colo., won the Christa McAuliffe Memorial Award for the year's outstanding math and science teacher.

• *Acknowledgments.* Parliamentarian for the AFA National Convention was Edward J. Monaghan. Edward A. Stearn was Sergeant at Arms. Inspectors of Elections were David L. Blankenship (Chairman), Earl D. Clark, Jr., and Joseph E. Assaf. Herbert M. West chaired the Credentials Committee, serving with Cecil H. Hopper and Bernard A. Walters.

The Association is particularly grateful to a corps of volunteers who assisted the staff in Convention support: Norm Aubuchon, Scott Boyd, Cecil Brendle, Douglas Franklin, Chuck Lucas, Mary Lucas, Laurie Nelson, Pierre Oury, Debbie Snyder, Dana Steinhauser, Angel Williams, and John Zipp.

The 1990 Convention will be held at the Sheraton Washington Hotel, Washington, D. C., on September 17–20. ■

Air Force Association's 1989 Individual Activity Awards

AFA Man of the Year

Oliver R. Crawford

Presidential Citations

Joseph E. Assaf
Gerald S. Chapman
Gerald V. Hasler
Cecil H. Hopper
Robert C. Newman, Jr.
Col. Donald L. Peterson
Corinna Petrella
Kenneth K. Robertson, Jr.
Walter G. Vartan
Glen W. Wensch
Roy P. Whitton

Special Citations

Air Force Electronic Warfare Center
American Legion Post 24
Gerald O. Black, Jr.
CDC Manufacturing, Inc.
Committee of the Eighties, Malmstrom AFB
Brig. Gen. Stephen B. Croker
Maj. Gen. Lewis G. Curtis
James A. Davidson
Charles G. Durazo
CMSgt. Wayne L. Fisk
H. B. "Buzz" Henderson
Robert A. Munn
Nation's Capital Chapter
Nellis AFB Honor Guard
Ohio State AFA
Nuel Sanders
Jean P. Schobert
Walter E. Scott
Edward A. Stearn
Jack Steed
James M. Still, Jr.
Patricia Turner
USAF Hospital, Mather AFB
James E. Young

Exceptional Service Awards

Donald D. Adams
R. Donald Anderson
Richard W. Asbury
Bruce Bauer
Carl Beck
Faye Beringer
Henry W. Boardman
Dan F. Callahan III
H. R. "Bobby" Case
Don Casteel
C. N. "Bud" Chamberlain
Ray Chuvala
Shirley Cleary
Horace W. Cook
CMSgt. James Craig
David R. Cummock
William B. Daly
Eric S. Doten
George Estrella
Stephen E. Finney
Richard A. Freytag
John R. Gilchrist
James Gleason
Dr. J. Rudolph Gossman
Robert W. Gregory
Joe Gyulavics
Tommy G. Harrison
Henry B. Hufnagel
Donald F. Kruse
John W. Lynch
James H. March
Steve Marsho
John T. McCarthy
Michael J. McGrevey
C. P. "Clem" Moore
Lyle T. Niswander
Walter B. Putnam
William T. Reynolds
Pat Schittulli
Andrew E. Sentgeorge
John J. Sherlock
Charles B. Spencer
Michael E. Stansell
Theodore J. "Ted" Stell
Harold A. Strack
Bobby G. Suggs
1st Lt. Tim Swanson
Kenneth L. Tallman
Mary Anne Thompson
James J. Wagner
Donald O. Weckhorst

Medals of Merit

Richard C. Anderson
Peter F. Ardizzi
Clarence Ashcraft
Clower F. Ashley
James W. Baldwin
W. E. Barrineau, Jr.
Steven L. Bartalsky
Carol A. Bartholomew
Mardis Barton
James H. Bassham
Edward L. Bishop
Harold Boston
Lt. Col. E. James Boyd
Scott E. Boyd
H. M. Branton
1st Lt. David Brescia
Carol Buford
CMSgt. Deborah S. Canjar
Brig. Gen. Shirley M. Carpenter
Ann M. Carswell
Homer N. Childs
Jose E. Clay
Paul M. Cleary
Alfred P. Cole
Stephen A. Conley
Carl S. Coulthard
Joanne Craig
John E. Craig II
William D. Curry, Jr.
George H. Damato
Norman E. Davis
Col. Roy A. Davis
Frank J. Debbout
Ben DeVane
Gary Diamond
Paul B. Eberhart
Donald A. Elliott
Joan A. Elliott
Robert G. Elliott
Martha V. Falcone
Eileen Franzese
Maj. Ronald D. Fuchs
Sid Fulgham
James E. Fultz
Norman E. Gallant
Carol B. Gallatin
Samuel M. Gardner
Max Goldsberry
CMSgt. Rodney L. Goodale
Elton W. Graham
Zane Harper
Allen G. Harris
Karen Hartman
E. A. Hastings
Edward J. Hayes, Jr.
Harold E. Henneke
Otto D. Henderson
Dean Hofstad
Edward V. Hudson
Clyde Jackson
Edwin A. Jackson
Bill D. Jeffries
Catherine K. Jenne
Maj. (Dr.) Chris P. Johnson
Marvin Jones
Paul G. Jubelt
Tony Kausal
Edward J. Kelly, Jr.
Maj. Gen. Philip G. Killey
Joseph R. Kuhlman
William A. Lafferty
Paul G. Layton
Preston A. Leap
E. Ray Leomazzi
A. R. Lewis
O. Wayne Lewis
Alwyn T. Lloyd
Kirk Loney
James S. Long
Raymond F. Maisch
Paul G. Markgraf
Ray J. Marsico
John S. Masterson
Noboru Masuoka
R. S. Maynard
Ivan L. McKinney
Charles K. Melby
Joseph A. Molony
Jack E. Moore, Sr.
Barbara Moreau
P. K. Nicolos
Jerry Nuss
John T. Parker
Albert Perez
John Petrovich
Robert J. Picknally
Thomas P. Poole
John R. Ransome
Perry Reimers
James A. Riccardi
William Rice
Robert B. Roit
CMSgt. Larry Sahr
Ben F. Schneider
Robert E. Schuldt
James M. Shipman
Howard S. Silber
Theodore R. Sparn
Joe S. Stafford
Lee R. Starrick
Albert E. Steensland
Michael J. Steger
John R. Stewart
Vincent Tampio
Lawrence H. Taylor *(posthumous)*
George J. Thom
Joseph E. Tucker
Emmett Venett, Jr.
Lou Villegas
Roland Von Miedel
James W. White
Capt. Martha Will
Capt. Paul A. Willard II

—Photo by Paul Kennedy

During Convention week, trustees of the Aerospace Education Foundation met and elected James M. Keck Chairman and Gerald V. Hasler President. George Hardy stepped down as AEF Chairman. Shown here in front of a Pratt & Whitney engine are (from left) Mr. Hardy, Mr. Keck, and Mr. Hasler.

Aerospace Education Foundation Fellowships

(Presented at September 18 Luncheon, Listed Alphabetically)

Individual Jimmy Doolittle Fellows	**Sponsors**
Donald D. Adams	Midwest Region
Benjamin S. Catlin	AFA National Officers and Directors
Kathryn G. Chapman	Gerald S. Chapman
CMSgt. Michael Di Gregorio, USAF	Paul Revere Chapter
Margaret Durazo	Virginia State AFA
Frecce Tricolori	Associazione Arma Aeronautica and North Babylon High Flight Club
New Mexico State AFA	New Mexico State AFA
M. N. "Dan" Heth	Fort Worth Chapter
Lt. Col. J. Scott Keegan, CAP	Dr. Arthur R. MacFadden
Richard K. King *(in memoriam)*	Friends and Loved Ones
Arley McQueen *(in memoriam)*	New England Region
Robert L. Puglisi	Ohio State AFA
Les J. Rose	Langley Chapter
Gen. John A. Shaud, USAF	Aerospace Education Foundation
Panhandle Chapter	Texas State AFA
Lt. Col. Dana Spears, USAF	Arnold Air Society/Angel Flight
Charles B. Spencer	Ohio State AFA
Harold B. Strach *(in memoriam)*	Harold A. Strack

Individual Ira C. Eaker Fellows	**Sponsors**
William A. Belanger	Anheuser-Busch, Inc.
CMSgt. Stanley R. Janesik, USAF (Ret.)	Nevada State AFA and Thunderbird and Dale O. Smith Chapters
Paul Markgraf	General E. W. Rawlings Chapter
Richard M. Skinner	AFA National Officers and Directors
Donald E. Zweifel	Vietnam Veterans Historical Association

Individual Barry Goldwater Fellows	**Sponsors**
Gen. William L. Kirk, USAF (Ret.)	AFA Chapters and Friends in Europe
W. R. Timken, Jr.	Mrs. H. H. Timken, Jr.

This is the Aerospace Education Foundation

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Hon. Barry Goldwater
George D. Hardy

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President
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William C. Rapp
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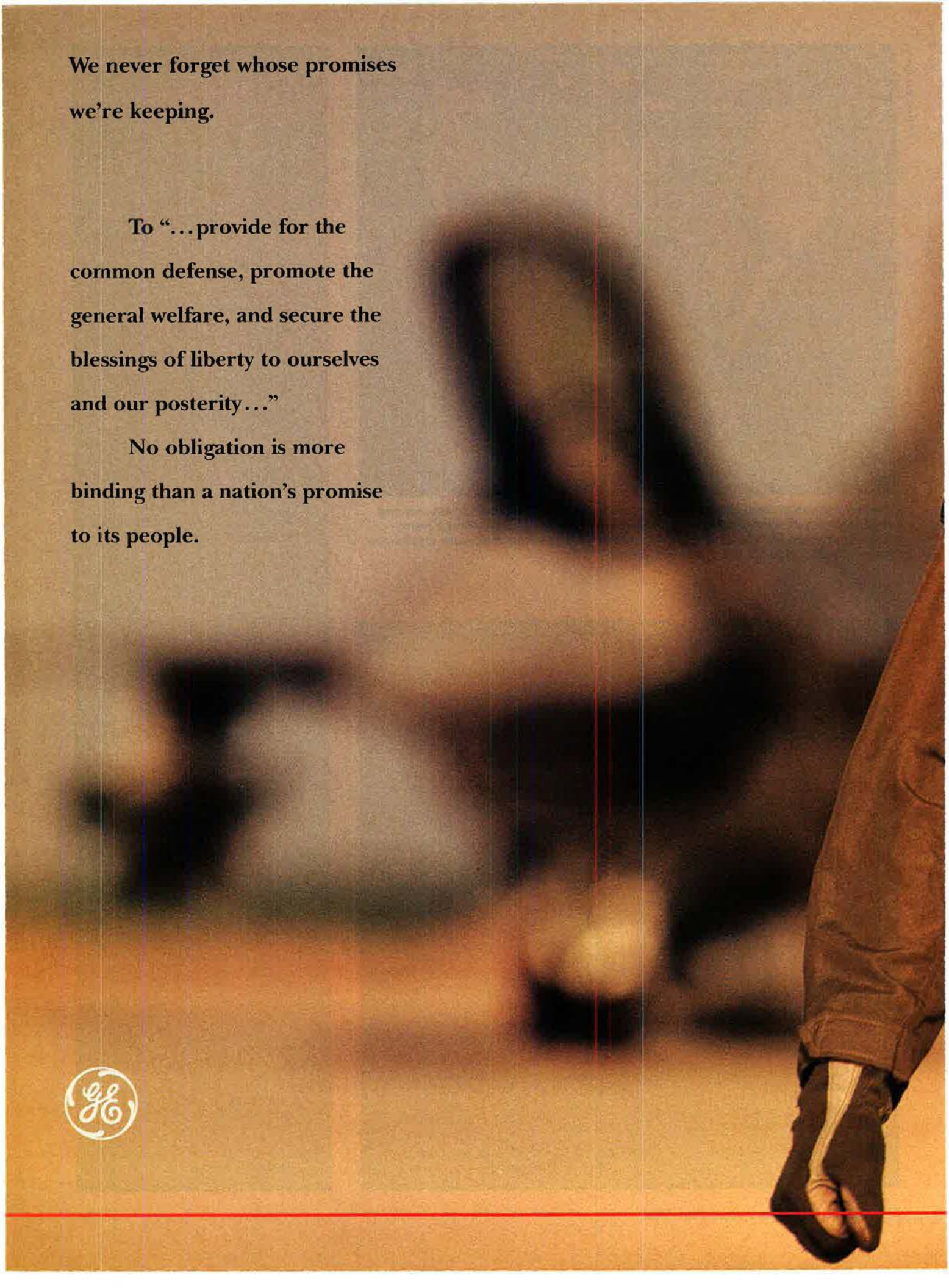

We never forget whose promises we're keeping.

To "...provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves and our posterity..."

No obligation is more binding than a nation's promise to its people.

GE Aircraft Engines
Keeping the Promise

Aerospace briefings and displays keep visitors current on defense systems.

Information by the Acre

Chief of Staff of the Air Force Gen. Larry D. Welch checks out the cockpit of the new C-17 airlifter at the McDonnell Douglas booth.

EVEN as Northrop's B-2 flew high above California, its pilot was briefing Washington listeners about the batwinged bomber.

Bruce J. Hinds, Northrop's chief test pilot, sat in the cockpit September 21 during a B-2 flight from Edwards AFB, Calif. At the same time, his videotaped image and voice drew large crowds to the Northrop exhibit at AFA's Aerospace Development Briefings and Displays in Washington, D. C.

Hinds, narrating footage of B-2 flights, told of the plane's unexpected quickness. "I put the throttles to just below maximum continuous thrust," he noted. "The airplane accelerated away. It really caught the chase airplanes by surprise. They just couldn't believe that this big an airplane could accelerate that fast."

For many of the visitors at AFA's 1989 exhibition, held September 19–21, Northrop's video was the first substantive look at the bomber. The B-2's handling qualities were described as being akin to those of a fighter.

The speed with which it gains altitude is reminiscent of the U-2. The layout of the B-2 cockpit, reported Hinds, is "very friendly." Side-by-side seating "cuts down a lot of the intercom traffic that you have in other large airplanes."

Expansion of the B-2's flight envelope is taking place "fairly rapidly," the test pilot contended. It has now gotten up to moderately high speeds and medium altitudes. The B-2's four General Electric F118 engines have turned in "exceptional" performance.

The Air Force-Northrop team has found few surprises. "Everything that we've done so far in flight test," said Hinds, "has been very close to what we predicted in our simulation."

The B-2 exhibit was only one of almost 100 contractor displays covering 1.2 acres of floor space at the Sheraton Washington Hotel. Half of the contractors also provided briefings. Among the highlights:

- **Advanced Tactical Fighter.** Both teams of ATF contractors displayed artist's renderings and furnished new details of their candidate aircraft—the YF-22A, being developed by Lockheed (teamed with Boeing and General Dynamics), and

—Staff photo by Guy Aceto

The briefings attracted military people from other services and other nations. Here, a Naval officer flies a model of Link's World War II-era instrument flight trainer.

—Photo by Paul Kennedy

the YF-23A, being developed by Northrop (teamed with McDonnell Douglas).

Lockheed officials said the company has scheduled rollout of its YF-22 prototype for March 15, 1990, with first flight to come soon after. Rollout and first flight of the Northrop entry could come even earlier, perhaps in January 1990.

Lockheed and its partners, in a joint film presentation, discussed manufacturing technologies involved in constructing its aircraft from the ground up. Northrop also emphasized the advanced manufacturing processes it has been using.

Word on the exhibition floor was that early ATF prototypes won't have thrust-vectoring engine nozzles. These are to be installed later.

• **Advanced Tactical Aircraft.** USAF's version of the Navy A-12A Advanced Tactical Aircraft (ATA) gained visibility. The plane is a stealthy, subsonic, medium bomber being built by McDonnell Douglas, teamed with General Dynamics. Plans call for it to replace USAF F-111s in the 1990s.

Both companies displayed a four-color representation of what the USAF ATA variant's cockpit would look like. Installed in the front-seat area were six-inch by six-inch multifunction displays, giving the pilot four-color, high-resolution symbology of the air and ground situation. There was a thirty-degree by twenty-three-degree wide field of view head-up display, plus voice warning systems and night-vision devices.

The backseat area was fitted with eight-inch by eight-inch tactical situation displays, with images in full color. The displays would be sensitive to the backseater's touch.

• **X-31A Demonstrator.** Rockwell and Messerschmitt-Bölkow-Blohm of West Germany, partners in the international Enhanced Fighter Maneuverability project, displayed scale models of their prototype EFM aircraft. The plane is scheduled to roll out in December. Included on the model were canards, a delta wing, a tail structure devoid of horizontal surfaces, and thrust-vectoring engine nozzles.

Briefers said that the first prototype, built at Rockwell's Palmdale, Calif., plant, had been moved to El Segundo for four weeks of proof loading tests to measure its structural strength. It will begin flight tests in early 1990. The goal is to study the extent of the aircraft's agility and maneuverability at low, transonic, and supersonic speeds.

• **Engines.** Pratt & Whitney, one of the ATF's engine contractors, said it will deliver its YF119-PW-100 powerplant by the end of this year. P&W officials say that the YF119, which completed initial altitude testing in September, will be installed on the Northrop YF-23. General Electric's entry, the YF120-GE-100 engine, will fly first in the Lockheed YF-22. Later, engines and airframes will be switched.

The Pratt & Whitney engine house presented the latest developments in its F100-PW-229 Increased Performance Engine, a 29,000-pound-thrust update of the F100 that powers the F-15 and F-16. It will compete with GE's F110-GE-129 IPE, an advanced version of GE's F110, to power the Air Force fighters of the 1990s.

P&W officials reported that the PW-229 has successfully completed endurance testing. Final test was a series of simulated high-altitude test

runs. General Electric briefers claimed that the digitally controlled GE-220 IPE was also moving ahead smartly. In addition, GE Aircraft Engines exhibited an expanded view parts display of the F110.

• **Tactical missiles.** Hughes reported that the AIM-120A Advanced Medium-Range Air-to-Air Missile (AMRAAM) was still on schedule for Initial Operational Capability (IOC) in the last quarter of this year. The only problem may be that Micronics, which makes the fuze for AMRAAM, has gone into receivership.

So far, Hughes has produced sixty-seven Lot 1 production missiles. AMRAAM Air Vehicle Instrumentation Rounds have been provided for the 33d TFW, the first operational wing equipped with AMRAAM, to help prepare crews for their use and acquaint missile loaders with them.

—Staff photo by Guy Aceto

Texas Instruments, which is headquartered in Dallas, Tex., was filmed by a news crew from station KXAS Dallas during AFA's Aerospace Development Briefings and Displays program. More than 220 journalists and other news media representatives were on hand to cover the program.

AEROSPACE INDUSTRY IN REVIEW

Companies Represented at the 1989 Aerospace Development Briefings and Displays

AIL Systems Inc.
Advanced Electronic Warfare Systems for USAF

Allied Signal Aerospace Co.
Display of Aircraft Equipment, Including Sophisticated Systems, Subsystems, and Components

Bell Helicopter Textron/Boeing Helicopters
The SOF Osprey

Boeing Co., The
Strategic Missile Modernization, Strategic Aircraft Modernization, Tactical Forces Modernization

British Aerospace
BAe's Extensive Aircraft, Missile, and Supporting Technologies Programs

Brunswick Corp.
Composite Structures Technology: "Implementing the Advantage"

CAE Link Corp.
1989 USAF Training Report

Chrysler Technologies Airborne Systems
An Introduction to Chrysler Technologies' Airborne Systems

Contel Federal Systems
Office Automation Secure Information System (OASIS)

Control Data Corp.
Tactical Air Reconnaissance and Command and Control System Software Development

E-Systems
High-Technology Defense Electronic Systems

Emerson Electric Co.
Airborne Special Applications Radars and C³I Equipment

Ferranti
Terrain Reference Navigation Systems

Ford Aerospace
Tactical Missile Systems, Air Base Defense, Satellite Control, and Communications Systems

GEC Avionics
Total Capability—Electronic Systems for Aviation

General Dynamics Corp.
The F-16 as a Battlefield Air Operations Aircraft

Grumman Corp.
Systems Integration and Tactical Effectiveness

GTE Government Systems
Communication/Information Systems Integration

Hercules Aerospace
Pegasus, Assured Low-Cost Access to Space

Honeywell, Inc.
Digital Mapping Combined Effects Munitions, and On-Board Processing

Hughes Aircraft Co.
AGM-65 Maverick Air-to-Surface Weapon System and the Latest Medium-Range Air-to-Air Missile, the AIM-120 AMRAAM

IBM Corp.
IBM's Role in USAF Space, Air Traffic Control, Training Systems, C³I, and VHSIC Products

Israel Aircraft Industries Ltd.
PHALCON Airborne Early Warning System

ITT Defense
Advanced Systems for an Advanced Air Force

Lear Astronics Corp.
Fly-by-Wire Flight Control and Vehicle Management Systems

Learjet Corp.
Tanker/Transport Training System Team

Lockheed Corp.
The Spirit of Flight: Evolution of the F-22 Advanced Tactical Fighter

Loral Corp.
Loral's Capabilities in Electronic Combat and Flight/Mission Simulation for Training

LTV Aerospace and Defense Co
YA-7F Program

Magnavox Government and Industrial Electronics Co.
Electronic Combat—A Sixth Sense

Martin-Baker Aircraft Co. Ltd.
Latest Developments in Ejection Seats

Martin Marietta Corp.
Total Quality Management in the Titan IV Pathfinder E-O and LANTIRN Programs

MBB-Panavia
Status of Aircraft Programs—Tornado, ECR, EFA, X-31A, and WWFO

McDonnell Douglas Corp.
History of Fighter Crew Stations 1912–2000+

Motorola, Inc.
Missile End-Game Scoring (MEGS)

Northrop Corp.
B-2 and ATF: Military Airpower Enters a New Age

Raytheon Co.
Air-to-Air Missiles

Rockwell International

Autonetics ICBM Systems Div.
Supplier of ICBM Guidance and Control Systems to the US Air Force for over Thirty Years

Collins Government Avionics Div.
Navstar GPS Receiver Production and Technology Update

North American Aircraft
B-1B, TTTS, C-27, X-30, NASP, and X-31A EFM

Space Transportation Systems Div., Satellite and Space Electronics Div., Rocketdyne Div.
Progress on the Space Shuttle, Enhancements, and Future Plans

Sundstrand
Sundstrand Products for USAF Applications

Teledyne CAE/Teledyne Aircraft Products Div.
Propulsion Systems: As They Are Today

Textron, Inc.
Strategic and Tactical Weapon Systems

Thomson-CSF
Thomson-CSF: Your Total Partner in Aeronautics

Tracor, Inc., A Westmark Co.
Countermeasures Systems, Expendables/EW Training Systems/Aircraft Modification/Flight Services

TRW Space & Defense Sector
Space-Based Surveillance: The High-Ground Advantage

United Technologies Corp.
Update of the F100-PW-220, -PW-229, F119, and F117 Engine Programs

Vitro Corp.
Applying the Vitro Method to Systems Integration and Software Engineering

Williams International
Advanced Gas-Turbine Engines

IOC will depend on availability of fuzes for the live rounds. Hughes said it planned to begin on October 1 with initial equipping of the 33d TFW. A "four vs. four" (four missiles against four targets) test has been scheduled for mid-November.

West Germany has dropped out of the multinational AIM-132A Advanced Short-Range Air-to-Air Missile program (ASRAAM). British Aerospace, the prime contractor, said it had received inquiries from other firms interested in assuming the roles of West German firms. BAe officials said that all of the potential partners are European.

McDonnell Douglas touted its new AGM-84E Standoff Land-Attack Missile (SLAM), a derivative of the Harpoon antiship weapon. Boeing provided a model of its so-called SRAM T, a candidate to meet NATO's requirement for a nuclear Tactical Air-to-Surface Missile.

• **Transport aircraft.** Lockheed unveiled its C-130J airlifter configu-

—Photo by Paul Kennedy

TAC Commander Gen. Robert D. Russ (left) and Air Force Vice Chief of Staff Gen. Monroe W. Hatch, Jr. (center), listen to a General Electric exhibitor describe his company's engine programs. GE's exhibit included displays on F110, F101, F118, and F120 engines, as well as models of the UDF and CFM56 engines.

The following companies displayed, but did not hold briefings.

AAI Corp.
Development and Production of Training Simulation Systems, ATE, Ordnance, Combat Vehicle Systems, and Missiles and Robotics

Aerojet
Latest Developments in Rocket Propulsion, Ordnance, and Defense Electronics

Aérospatiale, Inc.
RAM-JET Technology (ASMP), TBM-700, ATM-42, OMEGA Trainer

ASE Government Systems, Inc.
ASE Designs and Manufactures Gas Turbine Engine Test Facilities and Gas Turbine Engine Component Test Equipment

Astra Holdings Corp.
IR Decoy Flares, Fuzes, Components, and Subsystems

AT&T
Integrated Computing Solutions from the Standard Multiuser Small-Computer Requirements Contract (AFCAC 251)

Ball Aerospace Systems Group
Highlights of Current Air Force Programs at Ball Aerospace

Canadair, Inc.
CL-227 Sentinel Remotely Piloted Vehicle

Canadian Marconi Co.
Navigation Systems, Engine Instrumentation, Cockpit Display Systems

Cleveland Pneumatic Co.
Involvement in Air Force Landing Gear Programs

Cubic Defense Systems
Air Combat Training Systems, with Eighteen Ranges Operational and Three More in Production

Deere & Co.
Rotary Engines, Electric Generators, and Construction Equipment and Techniques

Dowty Aerospace
Landing Gear, Flight Controls, Polymers for Stealth Applications, and Other Systems for USAF

Eastman Kodak Co.
Capabilities in Image-Processing Products and Technologies

ECC International Corp.
Design and Development of Avionics Pilot Trainers, Maintenance Trainers, and Aerial Refueling Trainers

EDO Corp.
High-Technology Stores Release Systems, Weapons Ejector Racks, and Missile Launchers

Electronic Data Systems Corp.
EDS Presents the USAF's Unified Local Area Network Architecture—ULANA

Evans & Sutherland Computer Corp.
Evans & Sutherland Designs, Builds, Sells, and Services Special-Purpose Image Computing Systems, Software, and Display Systems

Fairchild Communications & Electronics Co.
Automated Mission-Planning Systems for Military Aircraft

FlightSafety International
Total Training Systems Approach to Aircrew Training

General Atomics
High-Technology R&D in Nuclear Space Power, Directed Energy Systems, Hazardous Waste Process Automation, and More

General Electric
Aerospace
Armament Systems, Inertial Guidance, Reentry Systems, Communications, Training Systems, and Other Electronic Systems
Aircraft Engines
F110 Engines and F101, F118, and F120 Engines. Models of UDF and CFM56 Engine Programs

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Jane's Information Group
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LTN-92 Inertial Navigation System, New-Generation AHRS, and AN/TYQ-23 (MCE)

Loral Fairchild Systems
Reconnaissance Systems, Digital Cassette Recording Systems, Mini Electronic Countermeasures Jamming Equipment, ECCM Training Systems

Lucas Aerospace Ltd.
Engine Controls, Flying Controls, Electrical Systems, and Defense Electronics

Recon/Optical, Inc.
Reconnaissance Systems for Tactical Missions, Remotely Piloted Vehicles, and Advanced Long-Range Real-Time Applications

Rockwell International
Autonetics Sensors and Aircraft Systems Div.
Autonetics Involvement in Support of F-111 Aircraft Avionics Design and Integration
Missile Systems Div.
Family of Standoff Weapon Systems, GBU-15, AGM-130

Rolls-Royce, Inc.
Aircraft Engines for Military Applications

Schwem Technology
Image Stabilizing Lens and Camera Platforms and Camera Stabilizing Systems

Short Brothers (USA), Inc.
C-23 Sherpa Transport Aircraft and Tucano Primary Trainer Aircraft

Smiths Industries
Aerospace & Defense Systems
Aircraft Instrumentation and Controls

Snap-On Tools Corp.
Tools for Aircraft Maintenance

Standard Manufacturing Co., Inc.
Aircraft Weapons-Handling and Loading Equipment, Robotic Vehicles, and Off-the-Road Munition and Cargo

Systron Donner
Components for Aircraft Fire and Overheat Detection and Suppression Systems

Texas Instruments
Antiradiation Missiles, Advanced Radar, Covert Penetration Radar, Advanced Infrared Systems, and ATF Mission Display Processor

Textron Inc.
Bell Aerospace's Military Landing System, Inertial Products and Systems, and Strategic Communications Products

Thiokol Corp.
Solid-Fuel Propulsion Systems

Unisys Defense Systems
Nexrad, North Warning, Blacker, FDD1/LAN, MIDL/MIST, ABCCCIII, and Royal Thai Air Defense System

Vega Div., Compudyne Corp.
Radar Tracking Command and Control Systems for RPVs and Target Drones

Westinghouse Electric Corp.
Electronic Systems Group
Radar and Other Defense Electronic Systems

—Staff photo by Guy Aceto

All the major contenders for the Air Force's Tanker/Transport Training System (TTTS) were represented at the program. General Dynamics (teamed with CAE Link and Cessna), McDonnell Douglas (teamed with Quintron and Beech), and FlightSafety (teamed with Lear and Allied Signal) all showed cockpit mockups, training-system hardware, and other TTTS items.

ration, a company-funded, radical revamp of the traditional C-130. The plane would have six-bladed propellers. Its two-person cockpit would eliminate the places of flight engineer and navigator. It would have a ground-mapping function and two HUDs that can be pulled down like visors. Lockheed officials estimated that, by reducing manpower and other requirements, the C-130J would bring a $6.5 million reduction in C-130 operation and support costs each year. Delivery of first aircraft could come in 1994. Lockheed showcased a recently developed 3-D cockpit presentation module.

To publicize work to date on the CV-22 Osprey, joint contractors Bell and Boeing provided a video update on program progress, including flight tests of the V-22. This included full conversion from helicopter to airplane mode.

● **Training systems.** Contenders for the Air Force's new Tanker/Transport Training System had high visibility. General Dynamics (teamed with CAE Link and Cessna) will offer a modified Citation III; McDonnell Douglas (teamed with Quintron and Beech) will use the Beechjet; FlightSafety (teamed with Lear and Allied Signal) will use the Lear 31 aircraft. All showed cockpit mockups, training-system hardware, and other items. Rockwell and British Aerospace have dropped out of the competition.

USAF will evaluate both aircraft and planned cockpit—which must have a birdstrike-resistant windscreen, single-point refueling, and advanced environmental control. A winning team will be chosen in February.

In addition, Loral/Fairchild displayed its new laser guided training round, a trainer for the GBU-24A/B Paveway II laser-guided bomb.

● **Airborne early warning systems.** Israel Aircraft Industries' subsidiary, Elta Electronics Industries, showcased a new low-cost AEW system called PHALCON. This is designed for use in a Boeing 707, but it can be fitted to virtually any large transport aircraft. Unique features

—Photo by Paul Kennedy

AFA President Jack C. Price and Chairman of the Board Sam E. Keith, Jr., were each reelected for a second term during Convention week. Here, Mr. Price (left) and Mr. Keith inspect an expanded view of parts of the F110 engine. The F110 was the star of General Electric's exhibit.

include phased-array, L-Band conformal radar and long endurance. The IAI exhibit described the plane as having fully integrated sensors capable of tracking and classifying hundreds of aircraft, helicopters, and naval vessels simultaneously. It also would have a battle-management role. PHALCON, said IAI, would cost half as much as a US E-3 AWACS.

IAI representatives noted that joint projects with US contractors would be eligible for funding provided as a result of close relations and formal agreements between Washington and Tel Aviv. They called attention to Israel's possibly strong marketing position in 1992 Europe due to favorable trade agreements with the European Economic Community.

• **Aircraft upgrades.** First flight of LTV's updated YA-7F attack plane had been rescheduled for October. LTV is upgrading two ANG A-7Ds to accommodate afterburning F100-PW-220s or F110-GE-100s in a common engine bay, along with other new features that would make the YA-7F a supersonic CAS aircraft. The company will fly the plane several times in Dallas before turning it over to the service for nine months of testing at Edwards AFB. LTV proposes to refurbish 337 of the Guard's A-7s to the new configuration.

—Photo by Paul Kennedy

There was a lot of action between LTV's booth and the General Dynamics exhibits. Both companies are working on aircraft upgrades. LTV discussed its efforts to make the YA-7F a supersonic close air support (CAS) aircraft, while GD gave a report on the USAF/Army CAS demonstration project.

—Staff photo by Guy Aceto

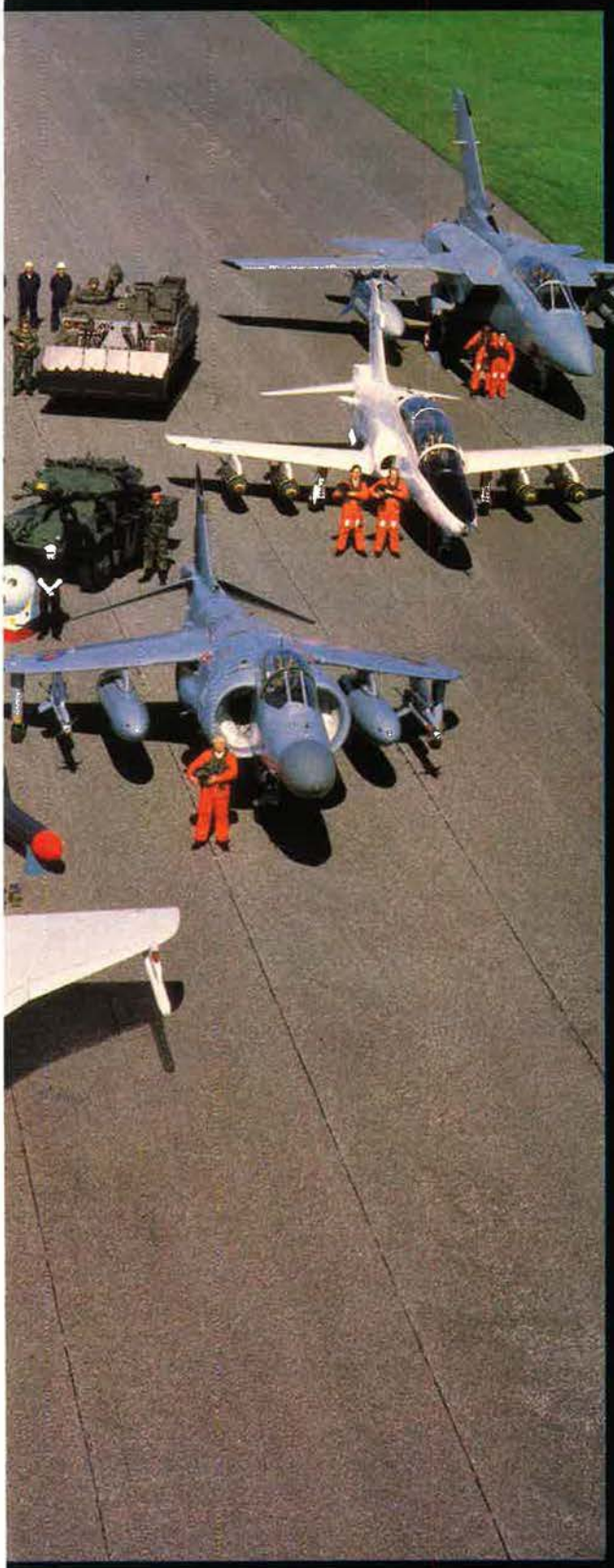
More than fifty companies and divisions held briefings at this year's program. Here, those attending a Rockwell International/Collins Government Avionics Division briefing hear the latest about the Navstar Global Positioning System program. Representatives from industry, the media, and the military all consider these briefings an invaluable source of information.

General Dynamics gave a report on the USAF/Army CAS demonstration project, featuring the utility of the GD F-16 in a modified CAS/BAI configuration.

• **Flight equipment.** Honeywell's unusual display of a futuristic Integrated Helmet System drew many curious onlookers. The helmet was fitted with two thick lenses, attached to the sides of the headgear, which projected in front of what would be a pilot's line of vision. This Integrated Night Vision system would employ image intensification with symbology and a forward-looking infrared system to display a fast-developing air situation. The pilot could clip the lens modules onto the helmet as needed for specific missions.

ITT's Electro-Optical Products Division presented its latest aviator night-vision goggle, now under development. ■

Displayed are: EAP (Experimental Aircraft Programme) – forerunner of the new European Fighter Aircraft, Harrier II GR.5 (advanced V/STOL fighter), Sea Harrier FRS2, Hawk 100 (advanced jet trainer/strike aircraft), Hawk 200 (single-seat fighter), Tornado ADV x 2 (Air Defence Variant), Tornado IDS (Interdictor Strike); Active Sky Flash, Boosted Sea Eagle, Sea Skua, Seawolf, ALARM air launched weapons; Merlin, Swingfire an TRIGAT anti-tank weapons; Sea Urchin and VEMS underwater systems; British Aerospac Systems and Equipment products (BASE); Rapier, Laserfire and Rapier 2000 surface-to-ai defence systems; Royal Ordnance 105mm light gun, 30mm Rarden gun, 81mm Morta



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The Air Force adjusts to fiscal and political realities.

Making the Best of It

Air Force Secretary Donald B. Rice told Convention attendees that USAF must make the most out of its funding, as "the defense budget is heading south."

THE Air Force sees no point in trying to wish bigger budgets into existence or in adamantly standing pat with its beleaguered acquisition system. It has come to accept the continuing downturn of defense spending and the pressures to revamp its procurement setup as facts of life—like them or not—and is bent on making the best of them.

USAF's conciliatory approach, marking a departure from its more combative stance of recent years, was conveyed by its leaders in addresses to the Air Force Association's forty-third national convention last September in Washington.

Air Force Chief of Staff Gen. Larry D. Welch and Secretary of the Air Force Donald B. Rice agreed that the Air Force must concentrate on getting the most out of the money allotted to it and on remaking its acquisition system as one way of doing that.

General Welch took note of such "disturbing realities" as the downward trend in defense spending and the big difference between the high levels of long-term funding formerly anticipated for major programs and the much lower levels of funding now available to keep those programs alive.

"That funding mismatch has been exacerbated by years of continued planning based on year-to-year expectations of an immediate return to budget growth," the Chief of Staff said. "And that brings us to a third reality—the need to end wishful thinking and get on with realistic planning to provide the best defense program possible for the resources available."

In like fashion, Secretary Rice asserted, "The defense budget is heading south. The annual real growth we had from Fiscal Year 1981 to Fiscal Year 1985 fueled an appetite for programs that we can no longer feed. We've been planning for more than we can afford, but no longer. We can't direct the wind, but we can adjust the sails."

At the time of the AFA convention, the Air Force was putting the finishing touches on a plan to put into effect the findings and recommendations of the Defense Management Review. A study undertaken by the Defense Department at the beginning of this year, the DMR aims at saving $30 billion over five

—Photo by Paul Kennedy

years by shedding layers of management and streamlining procurement and logistics hierarchies and operations.

Its Time Has Come

Secretary Rice noted that he and General Welch had been involved in conceiving and carrying out the DMR and were in agreement that "it was an idea whose time had come."

He declared: "If we don't move out, Congress will make the moves for us, and the budget will force more reductions in force structure and modernization. We either cut our overhead and our less-essential activities, or we mortgage our future. It's that simple."

General Welch took a substantially similar approach, but also pointed out past Air Force achievements in the acquisition arena. He claimed that USAF has been more successful than it is given credit for in managing and meting out resources for acquisition of new and improved systems. The proof of this lies in the Air Force's success in fulfilling its mission of deterring war at global and theater levels, thanks to such systems and to top-notch personnel, the Chief of Staff maintained.

Thus, he said, "we face the challenges of reduced defense spending from a high plateau of success in crafting and sustaining the forces that it takes to underwrite a well-planned, well-conceived national military strategy."

Referring to all the military services, General Welch asserted, "It is ironic that we suffer simultaneously from intense criticism of the defense acquisition approach and from an embarrassment of successes. We have more promising new technology being translated into military capabilities than we can afford to field at economic rates. And we have more quality forces than we can afford to sustain."

General Welch recalled that the services, having become reconciled to "fiscal facts of life," acquiesced in "painful" Defense Department decisions early this year to curtail the production of several major weapon systems, including USAF's much-coveted F-15E fighter. Then, he noted, came congressional moves to override those decisions and restore funding for the fallen systems by taking it away from others, such as the B-2 bomber, that the Administration had deemed more important to national security.

Such moves showed a congressional tendency to ignore the fiscal facts of life, said the Chief of Staff. He added: "We simply can't afford to humor those who refuse to step up to realities. This is not a time for business as usual or for narrow constituent or parochial interests. This is a time to seize opportunities to build defense forces that will serve the nation for decades to come."

General Welch said that the Air Force "should and will continue to strive mightily to persuade Congress and the public to maintain prudent defense programs." He acknowledged, though, that "it would be foolish to ignore changing conditions that bring changing perceptions about what is prudent."

Opportunity and Risk

In this vein, the Chief of Staff noted the changes in the Soviet Union and its bloc. He said that "the Soviet drive for new structures and new relationships offers great op-

—Photo by Paul Kennedy

portunities, if only we have the patience to stay with the principles and the priorities that brought us to this promising point. And it brings great risk if we fail to do so. The Soviets remain a formidable military threat."

General Welch claimed that the US military can take great credit for the free world's apparent ascendancy over the totalitarian world. He declared, "It is the US system, with all its problems, that produces the military equipment that sets the standard and is the most sought after by friend and foe.

"But we have no interest in resting on our laurels. Rather than complain about fiscal realities, we will produce the best possible combat capability with available resources. Instead of complaining about actions by Congress, we intend to provide Congress the information and insights needed to make the right decisions. Instead of resisting management changes, we intend to use the mandate for change to sweep aside obstacles frustrating our people who want to work smarter and more effectively."

In this context, Secretary Rice predicted that the Defense Management Review will have a "long-term impact" on the way the Pentagon does business. "The drive toward a more efficient organization will continue long after the initial blueprints we submit to OSD [Office of the Secretary of Defense]," he said. He called on Congress to "support our proposals for change" in order to assure their success.

Mr. Rice described the DMR as "a strategy for dealing with fiscal realities" and said that the Air Force was upbeat about implementing its findings. He made it clear that USAF intends to be a team player at the Pentagon, not only with regard to the DMR but in all matters of defense policy.

Declaring that "tough choices are upon us," Mr. Rice said that USAF will "make sure we align our budget with defense strategy and national strategy" in accordance with "clear-cut priorities set forth by Secretary [of Defense Richard] Cheney."

"Efficient procurement" ranks high among those priorities, he said, "because taxpayers have a right to expect it."

Mr. Rice continued, "How well we run the acquisition process determines whether or not the nation will support defense decisions. Buying smart is a public trust. To give the warfighters the kind and number of systems they need, we must capture the confidence and the support of our citizens and their elected leaders. Can we do better? Absolutely."

Defending the Priorities

The Air Force Secretary also earmarked strategic modernization as a "very high" priority. This will become all the more evident, he said, in "our highly visible effort in matching funding and forces with strategy." Strategic modernization, he added, "means forging ahead with the B-2 bomber, with mobility and survivability for Peacekeeper, fielding the Small ICBM in 1997, deploying Milstar satellites for assured command and control of our nuclear forces, and finishing the highly successful B-1B program."

Contending that "any discussion of priorities has to start with people," Mr. Rice declared: "The Chief and I will fight for pay, health care, and quality-of-life programs. We'll

Awards at the 1989 Air Force Association National Convention

USAF Chief of Staff Gen. Larry D. Welch stressed the need for "realistic planning to provide the best defense program possible for the resources available."

press for a market-sensitive pay system for civilians. And we won't let up on pilot retention."

Air Force Vice Chief of Staff Gen. Monroe Hatch also addressed the AFA convention. He emphasized the importance of "the day-to-day contributions" of enlisted personnel to USAF's military capability and thus to the success of the national "policy of peace through strength."

The convention's keynote speaker, 2d Lt. Carl J. W. Long II, enumerated challenges that USAF must meet. Retaining pilots is a major one, he said, and "must be addressed if the Air Force is to maintain its future usefulness."

He added: "Another challenge is understanding the threat that the Soviet Union continues to pose. Many young people today view the Soviets as fledgling democrats building an open society. But it is important to remember that none of the changes made there so far can be truly considered permanent, and we, as future leaders, must continue to maintain a strong defense. . . . We must ensure that a continuing peace does not weaken our abilities to perform in actual combat." ■

AFA'S NATIONAL AEROSPACE AWARDS

The H. H. Arnold Award (AFA's highest honor to members of the armed forces in the field of National Security)—To **Gen. Larry D. Welch,** Chief of Staff, USAF, Washington, D. C., for his extraordinary and courageous leadership of the United States Air Force during a period of national fiscal constraint and organizational reform.

The W. Stuart Symington Award (AFA's highest honor to a civilian in the field of National Security)—To the **Hon. Ronald W. Reagan,** Bel Air, Calif., for his farsighted national leadership devoted to rebuilding a strong America and promoting the values, pride, programs, and policies necessary to sustain that strength.

The David C. Schilling Award ("The most outstanding contribution in the field of Flight")—To the **4450th Tactical Group,** Nellis AFB, Nev., for superb airmanship, dedication to duty, and courage displayed while making pioneering efforts in flight, operational planning, and tactical execution in the world's first Stealth fighter. *(Accepted by Col. Anthony J. Tolin, Group Commander.)*

The Theodore von Kármán Award ("The most outstanding Contribution in the field of Science and Engineering")—To **Dr. Robert W. Selden,** Chief Scientist of the Air Force, Washington, D. C., for his brilliant innovations in nuclear weapons design, theoretical physics, strategic defense technology, and computer sciences, and his superb service in research and management positions that have improved US systems and enhanced the nation's deterrent capability.

The Gill Robb Wilson Award ("The most outstanding contribution in the field of Arts and Letters")—To **Col. John A. Warden III,** USAF, Deputy Director for Warfighting, DCS/Plans & Operations, Washington, D. C., for *The Air Campaign: Planning for Combat,* which addresses the complex philosophical and theoretical factors involved in successfully conceiving, planning, and executing an air campaign.

The Hoyt S. Vandenberg Award ("The most outstanding contribution in the field of Aerospace Education")—To the **Young Astronaut Program,** Washington, D. C., for a growing, highly successful effort that has sparked interest in the study of mathematics,

—Photos by Paul Kennedy

Col. Anthony J. Tolin (center) accepts the David C. Schilling Award on behalf of the 4450th Tactical Group, Nellis AFB, Nev. AFA Chairman Sam E. Keith, Jr. (left), and AFA President Jack C. Price congratulate the Stealth fighter commander.

Capt. Jean M. Bell (second from right) earned AFA's Juanita Redmond Award for Nursing. Her productive changes in practice at the USAF Hospital at Andrews AFB, Md., have greatly improved patient care.

science, and technology in our nation's elementary and junior-high schools, thus encouraging the youth of today to prepare for the challenge of the twenty-first century. *(Accepted by Wendell Butler, Executive Director.)*

The Thomas P. Gerrity Award ("The most outstanding contribution in the field of Logistics")—To **Col. Richard L. Jaeger,** 48th Tactical Fighter Wing, USAFE, for his unparalleled professionalism in leadership of the largest F-111 maintenance complex in the Air Force. His mission accomplishment and logistics management have set standards for years to come.

The Veterans Administration Employee of the Year Award—To **Thomas G. Deniston,** VA Central Office, Washington, D. C., for his outstanding efforts in ensuring accessibility for disabled persons within VA facilities. He has become a source of expert advice on this topic for federal, state, and local governments and commercial entities.

The Juanita Redmond Award for Nursing—To **Capt. Jean M. Bell,** USAF Hospital, Andrews AFB, Md., for effecting productive changes in practice that have improved patient care.

The General Edwin W. Rawlings Award for Energy Conservation (Manager)—To **Edward G. Foresman,** Keesler AFB, Miss., for outstanding achievements in energy conservation within the United States Air Force.

The General Edwin W. Rawlings Award for Energy Conservation (Technician)—To **Christopher A. Faurie,** Bergstrom AFB, Tex., for outstanding achievements in energy conservation within the United States Air Force.

AFA CITATIONS OF HONOR

The **22d Tactical Fighter Squadron,** Bitburg AB, Germany, for leading the command in development and execution of tactics of mass air-to-air employment. These efforts have laid a foundation for development of an advanced and previously unattainable combat capability for NATO air-superiority forces. *(Accepted by Lt. Col. William R. Looney, former Squadron Commander.)*

The **344th Air Refueling Squadron,** Seymour Johnson AFB N. C., for superb achievements in the refueling arena, transferring over 27,000,000 pounds of fuel to virtually every type of receiver in all military branches and several countries and supporting the highly successful American response to hostile Iranian action. *(Accepted by Lt. Col. Gary D. Garland, Commander.)*

The **Air Force Blue Ribbon Panel on Space,** Maxwell AFB, Ala., for innovative, comprehensive development of Air Force space doctrine and policy, linking space operations to warfighting missions and providing the vital framework for integrating those operations into the Air Force. *(Accepted by Maj. Gen. David C. Reed, Commandant, Air War College.)*

The **Civil Air Patrol,** Maxwell AFB, Ala., for continuing excellence as the Air Force Auxiliary and for its growing role in two new missions—rapid airlift of transplant organs and assistance to government agencies in the war on drugs. *(Accepted by Maj. Gen. E. E. Harwell, CAP National Commander.)*

Maj. Gen. John B. Conaway, Vice Chief, National Guard Bureau, Washington, D. C., for his determined force-modernization ef-

Ollie Crawford (center) is presented with the Man of the Year Award, AFA's highest individual activity award, by Chairman Keith (left) and President Price at AFA's Opening and Awards Ceremony.

forts while serving as Director of the Air National Guard. During his directorship, the Air National Guard achieved the highest state of mission readiness in its history.

Ellsworth AFB and Rapid City, S. D., for working together to alleviate a critical military housing situation through a sustained joint program of citizen education. *(Accepted by Brig. Gen. Robert M. Marquette, Jr., Commander, 12th Air Division, and the Hon. Keith T. Carlyle, Mayor of Rapid City, S. D.)*

TSgt. William R. Folds, Jr., 3511th Recruiting Squadron, Greater Pittsburgh IAP, Pa., for attaining 200 percent of his annual recruiting goal, plus successfully meeting ROTC and prior-service goals.

The **Infrared Branch,** Foreign Technology Division, AFSC, Wright-Patterson AFB, Ohio, for developing sophisticated techniques to integrate vast quantities of data generated by modern sensors, producing high-quality information critical to national security. *(Accepted by Ralph Fargnoli, Chief, Electro-Optic and DEW Division.)*

Maj. Rollin J. Lutz, Jr., Hq. USAF, Washington, D. C., for his ground-breaking, comprehensive study of close air support alternatives and his tremendous contributions to the resolution of difficult and sensitive fighter force-planning issues.

Capt. Darren S. McKnight, USAF Academy, Colorado Springs, Colo., for his superb technical achievement and farsighted, creative research that significantly expands the understanding of collisions in space and will contribute greatly to the effectiveness of US space operations.

Maj. Rollin J. Lutz (center) receives an AFA Citation of Honor from AFA Chairman Keith (left) and President Price. Major Lutz was cited in part for his ground-breaking study of close air support alternatives.

—Photos by Paul Kennedy

On behalf of the Thomas B. McGuire, Jr., Chapter, N. J., Chapter President Marvin Jones (center) accepts from Mr. Keith and Mr. Price the Donald W. Steele, Sr., Memorial Award.

Tataye Nagami, 1962d Communications Group, Kadena AB, Japan, for his outstanding and innovative logistics management—blending diplomacy, delicate negotiation, and tough-minded enforcement of contracts—which saved millions of dollars and dramatically improved communications systems at US bases in Japan.

The **Public Affairs Office, 419th Tactical Fighter Wing,** Hill AFB, Utah, for brilliantly telling the story of the Air Force Reserve's successful introduction of the F-16, thus significantly enhancing public understanding of the Reserve and national defense mission. *(Accepted by Barbara Ann Vessels, Chief, Public Affairs.)*

MSgt. Robert R. Richard, Elmendorf AFB, Alaska, for planning, implementing, and supervising all missile logistics and production actions required to support several Alaskan bases, setting the standard for other munitions managers to follow.

Bruce Robin Stoddard, Tucson, Ariz., for his extensive contributions to the education environment, the communities, and the children of the Tucson area, especially through his motivational program, "Wright Flight, Inc."

The **USAF Cargo Management Branch,** Hq. USAF, Washington, D. C., for positive action to ensure that rocket fuel was delivered to launch sites safely and on time, through detailed planning and close coordination with representatives of state, local, and federal authorities. *(Accepted by Col. Ron Harris, Chief, Cargo Management Branch.)*

AFA MANAGEMENT AWARDS FOR LOGISTICS

AFLC Executive Management Award—To **Thomas Harruff,** Air Force Acquisition Logistics Center, Wright-Patterson AFB, Ohio, for outstanding contribution to management while assigned to Air Force Logistics Command.

AFLC Middle Management Award—To **Billy M. Jackson,** Traffic Management, Wright-Patterson AFB, Ohio, for outstanding contribution to management while assigned to Air Force Logistics Command.

AFLC Junior Management Award—To **Capt. Richard G. Perales,** Peace Shield Construction Manager, Wright-Patterson AFB, Ohio, for outstanding contribution to management while assigned to Air Force Logistics Command.

AFA MANAGEMENT AWARDS FOR SYSTEMS

AFA Distinguished Award for Management—To **Maj. Gen. Fredric F. Doppelt,** Commander, Human Systems Division, Brooks AFB, Tex., for outstanding contribution to management while assigned to Air Force Systems Command.

AFA Meritorious Award for Program Management—To **Col. Anthony Bronzo, Jr.,** Program Director, Peace Shield, Hanscom AFB, Mass., for outstanding contribution to management while assigned to Air Force Systems Command.

—Photos by Paul Kennedy

Maj. John J. Smith, Jr. (center) receives the O'Malley Award. Major Smith is a U-2/TR-1 flight commander with the 99th Strategic Reconnaissance Squadron, Beale AFB, Calif.

AFA Meritorious Award for Support Management—To **Lt. Col. Eric A. Beshore, Jr.**, Program Manager, Large Rocket Test Facility, Arnold AFB, Tenn., for outstanding contribution to management while assigned to Air Force Systems Command.

AIR NATIONAL GUARD AND AIR FORCE RESERVE AWARDS

The Earl T. Ricks Award—To a **C-130 Crew of the 136th Tactical Airlift Wing,** Texas ANG, Hensley Field, Tex., for outstanding airmanship, crew coordination, and courage while flying a C-130 from Kansas to Texas in the wake of Hurricane Gilbert. In airlifting oversized equipment that had never before been flown on a C-130, their planning and perseverence enabled medical facilities in Texas to continue operating in this emergency. The timely airlift of this equipment precluded a need to evacuate the entire medical facility. *(Accepted by Maj. Ronald A. Hale, Jr., Commander.)*

The Air National Guard Outstanding Unit Award—To the **152d Tactical Reconnaissance Group,** Nevada ANG, Reno, Nev., as outstanding Air National Guard Unit of the Year. *(Accepted by Lt. Col. Jack Thomas, Commander.)*

The Air Force Reserve Outstanding Unit Award—To the **459th Military Airlift Wing,** Andrews AFB, Md., as outstanding Air Force Reserve Wing of the Year. *(Accepted by Brig. Gen. Larrie C. Bates, Commander.)*

The President's Award for the Air Force Reserve—To a **C-141B crew of the 707th Military Airlift Squadron,** Charleston AFB, S. C., as outstanding Air Force Reserve Flight Crew of the Year. *(Accepted by Maj. Van E. Short, Aircraft Commander.)*

SPECIAL CITATIONS AND OTHER AWARDS

The General Curtis E. LeMay Strategic Aircrew Award—To **Crew S-01, 320th Bombardment Wing,** Mather AFB, Calif., as the best overall (B-52) aircrew in Strategic Air Command. *(Accepted by Lt. Col. Cameron K. Green, Commander.)*

The General Thomas S. Power Strategic Combat Missile Crew Award—To **Capt. Dennis R. Benson and 1st Lt. Julia A. Gibbons,** who make up **Crew S-170,** 351st Strategic Missile Wing, Whiteman AFB, Mo., as the best overall combat missile crew in Strategic Air Command. *(Accepted by Capt. Dennis R. Benson, Commander.)*

The Lieutenant General William H. Tunner Aircrew Award—To **two crews of the 58th Military Airlift Squadron,** 608th Military Airlift Group, Ramstein AB, Germany, as the best overall aircrews in Military Airlift Command. *(Accepted by Capt. Theodore E. Hartenstein, Aircraft Commander of one of the crews.)*

The Lieutenant General Claire Lee Chennault Award—To **Maj. Michael L. Straight,** Chief of F-15 Academics, USAF Fighter Weapons School, Nellis AFB, Nev., as the outstanding aerial warfare tactician.

The General Jerome F. O'Malley Award—To **Maj. John J. Smith, Jr.,** 99th Strategic Reconnaissance Squadron, 9th Strategic Reconnaissance Wing, Beale AFB, Calif., as the best reconnaissance crew in the Air Force.

Best Space Operations Crew Award—To a **crew of the 10th Missile Warning Squadron,** 1st Space Wing, Cavalier AFS, N. D., as the best space operations crew in the Air Force. *(Accepted by 1st Lt. Mary E. Matusiewicz.)*

The Chief Master Sergeant Dick Red Award—To **CMSgt. James H. Erker,** Kansas ANG, McConnell AFB, Kan. for outstanding Air National Guard aerospace maintenance.

The Stuart R. Reichart Award for Lawyers—To **Col. James C. Roan, Jr.,** Hanscom AFB, Mass., for outstanding achievements in the field of law within the United States Air Force.

The Paul W. Myers Award for Physicians—To **Lt. Col. Roy Arnold,** Vandenberg AFB, Calif., for his innovative and aggressive management that has fostered teamwork, unity, and cost-effective health care, significantly improving patient services and dramatically increasing staff morale and unity.

Outstanding USAF Personnel Manager of the Year Award—To **Maj. Mary J. Brown,** Keesler AFB, Miss., for her initiatives in streamlining personnel procedures and enhancing customer service to more than 12,000 people.

Outstanding Crew Chief of the Year Award—To **TSgt. Wendell M. Keener,** Seymour Johnson AFB, N. C.

Civilian Wage Employee of the Year—To **David W. Bishop,** Explosives Operator, McChord AFB, Wash., for his superior management of munitions operations.

The performance of the 152d Tactical Reconnaissance Group in TAC's Reconnaissance Air Meet '88 helped it win the Air National Guard Outstanding Unit Award. Lt. Col. Jack Thomas accepted on behalf of the 152d at AFA's National Convention.

—Photo by Paul Kennedy

The Verne Orr Award, accepted by Col. Joseph F. Mudd (center), went to the 2d Bombardment Wing at Barksdale AFB, La., for the most effective use of human resources within USAF.

Civilian Program Specialist of the Year—To **Herbert G. Gwaltney,** Navigational Aids Systems, Eglin AFB, Fla., for saving thousands of dollars, improving flight safety, and resolving several critical equipment issues.

Civilian Program Manager of the Year—To **Thomas D. Appel-Schumacher,** Director, Family Support Center, Rhein-Main AB, Germany, for his outstanding management of base program planning development, analysis, and enhancement of services for Air Force families.

Civilian Senior Manager of the Year—to **Kingston A. George,** Vandenberg AFB, Calif., for his cost-effective commonality efforts as Chief Engineer for Range Safety at the Western Space and Missile Center.

The Verne Orr Award—To the **2d Bombardment Wing,** Barksdale AFB, La., for the most effective utilization of human resources within the United States Air Force. *(Accepted by Col. Joseph F. Mudd, Commander.)*

The Joan Orr Award—To **Rita C. Szpila,** Griffiss AFB, N. Y., as the Air Force Wife of the Year.

The Outstanding AFROTC Cadet of the Year Award—To **Trent P. Mitchell,** University of Alabama, Tuscaloosa, Ala.

The Outstanding CAP Aerospace Education Cadet of the Year Award—To **Lt. David A. Snell,** Butte, Mont.

The Diane O'Malley Outstanding Angel Award—To **Melissa Liggin,** Baylor University, Waco, Tex.

1989 AFA Membership Achievement Awards

The following chapters have qualified for a membership achievement award by showing a net chapter growth based on a comparison of chapter size at the beginning of the membership year, July 1, 1988, and chapter size at the end of the membership year, June 30, 1989.

Diamond Award: 20% net growth or more

Chapters	Presidents
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Gadsden, Alabama	Herman W. Ruehl
Gateway to Freedom, Germany	Lt. Col. John W. Droke
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Lufbery-Campbell, Germany	Nita Wilkinson
Major General Robert M. White, Germany	Lt. Col. John P. Carson
Manila, Philippines	Warren E. Beaumont
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Chapters	Presidents
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Gold Card, Utah	Harry Cleveland
Happy Hooligan, North Dakota	John Syverson
Inland Empire, Washington	Andy Kelly
Kalamazoo, Michigan	William Monica, Jr.
Northeast Texas, Texas	R. Leigh Oliver
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Membership Achievement Award: 2% net growth but less than 5% net growth

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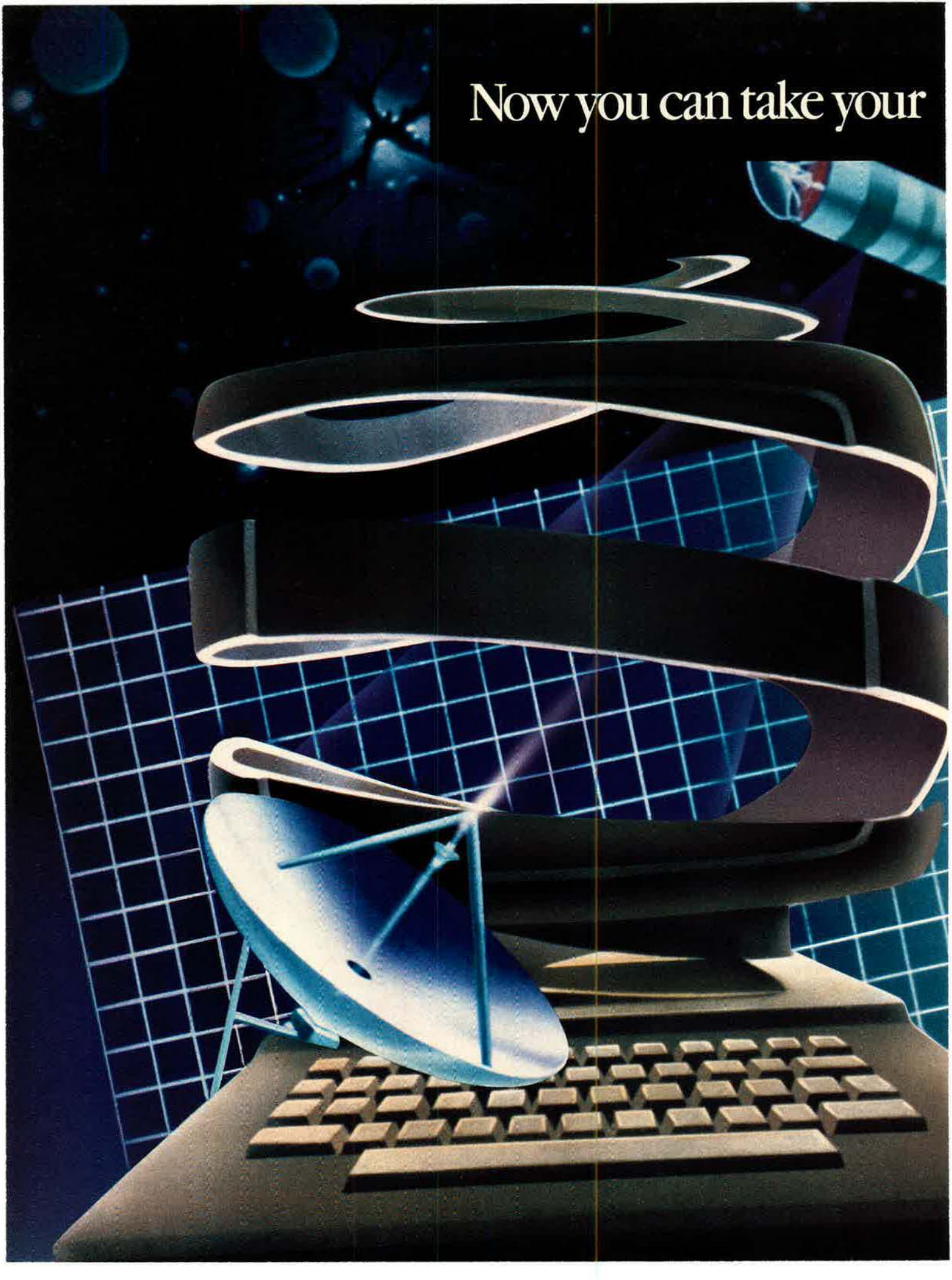
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USAF expects new weapons to be twice as reliable—and require only half as much maintenance—as their predecessors.

—Photo by Paul Kennedy

R&M Is Serious Stuff

BY PETER GRIER

THE missile guidance set on the Minuteman III ICBM is hard to service. The problem lies not in the subsystem itself, but in its location beneath the missile reentry system. To reach the guidance set, the Minuteman silo door must be opened and the reentry system with its nuclear payload must be removed—a procedure that requires five maintenance personnel, three vehicles, eight security police, and daylight.

Designers of the Peacekeeper ICBM learned from this maintainability problem. In the Peacekeeper, the missile guidance set also has been positioned underneath the reentry system, but it is mounted in a sliding drawer. Repair does not require warhead removal. The silo does not have to be opened, only one security guard is needed, and work can be carried out any time, day or night.

By decreasing ICBM downtime, this designed-in maintainability improvement, in effect, multiplies the US nuclear deterrent force. It reflects one of the primary goals of the Air Force's R&M (Reliability and Maintainability) 2000 initiative: increasing combat capability by buying weapons that perform reliably over time, instead of systems that promise much but are always in the shop.

The Air Force's headquarters office for R&M declares that the policy for new weapons is "Double-R/Half-M," meaning that next-generation systems should be twice as reliable and should require half the maintenance of the generation they replace.

Making this quantum leap will require, among other things, better design, more attention to quality, contractor incentives, and a commitment by the Air Force leadership to make the requirement stick. "We're talking about a cultural change, not just in the way the Air Force does business but in the way industry does business," says Brig. Gen. William Collins, Air Force Special Assistant for Reliability and Maintainability.

Official requirements for both the SRAM II (Short-Range Attack Missile) and the Advanced Tactical Fighter (ATF) take the R&M benchmark to heart. ATF requirements call for a break rate of eight to ten percent, compared to fifteen per-

Designers of the Peacekeeper ICBM learned from the Minuteman's maintainability problem. Repair of the missile guidance set does not require warhead removal.

cent for the F-15. Seventy-five percent of ATF problems should be fixable in four hours, as opposed to forty-two percent for the F-15. The requirement for ATF maintenance personnel is set at eight per aircraft, as opposed to the F-15's eighteen.

Response on ATF

The ATF's contractors are taking these goals seriously, according to the Air Force. General Electric is assigning top engineering talent to work on the controls, actuators, and piping that hang on the outside of its ATF engine prototypes. Although these units are the cause of most engine maintenance actions, GE officials say they haven't made them a top priority in the past. Pratt & Whitney says its ATF engine competition entrant will have forty percent fewer parts and require sixty percent fewer depot- and support-level tools than do current-generation fighter engines. Any main unit on the ATF engine will be replaceable in twenty minutes, says Pratt & Whitney.

Improved R&M isn't just the province of next-generation systems, notes General Collins. Upgrades and retrofits can greatly ease the burden of supporting currently deployed weapons. The new APG-68 Programmable Signal Processor for the F-16 will use VHSIC (Very-High-Speed Integrated Circuit) technology and have a mean time between failures of 2,000 hours. The MTBF rate for the unit it replaces is about 200 hours. Two-thousand-hour reliability is the goal for most fighter electronics. An Air Force R&M overview report points out that "many operating commands project that 2,000 hours for LRUs [Line Replaceable Units] would eliminate the requirement for intermediate-level maintenance."

R&M retrofits don't have to be driven by new technology. Take the case of LANTIRN (Low-Altitude Navigation and Targeting Infrared for Night) Targeting Pod laser alignment. In initial production units, maintenance personnel had to take off a large access panel held on by many small screws to get at the laser adjustment screws. Putting the panel back on often knocked the new adjustment out of whack. Laser adjustment often took longer than the predicted four hours.

Later LANTIRN production models have a small hatch on the access panel that can be quickly popped open. Average laser alignment time has been reduced by over seventy-five percent. "It's so obvious. Why didn't we do it in the first place?" says General Collins.

Poorly designed panel fasteners hold a particular horror for aircraft technicians. One FB-111 panel is held on with 187 screws of six different lengths. Nothing on the screw holes indicates which length fastener they take. A mechanic who threads a long screw in a short hole can sever wires behind the panel, grounding the plane for hours.

Trying to prevent such nightmares from happening in new systems is "pick-and-shovel work," the daily fare of his office, says General Collins.

Five Main Objectives

The R&M 2000 initiative is a focus for Air Force efforts to make reliability and maintainability of equal importance to weapon cost, performance, and acquisition schedule. R&M 2000 goals are an attempt to get away from traditional mean-time-between-failure bean-counting, says General Collins, listing five main objectives:

Increase combat capability. The overarching point of better R&M is to enable the Air Force to do more with less. Less time in the shop means more time spent over target. Fighters should be able to fly ten straight sorties without maintenance; ground radars should operate for thirty days without a critical failure.

"If you double reliability, you only need half as many planes to do the same job," says General Collins.

Decrease support structure vulnerability. Destruction of vulnerable airfield maintenance shops grounds airplanes. Aircraft that don't need so much field support are more combat-capable, because if support structures don't have to be in place, they are not vulnerable.

Destruction of base plants that supply liquid oxygen for pilots' breathing would ground fighters in days. So the F-15E (as well as the B-1B) has an on-board oxygen-generating system, which takes bleed air from the engine and runs it through a molecular sieve, eliminating the liquid oxygen plant requirement.

Cut mobility requirements. Aircraft that are more reliable and maintainable don't need so much logistics baggage. Hence, they're easier to shift between bases—multiplying the force by improving its flexibility.

The Mobile Electronic Test Set for the F-15E is only one-eighth the size of equipment fielded with other F-15 versions. In terms of mobility, that represents one C-141 trip that doesn't have to be made. Requirements call for an ATF squadron to be deployable with six to eight C-141-sized loads, as opposed to the eighteen necessary for an F-15 squadron deployment.

Reduce maintenance manpower needs. The Air Force thinks it should be possible to reduce the number of personnel needed to maintain new-generation systems by one-third to one-half, freeing personnel slots for distribution throughout the rest of the service. The KC-135 reengining program shows the possible effect: Reliability improvements with the plane's new F108 engine have now saved fifty manpower spaces in Strategic Air Command, according to the Air Force, with an additional savings of forty spaces to materialize by 1991.

Reduce maintenance costs. Obviously, fewer maintenance actions taken for new systems can help lower their overall maintenance costs. Less obviously, designing with R&M in mind can lower the cost of individual parts. Advances in electronics can be the key.

The redesigned Central Air Data Computer for the C-141 costs $20,000 less than the original model, while providing ten times the reliability. Use of VHSIC technology in the new F-111D Signal Transfer Unit has reduced parts costs from $24,000 to $2,000.

Such new technologies are the breakthroughs that have brought R&M 2000 goals within reach, says General Collins. Merely replacing the old with the new can pack a large increase in R&M punch. Use of fiber optics in place of copper cable in mobile ground radar, for instance, can save 1,000 pounds per set while increasing survivability and reliability.

Constant Attention Pays

The largest improvements may come just by keeping R&M in mind during development. "That really pays big dividends," says General Collins.

Take the C-17 transport aircraft. When McDonnell Douglas was setting up the new airlifter's production line, it conducted a study of the problems it had had manufacturing wide-body airliners in the past. One thing the engineers found was that with big planes, assembly workers typically crawled over fuselage sections and often slipped or dropped tools, causing dents and damage.

So McDonnell Douglas built huge jigs to hold fuselage sections and rotate them on stands in front of workers. That cuts down on dents and quality problems, increasing C-17 reliability.

The "Blue Two" program for sending engineers out to the field to see the real-world problems of maintaining systems is also a crucial R&M tool, says General Collins. (See "Blue Two," April '89 issue, p. 56.)

How can the Air Force ensure that its contractors take R&M seriously? "The timing is with us," says General Collins. "You're using their recognition that they're going to have to do this if they're going to compete."

R&M incentives can be written into contracts. Westinghouse recently won a $67 million bonus for meeting R&M goals on its APG-68 F-16 radar. Warranties can be written to hold contractors responsible for making sure their products perform up to standards over time. Effective R&M warranties should include, among other things, provisions for fixed-price repairs and no-cost retrofit of engineering changes.

Industrial cultural change, say officials, will have to be part of the R&M revolution too. Without it, defense contractors may find it next to impossible to produce systems with the built-in quality and reliability the Air Force says it's going to demand. The US defense industry prides itself on being the last bastion of American industrial superiority, but General Collins says even weapons makers have a lot to learn from the Japanese.

The ATF must have a break rate of eight to ten percent; the F-15's rate is fifteen percent. The ATF will need eight maintenance personnel per aircraft; the F-15 requires eighteen. ATF contractors are taking the R&M benchmarks seriously.

Beyond Inspection

When defective products start rolling off the assembly line, Japanese manufacturers don't just tighten the inspection net. "They go back and find out why," says General Collins.

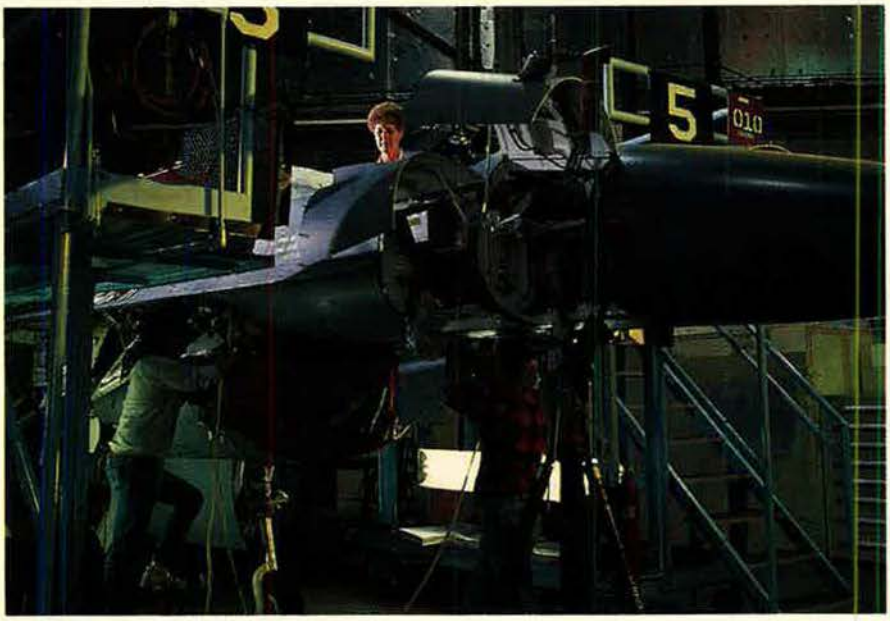
As a result, Japanese weapons are as well-made as Japanese VCRs. Last year, General Collins's office sponsored a joint industry-DoD trip to study Japanese licensed production of an F-15 variant, the F-15J. "There are some strong indications that the F-15J is more reliable than its American counterpart," says an Air Force report on the trip. "The predominant reason appears to be the emphasis on quality during manufacturing and depot activities."

Japanese attention to detail is apparent. Workers sweep their own space on the factory floor, says the Air Force report. Tools are stored on rubber mats, with drill bits covered. Parts that aren't in use are covered with clear plastic. Plastic sleeves are slipped over the threads of finished bolts.

At Mitsubishi Heavy Industries, one of four major Japanese F-15J contractors, about two percent of domestically supplied parts are found to be defective. In contrast, parts imported from the US prove to be defective about nine percent of the time.

Improvement of F100 engine-turbine blades made at Ishikawajima-Harima Heavy Industries shows the Japanese commitment to quality, according to the Air Force. The problem was that too many blades were going through the grinding process and coming out too long to be used.

Tracking the problem back to the factory floor, Japanese managers discovered that they had one star grinding machine that was producing virtually perfect parts. Ripping it apart to find out why, they discovered that it was the only machine



Computer analysis of the F-16A concluded that its combat capability could best be increased by improving the reliability of its weapons delivery system.

whose jig had been put together without locknuts. That meant it held blank pieces more tightly, resulting in more accurate work.

The locknuts were quickly stripped from all the grinding machines. Blade quality improved dramatically, to the point where none came out too long.

Quality improvements such as this can have a ripple effect that increases reliability and saves money all down the line, says General Collins. "If you get all the turbine blades right on target, you don't have to balance the engine," he points out.

Weapon systems often fail because of variability in the design and manufacturing process. Ishikawajima-Harima's turbine-blade detective work is an example of what General Collins calls the Variability Reduction Process (VRP). Use of VRP is a significant contributor to the F-15J's high reliability, according to the Air Force report on the R&M 2000 trip to Japan.

Air Force leaders say that VRP is the sort of quality-control technique that US contractors will have to make part of their everyday routine if they want to remain competitive. General Collins says his message to contractors is, "We're not going to pay more for quality. You're going to have to learn how to do it."

Finding the Payoffs

R&M is a good thing not for its own sake but because of what it makes possible. If total weapon system reliability isn't improved, then an R&M upgrade for a subsystem isn't worth making.

UHF radios are already the aircraft equivalent of an AM/FM transistor: reliable, cheap, and not too glamorous. General Collins says he probably wouldn't pay for a longer-lasting radio, because broken receivers aren't keeping planes out of the air. Resources should be concentrated on more delicate systems, where the payoff for improvement would be much greater.

The Air Force is developing a computer program named MARGI (Methodology for Analyzing Reliability and Maintainability Goals and Investments) to help it get the biggest increase in combat capability it can out of R&M retrofit dollars. By analyzing the importance of a particular subsystem to an aircraft's mission, then mixing in predicted parts failure rates, the program can point to the things that most need to be made more reliable.

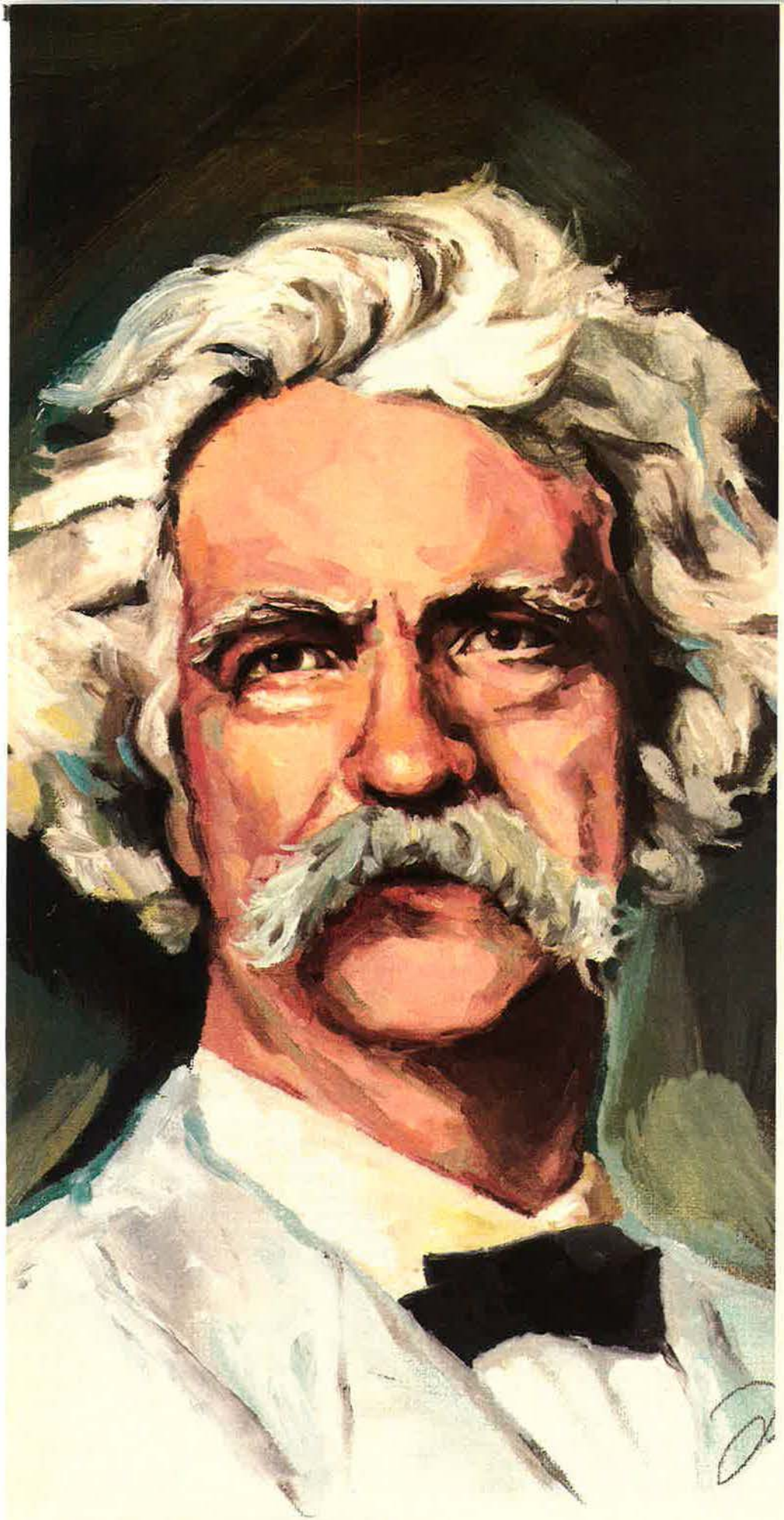
A MARGI analysis of the F-16A concluded that the plane's combat capability could best be increased by improving the reliability of its weapons delivery system. MARGI also calculates the estimated impact of specific part changes. If ring-laser gyros were inserted in all F-16As, for instance, the resulting increase in fleet reliability would be equivalent to the purchase of seven new aircraft.

Strategic Air Command and Tactical Air Command are now using the MARGI model, with Military Airlift Command to come on line soon. General Collins says the software will be a valuable tool in the hunt for such items as the F-111D Signal Transfer Unit, where a relatively small investment in R&M has meant a big jump in aircraft availability.

After all, the ATF may represent a new level of reliability and maintainability, but current-generation aircraft will be the backbone of the Air Force for many years to come. Even next-generation systems will break and undoubtedly will be worked on in the open, in bad weather, by crew chiefs muttering about the boneheaded engineers who designed them.

"There's a lot more pick-and-shovel work still out there," says General Collins. ■

Peter Grier is a Washington-based defense correspondent for the Christian Science Monitor. *His most recent article for* AIR FORCE *Magazine was "Squeezing More from the Logistics Dollar" in the August '89 issue.*



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Mark Twain
American Writer
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Silicon-based electronics is venturing out of the sandbox. Gallium arsenide was the first of the new compounds, and others are coming along.

Silicon's Speedier Cousins

BY JOHN RHEA

SAND is one of the most abundant materials on the planet, which is one reason for the central role it has captured in modern microelectronics. Compounds of silicon and oxygen, typically in the form of sand, account for about three-fourths of the earth's crust. In a highly refined form, they also are the materials of choice for the electronics industry because of their excellent semiconducting properties.

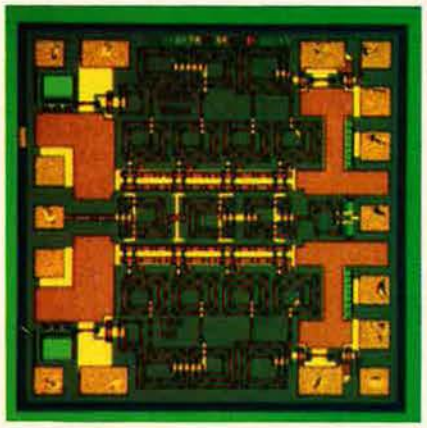
A semiconductor is a substance about halfway between a conductor (like metal, which passes electrical current along readily) and an insulator (such as rubber, which stops the electron flow). When overlaid with the right impurities, silicon chips become semiconductors, carrying current along designated paths and through selected gates under certain conditions.

This makes them good switches, which is essential. All data in modern information processing systems are represented in digital form, either as a "one" when the devices are conducting or as a "zero" when insulating.

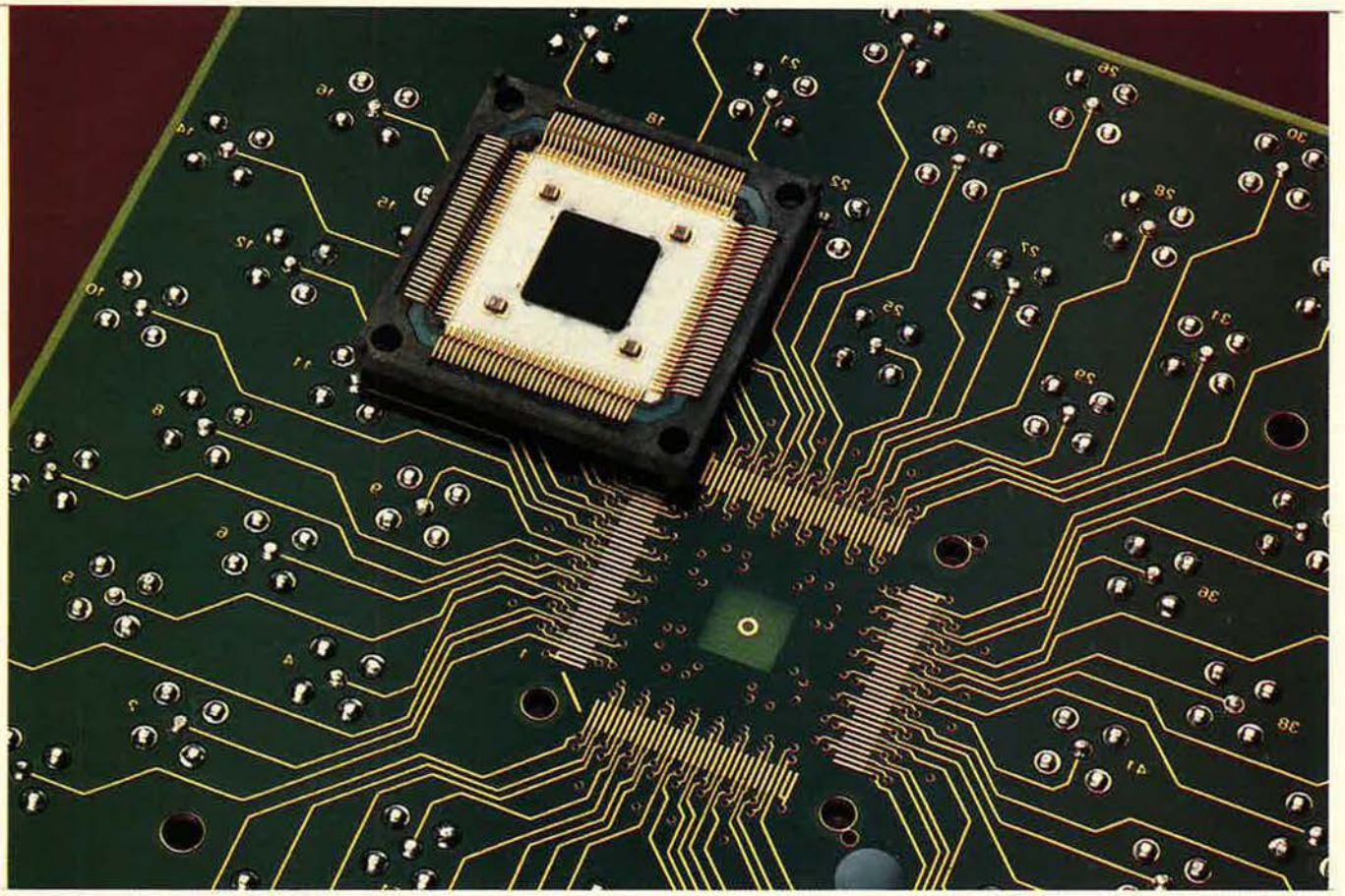
In addition to its universal availability, silicon has the advantage of high electron mobility. That's why silicon is so good for switches; the faster the electrons can move through it, the faster the computers made of silicon devices can operate.

Silicon is a member of the carbon family, found in column four of the periodic table. Carbon, the basic building block of all life and an electronics material, forms more compounds than all the other elements on the table combined. The other members of this family are germanium—used to make the first transistor in 1947 and today a key ingredient of optical fibers—tin, and lead, which are basic to future applications of superconductivity and advanced sensor systems.

Physical chemists have long known that still higher rates of electron mobility are inherent in compounds formed out of elements from columns three and five of the periodic table. In theory, these 3-5 compounds, as they're known, should replace silicon in future high-performance information-processing systems. They haven't yet because they're hard to work with, and the materials-processing technologies haven't kept pace with silicon.



Semiconductor symmetry: The starkly beautiful patterns of these gallium arsenide semiconductor chips resemble those of Moorish tiles. Above, a microphotograph of a monolithic microwave integrated circuit; above right, a 3000-logic-gate chip package on a high-speed test fixture.



Until now. Starting in 1986 with the Microwave/Millimeter Wave Monolithic Integrated Circuits (MIMIC) program at the Defense Advanced Research Projects Agency (DARPA), 3-5 technology has advanced to the point where it's beginning to close the gap with silicon.

MIMIC was aimed at analog applications in weapon sensor systems such as radar. Instead of processing the data as ones and zeros, the MIMIC devices generated representations, or analogs, of the targets of interest in the form of voltages that were then converted to a digital format and processed by onboard digital computers. The idea was to quickly accumulate and pass on to the computers large volumes of intelligence data for identification and appropriate response.

First of the 3-5s

MIMIC also pushed the technology of the first of the 3-5 compounds, gallium arsenide (GaAs). With an electron mobility about five times that of silicon, plus reduced power requirements and inherent resistance to radiation, GaAs was the perfect material to break the front-end bottleneck of airborne systems. GaAs devices derived from MIMIC, such as the transmit/receive modules for the Westinghouse phased-array radar on the Air Force's Advanced Tactical Fighter (ATF), have begun finding their way into operational systems.

Now, building on that base, the solid-state physics community is accelerating its efforts along two paths: using these new materials in the more demanding digital applications and experimenting with other 3-5 compounds that have even greater potential performance than GaAs.

Once again DARPA is leading the military effort, this time with a program to insert digital GaAs technology into eleven current weapon systems as one-to-one replacements for existing silicon devices (see box). The major advances, however, are coming from the commercial world. Even before the DARPA program began, Seymour Cray, the legendary progenitor of supercomputers, began designing his next machine entirely out of digital GaAs logic. Known as the Cray 3 and expected to be the world's most powerful supercomputer, the new machine is scheduled for initial deliveries in mid-1991.

Meanwhile, the basic research organizations of Bell Laboratories (which demonstrated that first germanium transistor), Hughes, IBM, and others are reporting initial successes with such other 3-5 combinations as indium phosphide (InP), aluminum indium arsenide (AlInAs), and gallium indium arsenide (GaInAs). In each case, the key to improved performance lies in increasing the content of indium, because it has the potential of improving electron mobility three or four times beyond GaAs.

Memory is the Bellwether

GaAs thus represents the opening wedge of a revolution that is transforming electronics. Today, the technology is about where silicon was in the early 1970s, when Silicon Valley in California was turning out sample quantities of the first crude microprocessors and semiconductor memories. Those devices have since become ubiquitous, making possible the present era of distributed computing and intelligent

weapons. A bellwether is memory, which has gone from a thousand bits per chip to a million, at essentially the same price.

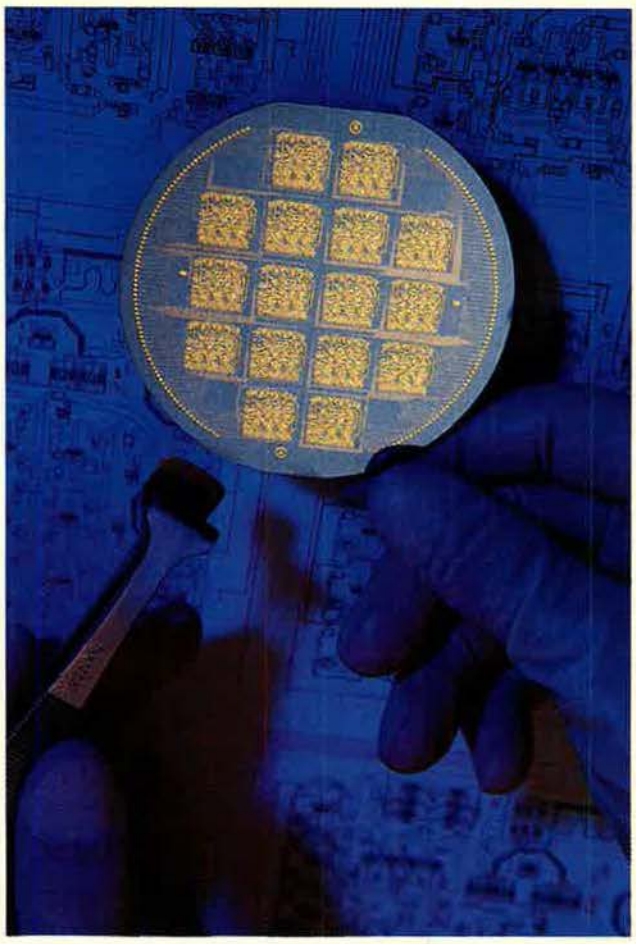
Price-performance achievements like that are a function of volume production. That's what the DARPA program is all about, according to Dr. Arati Prabhakar, GaAs program manager in the agency's Defense Sciences Office: building the necessary infrastructure. That's also why DARPA chose weapon systems currently in production. "We're taking one risk at a time," she adds.

Two of the Army demonstration projects, in particular, should drive up digital GaAs volume, according to Sven A. Roosild, DARPA assistant director for electronic sciences. They are a new modem and frequency synthesizer being developed by E-Systems to provide antijam capability for the AN/PRC-126 radio and a digital signal processor from Martin Marietta to replace bulky analog components in the RF Hellfire antitank missile and thus increase the lethality of its warhead. Each of these projects will require hundreds of thousands of the new components, he says.

In addition to assuring military program managers of reliable sources of supply, this increased volume should give the United States an edge in the inevitable GaAs shoot-out with Japan. Already, four Japanese companies—NEC, Oki, Hitachi, and Sumitomo—are actively marketing GaAs integrated circuits in the United States, although these are generally less complex devices derived from the companies' programs in fiber optics.

There are only two, relatively low-volume, Air Force projects on the list, but they could have the biggest impact on pushing GaAs technology. E-Systems in Greenville, Tex., is developing a distributed array processor for "special mission aircraft" under a contract from the Air Force Logistics Command that will increase processing speed sixfold while reducing subsystem weight by 300 pounds. Martin Marietta in Denver is developing a one-chip on-board spacecraft computer for a classified reconnaissance satellite that will increase processing speed from 75,000,000 operations a second to 560,000,000—without changing the system architecture or software. Vitesse Semiconductor of Camarillo, Calif., is supplying 15,000-gate arrays for this project.

For the Navy, Texas Instruments in Dallas is developing a GaAs thirty-two-bit computer operating at 200 MHz (two hundred million cycles per second) to improve the resolution of the AN/APS-137 surface-search radar on the P-3C patrol aircraft. Under a separate DARPA-sponsored program, the Navy is also looking at GaAs devices to improve the performance of its Ariadne undersea antisubmarine warfare system. The devices would reduce power requirements by a factor of five to ten at each node of the fiber optic cables.



A Westinghouse technician finishes a GaAs boule, above right, that will be sliced and polished into three-inch integrated wafers like the one at left. The wafer is then patterned and sawed into individual GaAs chips (in this case, sixteen of them). The larger the wafer manufactured, the lower the finished price of the chips.

The Speed-Power Product

These DARPA-sponsored projects illustrate another edge for GaAs. Compared to silicon, it has what is known as a speed-power product that is about six times better. That means you can send the same amount of data traffic for one-sixth the power (particularly important for spacecraft and, to a lesser extent, aircraft) or six times as much information for the same electrical power requirement (a better choice for terrestrial applications). Moreover, radiation resistance comes for free, which makes GaAs particularly attractive for military use.

Outside the DARPA program, GigaBit Logic of Newbury Park, Calif., one of the GaAs chip suppliers, is under contract to the Air Force's Ballistic Systems Division at Norton AFB, Calif., to develop a GaAs

Eleven weapon systems will be updated with GaAs technology.

Infusions of Arsenic

The Defense Advanced Research Projects Agency (DARPA) this year selected nine major defense contractors to participate in a program to insert digital gallium arsenide (GaAs) integrated circuits into eleven operational weapon systems.

The selection follows a broad agency announcement issued by DARPA on January 22, 1988, in which the agency sought proposals from industry on ways to upgrade current silicon-based devices to improve performance.

Supporting the nine prime contractors are three new companies founded specifically to produce GaAs digital integrated circuits for military and commercial markets: GigaBit Logic of Newbury Park, Calif., TriQuint of Beaverton, Ore., and Vitesse Semiconductor of Camarillo, Calif.

Program manager at DARPA is Dr. Arati Prabhakar, and the program is under the direction of Sven A. Roosild, assistant director for electronic sciences in DARPA's Defense Sciences Office. The projects, by service, are as follows:

Air Force: E-Systems, Greenville (Tex.) Division: distributed-array processor for special-mission (reconnaissance) aircraft, Air Force Logistics Command.

Martin Marietta Space Systems, Denver, Colo.: spacecraft on-board processor for reconnaissance satellites (a "black" program for which the program office was not disclosed).

Army: E-Systems, ECI Division, St. Petersburg, Fla.: modem and synthesizer for AN/PRC-126 small unit radio, Army Communications Electronics Command (C-ECOM).

ITT Avionics, Nutley, N. J.: digital radio frequency memory for AN/ALQ-136 jammer, C-ECOM.

Martin Marietta Electronic Systems, Orlando, Fla.: signal processor for RF Hellfire seeker, Army Missile Command.

McDonnell Douglas Electronic Systems, Huntington Beach, Calif.: mast-mounted sight processor for OH-58D Scout helicopter, Army Aviation Systems Command.

Navy: Grumman, Bethpage, N. Y.: radar processor for E-2C airborne early warning aircraft, Naval Air Systems Command (NavAir).

Honeywell Defense Avionics Systems, Albuquerque, N. M.: digital map computer for the multiservice V-22 Osprey and other aircraft, NavAir.

KOR Electronics, Huntington Beach, Calif.: digital radio frequency memory for AN/ULQ-21 threat jamming simulator, Navy Pacific Missile Test Center.

Sanders Associates, Nashua, N. H.: digital radio frequency memory for the AN/ALQ-126B used on several tactical aircraft (perhaps later on the A-12 advanced tactical aircraft), NavAir.

Texas Instruments Defense Systems and Electronics Group, Dallas: high-resolution upgrade for the AN/APS-137 surface search radar, NavAir.

version of the Air Force's popular 1750 airborne computer. The one-chip, sixteen-bit microprocessor is intended to be capable of speeds of 1 GHz (a billion cycles per second) with error correction. GigaBit Logic is teamed with Jaycor, a company in San Diego that specializes in radiation resistance, and Galaxy Microsystems, a 1750 architecture design firm in San Jose, Calif., and Austin, Tex., on the project.

Another small start-up company, Gazelle of Santa Clara, Calif., has developed a GaAs program logic array that is compatible with conventional transistor-transistor logic (TTL) but is twice as fast. This array will replace an entire box in a military system with a single chip.

As is customary in any new technology, costs are initially high but are plummeting rapidly. Dr. Prabhakar estimates that a three-inch-diameter wafer costs $160 to $175 and that the processing and testing of the devices adds another $2,000 per wafer. However, the industry is moving up to four-inch-diameter wafers, which reduce costs. Mike Pawlik, vice president for marketing at GigaBit, estimates that twenty suppliers have been qualified on three-inch wafers and eight on four-inch wafers. The silicon industry has long been working with five-inch wafers.

GaAs has an inherent cost advantage over silicon at the processing end. The photolithographic process used to imprint the devices onto a substrate requires only twelve masking steps for even the most complex GaAs devices. That compares to twenty or more for comparable silicon devices made with the complementary metal oxide semiconductor process.

Prices May Drop

In fact, as all the new companies scramble to get on board this technology, a worldwide drop in GaAs prices may be in the works, according to Dr. David Miller, a manager at the Litton Airtron Division, Morris Plains, N. J., one of the principal GaAs wafer suppliers. "Because of all the hype, the hockey stick [an allusion to steep sales curves in growth industries] is lying down. It's not straight up," he says. "There's overcapacity at every level."

Gallium is a material for which the United States is completely dependent on foreign sources of supply: Canada, France, Germany, and Japan. "Arsenic is cheap. It's everywhere," says Pawlik of GigaBit. "Gallium is priced like silver." In addition to Airtron, the major wafer suppliers include the Canadian conglomerate Cominco (which extracts gallium as a by-product of aluminum refining), M/A Com of Lowell, Mass., and the Japanese firms Mitsubishi and Sumitomo.

Dataquest, a market research firm in San Jose, Calif., that has a reputation for conservative forecasts, projects that the merchant market for GaAs devices will rise from $328 million this year to nearly $1.3 billion by 1993. That's a thirty-five percent compound annual growth rate, but about thirty percent of the total today is accounted for by nonrecurring engineering costs for technology and product development.

The growth is projected to be fastest for digital GaAs—from $127 million this year to $656 million in 1993—which is currently dominated by the "big three" merchant suppliers, GigaBit, TriQuint, and Vitesse. The market for analog devices (not including those for DARPA's MIMIC program) is projected to grow from $201 million to $621 million over the same period. (The figures also do not include the output of the "captive" suppliers such as AT&T, Hughes, McDonnell Douglas, Rockwell, Texas Instruments, TRW, and Westinghouse, which produce solely for their own needs.)

Competition for Silicon

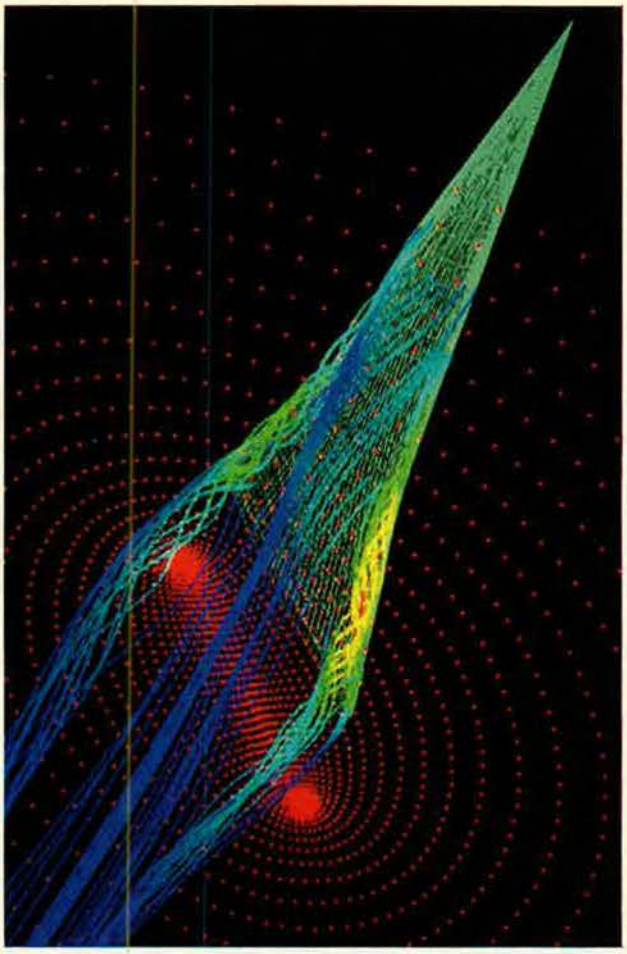
The real competition is not among the GaAs producers, according to Louis Pengue, marketing manager at TriQuint, but against the entrenched silicon devices, particularly top-of-the-line emitter-coupled logic (ECL), which has replaced TTL and dominated military systems in recent years. He calls the problem the "FUD factor" (fear, uncertainty, and doubt), which he expects to be erased as more program managers become familiar with the new technology.

Reducing costs is essential to winning acceptance, according to Mr. Pengue. That means driving down the cost per gate of a large logic array (10,000 gates or more) to three to five cents so it can compete head-on with ECL. One of the best ways to do that is to increase the chip size, and GaAs has been moving up steadily from 100 mils on a side to 200 mils. (One mil is a thousandth of an inch, so 100 mils is a tenth of an inch.) It needs to go beyond 300 mils, Mr. Pengue maintains, but he says there's a "fear threshold" among users at about 250 mils.

If anybody should know the pluses and minuses of GaAs, it's Seymour Cray, who has been building the world's most powerful supercomputers for at least twenty years. He laid it all out at last year's Supercomputing '88 conference in Orlando, Fla., cosponsored by the IEEE Computer Society and the Association for Computing Machinery.

"Gallium arsenide is pretty horrible to work with. It has a lot of grain," which affects the flow of electrons, he said. "It's . . . tough to get everything lined up right in order to make the system function properly," he explained. "It's like working with potatoes. There are soft spots, hard spots, eyes, and skin—and it's very hard right now to get good quality basic material to work with. But it gets better every year."

The Cray 3 uses GaAs for all the logic functions (but silicon devices for memory) to achieve breathtaking speeds of sixteen gigaflops (that's 16,000,000,000 floating point operations a second). It was originally scheduled for initial deliveries right about now, but technical problems and a move of the company from Minneapolis to Colorado Springs, Colo., have caused a slip of nearly two years. But already Cray is reported to be working on an all-GaAs Cray 4 capable of 128 gigaflops.



The tremendous calculating speeds that gallium arsenide chips make possible are being studied and developed by Cray Research, Inc. Cray supercomputers, the most powerful computers in the world, are used in computational fluid dynamics testing to simulate various aircraft flight parameters (right). Future GaAs technology could include ultrasensitive radars and radios.

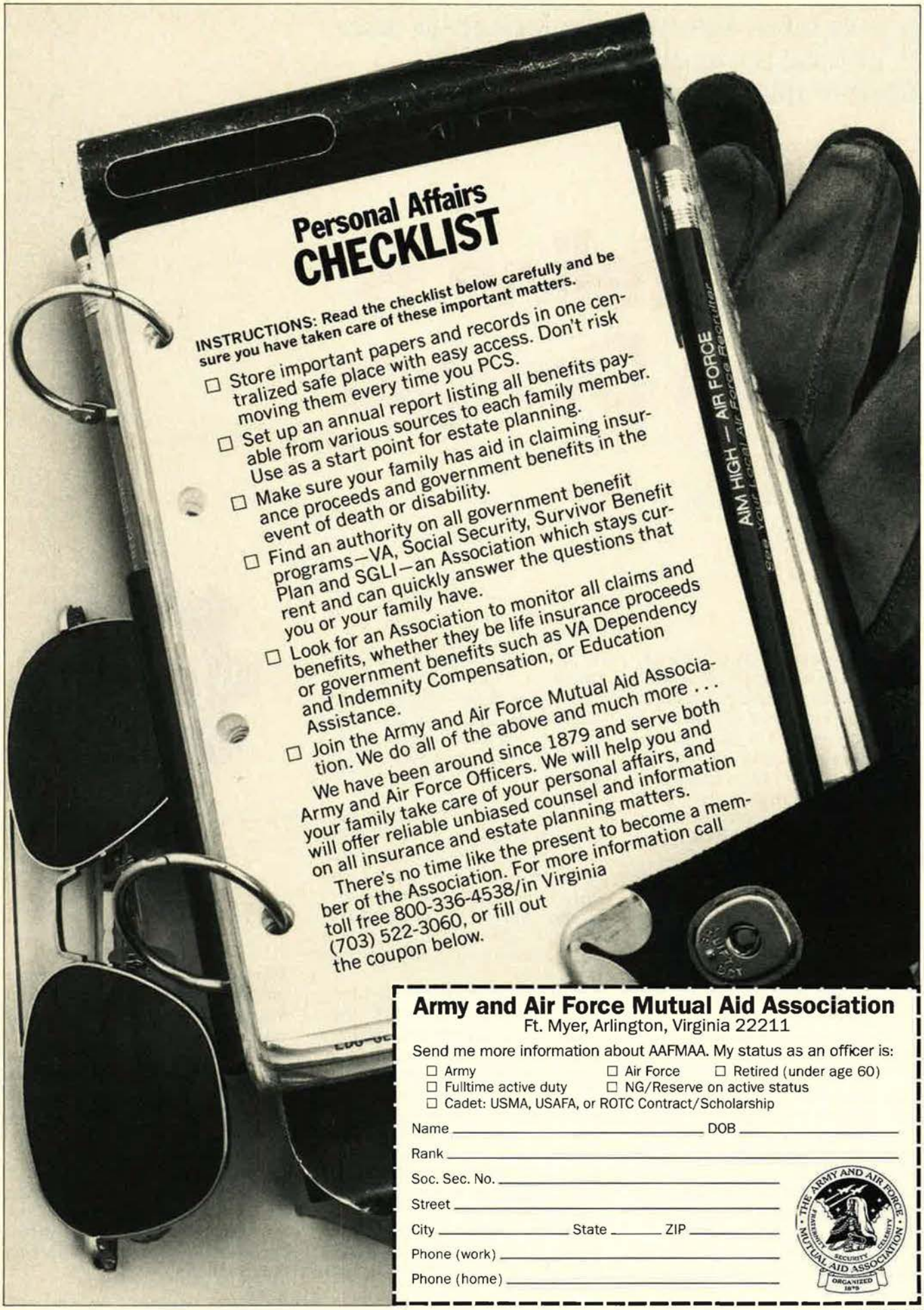
Out of the Sandbox

Looming over this GaAs free-for-all is the emergence of indium phosphide. Paul Greiling, manager of gallium arsenide research at the Hughes Research Laboratories in Malibu, Calif., reported in July on a high-electron-mobility transistor in which individual layers of indium phosphide, aluminum indium arsenide, and gallium indium arsenide as thin as five individual atoms were deposited using the molecular beam epitaxial process.

The result is a fifteenfold improvement in sensitivity for a communications satellite receiver, which means the ground antenna for use with a direct broadcast satellite could be reduced to one foot in diameter. Data rates as high as twenty-five gigabits (twenty five billion bits) a second were achieved. Reasonable extrapolations of this technology could lead to ultrasensitive radars capable of spotting stealth vehicles—or to the "Dick Tracy" wristwatch radio.

What may be even more exciting is that the gallium indium arsenide layer can serve as a laser diode operating at the wavelengths of 1,300 and 1,550 nanometers (billionths of a meter). Those are the wavelengths of state-of-the-art single-mode optical fibers, which would permit data output from the computer chip to be in the form of photons rather than electrons. That would be a big step toward the post-electronics world of photonics (see "Beyond Electronics," p. 78, June 1989 issue). Nobody is predicting an end for silicon-based electronics devices, but the industry has begun venturing cautiously out of its sandbox. ■

John Rhea is a free-lance writer living in Woodstock, Va., who specializes in military technology issues and is a frequent contributor to AIR FORCE *Magazine. His book* Department of the Air Force *is scheduled to be published this month by Chelsea House, New York, N. Y.*



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A year later, the defense industrial base is getting more attention, but the decline and the problems continue.

The Lifeline Is Still in Danger

BY F. CLIFTON BERRY, JR.

"AMERICAN industry today is unable to expand its production to meet wartime mobilization needs in less than eighteen months. It is not possible to surge the output of even the most important weapons and war materials much faster than that. The nation has been dependent for years on foreign sources of raw materials. Now it is becoming dependent for critical manufactured goods as well, including some high-technology products that are essential to defense production."

That is the gist of the problem as summarized by the Air Force Association and the USNI Military Database in "Lifeline in Danger," their September 1988 assessment of the US defense industrial base. Contractors are leaving defense industry by the thousands. Even in peacetime, the domestic industrial base cannot meet defense needs. The Pentagon does not know how reliant its prime contractors are on foreign sources or the extent to which they count on the same limited domestic sources for surge production.

Among the reasons why the problem developed were the instability of defense funding, an incredible tangle of confusing legislation, poorly structured—and sometimes conflicting—incentives and disincentives, an adversarial relationship between government and industry, and general neglect of the industrial base.

A year after the report was published, the lifeline is still in danger. The defense industrial base continues to decline. The only encouraging news is that the problem now has high visibility in both houses of Congress and that the Pentagon is giving it more serious attention than it once did.

"Lifeline in Danger" called for a Presidential Commission to lead the recovery. No commission has been named, but a bill introduced by Sen. Alan J. Dixon (D-Ill.) would establish an Industrial Capabilities Committee appointed by the President to "assure a realistic assessment of the demands to be placed upon industry by national defense plans and industry's capabilities to fulfill those expectations."

Already established in the Pentagon is a new office headed by Richard E. Donnelly, Assistant Deputy Under Secretary of Defense for Manufacturing and Industrial Programs. Mr. Donnelly and his small staff of career civil servants and military officers constitute the focal point for industrial base matters. A key part of Mr. Donnelly's operation is the Office of Industrial Base Assessment (OIBA).

OIBA, headed by John E. DuBreuil, is leading the effort to gather crucial information. It is not waiting for legislation or more studies before beginning work. The current concentration is on critical foreign vulnerabilities.

Examples of US reliance on foreign sources range from the commonplace to the exotic. They include quartz fibers, semiconductors, bearings, fasteners, precision optics, and machine tools. Also on the list is an essential ingredient for the atropine Syrettes issued to troops for use in case of nerve-gas attack. Belladonna, an essential ingredient in the compound, comes from a sole foreign source: Bulgaria.

The Defense Industrial Network

OIBA's major means of data collection is the Defense Industrial Network (DINET). Other data-collection actions include reviewing subcontractors' reports of foreign purchases, reviewing the production bases' analyses of the armed services, and developing a Joint Industrial Mobilization Planning Process (JIMPP) under the leadership of the Joint Staff.

Mr. Donnelly told Congress that "we have done fairly well at identifying problems; not so well at determining which are the most serious problems or [at] developing solutions." Thus the need to collect data, tie existing data sources together, and use available data more effectively so that comparisons and policy analyses are built on credible data foundations.

DoD has invested about $1.4 million in DINET since 1985. A basic operating capability had been built, and DINET was functioning on a modest basis. According to Mr. DuBreuil, DoD is applying resources to DINET and other data-collection activities at a rate that is prudent and consistent with development of the information base.

One might assume that all the requisite information must already exist in government databases somewhere. It doesn't. Information is fragmented, in different formats for different purposes in different departments, or just plain unavailable. The information may be in contractors' files, and to extract data raises issues of cost and proprietary rights.

DINET now has the capabilities to identify alternate sources, perform facility-impact assessments, provide corporate profiles, and identify major suppliers for about 3,000 weapon systems.

Gaps in the Net

Major suppliers can be identified, but not the subcontractors at lower tiers. The OIBA staff has exercised the system to identify subcontractors for critical components at increasingly lower tiers.

In early 1989, for example, OIBA tracked specialty glass used in several important weapon systems. Beginning with the special glass in the target acquisition designation system/pilot night-vision system (TADS/PNVS) of the AH-64 Apache attack helicopter, OIBA staff tracked the supply to its source.

The search led from the AH-64 prime contractor (McDonnell Douglas) to the TADS/PNVS subcontractor, Martin Marietta, then through a series of subcontractors. After working down through seven or eight tiers of subcontractors, the searchers found the source of special glass for the TADS/PNVS: the Schott Co. in Pennsylvania.

They also learned that Schott is the sole supplier for all systems that use precision glass. All primes and major subcontractors get their glass from Schott. Another surprise: Schott, a lower-tier subcontractor with no direct relationship to DoD, had not been identified as a defense contractor.

The DINET database obviously needs to go beyond defense contractors. The defense industrial base is not an isolated component of the national economy; it is simply part of the national industrial base.

Other Sources, Other Data

SOCRATES is an information system maintained by the Defense Intelligence Agency. It tracks capabilities around in the world in the critical military technologies. The Pentagon recommends merging DINET and SOCRATES into a single comprehensive industrial data-management system. So far, that has not happened. However, the basic staff work has been done to make it happen when the funds become available and the necessary directives are issued.

Another effort was started by the Army. Called the Army/Census Bureau survey, it was intended to obtain information on US manufacturers' ability to expand production capacity and assess foreign dependency. It was supposed to provide statistically valid information and to be linked with DINET. The survey was stillborn for several reasons, among them industry opposition (manufacturers regarded it as burdensome, costly, and possibly redundant) and the Army budget squeeze. According to the General Accounting Office, a decision on whether to try again has been postponed until 1992.

Richard Donnelly says the DINET system currently serves seventy users in thirteen DoD organizations. It is being expanded as resources permit and as the necessary compatibility of data from different sources can be achieved. GAO estimates that getting DINET to full capability would cost between $7 million and $29 million. To date, only $1.4 million has been committed.

The Defense Production Act

In the Senate, Senator Dixon has led the effort to renew the Defense Production Act (which was to have expired on September 30, 1989) and to provide the administration with the tools to revitalize the defense industrial base. Other key legislators, such as Sen. Jeff Bingaman (D-N. M.), and Sen. Donald Riegle (D-Mich.), have taken action to gather information and illuminate the issues. The Defense Production Act falls under the purview of the Senate and House banking committees, not that of the armed services committees.

The Defense Production Act (DPA) is the basic authority for industrial preparedness planning. It was passed during the Korean War, when Presidential authority was required to remobilize after the post-World-War-II dismantling of the defense industrial base. Over the years, the DPA has been amended to reflect changing conditions.

Title I authorizes the President to order priority performance and allocate materials to promote national defense. It was used in 1988 to assign high priority to rebuilding the burned-down factory in Nevada that had supplied fifty percent of domestic capacity for ammonium perchlorate, an essential ingredient in rocket-motor propellant. As a consequence of the Title I priority, the plant will begin producing ammonium perchlorate within one

year, rather than the two to three years such a construction contract would normally require.

Air Force Systems Command is the DoD executive agent for Title III, which authorizes the President to make purchases, purchase guarantees, loans, and loan guarantees in order to expand national defense-related productive capacity and supply. Senator Dixon recently cited a prime example of using Title III as it was intended. High-purity quartz fiber is an important ingredient in complex electronics. The sole source for the quartz fiber was France. The French contractor was providing fiber slowly, causing delays in critical DoD programs. By using the purchase-guarantee provisions of Title III, the Defense Department was able to encourage a US firm, Fiber Materials of Columbus, Ohio, to begin production. Now DoD has a domestic source for the critical high-purity quartz fiber. Furthermore, Fiber Materials is delivering on time and is an effective competitor for the French supplier.

Title VII contains general authorities useful to industrial preparedness. A new provision, added in 1988, gives the President authority to block mergers, acquisitions, or takeovers of US firms by foreign entities if he determines the acquisition would threaten or impair US national security.

Congress and DPA

A House subcommittee of the Banking Committee has been considering a bill offered by Rep. Mary Rose Oakar (D-Ohio). It would require that within five years, all DoD purchases be made from domestic sources. The intent is to preserve the domestic industrial base and remove US dependence on foreign sources. DoD does not support the bill, contending that its provisions will not strengthen and may weaken the US industrial base.

The Senate Banking Committee has before it Senator Dixon's bill to extend the Defense Production Act through 1993 and to strengthen substantially the three remaining operative titles. His legislation would create a revolving fund to provide stable funding for Title III projects. It would also look to the stockpiling of critical components that the US buys from foreign sources because it lacks materials or because domestic production is not economical. It recommends provisions to encourage investment by defense contractors in modern production facilities and processes. The Dixon bill would expand antitrust defenses now available in Title VII to encourage industry-sponsored joint ventures for the production and development of products.

Although the Defense Production Act was due to expire on September 30 of this year, cooperation between House and Senate banking committees resulted in an extension of its life to June 30, 1990. The purpose: to permit extensive hearings on defense industrial base issues, especially in the Senate. As a result of the extension, more congressional attention will be given to those issues this winter than ever before.

The Adversarial Relationship

The Defense Management Review, published in July by Secretary of Defense Richard Cheney, recognizes that the government-industry relationship needs work. Deputy Secretary of Defense Donald Atwood was struck by what he found when he moved into the Pentagon.

He said the confrontational atmosphere between Congress, DoD, and the defense contractors contributed to the erosion of the industrial base. He said, "The extent of the mistrust . . . is shocking. I have never seen anything like it."

He and Secretary Cheney believe that the confrontational atmosphere is "completely unnecessary and, more importantly, it wastes scarce resources that could be used in other, more productive endeavors."

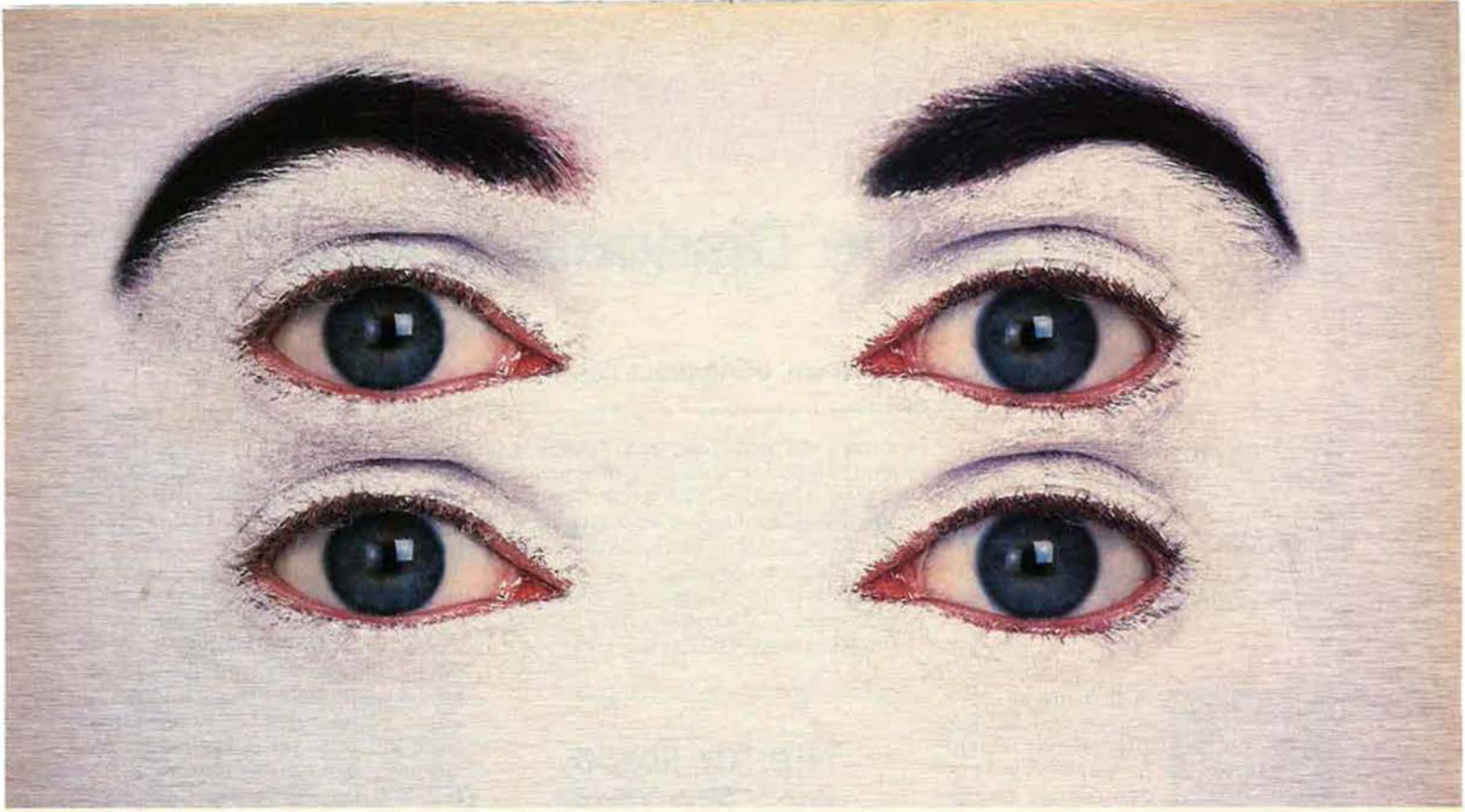
To overcome the confrontational atmosphere, Cheney, Atwood, and their colleagues are trying multiple approaches. The new Defense Manufacturing Board, for example, provides a nonadversarial means of communication and cooperation. John Betti, the new Under Secretary of Defense for Acquisition, will head a regulatory relief task force. It will conduct a thorough review of regulations from the ground up in an attempt to reduce the grief involved in doing business with DoD.

Secretary Cheney hopes to turn DoD into a "world-class customer," setting high DoD and industry goals for quality, reliability, and management improvement. That means raising DoD's internal operations to a higher quality level, while at the same time requiring contractors to make their own improvements.

Areas for improvement include acquisition streamlining by cutting system requirements to basic needs and eliminating costly, complex, and unneeded specifications. Given a high priority for achieving world-class customer status is DoD's Total Quality Management program.

Finally, as stressed by Christopher Galvin of Motorola (Chairman of the Quality Committee of the Defense Manufacturing Board), "Congress itself may have to commit to reform legislation on a fast-track basis," and set high quality goals for itself. Galvin advocates changing Congress's role from "constructive operations management" (diplomatic language for micromanagement) to that of a "kind of board of directors for the Department of Defense." ■

F. Clifton Berry, Jr., is a former Editor in Chief of AIR FORCE *Magazine. He saw USAF service in the Berlin Airlift, 1948–49. Later, he was a paratrooper and an officer in the 82d Airborne Division. He commanded airborne and infantry units in the US and Korea and saw Vietnam combat as operations officer of a light infantry brigade. His most recent article for* AIR FORCE *Magazine, "New Tools for Mission Planners," appeared in the August '89 issue.*



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Viewpoint

What the Dissenters Add

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

Well-reasoned disagreement—as distinct from simple bellyaching—has a long and honorable history in the military. We need all the constructive criticism we can get.

In this era of consensus and collegiality, Cmdr. David R. Carlson's condemnation of the cruiser *Vincennes*'s action in shooting down Iran Air Flight 655 and the decision of the US Naval Institute to publish his detailed charge in its authoritative journal, *Proceedings,* are remarkable departures from the rule. Commander Carlson was commanding the frigate USS *Sides* in the Persian Gulf at the time of the shootdown. His views are in strong disagreement with official findings and, in particular, with an article titled "The *Vincennes* Incident," which appeared in an earlier issue of that same magazine.

Commander Carlson makes his salient point when he says that putting a happy face on the affair may have been politically correct, but that "as military professionals, we owe ourselves more."

Dissent in the military has always been potentially hazardous to one's career. Only time will tell whether Commander Carlson has walked the career plank with his carefully prepared essay, but dissent is nevertheless an important element in a professional military service. Without it, you simply have a bureaucracy of time-servers. Well-reasoned disagreement, as distinct from simple bellyaching, has a long and honorable history in the armed forces. With the layers of civilian authority ever increasing, it is important that military professionals stake out their ground.

That most distinguished of military philosophers, Carl von Clausewitz, intensely disliked Napoleon. When his king, Frederick William III of Prussia, signed a treaty with France, Clausewitz resigned his post in disgust and joined the army of the Russian Czar in its war against Napoleon, and thus, in effect, against Prussia. After Napoleon's defeat, Clausewitz rejoined the Prussian Army. That he went on to become a fountainhead of military theory is a tribute not only to his own genius but also to the forgiving nature of the otherwise brutal Prussian system.

The Air Force, once the most innovative and free-thinking service, has become one of the more hidebound.

Modern politicians are not as benevolent toward dissenters as was Frederick William III. They do not gracefully accept dissent from military officers, as the case of Maj. Gen. John Singlaub illustrates. He was hustled into retirement, and considerable notoriety, by President Carter for insisting on the need for US troops in Korea.

Gen. Douglas MacArthur's banishment to a redoubt in the Waldorf Towers was brought about by his challenge to civilian authority over the conduct of the war in Korea. His sin lay in defying the Constitutional authority of President Truman. It was an intolerable challenge to the Commander in Chief.

Controversy among the military services is another matter, one that the civilian masters have traditionally looked on with equanimity, if not indifference. The unseemly B-36 squabble between the admirals and the Air Force came close, at times, to insubordination, yet the principal protagonists went on to high rank. The fact that the battle was intramural, and not confined to a single service, removed the danger of service retribution. Civilians, from President Truman on down, stayed out of the fray.

Professional military disagreements within the ranks, like that of Commander Carlson, are of still a different kind. Whether they should be aired in public rather than in a more restricted venue is a legitimate question, but there should be no question as to the need for professional dissent. Far better that it should come from active-duty officers than from those who, disenchanted, have left the service.

The Air Force owes its existence to a strong-minded and vocal generation of dissenters. They weren't always right, as was the case with their conviction that daylight bombers could fight in to the target unassisted, but they were more often right than wrong, and they made their opinions known without regard for official displeasure.

The Air Force, once the most innovative and free-thinking service, has become, in middle-age, one of the more hidebound. Doctrine, essential for orderly thinking, also produces doctrinaires. Like ancient theologians, military doctrinaires tend to function with closed minds.

Changes in deployments, in the budget, and in ways of employing airpower are fast approaching. The Air Force needs all the bright ideas, as well as all the constructive criticism, it can get. ■

Airman's Bookshelf

By Jeffrey P. Rhodes, AERONAUTICS EDITOR

The B-24 Liberator 1939–45, by Martin Bowman. If you're a fan of the Consolidated B-24, that sturdy, stalwart, long-range, heavy bomber of World War II, then you'll like this book, warts and all. The author calls it an overview, and so it is, but it also gives generous coverage to the RAF's and US Navy's use of the Liberator, something not usually found in specialty books of this sort. The pictures are copious and well presented. But there are warts, among them conflicting statements about the number of B-24s produced—variously given as 18,888, 18,886, and 18,188. Similarly, Cebu in the Philippines is referred to as "Cabu city" and "Cabu Island." Bailout is consistently misspelled "bale-out," and the Ryukyus Islands show up as "Ryukus." This is still a useful volume on the B-24. Sterling Publishing Co., Inc., New York, N. Y., 1989. 136 pages with photos and index. $24.95.

Combat Flying Equipment: US Army Aviators' Personal Equipment, 1917–1945, by C. G. Sweeting. It takes more than a flight jacket to outfit an aviator. This book describes the development and characteristics of nearly every item of personal equipment used by Army pilots from World War I through the end of World War II. Starting with a look at physiological factors and engineering, this work then looks at such items as oxygen equipment, parachutes, body armor, anti-G garments and pressure suits, survival equipment, and such miscellaneous equipment as watches, flashlights, and first-aid kits. The text describes how the equipment was used and often gives some background into its development through personal anecdotes from the people involved. Smithsonian Institution Press, Washington, D. C., 1989. 244 pages with photos, notes, glossary, bibliography, and index. $50.00.

The Experience of World War I, by J. M. Winter. Every once in a while a book comes along that is considered the definitive work on its subject. This could very well be that work on World War I. Divided into sections, the text views the cataclysmic war through the eyes of the politicians who instigated it, the generals who planned it, the soldiers who fought it, and the civilians who were caught in the crossfire. It also examines the aftermath and effects of the war and, most interestingly, the war's effect on literature and graphic arts, as well as how the war has been depicted in films. There are numerous charts, graphs, previously unseen photographs, maps, a multitude of sidebars covering such things as the songs the soldiers sang, and glossaries of words and phrases for each of the main sections. The amount of information in this volume is staggering. A highly recommended book. Oxford University Press, New York, N. Y., 1989. 256 pages with bibliography, acknowledgments, and index. $29.95.

Global Mission, by Gen. H. H. "Hap" Arnold. One of the most important books ever written on airpower, this all-time classic has been rereleased and is as vital as ever. "Hap" Arnold's professional life paralleled the development of military aviation, and he tells how US airpower was developed, the momentous decisions and operations of World War II, and the pertinent details of his private life. As a witness to and participant in history, General Arnold gives the background on how and why these events occurred and tells some humorous stories that never before made it into the record. General Arnold was never one to mince words, and his considered opinions on people and events give new insights into the Army Air Forces and World War II. This reissue is part of Tab Books' Military Classics Series. Tab Books, Blue Ridge Summit, Pa., 1989. 626 pages with photos and index. $18.95.

Post-World War II Bombers, by Marcelle Size Knaack. This work concentrates on the development and fielding of bomber aircraft between 1945 and 1973. Beginning with the B-36, the author traces the development of each operational type and includes hard facts such as total number of aircraft accepted, acceptance rates, dates of start and finish of production, and flyaway cost per production aircraft. The author also examines the policy issues and technological decisions that molded each bomber program and the modification/modernization efforts that occurred once the plane was fielded. An appendix covers World War II bombers that saw use after the war and bombers such as the XB-35 and B-1A that never made it past the prototype stage. This is the second volume of the *Encyclopedia of U. S. Air Force Aircraft and Missile Systems.* Office of Air Force History, Washington, D. C., 1988. 619 pages with photos, glossary, selected bibliography, and index. $31.00.

Unit 731: Japan's Secret Biological Warfare in World War II, by Peter Williams and David Wallace. Set up in 1935 by bacteriologist Shiro Ishii in a remote village in Japanese-occupied Manchuria, Unit 731's soldier-scientists carried out cryogenic, ballistic, and vivisection experiments on Soviet, Chinese, American, British, and Australian prisoners of war for more than ten years in order to perfect germ warfare. Ishii and his colleagues were never prosecuted. The authors provide documentation that at least seven nations, including the US, Britain, and the Soviet Union, had knowledge of Japanese bacteriological and chemical-warfare programs. The authors also say that the US granted immunity to those involved in exchange for research data. The Free Press, New York, N. Y., 1989. 303 pages with photos, appendices, notes, and index. $22.95.

United States Military Aircraft Since 1909 (Third Edition), by Gordon Swanborough and Peter M. Bowers. Much as *Gray's Anatomy* is the standard reference for medical students, this work is an indispensable reference for the aerophile. Every major type of airplane from the Wright Military Flyer to the Bell-Boeing V-22 and the Northrop B-2 are included in this newly revised edition. This latest version of the book (last revised in 1971) expands on the aircraft in service then and includes the more than twenty new Air Force and Army types that have been introduced since. In addition to historical and technical detail about the individual aircraft types, this monumental effort includes a brief history of the Air Force and sections on aircraft procurement and disposal, designation systems, and coloring and markings. Balloons and airships, foreign-built aircraft, pre-World War I aircraft, and aircraft that saw only minor service are included in the appendix. Airplane buffs the world over are rejoicing that this book is back. Smithsonian Institution Press, Washington, D. C., 1989. 766 pages with photos and indices. $49.95.

IN VIDEO—"Military Aircraft Video Report, Vol. II, No. III." The latest issue of this quarterly video magazine covers two "news" stories (the rollout of the Northrop B-2 bomber and TAC's William Tell air-to-air competition) and two "feature" stories (profiles of the Grumman X-29 and the General Dynamics F-111) in some depth. It also gives cursory attention to the start of C-17 production and the Swiss purchase of McDonnell Douglas F/A-18s. All of the pieces move along smartly, not boring the viewer with shot after shot of the same action, and the footage is excellent. There are a handful of minor inaccuracies in the narration, though, and the F-111 profile fails to mention either FB- or EF-111s. Air Force Medal of Honor winner Joe Jackson serves as host. 70 minutes, 1989, color. Distributed by Fusion Video, Tinley Park, Ill. $39.95.

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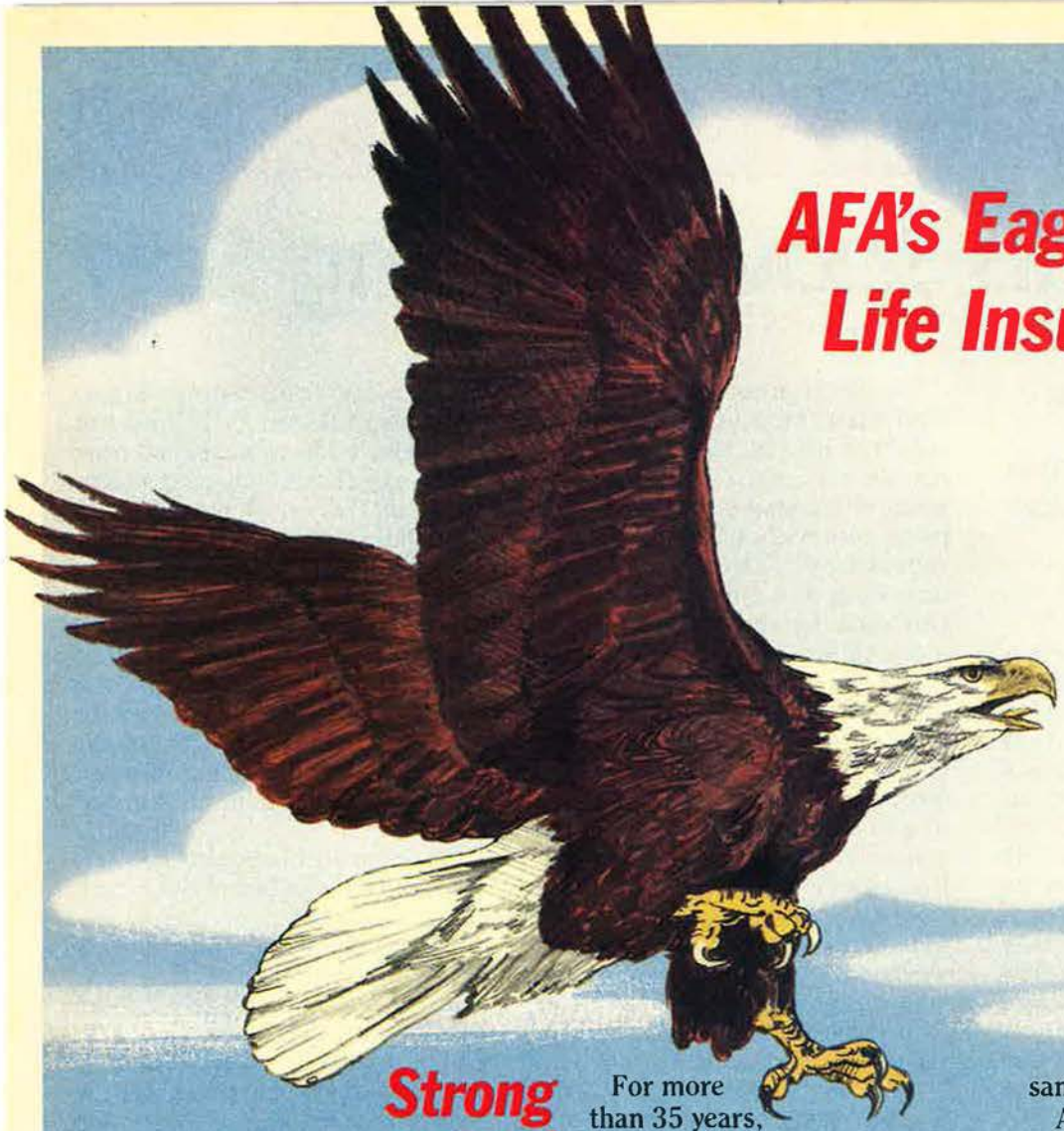

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One-Man Show at Bong Son

Among the most courageous forward air controllers was a former fighter pilot called "Mac the FAC."

BY JOHN L. FRISBEE

WHEN awards of the Air Force Cross in the Vietnam War are tabulated by mission area, the forward air controllers (FACs) rank third, exceeded only by tactical fighter pilots and helicopter rescue crews. The mission of the FACs was to find targets and mark them with smoke rockets for attention by fighters or ground fire. It was sweaty work, especially in the early years of the war when FACs flew light planes like the Cessna O-1 Bird Dog, designed for private pilots back home, not for war. The degree of danger was in direct proportion to the aggressiveness of the individual FAC. One of the most skillful and determined was a former fighter pilot, Maj. William McAllister.

In early 1964, Major McAllister was assigned to the 22d ARVN Division, flying out of Qui Nhon on the east coast of Vietnam. He rapidly earned a reputation for daring, accuracy, and sound tactical judgment. Some FACs would fire their rockets from an altitude of a few hundred feet. Not Major McAllister, known to the fighter pilots and ground troops with whom he worked as "Mac the FAC." He went in on his target at treetop level, and although the O-1 was not equipped with a sight, Major McAllister developed uncanny accuracy, often attacking a target with his four rockets before the fighters arrived. He was, in short, one of the best in the business. Since targets invariably shot back, his aggressive style drew an unusual number of hits on the O-1, which did nothing to dampen the combative spirit of Mac the FAC.

On the afternoon of March 25, 1965, Major McAllister flew the prelude to a mission that was to earn him the Air Force Cross. A detachment of Vietnamese Marines was pinned down in a narrow valley surrounded by 3,000-foot mountains near Bong Son, fifty miles north of Qui Nhon. In marginal weather with a ceiling lowering from 1,200 feet, Major McAllister, under frequent heavy fire from small arms and automatic weapons, directed a series of attacks by A-1Es against enemy forces, enabling the ARVN Marines to gain their objective. He then remained in the area, a target for Viet Cong gunners, while a helicopter from Qui Nhon evacuated two US Marine advisors who had been wounded. Low on fuel and with engine problems, Major McAllister limped back to base, ending another successful three-hour mission.

At 11:00 that evening, the ARVN Marines again called for help. Grabbing the first in-commission Bird Dog he could find, Major McAllister headed for Bong Son, flying under a low overcast that extended up to 8,500 feet. After finding the valley, which was barely wide enough for tight 360-degree turns, he called for flares. The assigned C-123 flareship could not enter the valley under a 500-foot ceiling. Major McAllister told the C-123's pilot to climb above the overcast and drop flares from 10,000 feet, using a radar fix from Pleiku. When the first flares fell off-target, he steered the flareship into position for accurate release, using dead reckoning. The intense light of the flares created a double hazard for the FAC: His O-1 now was illuminated against the overcast, making it a clear target for enemy fire, while the light of the flares threatened to blind him and set up perfect conditions for vertigo.

Maj. William "Mac the FAC" McAllister's aggressive tactics saved many a fighter and ground mission in Vietnam.

When enemy fire became too hot, Mac the FAC climbed into the overcast and orbited in the narrow valley, using the meager instruments with which the Bird Dog was equipped. He then requested the Air Support Operations Center at Pleiku to send a succession of flareships that would illuminate the combat area until dawn. Under the light of the flares, the Marines were able to reorganize themselves and hold off the VC attackers. Major McAllister helped disrupt the attack by firing an M1 out the window of the Bird Dog after his rockets were expended.

Nearly three hours after takeoff and with his fuel gauges hovering on empty, Major McAllister flew out of the valley, his O-1 ventilated by bullet holes. Shortly after his departure, the VC broke off their attack, confused and disorganized by the defenses Mac the FAC had directed while contending with weather, terrain, and enemy fire for which the little Cessna was not designed.

Before Major McAllister could be awarded the Air Force Cross—only the ninth of the Vietnam War up to that time—he was killed in an accident on what would have been his last mission before returning to the States. He left behind a record of valor that was an inspiration for those who were to come in the long remaining years of that war. ■

Bulletin Board

Information on the tail number of the **F-86 that Joe Logan flew** on his fatal mission on December 4, 1952, with the 336th FIS based at K-14 during the Korean War. **Contact:** Bob Cunningham, P. O. Box 748, Mail Zone 1636, Fort Worth, Tex. 76101.

Seeking **USAF Military Working Dog patches;** have Security Police K-9 patches to trade. **Contact:** Edward Russell, 7 Liberty Place, Boston, Mass. 02127.

Seeking information on my brother **(son of Elfriede Willmann Metzger)** who was **adopted by an Air Force officer** (possibly a Colonel), who may have been named "Pierce," in or about 1955, from a Catholic Orphanage near Stuttgart, Germany. **Contact:** Carl T. Sickman, 2105 128th St. East, Tacoma, Wash. 98445.

Information on the whereabouts of headquarters personnel of the **18th Replacement Wing,** based at Salt Lake City, Utah, from November 1942 to April 1944. **Contact:** Robert W. Hewitt (former Adjutant), 644 Hillsdale Ave., Hillsdale, N. J. 07642.

If you need information on an individual, unit, or aircraft, or if you want to collect, donate, or trade USAF-related items, write to "Bulletin Board," AIR FORCE Magazine, 1501 Lee Highway, Arlington, Va. 22209-1198. Letters should be brief and typewritten. We cannot acknowledge receipt of letters to "Bulletin Board." We reserve the right to condense letters as necessary. Unsigned letters are not acceptable. Photographs cannot be used or returned.—THE EDITORS

The 353d Special Operations Wing at Clark AB, the Philippines, is seeking donations of photos, documents, and other memorabilia for a historical display featuring its forerunner units, the **3d Air Commando Group** (May 1, 1944–March 25, 1946) and the **553d Reconnaissance Wing** (February 9, 1967–December 15, 1970). **Contact:** CMSgt. Edward J. Winkelseth, USAF, 353d SOW, APO San Francisco 96274.

Information on the whereabouts of **Leland Williams,** who was a pilot in the Army Air Corps in World War II and later in USAF. He was at an air base in San Antonio, Tex., in 1945, and later at Langley Field, Va. **Contact:** Emmet Condon, 3300 N. State Rd. 7-C291, Hollywood, Fla. 33021.

Seeking a source of Garrett or Turbo Mach surplus **engines** with gear reduction from 6,000 to 8,000 rpms, 50–150 hp., without airbleed if possible, to help develop a sport turbine-powered ski/bass boat. Also need assistance designing and building a new marine turbine with modulator. **Contact:** SSgt. Johnny A. Shelton, USA, 399 Atwater Rd., Hopewell, Va. 23860.

Seeking **photographs or lithographs** of military aircraft and helicopters. **Contact:** Tuncer Temel, Kizilcikli cad, No. 21/9, Eskisehir, Turkey.

Seeking World War II **seat pack chute,** less canopy; also Atlas material, military manuals, technical orders, books, photos, etc. Have aviation magazines and items of 1920s and 1930s to trade. **Contact:** Albert Pratt, 114 W. Lake View Ave., Milwaukee, Wis. 53217.

Information from anyone who knew **Lt. Robert F. Jeffries,** who was killed in action in a B-29 piloted by a Lieutenant Schroeder, over Tokyo on February 10, 1945. He was a member of 484th Squadron, 505th Bomb Group, stationed on Tinian in the Marianas. **Contact:** Nancy Jeffries Samp, 19 Acacia Tree Lane, Irvine, Calif. 92715.

Information on the **enlisted gunners flying from bases in England** who shot down the most enemy aircraft during World War II. **Contact:** SMSgt. Richard K. Rogers, USAF, Box 2196, APO N. Y. 09127-5367.

Seeking **autographs** of bomber and fighter pilots and aces who served in England during World War II. **Contact:** Adrian M. Hocking, 16 Coombe Rd., Penzance, Cornwall TR18 3NS, England.

Seeking color **patches** from the 13th Air Force, 7th Air Force, 5th Air Force, and 22d Air Force. **Contact:** Franklin W. Kinnamon, Jr., 29 Oakcrest Dr., Dover, Del. 19901.

Seeking anyone who has or can take a **photograph** of a KC-10 refueling one or two F/A-18s and, at the same time, refueling an F-15. **Contact:** Adrian F. Nagle IV, 2201 S. Yampa Court, Aurora, Colo. 80013.

Information on how to purchase the **flight handbooks** for the C-121 and EC-121 aircraft. **Contact:** Capt. Michael R. Vela, USAF, P. O. Box 4603, Norton AFB, Calif. 92409.

Would like to purchase a **US Army Air Forces Pilot's Ring,** Class 44-I, Single Engine Pilot; white metal with a red stone. **Contact:** Kenneth J. Klouzer, 5773 W. 75th St., Los Angeles, Calif. 90045.

Information on the whereabouts of **TSgt. Earl J. Parrish,** 44th Bomb Group, 8th Air Force, 1944–1945. Last known address was in St. Petersburg, Fla. **Contact:** Forrest S. Clark, 703 Duffer Lane, Kissimmee, Fla. 34759.

I would like to correspond with former **"Jungle Jims" and C-123 Air Commandos** on any aspects of COIN operations and personal experiences in Vietnam between 1960–1966, for a master's thesis in history on Air Force contributions to counterinsurgency efforts in Vietnam. **Contact:** Lt. Col. Fred Berry, USAFR (Ret.), 1845 Capri, Seabrook, Tex. 77586.

Information on the **Luscombe UC-90 and the Luscombe UC-90A** purchased and evaluated by US forces in Panama in 1942. Any documents or photographs relating to these specific aircraft would be appreciated. **Contact:** James B. Zazas, Rte. 3, Box 389, Carthage, N. C. 28327.

Seeking North American active-duty/guard & reserve unit **patches,** also state/province plates to display with the patches. **Contact:** Gene Barrett, 1019 E. 25th St., Cheyenne, Wyo. 82001.

Information on the whereabouts of **Francis J. d'Entremont,** also known as "Lucky Pierre," who flew P-47s in the 34th Squadron, 413th Fighter Group, from Okinawa in 1946. I believe he was from California. **Contact:** Ed Poole, 303 N. 90th St., Milwaukee, Wis. 53226.

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Would like to hear from any member of **Cadet Class of 44-E,** Columbus, Miss. (USAAF Flight Training—Pilot). **Contact:** Capt. Edward J. O'Brien, USAFR (Ret.), 14 Water St., Assonet, Mass. 02702.

Information on the whereabouts of **Robert Floyd**, who was a gunner in the 781st Bomb Squadron, 465th Bomb Group, 15th Air Force, Italy. Last known residence was Las Vegas, Nev., or southern California. **Contact:** Lt. Col. Ben L. Donahue, USAF (Ret.), 365 Oak St., Mountain View, Calif. 94041.

Niagara Frontier Aviation and Space Museum seeks donations of photographs and other memorabilia from World War II pilots of **Curtiss- and Bell-built aircraft,** including O-52, P-39, P-40, P-63, and C-46. **Contact:** Jack B. Prior, Prior Aviation Service, Buffalo Airport, Buffalo, N. Y. 14225.

Unit Reunions

Air Weather Ass'n
Veterans of the Air Weather Service will hold a reunion May 23–27, 1990, in San Antonio, Tex. **Contact:** Maj. Gen. John W. Collens, USAF (Ret.), 5301 Reservation Rd., Placerville, Calif. 95667.

Burtonwood Ass'n
Personnel stationed at RAF Burtonwood, England, will hold a reunion May 15–21, 1990, at the Hoole Hall Hotel in Chester, England. **Contact:** John T. Bado, 3432 N. W. 51st, Oklahoma City, Okla. 73112. Phone: (405) 942-3127.

Stalag Luft III
Former prisoners of war who were held in Stalag Luft III in Germany during World War II, will hold a reunion April 26–29, 1990, in Norfolk, Va. **Contact:** Robert L. Weinberg, 2229 Rock Creek Dr., Kerrville, Tex. 78028. Phone: (512) 257-4643.

11th Air Force
Veterans of the 11th Air Force are planning a monument dedication and reunion October 4–7, 1990, for personnel who served during World War II in Alaska and the Aleutians. **Contact:** Lt. Col. Charles A. Pinney, USAF (Ret.), P. O. Box 375, USAF Academy, Colo. 80840. Phone: (719) 685-1913.

29th Air Service Group
The 29th Air Service Group, 13th Air Force, will hold a reunion July 10, 1990, in Norfolk, Va. **Contact:** Frank Pace, 315 W. 15th St., Dover, Ohio 44622. Phone: (216) 343-7855.

P-38 National Ass'n
Former P-38 pilots, crews, builders, and fans will hold a reunion May 18–21, 1990, at the Universal Sheraton Hotel in Universal City, Calif. **Contact:** P-38 National Association, P. O. Box 1816, Burbank, Calif. 91507.

Class 45-A
Members of Class 45-A (Enid Field, Okla.) are planning to hold a reunion in March 1990. **Contact:** Frank A. Therrell, 3303 Shady Cove, Tyler, Tex. 75707. Phone: (214) 566-2616.

50th Troop Carrier Wing
Members of the 50th Troop Carrier Wing will hold a reunion September 6–9, 1990, at the Marriott Hotel in Nashville, Tenn. **Contact:** Frank Ehrman, 840 Staton Place West Dr., Indianapolis, Ind. 46234-2162. Phone: (317) 271-8568.

57th Bomb Wing
The 57th Bomb Wing (World War II), which comprised the 12th, 310th, 319th, 321st, and 340th Bomb Groups and their service squadrons, plus the 308th Signal Wing, will hold a reunion October 1–7, 1990, at the Sheraton Hotel in Colorado Springs, Colo. **Contact:** Robert E. Evans, 1950 Cunningham Dr., Speedway, Ind. 46224-5341. Phone: (317) 247-7507.

65th Fighter Squadron
The 65th Fighter Squadron, 57th Fighter Group, will hold a reunion March 29–April 1, 1990. **Contact:** Bill Hahn, 405 E. Carlton St., Savannah, Ga. 31401. Phone: (912) 236-7810.

318th FIS Officers
Officers of the 318th Fighter Interceptor Squadron "Green Dragons" will hold their annual D. B. Cooper Practice Dining-In November 17, 1989, at the McChord AFB Officers' Mess. **Contact:** Capt. Robert P. Otto, USAF, 318th FIS/DOW, McChord AFB, Wash. 98438. Phone: (206) 984-2171. AUTOVON: 976-2171.

344th Bomb Group
Members of the 344th Bomb Group (World War II) will hold a reunion June 7–10, 1990, in Dayton, Ohio. **Contact:** Lambert D. Austin, 5747 Darnell, Houston, Tex. 77096. Phone: (713) 774-3030.

379th Bomb Group
The 379th Bomb Group (World War II) will hold a reunion September 12–16, 1990, in Framingham, Mass. **Contact:** Ken Hampton, P. O. Box 123, Eatontown, N. J. 07724. Phone: (201) 542-0713.

4135th SW/39th BW
Members of the 4135th Strategic Wing and 39th Bomb Wing will hold a reunion March 30–31, 1990, at the Sheraton Coronado in Fort Walton Beach, Fla. **Contact:** Rex Nevill, 123 Sotir St., Fort Walton Beach, Fla. 32548. Phone: (904) 862-2819 or (904) 897-2312.

405th Fighter-Bomber Group
For the purpose of organizing a reunion, I would like to hear from personnel of the 405th Fighter-Bomber Group, which includes the 509th, 510th, and 511th Fighter-Bomber Squadrons, stationed at Langley AFB, Va., between 1953 and 1956.

Please contact the address below.

Roger Warren
7550 Palmer Rd.
Reynoldsburg, Ohio 43068

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, time, location, and a contact for more information.

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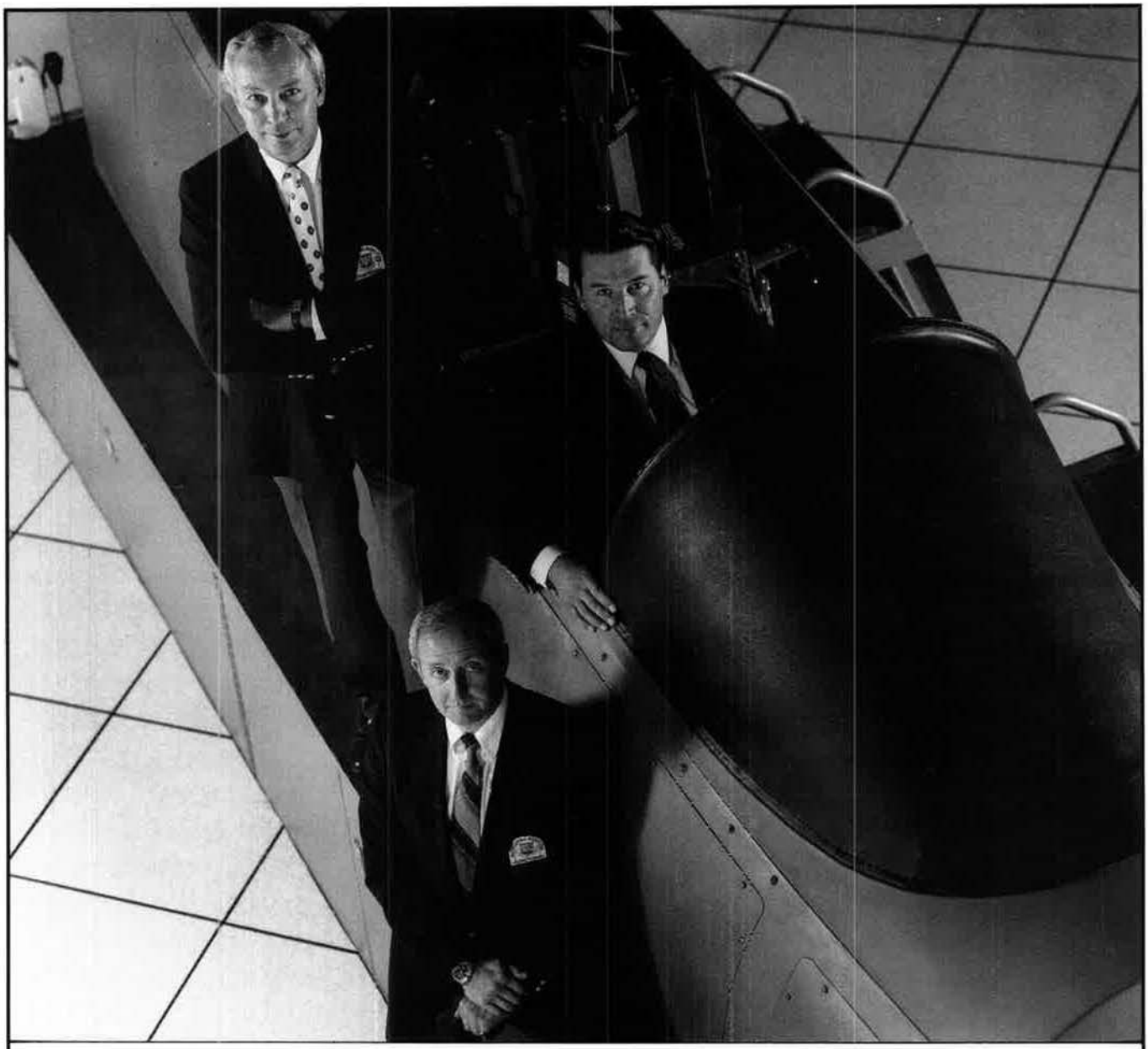

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