JULY 1978/$1

AIR FORCE MAGAZINE

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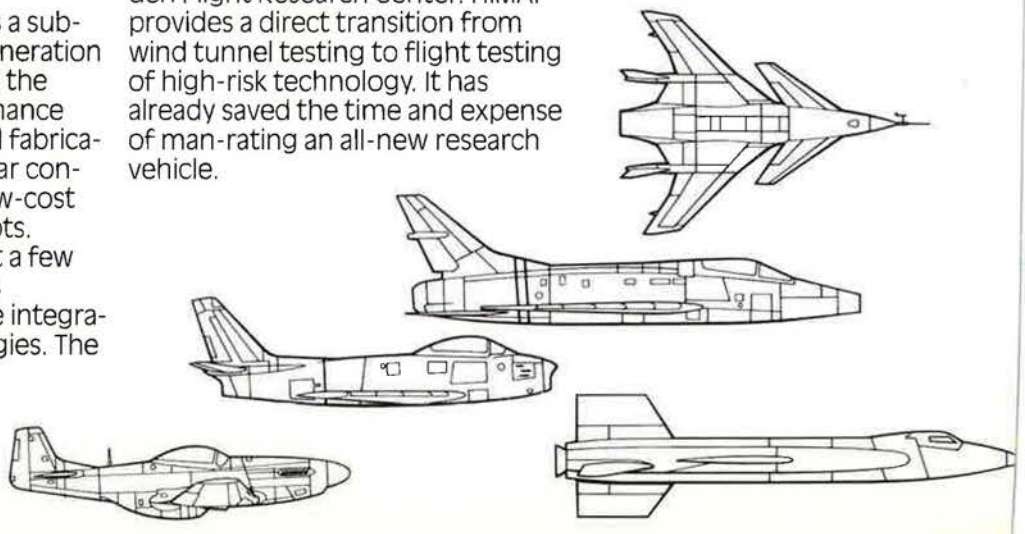

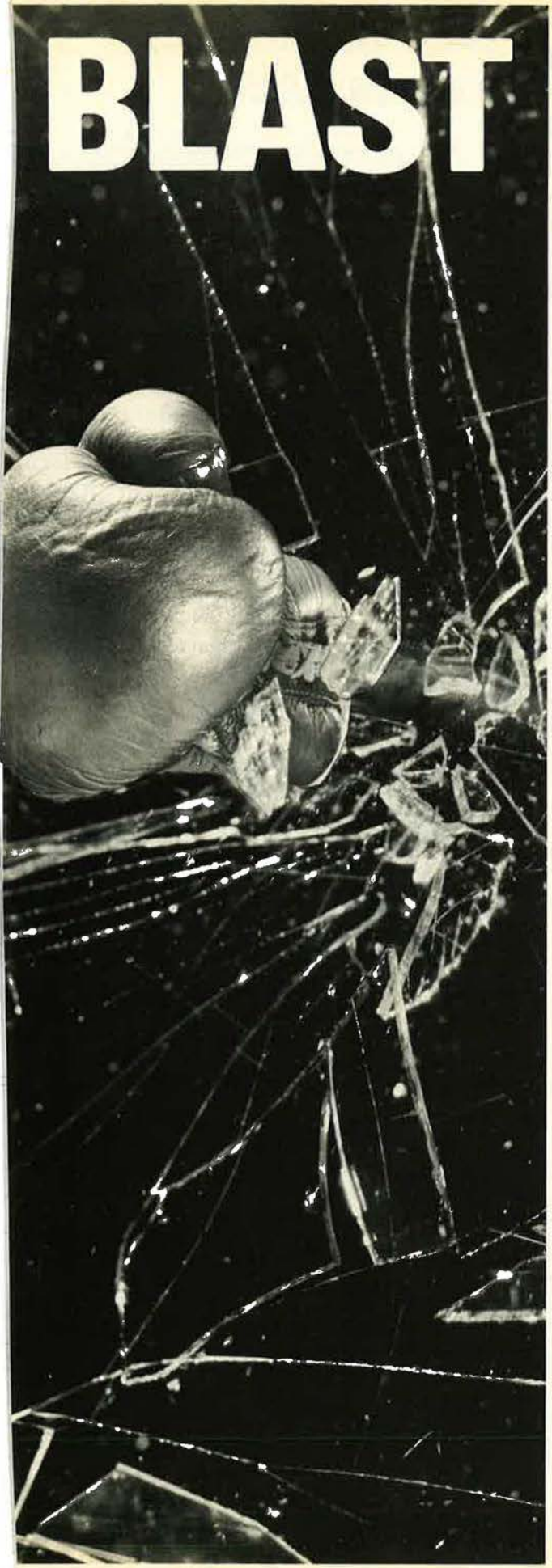

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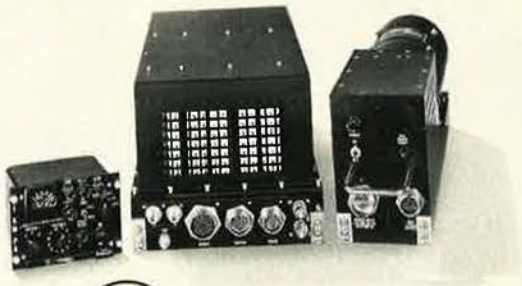

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AIR FORCE MAGAZINE

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This Month

ABOUT THE COVER

The July issue of AIR FORCE Magazine, as in prior years, features a special section on electronics and the impact that this technology has had on the way the Air Force will fly and fight. The electronics section begins on p. 42. The cover design is by Barbara Hammel, a Washington, D. C., area artist.

Departments

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AN EDITORIAL

Sounding Brass and Tinkling Symbols

WHEN Jimmy Carter was tramping the campaign trail, he liked to portray himself as a populist, drawing his inspiration from the innate wisdom and goodness of the people. Well, a large percentage of the people have been growing increasingly uneasy about the Carter Administration's handling of US-Soviet relations and about the military balance that underlies superpower relations.

Since we last commented on this subject a couple of months ago, there has been a notable stiffening of the Administration's foreign policy line—at least a stiffening of the vocal cords. Whether that is, philosophically, populism or just plain politics is anyone's guess.

In May, the President dispatched Vice President Mondale to the UN disarmament session, where Mr. Mondale addressed the unprecedented Warsaw Pact military buildup in Europe. "No nation," he said, "can be asked to reduce its defenses to levels below the threat it faces." Getting the Vice President to deliver a "hard-line" speech must have required persuasive powers that Mr. Carter has not been able to communicate to his TV audience.

Late in May, National Security Advisor Zbigniew Brzezinski, on "Meet the Press," talked in unequivocal terms about Soviet military expansion and other Soviet transgressions against "the code of détente," particularly in Africa. That came as no great surprise, since Mr. Brzezinski has never seen eye to eye with the legion of soft-line advisors who were brought into the Administration in its formative months.

The same tough themes were followed by the President himself in his remarks at the meeting of NATO heads of state on May 30. He also made well-publicized statements on Soviet and Cuban complicity in the recent attack on Zaire's Shaba Province, as did other high-ranking Administration brass.

But the *pièce de résistance* of this apparent metamorphosis in the Administration's attitude toward superpower relations was Mr. Carter's graduation address at the Naval Academy on June 7.

There is much in that speech with which we agree. We agree, for example, that the Soviets regard détente as "a continuing aggressive struggle for political advantage and increased influence. . . ." We agree that they are attempting "to export a totalitarian and repressive form of government. . . ." And we agree that "our long-term objective must be to convince the Soviet Union of the advantages of cooperation and the costs of disruptive behavior." How we do it is something else.

On some major points of the speech, we part company with the President. In discussing military power, the backdrop for relations between the US and the USSR and between NATO and the Warsaw Pact, Mr. Carter said:

". . . the military capability of the United States and our Allies is adequate to meet any foreseeable threat."

". . . we have the highest defense budget in history . . ." (an equivocation that can be supported only if one ignores the pervasive and growing influence of inflation).

"America has the capability to honor this commitment [to meet any foreseeable nuclear or conventional challenge to our security] without excessive sacrifice by the people of our country. . . ."

". . . our military capability is second to none."

We would not argue that last point very vigorously, at least today, but the President's judgment is not shared where it counts most. In March, members of the House Armed Services Committee visited Russia and met with, among others, Marshal N. V. Ogarkov, First Deputy Minister of Defense and the principal Soviet negotiator at SALT I. According to Rep. John B. Breckenridge of Kentucky, Ogarkov told the group, "Today the Soviet Union has military superiority over the United States and henceforth the United States will be threatened. You had better get used to it."

Unmentioned in the President's Annapolis speech were the facts that US armed forces—the symbols of national power—are the smallest since 1950; all of the services, to degrees varying from moderate to extreme, are having trouble recruiting enough qualified people under the All-Volunteer concept, especially to man the Reserve Forces; the US Army has lowered the reading level of its training manuals from the eleventh to the ninth grade standard and is having trouble maintaining its equipment with the recruits it gets; the Air Force faces a critical shortage of pilots, engineers, and scientists; stretchouts of USAF's tactical air modernization are creating potentially serious problems for future combat capability.

These are but a few examples of why the once booming peal of the US armed forces seems, in Kremlin ears, to have become more akin to tinkling symbols.

Nevertheless, the President said, "The Soviet Union can choose either confrontation or cooperation. The United States is adequately prepared to meet either choice."

We don't know what President Carter considers "excessive sacrifice by the people of this country." We do know that some sacrifice is going to be needed to reverse the declining trend in US military capability, or it's a sure bet that the Soviets *will* choose confrontation whenever and wherever it suits their purpose.

The carrot of increased trade and scientific/cultural exchange offered the Soviets by Mr. Carter is not likely to outweigh in Soviet calculations a shrinking and not very firmly grasped military stick.

—JOHN L. FRISBEE, EDITOR

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Right Man, Wrong Slot

The May 1978 issue of AIR FORCE Magazine is one of the more humorous issues you have produced for some time.

I had to chuckle when I read the fancy words written [by] the Air Force Military Personnel Center. Several passages specifically just couldn't be swallowed. The reference to "first term . . . officers who are serving four-year terms receiving no more than two assignments after initial training" certainly doesn't apply to anyone I know, except for the highly volatile 17XX field. All others are stuck with four-year first assignments. Once someone reaches the two-and-a-half to three years on-station point, AFMPC tells you they would move you if they could, but since you only have a year to a year and a half left, it wouldn't be "reasonable" or "cost-effective" to move you. Hence, four-year tours are becoming the norm. The original concept of trying to motivate young officers to a twenty-year career, plus increase their knowledge and exposure to the Air Force, by having them serve two tours in their initial commitment, has been woefully forgotten. . . .

Under "The Bulletin Board," it was explained that scientific and engineering (S&E) personnel are badly needed. Here the problem is blamed on lower Air Force pay. Don't believe it! When S&E personnel are given challenging, meaningful jobs *within their specialty,* the retention rate will increase. As an example, my undergraduate degree is in computer science, and my specialty code is Computer Systems Analysis; yet the computer system I "work" with is not even located in the same state as I am, and programming the computer at my level is forbidden by MAJCOM regulations. At the same time, one of the people I graduated with has an electrical engineering degree and spends much of his time working on computer programs. The lack of sense in assignment policies equates directly with the lack of S&E personnel retention.

When Air Force planners begin seriously considering the career wishes of the individual and properly use their skilled personnel, the Air Force will become a much better place to work . . . as a career instead of just a minimum commitment.

1st Lt. Thomas J. Heidenfelder
Shaw AFB, S. C.

An Opposing Conclusion

In his May editorial, John Frisbee correctly points out that the Soviet Union is an expansionist power and the US is the principal obstacle to that expansion. From this he concludes, "It's hard to see how an agreement that advances the interests of one side [at SALT] can be compatible with the interests of the other." I don't believe this conclusion is correct, and would like to explain why.

It is true that certain aspects of SALT can be represented by a seesaw, in which anything subtracted from one side is, in effect, added to the other. Since neither side is going to sign an agreement placing it at a significant disadvantage, the only feasible treaties are those that leave the perceived position of the seesaw approximately where it would be if there were no treaty. If this were the whole story, one might reasonably conclude no purpose is served by an arms control treaty. But it is not the whole story.

There are two ways in which an arms control treaty can serve the interests of both sides simultaneously.

First, it can promote crisis stability.

Some weapons are destabilizing, in that their effectiveness lies in their ability to initiate a nuclear war. Examples are: high-accuracy ballistic missiles, depress-trajectory SLBMs, SSBN deployments close to target, and strategic ASW. Other weapons are stabilizing in that their effectiveness lies in their ability to deter war by threat of retaliation. Examples are: long-range SLBMs, secure-based ICBMs, and strategic cruise missiles.

A treaty that constrains or reduces the first group reduces the probability of strategic nuclear war, thus serving the interest of both sides.

Second, it can save money for both sides.

It is not unusual for one side to deploy weapon A, for the other to deploy weapon B to match or counter A, and at the end of the cycle to have the damage inflictable for both sides to be approximately the same as before. If the two sides can agree to refrain from building both A and B, the balance of forces will be unaffected but both sides will find themselves with funds freed for other purposes.

Thomas J. Downey
Member of Congress
Washington, D. C.

• *Congressman Downey is from the Second District of New York.*—THE EDITORS

Failure of a Concept

In response to General Milton's article "How We Backed Into Vietnam," in the May issue, one can readily observe that the war in Vietnam was one of a limited theater with regard to American involvement. It should be pointed out, though, that our failure in Vietnam was due to a lack of the application of basic principles of warfare—unified effort toward winning. Victory was not sought and, as a result, we subjected our military forces to the hardship of prolonged "limited" military action with no definite goal.

The concept of containment failed because it was based on an ill-advised defense posture. Containment is achieved by limiting the action of the enemy to his own borders. How could this have been done in Vietnam? The answer to this is simple: In the 1960–61 time frame in SEA, we should have encouraged and supported a major ARVN drive across the 17th parallel into the heart of North Vietnam.

The advantages of such a drive would have been twofold. First, it would have forced a withdrawal of Communist forces operating in South Vietnam, Laos, and Cambodia, in order to defend their own territory. Second, such a drive would have limited the role of American military personnel to advisors, instead of military combatants.

To further contain the enemy and preserve the independence of South Vietnam, we could have followed through with a proper application of airpower, such as applied by

President Nixon in the Linebacker I and II operations during the Christmas '72 bombing campaign. President Nixon's strategy at that time was correct; it denied the entry of military hardware into North Vietnam from Red China and Russia, and, perhaps of greatest importance, it brought the war right to the enemy's doorstep.

In Vietnam we walked away not only from a war but from an ally. There was a weakening of the national will and our commitment to the cause of freedom. Let us not forget the lessons of our indecent, limited engagement.

Harold R. Moroz
Elmont, N. Y.

No Scratching Necessary

As always, your May issue containing the Air Force Almanac is loaded with dynamite facts and statistics on our Air Force.

Forebodingly, I always get the impression that our potential adversaries also get this valuable military information much too easily—without having to scratch very hard to get it. Moreover, our Administration's eager giveaway programs create further consternation in my mind.

I hope we still have some remaining secrets and defense assets that have not and will not be given away gratis, and which will continue to cause our potential adversaries to further deliberate with respect, fear, and wonder.

Kenneth W. Wrede
Warner Robins, Ga.

Engineers' Exodus

Dr. Charles C. Moskos's article on "Compensation and the Military Institution" in your April issue misses a point that seems to have been overlooked by Air Force policymakers as well. Focusing on the enlisted grades in the context of this issue serves only to obscure the fact that there is currently under way an exodus of professionals, particularly engineers, from the Air Force to private industry. The undeniable cause of this shift is the superior pay and advancement opportunities available in private industry relative to the military.

This has serious implications for our national defense posture since the readiness of weapon systems like the Minuteman ICBM is dependent on the quality of Air Force in-house engineering capability. Contracts with private industry to provide engineering services do not fill the gap that is emerging. These are both inefficient and extremely costly to the taxpayer. A man-year provided by private industry can cost the Air Force up to three times as much as the same production obtained from a company-grade officer.

To allow the deterioration of our engineering community in the name of military institutionalism is foolish. Institutionalism in the engineering environment is virtually nonexistent. Typically, an engineer has trouble naming his squadron commander and couldn't care less. This is not to imply that engineers are not dedicated to performing an important duty for their country. It simply means that they are motivated by the nature of their work and the objective at hand and not by the organization.

Contrary to Dr. Moskos's contention that a "market" system of compensation would undermine our defense posture, it is clear from this vantage point that considerable damage is being done by the lack of just such a system. Dr. Moskos's mysterious inverse correlation between wages and the quality of people they attract at the enlisted grades simply does not hold water in the professional fields. The Air Force has always considered the physical health of its members important enough to demand that a premium be paid to maintain a military medical community. Is the physical health of our tactical and strategic forces not just as important?

Capt. Gerald Raubach
Project Engineer, Spec. Weapons & Reentry Vehicles
San Antonio ALC
Kelly AFB, Tex.

Ignored Missions

When I saw your April article "USAFSS: People Proud of Their Mission" [by Ed Gates], I thought, at last an article about my command free of the usual platitudes contained in the Air Force Almanac issue. I was right, and thoroughly enjoyed the plaudits I think are richly deserved. Unfortunately, the article completely ignored an important USAFSS mission and two functional entities collocated with the headquarters at Kelly AFB, Tex.

USAFSS has three missions: signals intelligence, communications security, and electronic warfare. However, as in your article, the signals intelligence mission often gets top billing to the detriment of the other two. The article did not even mention the Air Force Electronic Warfare Center and its mission, devoted only two paragraphs to the communications security mission of the Air Force COMSEC Center, and did not mention the Air Force Cryptologic Depot, which performs for unique USAFSS mission equipment AFLC-type inventory management, maintenance, and other logistics functions.

Maj. John M. Stanley
AF COMSEC Center/EPP
San Antonio, Tex.

Belated Credit

I read the article in your April issue regarding presentation of the first Risner Trophy [p. 17]. Having some small knowledge of this project, I am very much interested.

I think it is an excellent statue and trophy, but I think it would only be fair to mention the name of the artist who executed the work. So often some statue is dedicated and there are many photos of all the famous, but the poor artist, who has worked like hell to do a good job, is never mentioned.

Lincoln Borglum
La Feria, Tex.

• *We agree. The sculptor is Larry Ludtke, a member of the National Sculptors Society and the Royal Society of British Sculptors. He was commissioned by Ross Perot (who was particularly interested in the fate of the MIA/POWs during the Vietnam War) to do the statue of General Risner for the trophy. And speaking of sculptors, our correspondent is the son of Gutzon Borglum, who designed and supervised the carving of the faces on Mt. Rushmore. After the death of his father, Lincoln Borglum completed the awesome project.*—THE EDITORS

Wycombe Abbey School

Former members of Headquarters VIII Air Force Bomber Command and the Eighth Air Force will well remember High Wycombe, England, and the Wycombe Abbey School, code-named "Pinetree."

A plaque in the entrance hall of the school reads: "Wycombe Abbey School served as the Headquarters of the United States VIII Bomber

Airmail

Command from April 1942 until January 1944, and as Headquarters of the United States Eighth Air Force from then until October 1945. In these buildings were conceived, planned and directed the mighty air assaults on Germany which, with those of the Royal Air Force, paved the way for Allied victory in Europe."

We recently have heard from the Rt. Hon. Sir Goeffrey Howe, QC, MP, Great Britain's Chancellor of Exchequer. Sir Goeffrey informs us that the Wycombe Abbey School is now investing some $600,000 in additional facilities and is in hope of raising about $40,000 from American friends to name the new Common Room as a permanent memorial to the US Eighth Air Force. He also advises us that, to ensure that such donations by American donors are tax-deductible, arrangements have been made with the British Schools and Universities Foundation to receive contributions. Therefore, checks or money orders should be made payable to that Foundation and sent to:

British Schools and Universities Foundation, Inc.
c/o The Bank of New York
530 Fifth Ave.
New York, N. Y. 10036

In a covering letter, donors are asked to mention their interest in the work of the Foundation and that the donation is made to the Wycombe Abbey School. The Foundation is a nonprofit, educational, scientific and literary foundation. Contributions to it are tax-deductible. —THE EDITORS

Bruce's Great Escape

I've been waiting patiently for Bruce Carr to set the record straight on his Me-109 episode, caricatured in Bob Stevens's piece in January, but who knows if Bruce even reads AIR FORCE Magazine.

My not-too-hazy recollection is that the 354th Pioneer Mustang Group was then at Ansbach, Germany. The time was very close to the end of the war, and Bruce was essentially finished with his second combat tour. He heard about a field full of Me-109s at (I believe) Linz, Austria. He arranged to rendezvous with his flight members at a specified time and date, hitchhiked to Linz, found an Me-109 that worked, and at the appointed time took off when his flight arrived to escort him home.

Upon arrival at Ansbach, he sure enough couldn't get the gear down, and made a perfect belly landing in the middle of our air patch. I even have a picture of him somewhere, standing in the cockpit scratching his head in a bemused fashion. Even without the derring-do of the prison escape, it was quite an episode.

I might add that Bruce could hit enemy airplanes at angles-off that most of us wouldn't think of firing. He contributed significantly to the record of the 354th, which shot down more aircraft in the air than any other WW II fighter group.

Col. Felix Kozaczka, USAF (Ret.)
Woodland Hills, Calif.

Looking for a Photo

I would like to contact anyone who served in the 829th Bomb Squadron, 485th Bomb Group, Fifteenth Air Force, between July 1942 and April 1945. I am trying to locate a photograph entitled "Dressed to Kill."

The airman in the picture was Hailey Sullivan, Jr. This is very important to me and my children.

Mrs. Hailey Sullivan
1917 Glendora Dr.
District Heights, Md. 20028

B-24 Radar "Wing"

During the summer of 1945, I ferried B-24s from the Radar Navigation Training School at Victorville, Calif., to McClellan Field, Sacramento, Calif., to be modified. This consisted of installing a radar housing, in the shape of an airfoil, under the fuselage just behind the nose wheel. I never got a picture of this installation, and would like very much to add one to my WW II pictures.

I would appreciate any help in obtaining a picture of a B-24 with this radar "wing."

Robert K. (Ken) Barmore
22632 Anza Ave.
Torrance, Calif. 90505

All About Vandenberg

I am engaged in writing a biography of Gen. Hoyt S. Vandenberg, Sr., and would greatly appreciate information, anecdotes, etc., concerning that portion of his career from his days at West Point (Class of 1923) until V-E Day, when he commanded Ninth Air Force.

I am particularly interested in correspondence from officers or cadets who may have been assigned with him at March Field (May 1927–May 1929), Wheeler Field, Schofield Barracks (May 1929–May 1931), Randolph Field (September 1931–August 1934), or on the Air Staff from July 1939 until July 1942.

Lt. Col. Jon A. Reynolds
Assistant Professor
Department of History
USAF Academy, Colo. 80840

Lt. Col. Clifford C. Gould

I am trying to locate former or present members of the Air Force who knew and/or served with my uncle, the late Lt. Col. Clifford C. Gould.

Colonel Gould was a lieutenant during WW II and flew an extensive number of combat missions in both P-38s and P-51s while a member of the Eighth Air Force's 55th Fighter Group (the well-known "Loco Busters"). He then served as a captain in the Michigan Air National Guard after WW II. He attained the rank of lieutenant colonel while flying F-84s in Korea. He also commanded the 7th Fighter Bomber Squadron (the "Screamin' Demons") during the Korean War.

In November 1957, Colonel Gould was killed at Bremgarten, Germany, when his F-84 crashed during takeoff. At the time of his death he was serving as a member of the USAF Military Assistance Advisory Group to the French Air Force.

If any readers knew my uncle, I would greatly appreciate it if they would get in touch with me.

SSgt. Willard T. Wheeler
PSC 1, Box 3911
APO New York 09109

SEA Unit Patches

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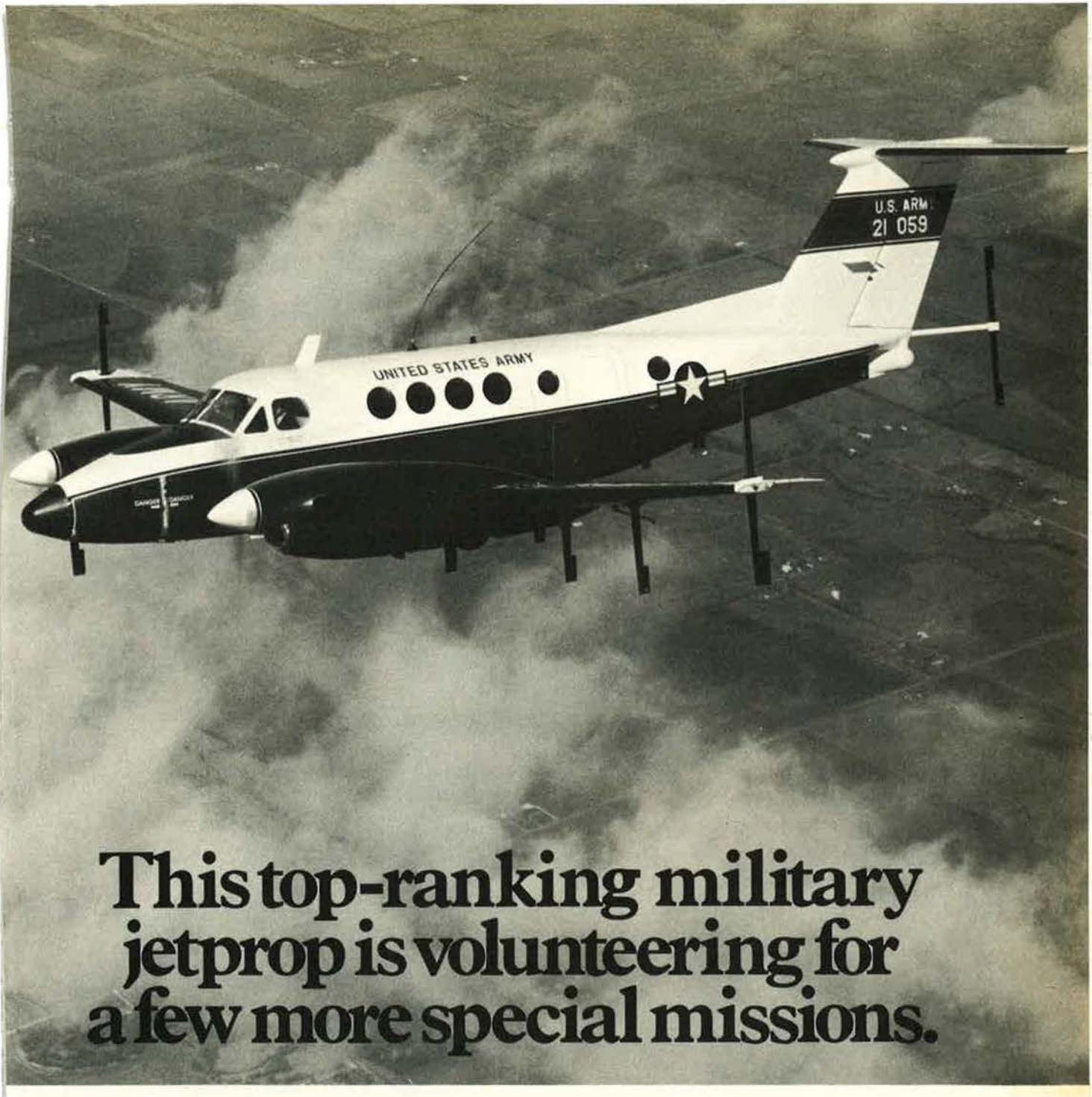
I know some of the units are no longer active, but I would appreciate it if anyone who did serve with them would send me a patch to help finish this project. I kept an old briefing map and would like to place the patches where the units were assigned during my tour in 1968.

The units I am missing are: 3d, 8th, 12th, 31st, 35th, 37th, 355th,



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Scottsdale, Ariz. 85257

UNIT REUNIONS

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Tulsa Air National Guard is having a reunion to help commemorate the 50th anniversary of the Tulsa International Airport. Reunion will be held July 22–23, at the Sheraton Inn at the airport. Contact

Lt. Col. Jack R. Seay
815 Riverside Dr.
Tulsa, Okla. 74127
Phone: (918) 583-7663

Tuskegee Airmen
Tuskegee airmen will hold their annual reunion at the Red Lion Motor Inn, Sacramento, Calif., August 9–13. Civilians; ex-cadets; instructors; dependents; dependents of deceased personnel; minority cadets of all service academies; the 99th, 553d Fighter Squadrons; 332d Fighter Group; 477th Bomb Group (M); 118th and 126th ABUs (Sq-F); and all supporting units of WWII at Tuskegee Institute; Tuskegee, Walterboro, Godman, and Freeman Air Fields; and Selfridge and Lockbourne AFBs, are invited. Other service personnel may attend by request or invitation. Contact

John Whitehead
Sacramento Chapter
P. O. Box 13306A
Sacramento, Calif. 95813

U-2
Annual reunion (Tucson Free-Style) of U-2 pilots and navigators will be held August 18–20, at the Woodlake Inn, Sacramento, Calif. Contact

Rhonnie Rinehart, Chrmn.
U-2 Reunion Committee
99th SRS
Beale AFB, Calif. 95903

6th TCS/374th TCG
A reunion of the 6th Troop Carrier Squadron, 374th Troop Carrier Group, is attempting to organize from New Guinea's "Bully Beef Express." Further information from

Capt. Norm Hardee
3705 Overton Park, E.
Fort Worth, Tex. 76109

8th Air Force
The 4th reunion of the 8th Air Force Historical Society will be held in Washington, D. C., October 19–22. Many 8th AF groups will join in minireunions again this year. An optional tour to Bermuda will depart Washington on October 22. All those not on the 8th AF mailing list are invited to send a stamped self-addressed envelope to

Elmer Fessler
8th AF Clearinghouse
3911 N. W. 173d Terrace
Opa-Locka, Fla. 33055

14th Liaison Sqdn.
A reunion of the 14th Liaison Squadron will be held in Niagara Falls, N. Y., August 25–27. Contact

Fred Podbielsky
560 78th St.
Niagara Falls, N. Y. 14304

22d Bomb Group
The 29th annual reunion of the 22d Bomb Group (M, H), 5th AF, SW Pacific to Japan, will be held in San Diego, August 3–5, at the Master Hosts Inn, 950 Hotel Circle, San Diego, Calif. 92108. In charge is

Harry Baren (ex-19th Sqdn.)
1729 Circo Del Cielo Dr.
El Cajon, Calif. 92020
Phone: (714) 442-8809

48th Fighter Sqdn.
Members of the 48th Fighter Squadron, 14th Fighter Group, WW II P-38ers, are holding a reunion in St. Louis, Mo., September 22–24. Contact

Norm Schuller
822 Lawrence Ave.
East Aurora, N. Y. 14052

Class 71-03
All former members of Laredo AFB class 71-03 II "Smokey's Bunch" and any of our IPs—we'd like to find out where you're hiding so we can plan a reunion in the near future. Contact

Capt. Ed Miller
PSC Box 2822
Nellis AFB, Nev. 89191
Phone: AUTOVON 682-4750
or
Capt. Ted Jessup
1496 Potomac Heights Dr.
Oxon Hill, Md. 20022
Phone: AUTOVON 225-2086

80th Fighter Group
The 80th Fighter Group, 10th AF, formerly stationed in CBI theater, is attempting to update its roster in order to hold its 3d postwar reunion. Send your current address, and those of any other former members you know, to

West Coast: George F. Schlagel
16432 Barn Stable Circle
Huntington Beach, Calif.
92649
Phone: (213) 699-0307

East Coast: Bradford P. Shuman
Black Hawk Apartments
Downingtown, Pa. 19335
Phone: (215) 269-2500

84th Air Rescue Sqdn.
The reunion of the 84th Air Rescue Squadron will be held August 24–27 at the Tropicana in Las Vegas, Nev. Further information from

CMSgt. Robert N. Butler
310 Adams Ave.
Sumter, S. C. 29150
Phone: (803) 775-9626

132d Air Refueling Sqdn.
The 132d ARS "Maineiacs" (formerly the 132d FIS), Maine Air National Guard, will hold its 19th annual reunion/lobster bake July 21 at Bangor International Airport, Bangor, Me. Would like to hear from all former members of the unit.

Maj. Gerry Hersey
or
Capt. Ron Sailor
Bangor International Airport
Bangor, Me. 04401
Phone: (207) 947-0571

352d Fighter Group
Former members of the 352d Fighter Group (WW II), 1st Air Service Group, or members of any unit stationed at Podney, England, are invited to a reunion July 7–9 at Riviera Beach, Fla. Contact

Maj. Robert J. Robinson
1260 N. Harbor Dr.
Riviera Beach, Fla. 33404

401st Bomb Group (H)
The 3d annual reunion of the 401st Bomb Group (H) will be held in St. Louis, Mo., August 6–8. Looking for all persons who served with the 401st at Deenethorpe, Northants, England, Station #128, in WW II. Contact

401st Bomb Group (H) Assn.
Box 22044
Tampa, Fla. 33622
or
Ralph M. Dempsey
180 Highland Dr.
Centerville, Mass. 02632

434th Troop Carrier Wing
All 434th TCW personnel formerly of Bakalar AFB and presently at Grissom AFB, Ind., are invited to an R&R weekend September 16–18. Contact

Brig. Gen. Joe Thomas
7800 Shelby St., Suite 7
Indianapolis, Ind. 46227
Phone: (317) 788-1596
or
TSgt. T. D. McCord, Jr.
117 S. Spencer
Indianapolis, Ind. 46219
Phone: (317) 359-4470

451st Bomb Sqdn.
The 30th annual reunion of the 451st Bomb Squadron, 322d Bomb Group—WW II Martin Marauders—will be held September 15–17, at the Holiday Inn, Amana, Iowa. More detailed information from

R. E. Potratz
4211 42d St.
Des Moines, Iowa 50310


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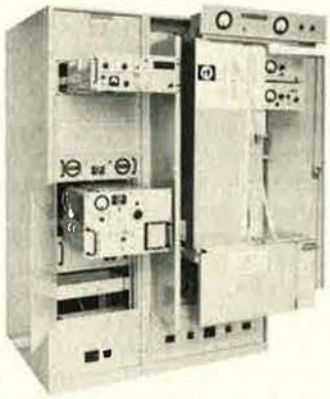

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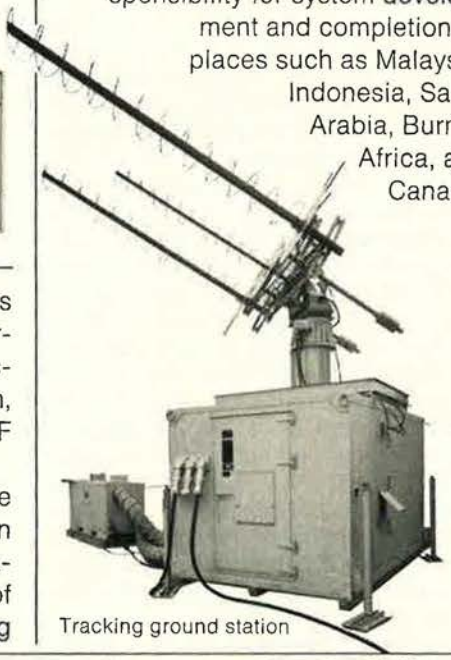

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Focus On...

BY EDGAR ULSAMER, SENIOR EDITOR

Washington, D. C., June 7

Toward an MX Decision?

In an unusual reversal of roles, Congress is attempting to invoke cloture of what its two armed services committees seem to perceive as a filibuster of a new survivable ICBM, the MX, by the Carter Administration. The Committee on Armed Services of the Senate, in an amendment to the Defense Department's budget authorization, requested the Secretary of Defense to report to the Congress by September 30, 1978, "the decision of the Executive Branch regarding full-scale development of a mobile intercontinental missile system."

The Senate amendment, introduced by Sen. Jake Garn (R-Utah) with the active support of Sen. Henry Jackson (D-Wash.), Sen. Samuel Nunn (D-Ga.), and Sen. Thomas McIntyre (D-N. H.), leaves little room for equivocation. It insists that the Executive Branch's report spell out why no decision was made by the congressional deadline, including the "technical, political, or other considerations necessitating a delay," in case the Administration has not agreed on MX by then. Further, the Defense Department is instructed to report when the Administration expects to decide on the matter. Finally, Congress ordered the Secretary of Defense to submit monthly reports, after September 30 and until a final decision is reached and the committee has been so informed, on why further delays are considered necessary by the Administration. The House Armed Services Committee, meanwhile, directed the Defense Department to report by July 1 on its program schedule for a survivable ICBM basing mode and announced that its members would be receptive to a relevant supplemental budget request by the Administration.

On the negative side, the Office of Management and Budget (OMB), an element of the White House, has recommended that the FY '80 funding of the MX program sought by the Defense Department be cut in half and that the Air Force be instructed to use the D-5 SLBM under development by the US Navy, rather than develop an optimized ICBM of its own. The MX missile under consideration by the Air Force has a throw-weight of about 7,850 pounds, compared with about 5,000 pounds for the Navy missile. The MX funds requested by the Defense Department's Five-Year Plan for FY '80 are about $510 million.

Congressional attitudes toward a new, survivably based ICBM are becoming clearly favorable, but the Administration's strong interest in disarmament is thought to militate against production of a new ICBM. Influential pro-defense elements in Congress thus have virtually expunged the term "MX" from their vocabulary, and instead stress the need for a survivable basing mode for ICBMs. The underlying rationale, this writer was told, is that in view of the mounting Soviet ICBM threat combined with intensifying congressional pressures, the Administration might well be willing to make the currently existing Minuteman III force survivable. This, it is being reasoned, is not tantamount to a "new" strategic weapon—and thus less of a target for the vocal arms-control lobby than a new MX missile.

Some advocates of such an approach favor a survivable basing scheme that, from the outset, is compatible with MX, should a subsequent Administration decide that the US can't remain confined to only small, low-throw-weight ICBMs. Others are willing to sacrifice MX compatibility—at least initially—in order to expedite the program. The latter faction believes that Minuteman III can be upgraded through the use of new propellants and other technical innovations to permit a doubling of its throw-weight to about 4,000 pounds, while technically remaining an "old, politically unprovocative" weapon.

Defense Department and USAF analysts told this column that capitulating on a medium-size ICBM at a time when the Soviet Union is transitioning to a force made up mainly of a large (about 14,000 pounds' throw-weight) and medium size (7,000 to 8,000 pounds' throw weight) ICBMs is neither cost-effective nor militarily sound. Cost of converting about 100 Minuteman IIIs to a multiple basing mode involving nine look-alike empty shelters for every one that actually houses a missile is thought to approach $2 billion, yet fails to offset the Soviet throw-weight lead of about seven to one.

MX: Best BMD Weapon in Sight?

An important, often-overlooked reason why ICBM throw-weight is crucial—even if national policy were to be confined to minimum assured destruction—is the potential of a Soviet Ballistic Missile Defense (BMD, formerly known as Anti-Ballistic Missile) breakout from the constraints of the SALT I ABM Treaty.

Throw-weight could play a major role in defeating Soviet ballistic missile interceptors. Ground-based BMD works in one of two ways: High-speed interceptor missiles attack incoming RVs either while they still are in space or after they enter the atmosphere. (While there has been considerable press speculation about Soviet work on exotic, directed-energy weapons capable of attacking US ballistic missiles from space-based platforms, no palpable evidence of such a program exists. Testing such a weapon would represent a categoric violation of Article III of the SALT I ABM Treaty.) Obviously, the number of interceptors operating in either regime is finite. Hence, the US MIRV technology, which was born of the perceived need to saturate Soviet defensive weapons. But there are practical limits to the number of MIRVs that can be placed on a ballistic missile with a given throw-weight, especially if the weapon is to be used against hardened targets.

The Air Force, therefore, developed, tested, and deployed a variety of peneration aids for use by the Minuteman ICBMs. Some of them are decoys that behave at certain altitudes like real warheads and cause the defense to attack them. Decoys meant to operate only in space can be made very light, including even inflatable devices and aerosols. The rule of thumb is that

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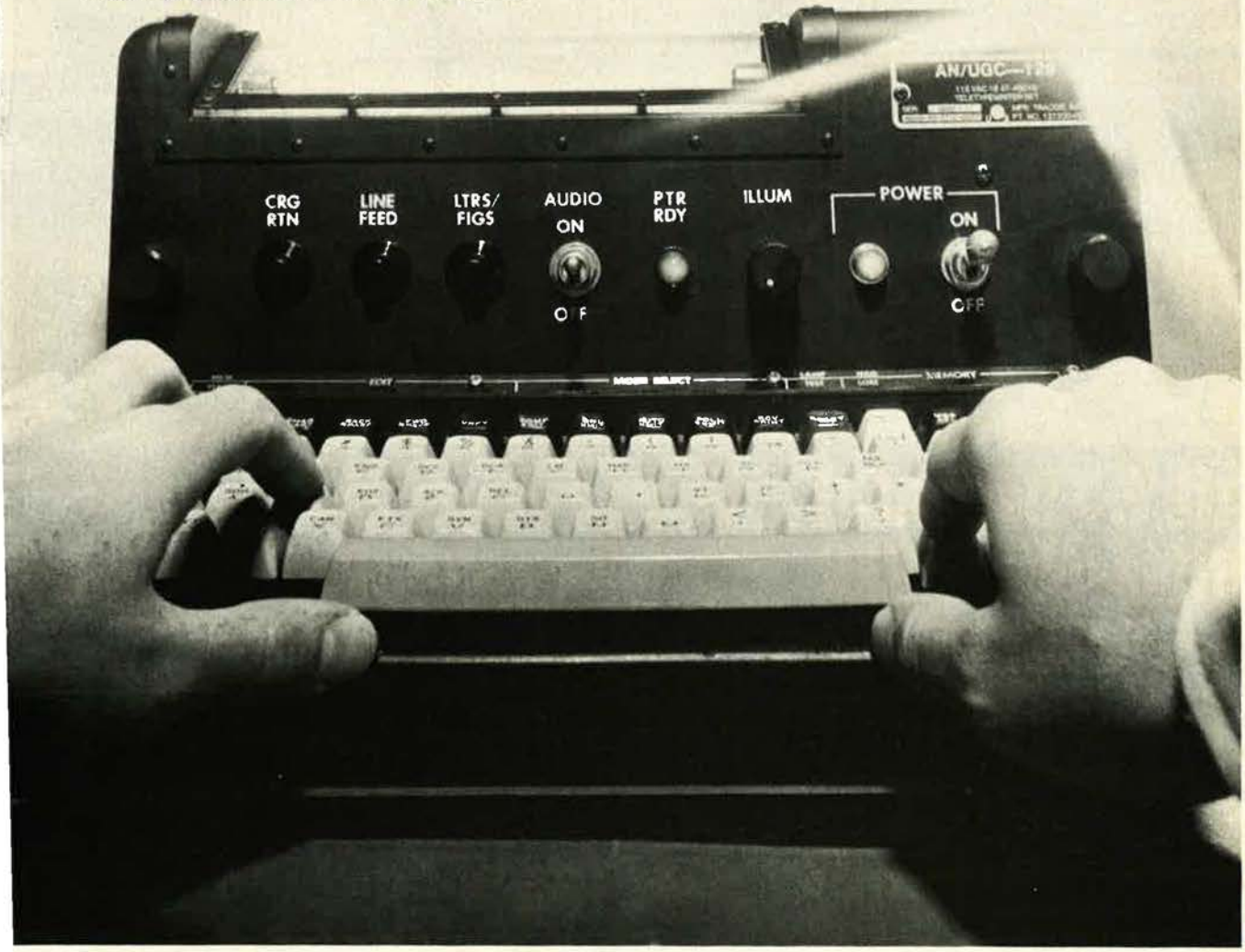

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y giving up one RV it is possible o deploy up to thirty space decoys. he numbers change if the defender ntercepts in the atmosphere. Since he atmosphere "sorts" in various ways objects that enter from space, such as by burning up lightweight structures or by the so-called beta factor—the interaction between size, weight, shape, and heat and weather erosion of a reentering object and how it behaves while descending to the target—the job of building decoys that can deceive the defense while descending to low altitudes is both more costly and more difficult than in the case of space decoys. How costly and difficult depends on how low the decoy is designed to descend while simulating the beta factor of a real warhead. Obviously, it would be pointless to pay the price of going lower than the defender's intercept altitude or to simulate real RV behavior beyond the diagnostic limits of his radar and automatic data processing systems.

With Soviet radar capabilities outdistancing computational capabilities—and this imbalance likely to continue for years to come—most experts believe that USAF can deploy several "atmospheric" decoys in place of one RV and thus "overload" Soviet BMD systems if that country decides to break out from the bilateral ABM treaty.

In determining the number of decoys and RVs required to provide effective strategic deterrence in the 1980s, another crucial factor enters the picture—the increasing, massive hardening of the Soviet target complex combined with continuing growth in civil defense capabilities. This condition requires a relatively large number of US RVs. If the Soviets were to defend this large number of hardened targets with efficient reloadable terminal (low-altitude) BMD weapons, the number of required penetrating vehicles (RVs and decoys) probably would be greater than can be accommodated by the aggregate US ICBM throw-weight. MX, on the other hand, with nearly four times the throw-weight of Minuteman III, could carry the needed number of RVs and decoys and provide credible US deterrence capabilities even under such adverse conditions.

Pentagon Probes Middle East Defense Schemes

Senior Defense Department officials recently requested the Joint Chiefs of Staff to examine potential security threats to the Middle East region and to recommend comprehensive politico/military solutions. The outcome of any sizable attack, either by the Soviet Union or its surrogates, on one or more of the oil-producing nations of the Middle East presumably will be decisively influenced by the speed with which US reinforcements can be brought to the scene. There is little doubt also that availability of airlift and rapid projection of US and allied airpower would be the two most urgent and critical factors during the initial phases of such a conflict.

Further, it is probable that Soviet-directed forays into the Middle East will be orchestrated with Warsaw Pact threats against or attacks on NATO, meaning that both areas would require simultaneous airlift and tactical airpower augmentation. The forces required to do both jobs at the same time involve price tags that appear not affordable. On first blush, two requirements are thought to be quintessential: the formation of a defense alliance encompassing the US, NATO, and the Middle East nations, including Israel; and secondly, a genuine rapprochement between the latter and the Arab countries and Iran. Washington foreign policy specialists, of course, recognize that such a reconciliation isn't within sight, but feel that the mechanism of a defense alliance that guarantees protection of all members could become the catalyst for a genuine union of all Middle East nations. NATO is thought to be receptive to such an arrangement in light of its dependence on Middle East oil supplies. The current JCS study is expected to be completed this summer.

USAF Fighter Production Lagging?

Just-released testimony by Gen. Robert J. Dixon, then the Commander of Tactical Air Command (now retired), before the Senate Armed Services Committee brought out significant differences in US and Soviet fighter aircraft procurement figures and production rates. Terming the Soviet way of building "three new fighters every day of every week of every year" for the past four years with the apparent intent of doing so over the next four an "ideal state of affairs," the former TAC Commander by contrast saw US production rates moving at a "helter-skelter," decelerated rate.

This colloquy between Sen. Howard C. Cannon (D-Nev.) and General Dixon on trends in Soviet vs. US airpower was instructive:

Senator Cannon: ". . . Are you concerned about the size of our tactical fighter forces and the production base the Air Force will have in the 1980s?"

General Dixon: "Yes, sir, I am. . . . We are outnumbered. . . . We at the moment are in a declining posture as regards production of airplanes, with the exception of the F-16.

"Since 1974, the production of the F-15 has been cut, the production of the A-10 has been cut, and the production of . . . the E-3A has been cut. We are reaching our modernization goals much later and more slowly. We have one major fighter aircraft engine in production, the F100 engine for the F-16 and for the F-15. I believe that we have a requirement to increase production. The question is just how much can we increase it and how quickly, and I would not be sanguine as to the answer if that is an emergency requirement."

This column has learned that since its inception four years ago, USAF's force-modernization program is about $6 billion "in arrears."

The Congress vs. SALT

While ratification of arms-control agreements—primarily SALT, the Comprehensive Test Ban treaty (CTB), and Mutual Balanced Force Reduction (MBFR) negotiations—falls under the purview of the Senate, the House Armed Services Committee (HASC) plans to take an active part in the review of any of these pending accords. Chairman Melvin Price (D-Ill.), in May of this year, announced that under the rules of the House of Representatives, the Committee on Armed Services is charged with "reviewing and studying, on a continuing basis, all laws, programs, and government activities dealing with or involving international arms control and disarmament. . . ."

The HASC Chairman, therefore, appointed several panels to investigate and report back to the full committee "prior to the formal submission of any proposals or treaty drafts to Congress by the Administra-

Focus On...

tion." A five-member group, chaired by Rep. Charles Wilson (D-Calif.), was assigned to monitor the SALT II and CTB negotiations and sent on a fact-finding trip to Geneva, Switzerland, "since there are indications that there might be a summit meeting concerning SALT as early as this summer."

Following a five-day visit in Geneva, the panel called for a change in direction in both the SALT II and CTB talks. Mr. Wilson, speaking for the group, warned that the two agreements, in their present form, don't adequately protect the vital defense interests of the nation and contribute nothing to strategic stability. Calling for a tougher negotiating posture by the Administration, the panel chairman pointed out that the Administration's plan to propose to the Soviets a five-year moratorium of all nuclear weapon tests would "lead to the inevitable erosion of the reliability of our nuclear deterrent."

The panel also expressed concern because recommendations relating to the Geneva negotiations by senior defense officials and the Joint Chiefs of Staff "have not been given sufficient weight by the Administration." (Gen. David C. Jones, designated the next JCS Chairman, reportedly testified before a Senate Committee just prior to the White House decision on a five-year moratorium that the Joint Chiefs had no knowledge of such an impending action and that a "zero-yield" test ban was not in the national interest.) SALT II, as presently formulated, suffers from "very serious verification and breakout problems," according to the House Armed Services Committee's special panel.

Some members of the panel learned in Geneva that the Administration is being pressured by its supporters in the Senate, notably Sen. Edward Kennedy (D-Mass.), to delay conclusion of SALT II until after the November 1978 elections. Reportedly the reasoning is that public resentment of Soviet belligerence in Africa and intractability elsewhere could lead to a backlash against SALT supporters in Congress who are up for reelection.

SALT II, in its present form, is scheduled to come under intense fire from the American Conservative Union, self-styled as "the nation's leading conservative union." According to the head of the group's defense task force, Sen. Jake Garn (R-Utah), a congressional advisor to SALT II, the American Conservative Union plans to launch a nationwide media blitz this month to bring out those SALT aspects which, if ratified, "would undermine the security of the United States."

The "opening effort" by the group will be a half-hour TV documentary linked to "as vigorous a campaign to defeat the SALT treaty as we possibly can [wage]."

Participating in the program will be Maj. Gen. John K. Singlaub, USA (Ret.), whose comments on the Administration's actions in Korea and elsewhere have generated headlines and led to his early retirement. At a Washington press conference, immediately following his retirement, General Singlaub made this comment on SALT II: "The Soviets are not born-again Christians; they are, in fact, born-again Bolsheviks and they have no Judeo-Christian ethic to prompt them to grant us the same concessions we are making in hopes that they will reciprocate."

Similar chariness concerning SALT was reflected by the Senate's Armed Services Committee, which warned the Administration against degrading US strategic and nuclear-weapon programs authorized by the Congress "in expectation of a concession or in anticipation of an agreement to limit arms without prior congressional consideration." Announcing that it will review this question in the months ahead, it summoned Defense Secretary Brown to testify on this subject early in June.

Congressional Opposition to the Administration's Korea Policy

The Investigations Subcommittee of the House Armed Services Committee, following a fact-finding tour of South Korea and adjacent areas, warned that the Administration's decision to withdraw US ground forces from Korea could "pose grave hazards to the stability of Northeast Asia."

If left to its own devices, South Korea faces an uncertain future, the subcommittee found. The country is "inferior to North Korea in every relevant military indicator except manpower." Quoting Gen. John W. Vessy, Commander in Chief, United States Forces Korea, the subcommittee points out that "the North Korea enjoy a two-to-one advantage tanks, artillery, and tactical aircra They have a four-to-one advanta in naval combatants, including three-to-one lead in missile attac craft, and a more than twelve-to-or advantage in submarines."

Washington Observations

- Energy Secretary Dr. Jame Schlesinger has written what wa described to this column as a firml worded, personal letter to Presiden Carter, expressing strong oppositio to the Administration's decision t seek a moratorium on all nuclea weapon testing and a zero yield tes ban treaty. Secretary Schlesinge informed the White House that he would testify against the Administration's policy if required to appear as a witness before Congress.
- NATO Secretary General Joseph Luns, following a detailed, classified briefing of NATO leaders in Washington on US/Soviet strategic capabilities and trends, commented, "What a dismal picture." Defense Secretary Harold Brown, who apparently had hoped for a more sanguine reaction, reportedly was chagrined.
- The Senate Armed Services Committee has requested the Defense Department to report by October 30, 1978, on concessions the Soviet Union is willing to make if the United States does not produce enhanced radiation ("neutron bomb") weapons.
- US Arms Control and Disarmament Agency (ACDA) Director Paul Warnke has won White House approval for his plan to offer Moscow an agreement halting test and development of antisatellite (ASAT) weapons. The Soviets have these weapons in their operational inventory the US has neither developed no tested such weapons.
- PRM 23, a recently complete review of US space policy, produce no earth-shaking changes—the role and missions of the Defense Depart ment, CIA, and NASA remain un changed basically.
- Soviet production of plutoniur —key element in weapons produc tion—has doubled over the pas seven years.
- ACDA and its congressional a lies are working toward requirin arms control impact statements c all new US intelligence systems a well as civilian reactor install tions.

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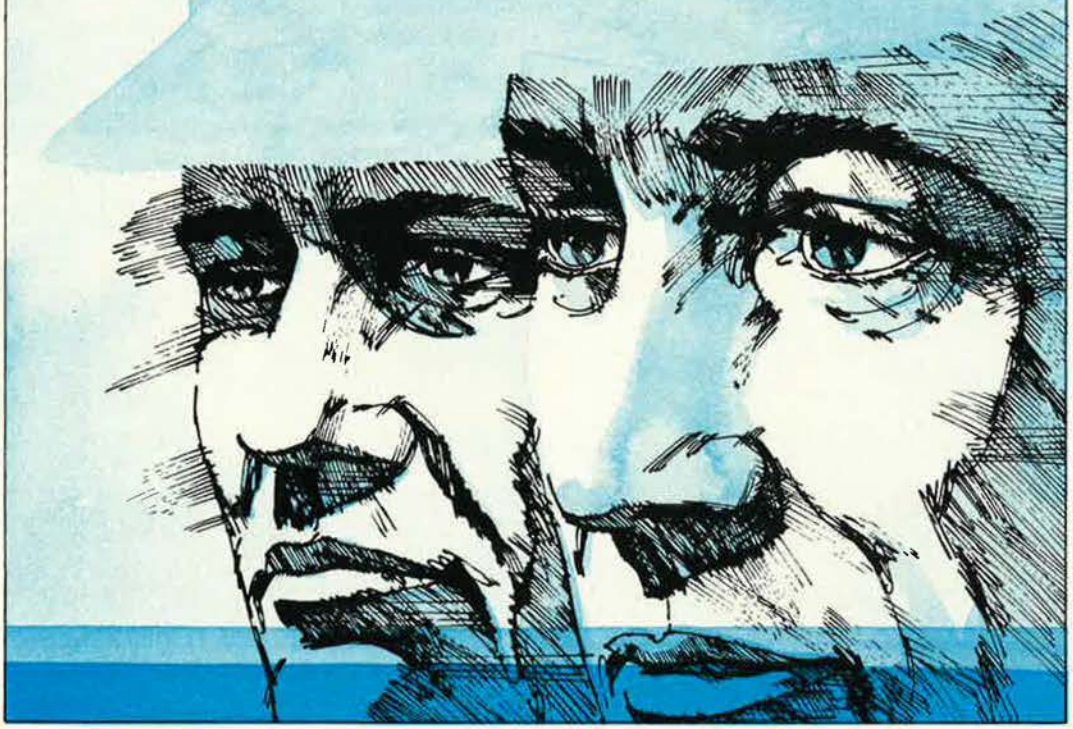

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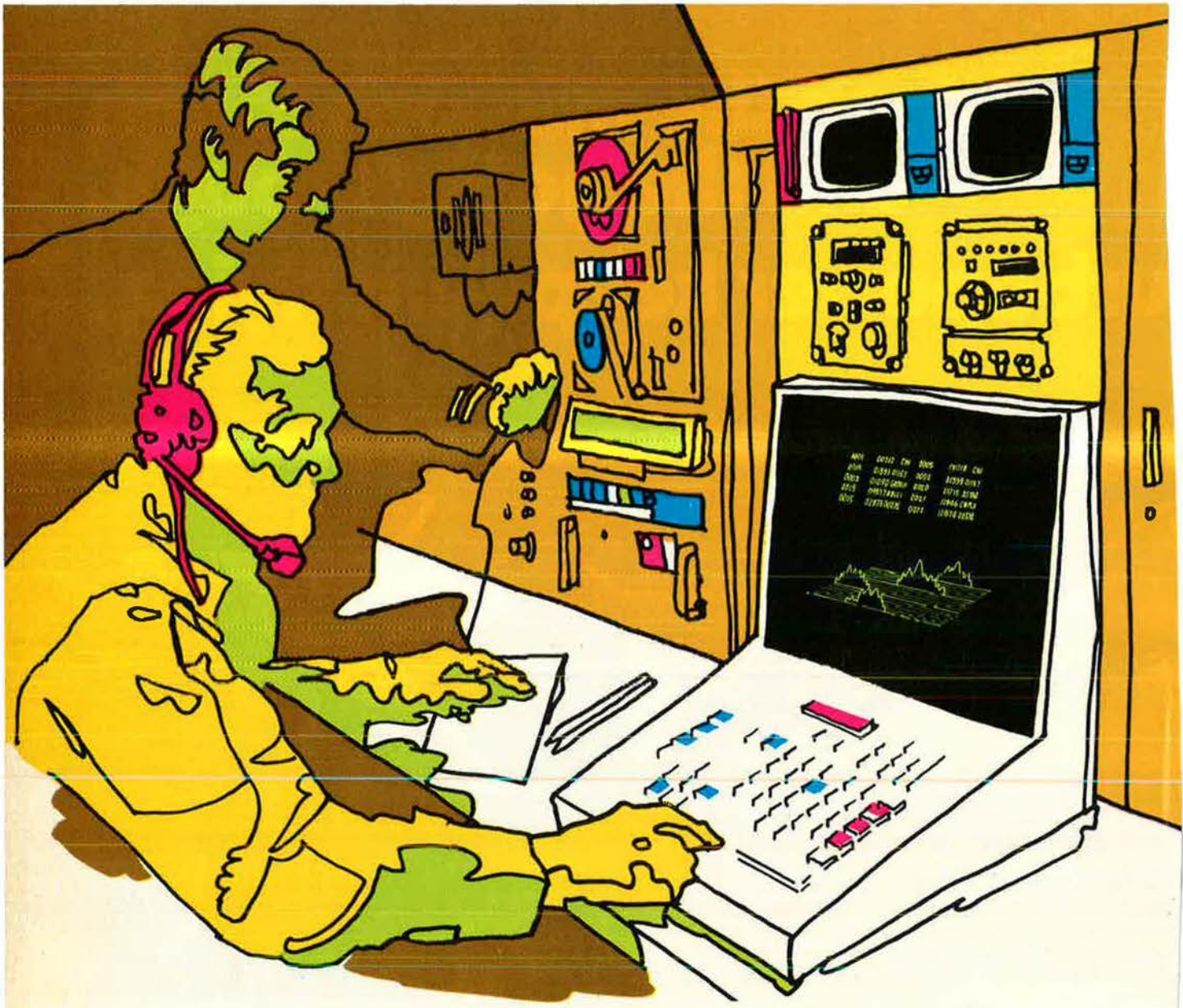

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Aerospace World News, Views & Comments

By William P. Schlitz, ASSISTANT MANAGING EDITOR

Washington, D. C., June 5

★ USAF's F-15, already touted as the best fighter aircraft in the world, is due for additional improvements.

The most significant will be a dramatic upgrading of the aircraft's already impressive radar performance.

F-15As and F-15Bs on the McDonnell Douglas assembly line will be followed by "C" and "D" versions next year, for delivery to USAF in 1980. The one-seat "C" and two-seat "D" will be equipped with a programmable radar signal processor, which will provide a fourfold increase in the aircraft's computer capacity, the ability to continue tracking one target while searching for others, and to transfer radar lock-on from one target to another.

The modification also means that further capability can be added through changes in radar program tapes, rather than complicated and costly renovations of the radar system itself.

Besides the improved radar, the "C" and "D" will be able to carry an additional 2,000 pounds (907 kg) of fuel internally and will be equipped with external fittings for Fuel and Sensor Tactical Package (FAST Pack) pallets.

Besides USAF, the Israeli Air Force is equipped with the F-15, and Japan recently announced that the Eagle will be the island nation's next front-line fighter. An Administration proposal to sell sixty F-15s to Saudi Arabia was recently approved by the Congress.

★ What experts believe to be a replacement for the USSR's Soyuz spacecraft returned to earth on April 15 following an eleven-day orbital test. The craft was unmanned.

The April flight was also believed to be the fourth unmanned test of the new vehicle, and perhaps the last before a manned mission.

The current Soyuz capsule has been limited to a two-man crew wearing spacesuits on reentry since the deaths of an unsuited three-man crew when the Soyuz-11 capsule decompressed during reentry in 1971. The new vehicle is thought to be equipped with more advanced systems than Soyuz and capable of carrying a three-man crew in spacesuits.

During the April mission, the craft was known to have changed orbit at least twice, presumably on command from an earth station.

★ The US and the Soviet Union each plan two launches of spacecraft to Venus this year.

With the successful launch of

Incredible as it may seem, the F-4 has been flying for twenty years. It celebrated that anniversary in May with delivery of the 5,000th Phantom. The aircraft has seen service with USAF, USMC, US Navy, and ten foreign nations.

Aerospace World

Pioneer Venus-1, the first of the US missions to earth's nearest planetary neighbor got off on May 20. The second is to go in August.

The four missions to Venus constitute the most comprehensive scientific probe of the planet yet attempted.

Pioneer Venus-1 is to arrive in the vicinity of the planet in December and will conduct the first radar topographical survey of the perpetually clouded planet.

NASA and Soviet officials were to have met in June to arrange an exchange of data that will be returned by the Venus probes. Both Soviet missions are scheduled for launch in August.

Besides surface features, scientists are interested in the planet's weather, atmosphere, and gravity field. Venus's cloud layer is mainly carbon dioxide, which traps sunlight in the so-called "greenhouse effect" that has led to the extremely high surface temperatures on the planet.

Theoretically, at least, a similar situation could occur on earth, as more and more carbon dioxide enters the atmosphere.

★ The 91st Strategic Missile Wing, Minot AFB, N. D., pretty much rolled up the competition at the SAC missile combat meet, Vandenberg AFB, Calif., this past spring.

The 91st took top honors (and the Blanchard Trophy) by scoring 2,783 points of a possible 3,000 during the three days of Olympic Arena '78. The wing also was named Best Operations, Best Crew, and Best Minuteman Crew among the nine Minuteman and Titan II wings in the meet. The 91st captured trophies for the Best Minuteman Security Police Team and Best Minuteman Communications Team, not to mention AFA's award for Best Minuteman Operations.

Best Titan II wing honors went to the 381st SMW, McConnell AFB, Kan., which placed second overall with a score only twenty-seven points behind the front runner. The McConnell Titan II unit also garnered Best Maintenance, Best Titan Propulsion Team, Best Titan Facilities Team, Best Security Police Team, and Best Titan Electronics Laboratory Team, as well as AFLC's Best Titan Logistics Trophy, and AFA's Titan Operations Trophy.

Reflecting the high state of readiness of the competitors in this eleventh annual SAC event was that a mere 183 points separated the last-place entry from the winner.

★ The first production F-4G Wild Weasel electronic warfare aircraft came off the modification line in Ogden, Utah, on April 24, with a total of eight expected to be delivered by the end of June.

In all, USAF will modify 116 F-4s for the Wild Weasel role—that of detecting, identifying, and suppressing or destroying enemy electromagnetic emitters.

The first production F-4G went to TAC's 35th Tactical Fighter Wing, George AFB, Calif.

Two F-4Gs are now engaging in a follow-on operational test and evaluation flight program under TAC direction at Nellis AFB, Nev. That effort will extend through July.

★ The US Aerobatic Team, representing the Aerobatic Club of America, will journey to Czechoslovakia to compete late in August in the 9th World Aerobatics Championships.

The five pilots of the US team, flying tiny custom-built aircraft, are

Flying a Four-Engine Ocean With Two-Engine Aircraft

B-25s first became famous when they flew from the deck of the US carrier *Hornet* in the 1942 Doolittle raid on Japan.

In May of this year another "historic" flight took place when four privately owned B-25s, decked out in World War II markings, flew from the US to England via the Azores. The venture entailed some risk, noted one veteran pilot participant, "since it meant flying a four-engine ocean with two-engine aircraft." The vintage warplanes had been outfitted with survival gear in case of ditching.

But the planes—probably the largest contingent of such aircraft to cross the Atlantic since World War II—arrived in England without mishap. They are there to appear in a film entitled "Hanover Street," set in the war years. The film stars Harrison Ford—Han Solo in "Star Wars."

The Atlantic crossing was led by former RAF pilot John Hawke, a naturalized American citizen who owns two of the B-25s and who procures historic aircraft for film making ("The Battle of Britain," "A Bridge Too Far," "633 Squadron"). One of Hawke's B-25s appeared in "Catch-22."

The other two B-25s (plus one that aborted the flight shortly after takeoff) belong to West Coast restaurant chain owner David Tallichet, who is reputed to own the world's largest private military aircraft collection.

The B-25 has become an endangered species, with only twenty-five or so still in existence.

—Photo by W. W. Parish

In World War II markings, five B-25s on the flight line prior to takeoff for transatlantic flight from the US via the Azores to Great Britain. In loose formation, four of the old warbirds accomplished the crossing. The other one aborted and returned safely to the mainland.

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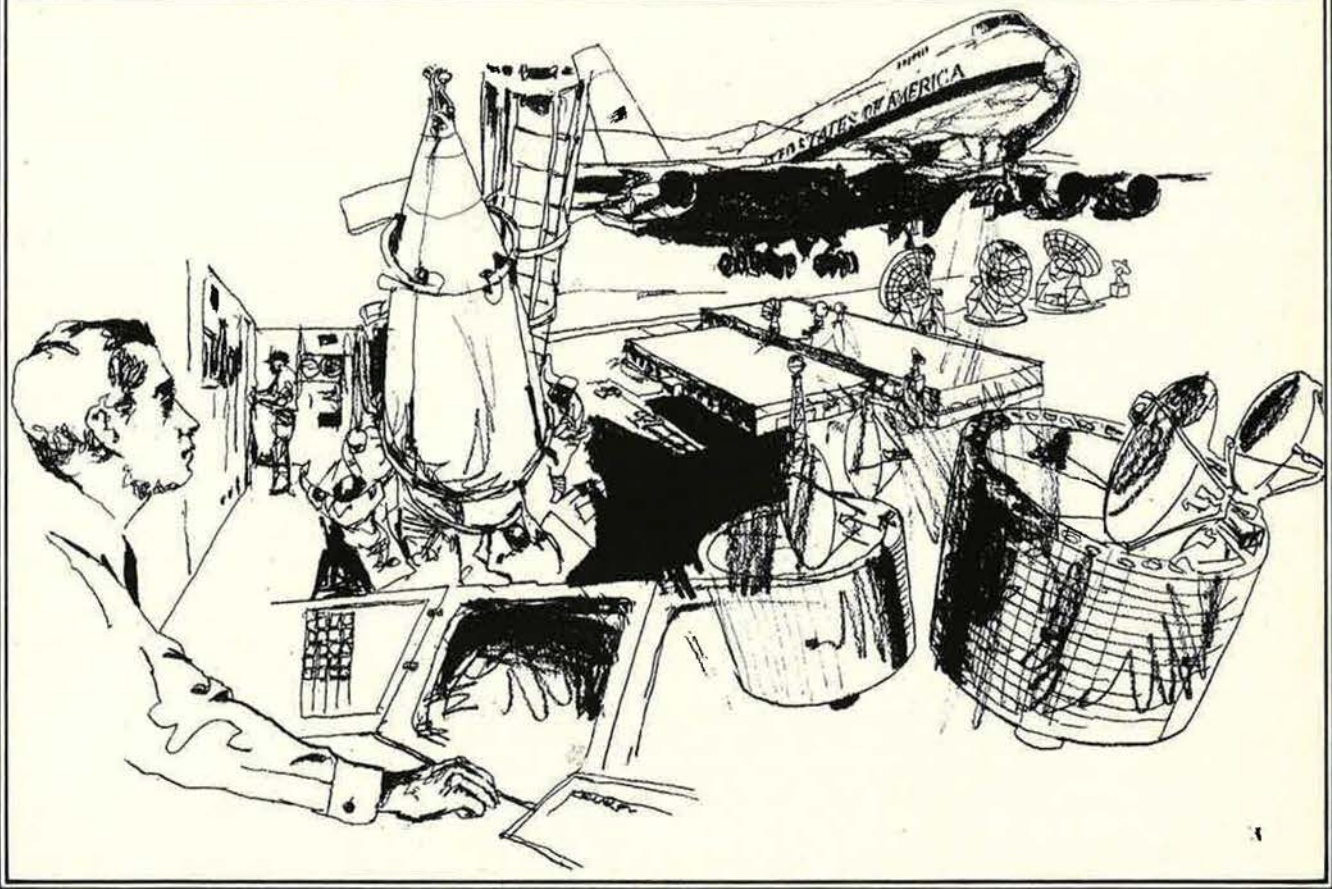
If you have a nuclear hardening problem, contact A.K. Williams, Product Line Manager, Advanced Technology Division, One Space Park, Redondo Beach, Ca. 90278, (213) 535-0133.



SYSTEMS SURVIVABILITY

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Aerospace World

aiming at winning back the world championship titles they garnered in France in 1972 and then lost to the Russians in 1976.

While many teams are subsidized by their governments, the US team pays its own way. Two members are airline pilots, one is a retired industrialist, another an investment manager, and the fifth a computer engineer. All fly aerobatics for fun, and most have spent years developing their aircraft for competitive flying.

The team was selected on the basis of contests held in the US last year. Leading it is three-time US National Champion Leo Loudenslager, Sussex, N. J. With him will be Henry Haigh, Howell, Mich.; Randall Melton, Brighton, Colo.; Kermit Weeks, Miami, Fla.; and Bob Carmichael, Roanoke, Tex. Alternate pilot is Alan Bush, Coral Gables, Fla.

US aerobatic champion Leo Loudenslager in his Laser 200 competition monoplane; behind him, Bob Carmichael in his modified Pitts Special. The US team hopes to score in upcoming international meet (see item).

US hopes will be challenged by a crack Czech team, which has the advantage of familiar terrain, and the Soviets, who captured all the honors in 1976. (That feat created considerable controversy because of officiating tactics, and the resulting protests led directly to major rule changes.)

★ A nonprofit organization called Odysseys In Flight, Inc., is appealing for donations in order to save the decommissioned aircraft carrier *Intrepid* from being scrapped and use it as a floating international aerospace and naval memorial museum.

Intrepid, the survivor of much Pacific combat during World War II, also served as Prime Recovery Ship during the manned spaceflight program. She joined the reserve fleet in 1974 and is now in Philadelphia awaiting a decision on her fate.

The museum concept visualized

The San Diego Aero-Space Museum Rises From the Ashes

As previously reported, arson was suspected in the destruction of the San Diego Aero-Space Museum and International Hall of Fame last February.

The fire consumed the core of the museum's collection—forty-six original and replica aircraft and more than thirty engines, including a 1908 Wright.

Also gone is the museum's Prudden Historical Aviation Library and Archives, which contained thousands of books, magazines, and photos dating back to 1850; many are irreplaceable. Lost, too, are artifacts and items of memorabilia too numerous to list.

The irony of the tragedy is that the museum was to begin moving into a newly renovated building in November, with dedication on December 17, the seventy-fifth anniversary of the Wrights' first flight.

But the museum is fighting back. Museum officials are striving to assemble as comprehensive an aerospace collection as possible in order to meet that dedication date. The renovation of the new building is going forward as planned, to double the display area available and provide such other facilities as restoration space and a theater.

A move is already under way to replace the sixty-four oil portraits of the Hall of Fame honorees, and the museum needs additional sponsors for them.

A special task group has been organized to sponsor an "Aerospace Recovery Fund" to raise much-needed money. The museum gift shop is ready to answer mail orders for museum souvenirs. Museum officials have urged people around the country to search attics or otherwise donate or lend artifacts.

Other aerospace museums are helping.

The Air Force Museum, Wright-Patterson AFB, Ohio, for example, has arranged for the indefinite loan of surplus aircraft (from the Davis-Monthan AFB storage facility) to San Diego's museum. It also has recommended duplicates in its own collection be turned over and has already slated a Link trainer and Navy biplane. An Air Force Museum designer will TDY to San Diego to contribute exhibit ideas.

Substantial help, too, will be given by the National Air and Space Museum. From the NASM aircraft collection will come the Waterman Whatsit and Aerobile, a Ryan X-13, DH-4 mail plane, and a Curtiss P-40N. Other items include a sampling of space artifacts. Through the Library of Congress Books and Magazines Exchange Service, NASM hopes to provide the beginning of a new library.

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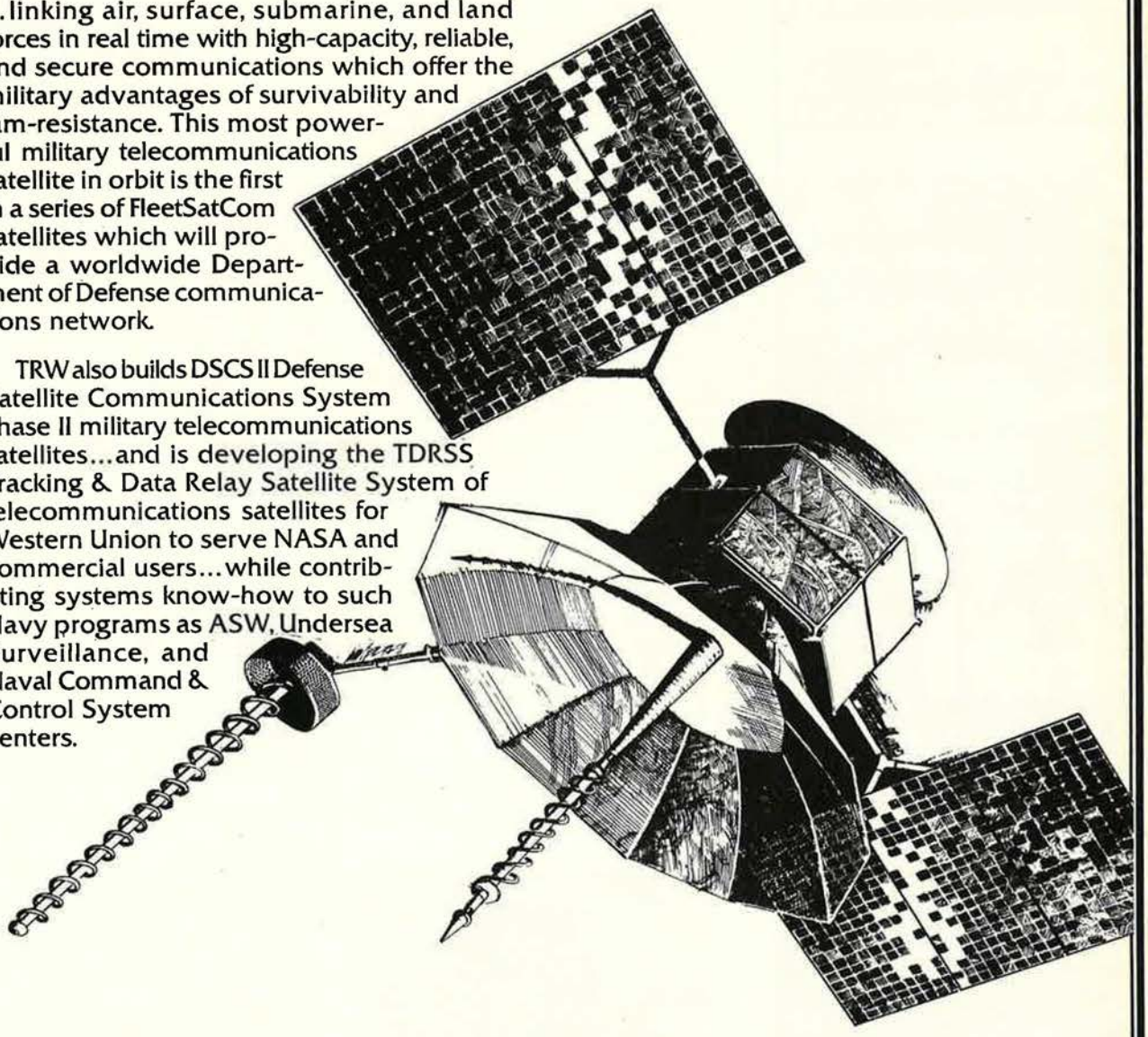

TELECOMMUNICATIONS SATELLITES

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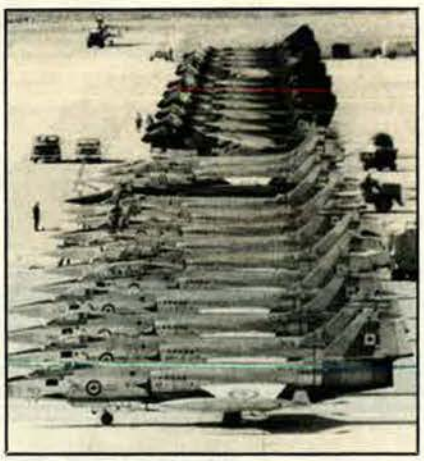
by Odysseys In Flight is ambitious and comprehensive. The ship would be moored in the Hudson River at New York City and its huge interior and hangar and flight decks used to house and display the various collections of artifacts and hardware. (Odysseys plans to open up some of *Intrepid's* war wounds to show the effectiveness of kamikaze attacks during WW II.)

Before the Navy will release the ship, however, considerable money must be raised in order, according to Odysseys, "to assure a viable memorial."

The organization's board of advisors consists of twenty-five prominent Americans, including Sen. Barry Goldwater; Astronaut Wally Schirra; Col. Francis Gabreski, USAF (Ret.); Brig. Gen. Joe Foss, USMC/ANG (Ret.); and actor Cliff Robertson.

Odysseys is accepting tax-deductible donations from individuals, corporations, and organizations, and is establishing special memberships for major contributors. For further information or donations, write: Odysseys In Flight, Inc., P. O. Box 229, Wantagh, N. Y. 11793.

★ A joint AFLC/AFSC Directorate for Acquisition Logistics has been set up at the Armament Development and Test Center, Eglin AFB, Fla.



An airborne arsenal: Canadian F-104s in the foreground and TAC A-7s in the background. The aircraft recently participated in Maple Flag D-1, an exercise designed to increase air-combat capability.

The new directorate combines the functions and personnel of the Air Force Acquisition Logistics Division's Directorate of Armament Logistics and the ADTC Systems Logistics Office.

The new organization should translate into streamlined acquisition operations, greater efficiency, and a more direct line of control, officials said. The new directorate will report to both the ADTC Deputy Commander for Development and Acquisition and the AFALD Deputy for Readiness Development, Wright-Patterson AFB, Ohio. Col. Dempsie Davis, AFALD's Director of Armament Logistics at Eglin, will head the new directorate.

★ **NEWS NOTES—Col. Arnald D. Gabriel,** Commander and Conductor of the United States **Air Force Band,**

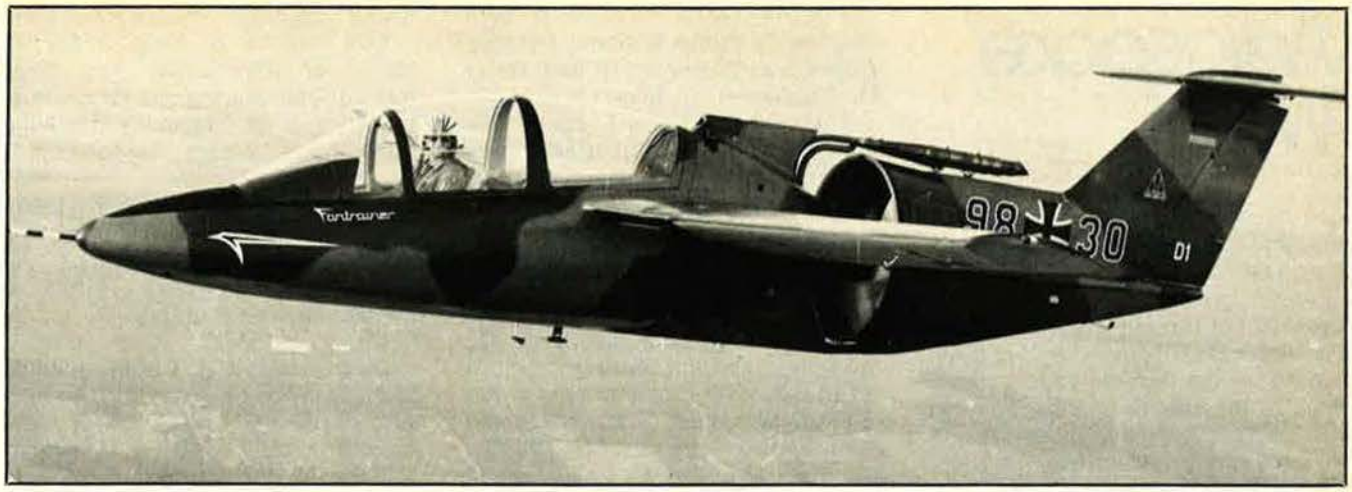
The Chappie James Scholarship Fund

The Los Angeles chapter of Tuskegee Airmen, Inc., had planned a dinner to honor Gen. Daniel "Chappie" James, Jr., on April 29, the day he was to retire from the Air Force. Proceeds from the dinner were to help inaugurate a national scholarship fund in his name.

Following his untimely death on February 25, it was decided to conduct the event as a memorial to General James and to inaugurate a nationwide campaign to raise $1 million for the scholarship fund. Chairman of the campaign is Thomas V. Jones, head of Northrop Corp.

Tuskegee Airmen, Inc., is a nonpolitical, nonmilitary, nonprofit association with chapters in leading US cities and whose general purposes are the promotion of educational and scientific research and the granting of scholarships to any deserving American youth seeking a career in aerospace. Membership is mainly USAF active-duty and veteran personnel.

For further information on the Chappie James Scholarship Fund, write Tuskegee Airmen, Inc., Los Angeles Chapter, 1675 Virginia Rd., Los Angeles, Calif. 90019. Phone: 213-731-2275.



The first prototype Fantrainer with integrated ducted-fan propulsion undergoes flight tests. Developed by VFW-Fokker subsidiary Rhein-Flugzeugbau, a second prototype of the training aircraft entered the test phase in May.

How USAF Made Possible the Zaire Rescue

In the May evacuation of Americans and Europeans from Zaire, it was the Air Force alone that represented the US. Paratroopers were sent in by Belgium and France to restore Zaire's control over Shaba Province. This copper-rich region, formerly called Katanga, was invaded that month for the second time in a year. This time an estimated 5,000 guerrillas trained and equipped by Cuba and the Soviet Union assaulted from neighboring Angola.

The guerrillas captured the provincial capital of Kolwezi, and proceeded to murder civilians in that city. Up to 200 whites and 700 blacks were killed before Zaire and its European allies were able to drive the guerrillas from the city. French paratroopers reported they interrupted a mass execution in progress when they landed by parachute.

Though the US Army had alerted its own crack 82d Airborne Division, only the Air Force was committed by the US in the evacuation operation, and then it was limited to what the Defense Department termed a "logistical role."

But it was the long range of the US Air Force's transport planes that made the rescue possible at all. One Defense official said the US Air Force is the only air force in the world capable of performing the airlift.

There is no doubt that the two European countries taking advantage of the range of C-141 StarLifter and C-5 Galaxy transports were able to launch their military operation much more quickly than if they had been left to their own resources.

And they avoided one potential bottleneck: By flying west of the African coastline over the South Atlantic, the transports didn't need to overfly African states that lay along a more direct flight path.

France flew its troops to Zaire in French military aircraft. Belgian troops flew in planes of Sabena, the Belgium civilian airline. Refugees were evacuated the same way. But to airlift the fuel, trucks, ammunition, and other supplies that are the lifeblood of such a military operation, the two countries, along with Zaire, appealed to the US Air Force.

This posed a major problem for the Carter Administration, which has been divided over what the US role should be overseas, particularly in Africa. The President's decision, after some debate, was to answer the mercy appeal, but to limit the US role if possible to one of support, and to forbid the presence of US military forces in what the Defense Department labeled "the area of conflict," the captured city of Kolwezi.

Within hours after getting the go-ahead, the Air Force began preparing for the airlift.

Like the American Pony Express, the Air Force first staged relief crews along the route: Torrejon, Spain; Corsica, France; Brussels, Belgium; Roberts Field, Liberia; Dakar, Senegal; and in Zaire itself, the cities of Kinshasha, Lubumbashi, and Kamina.

C-141 cargo planes from the US and C-130 transports from Europe were used to fly crews, ground equipment, and fuel bladders to the staging areas.

The Twenty-First Air Force, Maj. Gen. Thomas M. Sadler commanding, directed operations under the Military Airlift Command. From his headquarters at McGuire AFB, N. J., General Sadler began assembling aircraft for the actual airlift.

To Pope AFB, N. C., were flown C-130s and C-141s to support the 82d Airborne Division, if needed. The 317th Tactical Airlift Wing at Pope assembled planes from every tactical airlift wing in the US.

Flight crews were drawn from all C-141 wings of the Military Airlift Command in the US. Refueling crews were supplied by the Military Airlift Center in Europe.

Then the flights began. From Pope AFB in the US and a number of European bases, C-141s began assembling at Corsica, France, and Brussels, Belgium.

At Corsica, the French cargo was picked up. Brussels was the loading point for Belgian cargo.

The next stop was Roberts Field, Liberia, or Dakar, Senegal. At these two waypoints, crews were exchanged and the planes refueled for the last leg.

The entire flight amounted to more than fourteen hours of flying time, plus time on the ground for refueling or cargo loading.

In direct support of the French, one C-5 and twenty C-141 missions were flown to Lubumbashi. The C-5 flew refueling equipment that was too large for a C-141.

For the Belgians, the Air Force flew four C-141 missions from Brussels to Kamina.

For Zaire, several C-141 missions were flown from the US to Kinshasha, loaded with aircraft engines, truck parts, radio equipment, and other cargo.

The first US aircraft landed in Zaire May 19 and the last one departed May 27. There were conflicting reports on the number of Europeans actually evacuated, but one Pentagon report indicated that at least eighty Americans and 3,000 Frenchmen and Belgians were saved. And the US Air Force made it all possible.

—BONNER DAY

Aerospace World

has been elected vice president of the American Bandmasters Association; as is customary, he'll then serve as president-elect and finally president of the association. Colonel Gabriel has served with the Band for more than thirteen years, during which time the Band has traveled and performed in all fifty states and in many foreign countries. The Band and its component units perform more than 1,300 engagements annually.

Awarded stars on May 11, **Margaret Brewer** became the **first woman brigadier general** in the **Marine Corps.** Previously Director of Women Marines (an office now disestablished), she'll serve as Director of USMC's Office of Information.

Following last year's launch failure, on May 11 was successfully orbited **Orbital Test Satellite 2,** the first comsat to provide TV and telephone links (some 7,000 simultaneously) among Western European nations.

USAF **SSgt. Nicholas A. Alvarado** has been named **Military Newsfilm Photographer of the Year for 1977** for his award-winning "Pacer HO/ Herbicide Orange." In fact, USAF personnel won seventeen of the nineteen awards in the event, sponsored by the University of Oklahoma and the National Press Photographers Association.

A **new quarterly newspaper devoted to B-29s** in general and the Confederate Air Force's B-29 in particular is now being published. The nonprofit "Fifi's Diary" (Fifi is the only flyable B-29 in the world) can be subscribed to by sending a tax-deductible contribution to CAF's B-29 fund, c/o James P. McDonnell, Jr., 108 Central Ave., Buffalo, Minn. 55313.

The **Washington Section** of the **American Astronautical Society,** dormant the past several years, has now been reactivated. Among those named to its 1978 board of directors is AIR FORCE Magazine **Senior Editor Edgar Ulsamer.**

Noted NASA **historian Dr. Eugene M. Emme,** who chronicled space agency events since their beginnings in 1959, retired on May 1.

The Air Force Academy's **1978 Thomas D. White National Defense Award** was presented to **Sen. Barry M. Goldwater** on May 13.

The master control center for the **Navstar Global Positioning System** is to be constructed at **Fortuna AFS, N. D.,** and should be operational by the mid-1980s, USAF said. Fortuna was selected because of its position relative to the twenty-four satellites that will provide precision navigation data for land, sea, and air users. *(For more on the Navstar system, see p. 80.)*

Fred W. Haise, Jr., command pilot, and Air Force **Lt. Col. Charles G. Fullerton,** Orbiter pilot, have been awarded the **General Thomas D. White Trophy** for 1977 for their release and landing during the Space Shuttle Orbiter test flight last August—"the most significant contribution" to the country's aerospace progress during the year.

Col. Richard K. King, AFSC Director of Information, has been named Outstanding Air Force Public Information Officer by the Aviation Space Writers Association.

Died: Col. Henry W. Dorr, USAF (Ret.), long-time AFA member who was commander at Tempelhof Air Field during the Berlin Airlift, of cancer in Washington, D. C., in May.

Died: Bennett H. Griffin, aviation pioneer and director of National Airport 1947–57—a period of rapid growth in civil aviation—of a heart attack in Washington, D. C., in April. He was eighty-two.

Died: Famed inventor **William P. Lear,** who designed and developed the Lear executive jet, of leukemia in Reno, Nev., in May. He was seventy-five. ■

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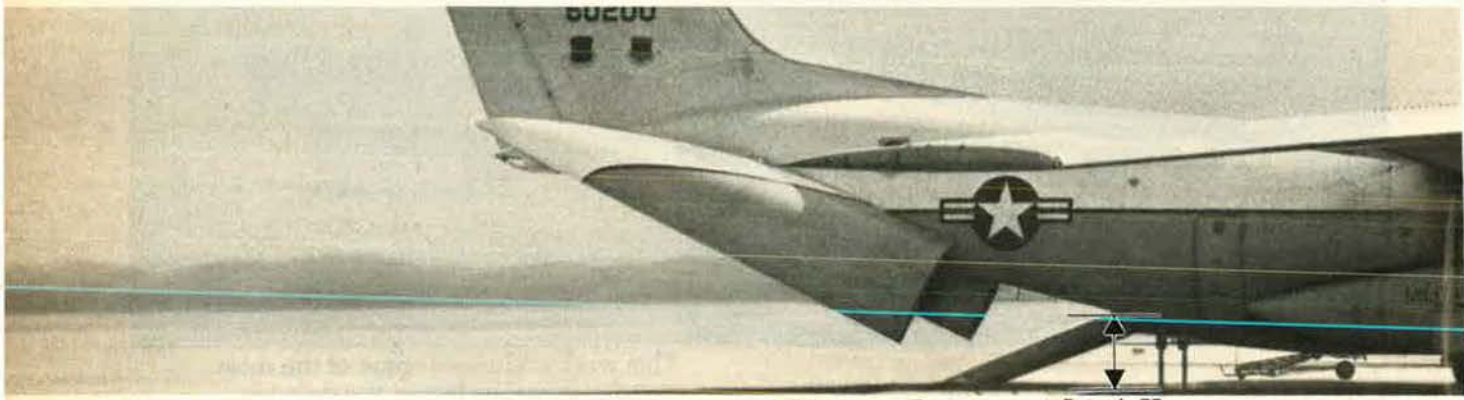
All great airlifters should

C-130 Hercules 4'0"



C-141 StarLifter 4'2½"

C-5 Galaxy 4'9"

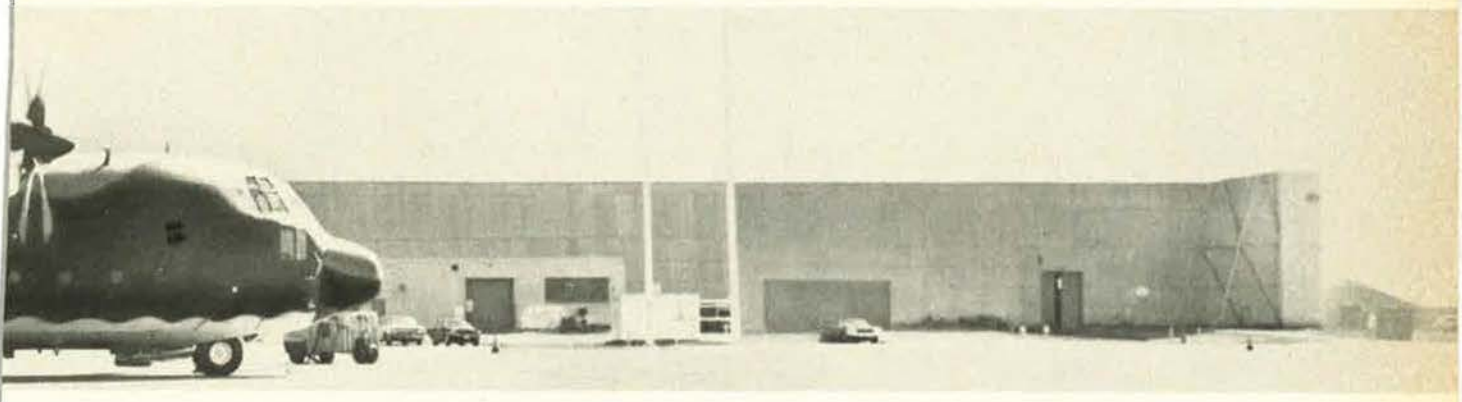
Lockheed airlifters come in many sizes and shapes, but they all offer shippers and military transport forces a number of down-to-earth advantages.

First and last, there's loading and unloading. All Lockheed airlifters have cargo decks low to the ground to permit fast loading and unloading without any sophisticated ground-handling equipment. Whether you're a commercial or military shipper, you can't always count on being around fancy facilities or long runways. The Lockheed airlifters—C-5 Galaxy, C-141 StarLifter, and C-130 Hercules—don't need them.

Even among Lockheed airlifters, the giant C-5 is unique. The largest airlifter in the world, it's the only one that can load and unload at both ends, the only one with drive-through capability.

And to speed cargo handling, the C-5 kneels on its 28-wheel landing gear. The rear cargo opening can be placed as low as 4'9" above ground, or the

be down-to-earth.



front opening as low as 4'5" above ground.

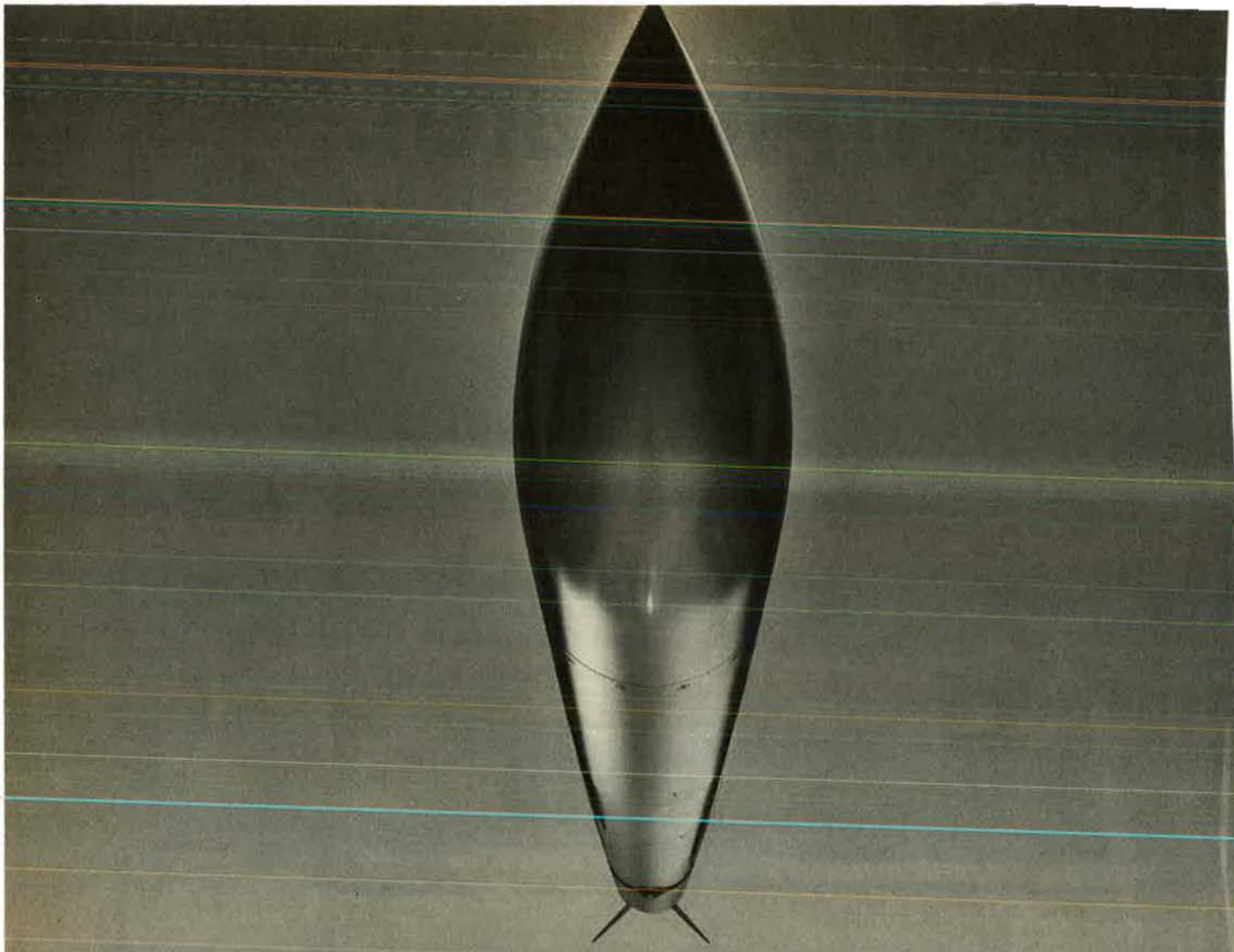
The C-130 Hercules shown in the top photo has been chosen by 43 nations because of its sturdy simplicity and versatility. It comes in commercial and military versions and its fuselage has been stretched twice to increase cargo capacity.

The C-141 StarLifter—middle photo—is also having its fuselage stretched over 23 feet to increase its cargo capacity by 33%. And it has had in-flight refueling added to give it worldwide range.

The down-to-earth airlifters. They come from the airlift experts at Lockheed, the people who have more experience designing and building airlifters than anyone else.

Lockheed

Lockheed-Georgia Company



AMRAAM

Distinctive body-lift, tail-control design of Northrop's Advanced Medium Range Air-to-Air Missile (AMRAAM) reduces aerodynamic drag now limiting usefulness of winged missiles.

The result: greater firepower because more missiles can be carried without degrading aircraft performance. Also, wingless missile can attain higher average velocity for quicker intercept at greater distance.

AMRAAM is first radar-guided missile specifically for tactical use by newest U.S. fighters (F-14, F-15, F-16, F-18) against superior numbers of highly maneuverable targets. Smaller, lighter, more accurate, more reliable, more maintainable than current radar-guided missiles. And designed to cut cost by half.

Northrop teamed with Motorola for joint U.S. Air Force/Navy program to select contractor to develop and produce AMRAAM. Northrop/Motorola team has proven experience in advanced tactical aircraft total weapon system integration, active seeker technology, RF signal processing, precision inertial guidance and control, fuze and warhead technology, ECCM.

NORTHROP

Making advanced technology work.

The early retirement of Army Maj. Gen. John Singlaub, together with charges that the military is being muzzled, raises some difficult questions regarding . . .

Freedom of Speech and the Military

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

THE Army's Maj. Gen. John Singlaub, either irrepressible or singularly unlucky in his press coverage, moves into retirement a celebrated figure. His comments on presidential decisions have earned him an award from the Veterans of Foreign Wars and high praise from assorted public figures. They have also made him expendable in the Army's inventory of general officers.

Across the Atlantic, that other bastion of democracy and free speech, the United Kingdom, has recently had a similar uproar over some remarks by a senior officer. Marshal of the Royal Air Force Sir Neil Cameron, speaking off the cuff at a luncheon in Peking, mentioned something about the Chinese and British sharing a common enemy. As soon as his remarks reached print, there were howls for his head by certain British politicians.

Superficially, the two affairs seem remarkably similar. In fact, the only similarity is the inherent sensitivity—"goosiness" is a more descriptive way of putting it—of politicians in a democracy to public utterances by serving officers. General Singlaub, in my hesitant opinion, was out of line. When you accept a commission, you also accept a few facts of life as part of the deal. Rank has its privileges, and rank also has a few inhibitions. Taking public issue with decisions by a superior is one of the things you cannot do.

Sir Neil Cameron's remarks were offered simply as the thoughts of an intelligent and important man. There was no break with British policy. The United Kingdom does subscribe, after all, to NATO, and there has never been any doubt as to the identity of NATO's potential enemy.

All of which raises some questions. Is the military muzzled, as some have recently charged? *Should* it be muzzled? If not, then what sort of speech freedom should the military have?

There is, of course, no ready answer to any of these questions. The aftermath of World War II saw us try, and even hang, some senior German officers for going along with their supreme commander. The fact that they would undoubtedly have been summarily dealt with by the Nazi authorities if they had sounded off was no mitigation in our judgment at Nuremberg. There were a few occasions during the air war in Europe when the targets seemed pretty farfetched from a military standpoint, and there were a few people in Eighth Air Force units who thought so, but they kept their thoughts to themselves.

Vietnam probably offered the greatest opportunity for intelligent military dissent. There, we were fighting a war under aimless guidance from the top. Everyone in authority knew the air targeting was wrong for most of the war. It was only during that brief period in December 1973, when President Nixon took on the real targets around Hanoi, that the bombing of North Vietnam was worth the risk. And yet we went at it year after year, losing pilots and airplanes, in an essentially fruitless campaign designed to give signals. Should someone in authority have made a public denunciation of this politically directed air war back in 1965?

There are, as we agreed, no easy answers. The whole question of military participation in the public debate is too complicated for easy answers, perhaps for any real answer. It seems obvious that senior officers cannot publicly take on the legitimate decisions of their superiors. Their only recourse at a point when they cannot live with those decisions is to retire in protest, and that would probably be a very healthy thing now and then.

Finally, if civilian control of the military is to remain a sacrosanct democratic principle, then the civilians in control have a deep responsibility to exercise that control with care and intelligence. A visible and reassuring sign of wise civilian control would be clear evidence that military advice was being listened to with effect. ■

Capitol Hill

By the Air Force Association Staff

Washington, D. C., June 2

Budget Resolution

Congress has approved a compromise version of the first concurrent budget resolution, which establishes spending targets for FY '79. The second and final resolution is due on September 15. Prior to adoption, attempts to increase, then cut, the defense budget target were defeated. Also defeated was the annual attempt to knock out the federal subsidy for commissaries. The resolution, as adopted, adds $300 million to the Carter-requested defense budget authority, but cuts his budget outlay request (money to be spent during the fiscal year) by $2.1 billion. The resolution also carries a 5.5 percent limitation on federal cost-of-living pay increases for civilian and military personnel.

Authorization Bills

By a vote of 319 to 67, and authorizing more than asked for by President Carter, the House passed its version of the defense procurement authorization bill. A similar version by the Senate was pending floor debate at press time. A congressionally agreed upon bill, expected to reach the President some time in July, will authorize, but not appropriate, funds for weapon systems procurement and research and development programs. It also will establish DoD civilian and military personnel ceilings.

By substantial votes, the House defeated substitute bills that would have cut the authorization level recommended by its Armed Services Committee. Also failing were attempts to substitute a committee add-on of a conventional *Nimitz*-class nuclear aircraft carrier, and an attempt to eliminate all authorized carrier funds.

Other add-ons in the House bill are sixteen C-130Hs for the Air Guard and Air Reserve, and eight A-7Ds for the Air Guard. The House did not tamper with the Administration's request for A-10s, F-15s, F-16s, AWACS, and $158 million for MX development. Air Force R&D money, however, was cut by $360 million.

The House bill would raise the ceiling for allowable CHAMPUS charges from the 75th to the 90th percentile of customary local fees, while turning down an amendment that would adjust pay for overseas military personnel to reflect changes in the value of the dollar.

The Senate version of the bill, as reported out by its Armed Services Committee, also includes add-ons for a nuclear aircraft carrier and additional C-130Hs and A-7Ds for the reserve components. With minor adjustments, the House and Senate have okayed DoD personnel ceilings essentially as asked for by the Administration.

Also passed by the House, with an overwhelming 363 to 18 vote, was the military construction authorization bill for FY '79. For the most part, the $2.7 billion Administration request for authorization was approved, including $142 million for the Space Shuttle facility at Vandenberg AFB, Calif.

In addition, the House passed by a vote of 288 to 57 a bill that establishes a three-year experimental study of flexible and compressed work schedules for federal employees, permitting them control over hours of work in order to meet personal needs and preferences. All mandatory aspects of the bill were eliminated, and a provision was added to guarantee that all federal employees are treated equally, regardless of religion.

Veterans Administration

The Veterans Administration is opposing a bill that would provide a five percent increase in educational assistance checks to veterans attending school on the GI bill. In testimony before the Education and Training Subcommittee of the House Veterans' Affairs Committee, the agency said it opposes any increase extended to veterans taking vocational rehabilitation courses, tutorial, special restorative, on-the-job, and apprentice training.

The VA also opposes a bill that would provide educational benefits to dependents of veterans who are eighty percent or more disabled from service-connected causes, and would transfer from the Department of Labor to the VA the Veterans Employment Service. The VA recommends that flight and correspondence training be eliminated from the GI bill program.

New Legislation

- **H.R. 12305,** Spellman (D-Md.), to increase the amount of group life insurance currently available to federal employees;
- **H.R. 12329,** Dellums (D-Calif.) and others, to provide that a taxpayer claiming conscientious objection to war may elect to have his tax payments spent for nonmilitary purposes;
- **H.R. 12412,** Armstrong (R-Colo.), to provide eligibility under specially adapted housing assistance for disabled veterans program to any veteran with a permanent and total service-connected disability who is subject to loss of muscular control or seizures.

What They're Saying

"In reviewing the state of our reserve forces and the manpower mobilization potential, it became obvious that the Selective Service System cannot meet manpower mobilization requirements in an acceptable time frame. To overcome that deficiency, Selective Service must be extricated from its present deep standby status [and we must] return to registration and classification."—House Armed Services Committee.

". . . the All-Volunteer Force is a peacetime concept that is not now providing sufficient numbers of reserve personnel and would be hard pressed to provide additional numbers of active recruits should the national security require an expansion of current active force levels. Therefore, in an important initiative the Committee voted 17 to 0 to require the Secretary of Defense to conduct a study of alternatives to the current All-Volunteer Force policies, including changes needed in current Selective Service laws changes needed for an effective standby draft for active reserve components; and alternative ways to improve and increase military recruiting."—Senate Armed Services Committee.

Sperry Update 4

. timely report of Sperry Flight Systems activities in the airline, efense, space and general aviation markets.

Sperry scores another autopilot first.

McDonnell Douglas has authorized Sperry to proceed with development of what will be the first digital flight guidance system certified for commercial airline use. The system is to be installed in the new DC-9 Super 80.

With the Sperry system, airlines will enjoy significant performance improvements, including autoland, and automated maintenance management.

The Super 80 DFGS will consolidate into one box functions normally requiring six to 10 boxes in analog autopilots. An automated test system will cut airline cost of ownership through reduced maintenence requirements.

Further savings will be realized through a higher flight completion percentage made possible by the autoland capability with a built-in autothrottle. The system will integrate aircraft stability and control, flight path steering and thrust management for more accurate approach guidance and simplified flight management, while reducing overall pilot workload.

perry ATE users ow total 20.

The number of Sperry automatic st equipment (ATE) users worldide has risen to 20 with orders from aqi Airways, British Airways, Air lgerie and China Airlines.

While British Airways is among e Sperry ATE users with more an one system, the other three lines are new users.

Space experimenters to use Sperry Flexible MDMs.

Flexible multiplexer-demultiplexer units for control of experiment payloads aboard the space shuttle will be supplied to NASA by Sperry.

The units are similar in function to those being supplied by Sperry for data handling and interface between the orbiter's main general purpose computers, spacecraft subsystems and solid rocket boosters. Unlike the orbiter and SRB MDMs, the Flexible MDM offers the option of passive cooling through the use of a silverized Teflon radiator, which is effective even when directed towards the sun.

The Flexible MDM is so designated because it is field programmable for a wide variety of payloads. When placed in NASA inventory, the units will be leased by firms conducting experiments in the shuttle bay.

Sperry leads way in helicopter avionics.

Considerable attention is being focused on Sperry's role in helicopter avionics and for good reason. Sperry, working with a number of helicopter air frames and installers, has secured single pilot IFR certifications on five helicopters, including the Aerospatiale Gazelle and Dauphin, Bell 212, Boeing/MBB BO-105 and Agusta 109A.

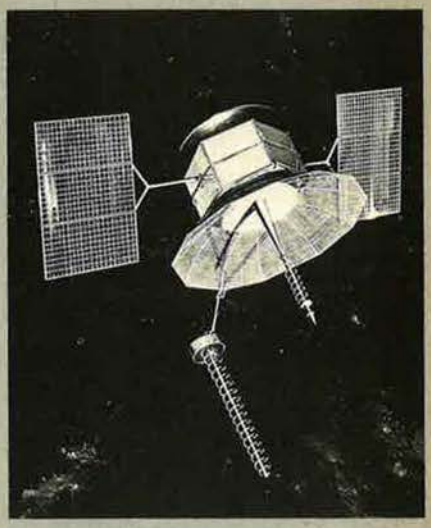
In addition, Bell selected Sperry to provide the standard IFR package for the 222 and Sikorsky will use Sperry flight director systems and gyros in its S-76.

Sperry momentum wheel stabilizes FLTSATCOM.

The first spacecraft in the Fleet Satellite Communications program is gyroscopically stabilized in space by a Sperry Flight Systems momentum wheel assembly.

Sperry's wheel provides three axis stabilization of the satellite to keep its 16-foot diameter dish antenna pointed properly.

Attitude of the 1950 lb. satellite will be controlled by varying the speed of the spinning gyroscopic wheel in response to commands from the on-board computer.



Remember us.

We're Sperry Flight Systems of Phoenix, Arizona, a division of Sperry Rand Corporation ... making machines do more so man can do more.

SPERRY
FLIGHT SYSTEMS

"For new business at Vough key. But managementi

"Over its 61 year history, Vought has firmly established a reputation as a dependable supplier of advanced technology systems.

"The catalogue of our successes, from the early Corsairs to the A-7, the Lance artillery missile, the Scout launch vehicle, and many others is so widely recognized that it needs no repeating.

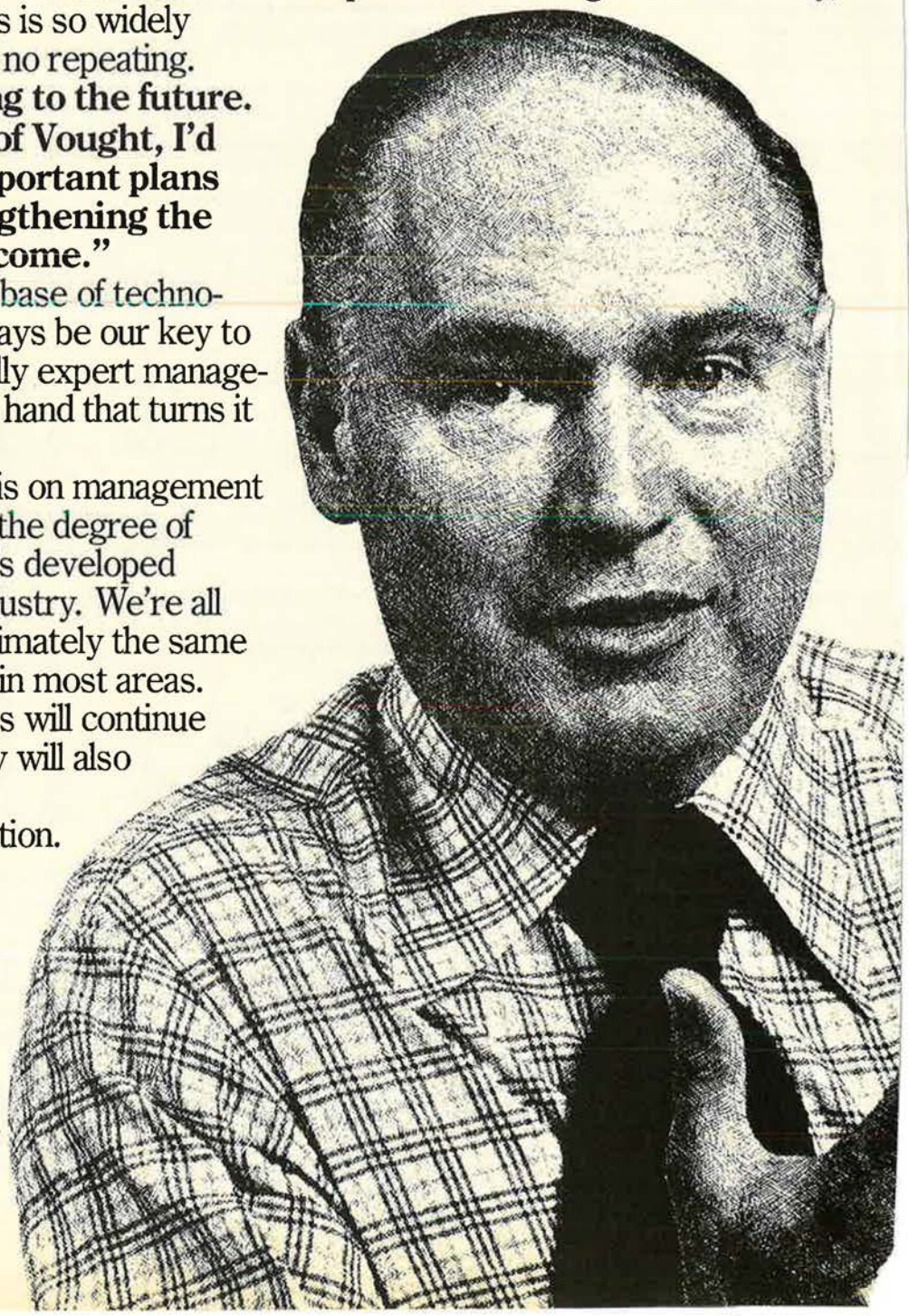
"Today, we're looking to the future. And as president of Vought, I'd like to discuss the important plans we've made for strengthening the company in years to come."

"Of course, a solid base of technological expertise will always be our key to new business. But equally expert management will have to be the hand that turns it and opens doors for us.

"This new emphasis on management is largely occasioned by the degree of technological parity that's developed within the aerospace industry. We're all bobbing beneath approximately the same 'state of the art' ceilings in most areas. And while breakthroughs will continue to occur frequently, they will also tend to be more quickly matched by the competition. Thus *management* of technology becomes a decisive issue.

"We're achieving our own management goals by first identifying, then concentrating on those product/market areas where our energies and financial resources can be applied most productively.

"With these now identified, we can focus our research, gain valuable lead time for development, predict production requirements with greater accuracy, and



Bob Kirk
President and Chief Executive Officer of Vought Corporation

uperior technology is the he hand that turns it."

prove more knowledgeable and incisive at the interface with prospective client companies and governmental agencies.

"Specifically, the market areas on which we are concentrating are: missiles; space and strategic defense; subcontract/specialty products/overhaul & modernization; and military aircraft."

"The last of these, of course, has been Vought's mainstay since its beginning. And with the strong possibility for several A-7 modifications, plus new V/STOL and trainer programs for the Navy, our military aircraft production can be maintained at viable levels through the next decade.

"In the missile area, we intend to win the prime contract award for the General Support Rocket System (GSRS) while continuing Lance production and enhancing our capabilities in guidance & control and propulsion.

"Each of the other market areas holds great promise for us as well. Together, they represent a renewed emphasis at Vought and will spearhead much of our new business thrust."

"Supporting these efforts, we're currently working in an impressive array of specialty areas, such as energy systems, space vehicle sub-systems, exoatmospheric maneuvering devices, simulators, composites, thermochromics, electronic intelligence, hydraulics, hydrodynamics, and other technologies.

"Because we're playing to our strengths and skills in these activities, we expect that Vought's contributions will continue to be sought. Indeed, we want to be known as specialists who offer not only superior technology, but technology that's well-managed throughout the life of any program.

"Identifying our markets is but the first phase of a sound management program. In the coming weeks, a series of messages similar to this one will discuss our initiatives for each market area in more detail."

"I hope you will find these messages interesting and informative. Each will feature a key Vought executive addressing a specific product/market area. They will outline our current programs, immediate objectives, and long-range goals in depth. And the resultant image of our organization will, I believe, be a clear and accurate one.

"Vought has a role of leadership in the aerospace industry today. As that role changes and grows, we're prepared to change and grow with it."

VOUGHT an LTV company

Applying management to technology

THE ELECTRONIC AIR FORCE

Managing Modern Electronics

BY GEN. ALTON D. SLAY, USAF,
COMMANDER, AIR FORCE SYSTEMS COMMAND

USAF's biggest job in electronics is to keep its perception of electronic opportunities abreast of technology in order to identify, build, and support electronic systems that will be needed.

IN thinking about the impact of electronics on the Air Force and on Air Force Systems Command's role in its development, I'm struck by how important and pervasive electronics has become to all of us. A title for this article was suggested to me: "Electronics—The Air Force's Central Nervous System." That analogy is inadequate. Electronics not only performs that function, but is now intimately involved as our eyes and ears. It is central to our ability to communicate and is fast becoming central to everything else. It is, in some cases, even taking over from bullets and explosives; for example, high-energy lasers.

The analogy of a human system also breaks down when you consider that electronics today gives us the ability to see in the dark, to see through bad weather, and to act at great distances. Certainly, the evolution we're seeing in electronics exceeds anything we're seeing on a human scale. Unfortunately, this rapid evolution brings with it the familiar litany of increased complexity, unreliability, and high costs. Last year, when I was Deputy Chief of Staff/Research and Development (DCS/R&D) at the Air Staff, I wrote in AIR FORCE Magazine on this subject in detail, as it applied to avionics. Later in this article, I'll cover what we've done since then to control the mushrooming avionics business.

To cover adequately the broad subject of Air Force electronics, we should examine it from at least two aspects—the impact of modern technology, and associated policy and management practices that apply to this field.

The Technology Impact

During my last tour as DCS/R&D, I saw that more of our development and acquisition budget was being committed to electronics, year by year, in almost every mission area. This year's budget submission contains well over $1 billion of R&D programs, directly involved with electronics—more than one-fourth of our total R&D budget. It was also apparent, as we conducted management reviews on each of our programs throughout the year, that many of the major issues are intimately involved with electronics and that, in fact, tremendous reliance was being placed on electronics in all segments of our combat forces.

As I came to AFSC and began to review in detail the capabilities of this command, again I was struck by the importance and influence of electronics in the command's daily operations. Even the last bastion of manual work, the administrative office, is beginning to show signs of the electronic revolution in the form of computer terminals and programmable typewriters. Every AFSC base and, indeed, almost every AFSC organization has become dependent on computers and their products. Even my top executives receive much of their "mail" via a cathode ray tube.

The AFSC Laboratories have always been at the cutting edge of technology. Now the vast majority of their operations and technical programs use advanced electronic technologies. What is particularly significant is that electronics is now assuming a vital role in some classically "nonelectronic" areas like propulsion and weapons, so that whole new mixes of technical disciplines are needed to cope with these areas.

The impact of modern electronics is probably most visible on our emerging weapon systems. When I say "modern electronics," I'm really referring to the order of magnitude improvements in processing and computation power afforded by solid-state microelectronics. It is a well-documented fact that every year since 1970 repeated microminiaturization and integration of solid-state devices have doubled the complexity of semiconductor devices while costs have dropped dramatically. The introduction of microcomputers and advanced memory technologies has accelerated system performance and further reduced hardware costs. Of course, accompanying all of this, our reliance on software has drastically increased. Software costs—the costs to write, test, and support computer programs—are becoming our major costs in fielding a new weapon system.

The processing power available from digital microelectronics has led to several significant trends and created some significant problems. The ability to put together small, relatively cheap computer modules has led to the concept of "embedded computers." Thus, we find that computational power is being distributed throughout an aircraft or spacecraft, rather than being confined in one tidy central

location. Immediately the specter of compatibility is raised. Digital data streams and computer software are notably unforgiving. "Just one bad bit" is as serious as a million bad bits if the system design is not sufficiently fault-tolerant.

Another major effect is that the tremendous computational power afforded by digital microelectronics is causing us to change from basically an analog approach to a digital approach in our weapon systems. Equipment domains that were exclusively analog, like radar and communications, have been swept up by the digital revolution. Thus, our modern generation of coherent, high-resolution, synthetic aperature radars and antijam, high-capacity data links and radios are heavy users of the latest large-scale integrated microelectronics. Again, digital technology brings problems with its blessings. Now it's necessary for two communicating users of our latest antijam radio to be synchronized in time to accuracies of much less than a millionth of a second. Also, without a great deal of care, effects of things like nearby lightning strikes or nuclear events can raise havoc with a digital system. Nothing comes free.

Possibly one of the greatest blessings of the digital revolution can come from our ability to combine functions through integrated designs to obtain greatly improved capability. Here I have in mind such things as combining communications, navigation, and identification functions into one system, to share information and processing power. This approach demands a rigorous analysis of requirements and a detailed understanding of interface requirements—down to the last bit.

This is a big change. In times past, our acquisitions of electronic gear were limited in scope and directed to specific tasks. The old ARC-27 air-to-ground radio and the VHF-101 radio set are examples of the acquisition emphasis of the late 1950s and early 1960s. These radios were acquired for narrowly defined purposes and within programs of limited scope. Later on, the Air Force acquired the TPN-19 and TPN-43 radars to perform very specific tasks. In the latter two, however, the evolution of emphasis toward standardization had emerged. These radars have often appeared as candidates for adaptation in roles other than those for which they were originally developed.

General Slay was named Commander of Air Force Systems Command in February 1978, after having served for more than three years on the Air Staff as Director of Operational Requirements and Development Plans, Assistant Deputy Chief of Staff for Research and Development, and DCS/R&D. He flew 181 combat missions in Southeast Asia, where he was DCS/Operations of Seventh Air Force and Deputy for Operations, MACV. He also has served as DCS/Operations of Air Force Systems Command, Commander of the Lowry Technical Training Center, and Vice Commander of Air Training Command.

New Emphasis in Development

The emphasis in Air Force electronics development is changing, both in terms of the way we develop new systems and the type of systems we develop. Some past programs have been carried through engineering development with little or no grasp of the operational requirement for the system. Although in many cases there has been a real, if unrecognized, need for these programs, the days are past when the Air Force has the resources to develop technologies for which an operational mission has not been defined. A wide range of new DoD and Air Force directives requires that all new programs document the operational need for the program at the same time that they document its technical feasibility.

Of particular importance in this change of emphasis has been OMB Circular A-109 and its resulting DoD Directives 5000.1 and 5000.2 governing the DoD acquisition process. The principal thrust of these directives is to formalize the front end of the acquisition process and base acquisition programs on clear understanding of mission needs. These new directives, which will have a major effect on future electronics acquisition, were brought about partly as a reaction to the problems encountered in the past. All too often, the services had leaped into one system acquisition or another based on a premature hardware choice, without the thorough study of the need or a search through the already existing and extensive inventory of government electronics.

Electronics mushroomed. Every need or system that came along had some new and marvelous electronic solution that could be applied, supplied by a healthy, prolific industry that was turning out new devices and developments at a phenomenal rate. New and better technology was being introduced so fast that systems often became at least partially obsolete while they were still in production. The burgeoning market gave birth to many a new electronics firm both here and abroad, each with its own new inventory of desirable technology.

But costs also mushroomed. It was only natural that the more devices there were on the market, the more varied and complex their combinations could become. The price of this complexity was longer processes, requiring more labor and greater skill, and these inevitably equate to longer hours and high labor costs. The market supplying required materials for all these developments also respond-

ed to the growing demands with growing prices. Hand in hand with higher labor and material costs came inflation, sometimes double-digit, year-by-year adding to the costs of systems whose acquisition cycles extended over long periods. The effects of inflation on the Air Force budget are dramatically portrayed in the chart below, showing the decrease in buying power we have experienced since 1960.

In spite of all its investment in electronic wonders, the Air Force often found itself with another problem—systems that could not interoperate. A test set designed to check out a certain piece of electronics on one aircraft might not be usable on the same piece in a different aircraft. Many an airbase found itself with three or four large computers, made by different manufacturers, which could not talk to each other. The tendency to build specific equipment for specific applications led to much duplication.

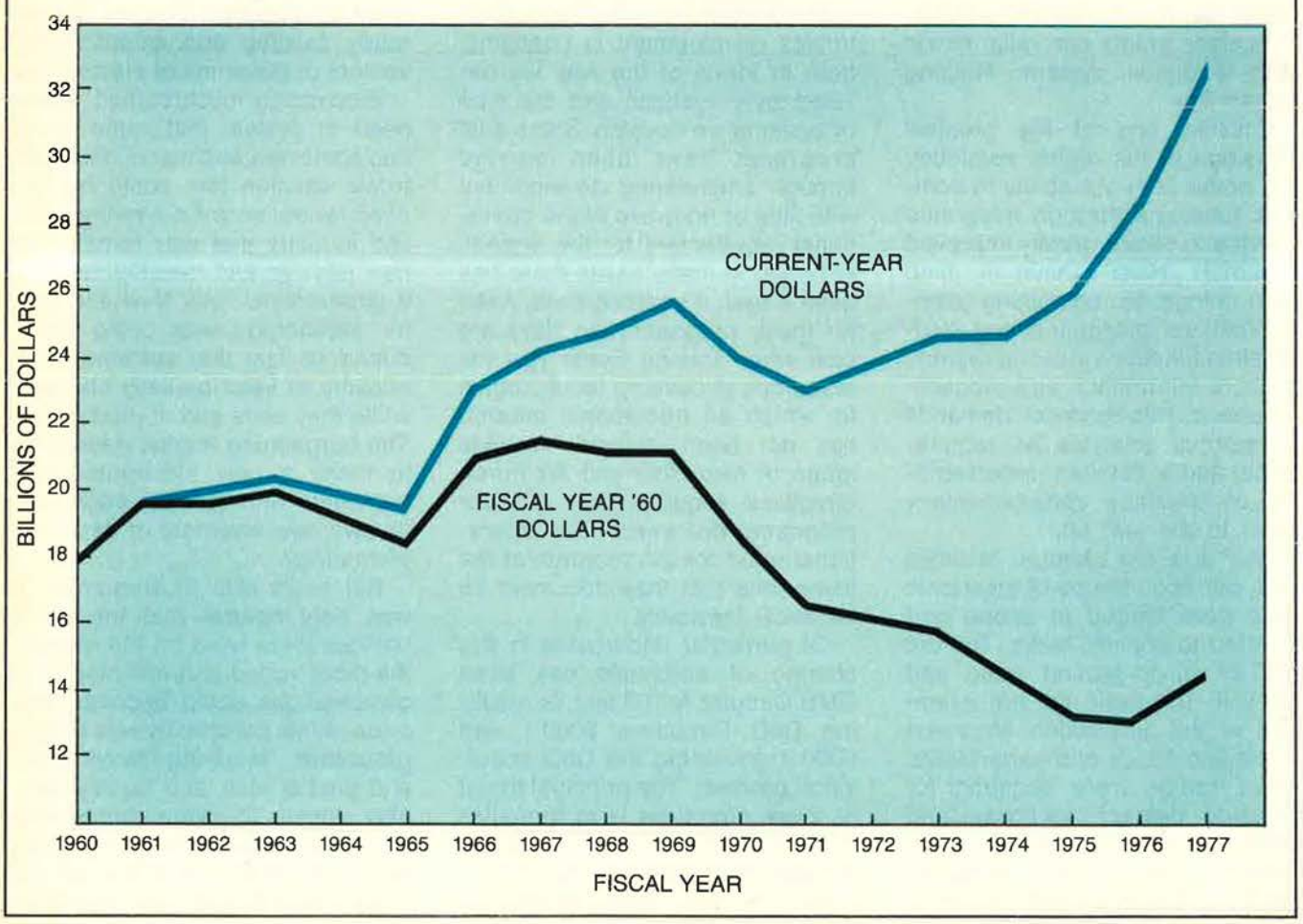
Yet, surprisingly, gaps in capabilities persisted. In efforts under the stress of limited time to produce systems that worked, the process of building in electronic counter-countermeasures (ECCM) features was often forgotten or ignored. Another gap brought about by increasing complexity was low reliability. Some of the new gear that came into the inventory at the time was plagued by ridiculously short mean times between failures.

The Architecture Approach

These problems were largely effects of the technology explosion. The Air Force came into this era caught off balance without an acquisition structure capable of dealing with such rapid expansion and with insufficient in-house expertise to cope with the explosion. Over the years, we have managed to regain our balance, modifying and beefing up our acquisition arm and acquiring the needed expertise within the Air Force. One evidence of this is the fact that the "architecture" approach to mission area planning has taken hold. "Architecture" in this sense is a disciplined approach to defining a plan that integrates all acquisition requirements with mission requirements to provide cost-effective, time-phased systems to meet Air Force needs.

The wisdom and utility of architectures (planning structures) for command control and communications systems (or, for that matter, any system) have now been proven. We have attacked the C^3 mission area architecture by manageable chunks, with an eye toward eventually tying the entire "White House-to-fighter plane" C^3 structure into a large systems architecture. This is proving to be no small task.

THE EFFECTS OF INFLATION ON THE AIR FORCE BUDGET
Fiscal Years 1960-77



Looking at some of the existing or germinating military C³ architectures, we can highlight:

- Strategic C³ (airborne command centers, missile control systems, WWMCCS, and the elements of the Defense Communications System);
- Tactical air control (sensor management, aircraft identification, targeting and strike control, deployable and fixed theater Tactical Air Control System);
- Satellites (all military C³ space segments);
- TRI-TAC (joint tactical switched communications);
- SIGINT (National Security Agency planning structures);
- Avionics (integration of communications, navigation, and positioning capabilities);
- JINTACCS (joint interoperability of designated tactical information systems);
- Army, Navy, and Marine Corps C³ roadmaps;
- NATO Integrated Communications System.

(For a brief description of several of the above programs, see "What's Happening in Electronics at ESD," pp. 67–69.)

What can be gained by interleaving and interfacing all of these entities into a "grand-design" architectural system of systems? We think much can be gained, including, of course,

- Identifying and designing interfaces among architectures to allow "cross-talk";
- Combining requirements, concepts, capabilities, and acquisitions to maximize opportunities for joint and combined enterprises;
- Managing the scarcity of and competition for dollars and expertise.

Unfortunately, knowing what must be done and why we should do it does not make the job easy. We must and are continuing to perfect architecture for manageable chunks of the C³ mission area on a dedicated and determined basis. We plan to assure ourselves that each architecture does the job in roadmapping our way through the concept/requirements/goal statement/acquisition for its specific "chunk," and then, when the light is seen at the end of each tunnel, we will put it all together!

We do believe that our whole national C³ structure can fit into the classic input-processing-decision-execution loop of force management and can indeed lend itself to a supersystem architecture that will work!

Perhaps the most intense effort in our attempts to orchestrate C³ planning is in the area of the tactical air control system (TACS). Though one of the "manageable chunks" we spoke of earlier, this architecture in itself is being broken down into subarchitectures dealing with a go-anywhere deployable TACS, the European TACS, and a Pacific TACS.

A unique work-a-day team is building this architecture. AFSC's Electronic Systems Division and Tactical Air Command's Tactical Air Forces Integration Group have generated a Tactical Air Forces Integrated Information System (TAFIIS) Master Plan as the architectural vehicle. Within this plan, we are structuring the integration of such battle-area force-management capabilities as information gathering and processing (sensors, fusion, correlation), directing and executing (target and strike force management), and the many C³ elements that make all this possible.

This TAFIIS Master Plan will form the core architecture for our tactical C³ planning; that is, all other tactical DoD C³ architectures (TRI-TAC, JINTACCS) will be treated as adjuncts from an Air Force point of view. The ensuing architecture will then be integrated into the all-tactical hoped-for "grand design" or system-of-systems architecture I spoke of previously.

An example of one new organization that has arisen to implement many of the new Air Force concepts in electronics development is the Deputate for Avionics Control (DAC) being established at AFSC's Aeronautical Systems Division, Wright-Patterson AFB, Ohio. This new organization is to act as the focal point for all avionics planning, development, acquisition, and modification programs. The primary task of the DAC is to develop, implement, and oversee an Air Force Avionics Master Plan that will serve as a roadmap to show everyone where we are going in avionics development and indicate how we will get there. In order to carry out this master planning activity, the DAC will have to review and coordinate all major avionics programs as well as to participate in developing new avionics requirements. The DAC will have no avionics programs of its own to manage, but will serve to coordinate the efforts of all those organizations that do.

The examples of development and management organizations and concepts given above are just a start for what the Air Force needs to do in the near future. Whole areas of electronics such as ECM, ECCM, and space systems need to be coordinated both within themselves and with all other electronics areas. These, in turn, must be coordinated with materials, structures, and other areas to provide a well-coordinated system/function/requirement/method approach toward meeting the total needs of the Air Force.

In Summary

The role of electronics in the Air Force is constantly evolving and expanding. We have technology available today that would have been ridiculed as science fiction only twenty-five years ago, but that in another twenty-five years may be looked on as simple and totally outdated. Our biggest job in Air Force electronics today is to see that our perceptions of electronics evolve and expand with the electronics field. The corollary job of expanding and evolving procedures for identifying, building, and supporting needed electronics systems is equally important.

I have described some of the new technology we are developing, some of the changes in our management structures, and some of our new approaches to viewing the whole electronics area to show that the Air Force is evolving and expanding with electronics. But we cannot become complacent with what we have done; we must constantly strive to do even more. I feel we are meeting the challenge and will continue to do so. ■

ESD: Enhancing Effectiveness Electronically

By EDGAR ULSAMER, SENIOR EDITOR

The Soviet Union's accelerating and broadening military research and development program is narrowing the US technological lead in some, and overtaking this country in other areas—with one notable exception. The US lead in information processing remains sovereign and, by extension, assures this country of superior C³I (communications, command, control, and intelligence) capabilities. USAF has assigned the crucial job of building its strategic and tactical C³I systems of the future to the Electronic Systems Division of the AF Systems Command.

DR. RUTH M. DAVIS, Deputy Under Secretary of Defense for Research and Advanced Technology, has named eight "kingpin" technologies that combine to form what she terms "the technical basis for our military future." Five of them are in the field of electronics. It is no coincidence that these areas also form the technical underpinnings of C³I (communications, command, control, and intelligence), the controlling force behind modern warfare and deterrence.

The Air Force Systems Command's Electronic Systems Division (ESD) at Hanscom AFB, Mass.—with the Rome Air Development Center (RADC) and two Federal Contract Research Centers, the MITRE Corp., and the Massachusetts Institute of Technology's Lincoln Laboratory—acts as one of this nation's foremost centers of C³I research, development, and acquisition. The ESD complex's span of technical functions extends from advanced computers to microelectronics, distributed C³ system concepts, sophisticated automation, and "smart" sensors to provide the Air Force, other DoD elements, and allied forces with vital C³I machinery and techniques. The end products are multiple, intertwining information networks that provide the nation's military and civilian leaders with the knowledge and controls required for *any* effective military action, from withholding force to force reconstitution following nuclear attack.

The toughest part of ESD's job, according to its Commander, Lt. Gen. Robert T. Marsh, is "front-end definition," meaning that C³I systems designed today must suit the changing tactics, doctrines, and weapon systems encountered during their life cycle. ESD's response to the certainty of change and the uncertainty of its nature is a policy of gradualism that starts with "base-line systems" that can grow and adapt to the user's changing needs and philosophies. Equally important, the mission requirement statement guiding the design concept must not place the cart before the horse. As defined by ESD's Vice Commander, Maj. Gen. Henry B. Stelling, Jr., this means that systems planning must revolve around discernable functional needs and resist the lure of designing against available hardware. What makes the challenge of designing C³I systems so much more difficult than that of weapon systems is that invariably they will have to "interoperate"—that is, work compatibly—with others that are either much older or may not even have reached the planning stage. The fundamental reason is that in the aggregate, C³I is a system of systems that must perform a multiplicity of functions—from "sensing," sorting, and routing to evaluating, computing, and "fusing" information—reliably, instantly, flexibly, and securely in the face of hostile action. Further, complications arise because of the need to "interoperate" with C³ systems of allied nations, changes of national defense policy—to wit, recent emphasis on defining a warning option that could support a Launch from Under Attack (LUA)—the advent of such weapons as the cruise missile and the multiple aimpoint MX ICBM; and mounting national concern with space systems survivability.

The New SPACETRACK System Program Office

Because of the latter concern, ESD recently reorganized and consolidated all work pertinent to space defense under a new SPACETRACK System Program Office (SPO), according to General Stelling. Space defense obviously depends on the ability to locate, track, and identify space objects. The currently used system, Dr. William J. Perry, Under Secretary of Defense for Research and Engineering, told AIR FORCE Magazine, consists mainly of a ground-based radar sensor network, designed for missile warning and which "has a very limited capability to detect objects above

3,000 nautical miles and has gaps in the coverage below this altitude." Hence the need for GEODSS (Ground-based Electro-Optical Deep-Space Surveillance System), a near-term program that is scheduled to become fully operational in the early 1980s.

(Two near-term programs complementing GEODSS, according to Dr. Perry, involve warning of "impending attack on one of our satellites," to be installed in the NORAD Cheyenne Mountain Complex, as well as range and accuracy improvements of some space surveillance radars.) GEODSS, according to Col. H. J. McLoud, Jr., of ESD's Surveillance and Navigation Systems Deputate, will be able to track up to 200 objects per night at altitudes ranging from 2,000 to 22,300 miles, or higher. A prototype of the system was developed by MIT's Lincoln Laboratory and installed at Stallion Range Center, White Sands, N. M. Performance of the prototype system has exceeded ESD's specifications. A key feature of the GEODSS is that its computer differentiates between stars moving at a natural, "sidereal" rate, and man-made objects, such as satellites, which don't. The sophisticated telescope focuses only on the latter category.

GEODSS will be installed at five sites spaced along the equator to provide worldwide coverage. A

The Rome Air Development Center's digital communications test facility at Griffiss AFB, N. Y., serves to analyze the performance of advanced communications systems.

$62 million contract was recently awarded to TRW's Defense and Space Systems Group for the system. ADCOM will operate the GEODSS.

The long-term solution for assuring optimized real-time surveillance up to geosynchronous altitudes, according to Dr. Perry, appears to center on spaceborne sensors.

A new ESD space defense program, the Pacific Radar Barrier, is meant to detect foreign space launches on their first revolution. Two or three sites will be involved in this $60 million program, according to Colonel McLoud. One of them is the US Army/Lincoln Laboratory Altair X-band radar in the Kwajalein atoll. Initial tests of that system, following some modification, suggest that it can sustain around-the-clock operation, as required for space surveillance work. Two additional island sites, one in the central and the other in the western sector of the Pacific, are under consideration. The GPS 10 radar, previously located in Thailand, will be erected on one site, while a new radar system is likely to be placed on another island.

Warning and Assessment Systems

The Enhanced Perimeter Acquisition Radar Characterization System (EPARCS) program involves ESD's upgrading of the US Army's SAFEGUARD long-range radar system in order to improve its contribution to ADCOM's ballistic missile warning system. SAFEGUARD was canceled two years ago, and its only operating element, PAR, was turned over to the Air Force for use in a warning and attack characterization role.

Another ESD program that will improve ADCOM's ability to assess the nature and scope of an impending missile attack on the US is known as the BMEWS Modernization. Purpose of this $100 million improvement is to increase the bandwidth of the Ballistic Missile Early Warning System's (BMEWS) detection and tracking radars.

Improved attack assessment is being pursued also by RADC. Working closely with the Air Staff and ADCOM, RADC is exploring two alternatives for attack assessment concepts to support a Launch on Assessment (LOA) option. TRW and MITRE are examining the relative merits of centralized vs. dispersed information processing, according to the RADC Commander, Col. J. Z. Dillon.

Late last year, ESD awarded three contracts to General Electric, Raytheon, and RCA to examine design alternatives for a shipborne phased-array radar system known as COBRA JUDY. The system, General Marsh said, is to provide the intelligence community and the US Army's Ballistic Missile Defense Agency with information concerning foreign ballistic missile launches. It will employ technology developed for COBRA DANE, ADCOM's phased-array radar on Alaska's Shemya Island. COBRA JUDY, according to congressional testimony, will flesh out intelligence information about Soviet ballistic missile development programs as well as aid threat analyses by the Ballistic Missile Defense Agency.

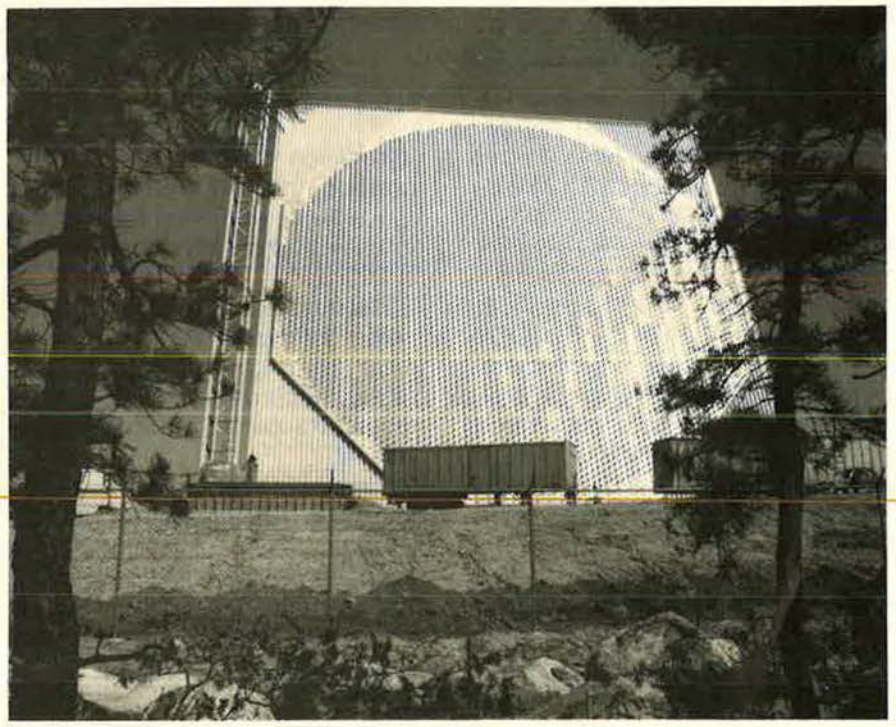
Terming COBRA JUDY one of

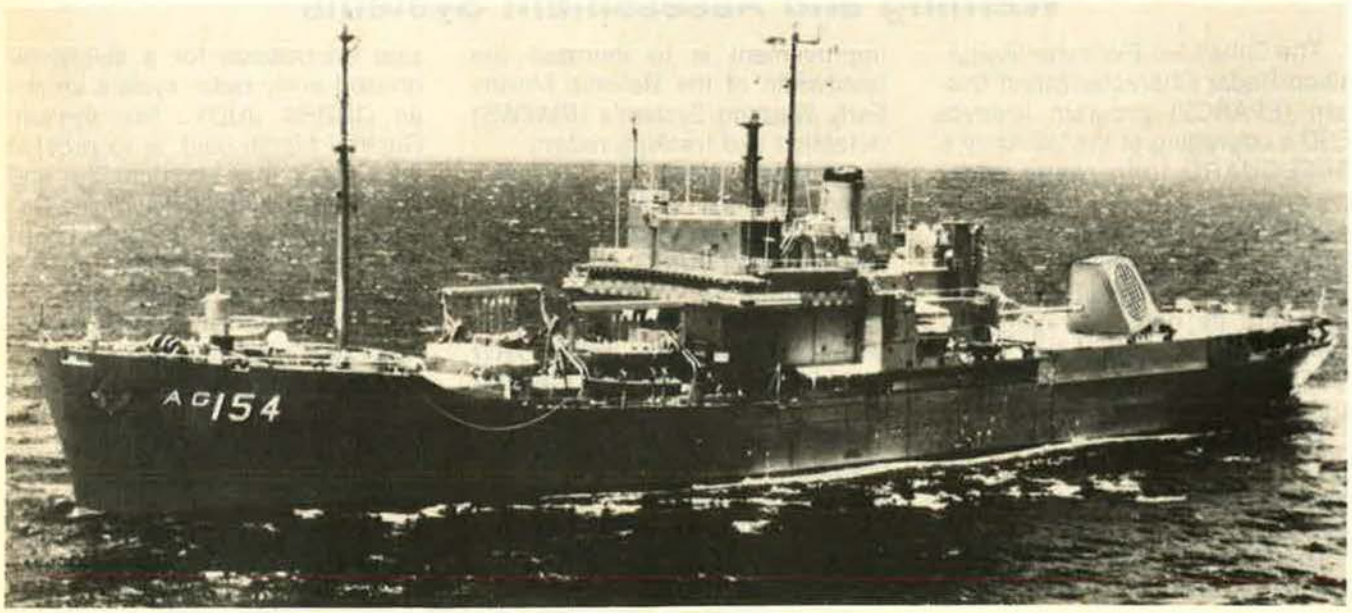
ESD's most "thoroughly scrubbed definition efforts," General Marsh said that a contractor will be selected from among the three competing companies late this year. The system will be installed on the USNS *Observation Island,* a naval ship now mothballed. A substantial amount of the costs of COBRA JUDY, according to Colonel McLoud, will go toward refurbishing and modification of the ship. The system is to become operational in the early 1980s.

Within a few years, two sophisticated, dual-faced, phased-array radar systems, one located at Otis AFB, Mass., and the other at Beale AFB, Calif., will provide rapid early warning of SLBM launches against the US, and will also catalog positional and velocity information about satellites in low earth orbits. Capable of reaching out about 3,000 nautical miles from the coast line, these PAVE PAWS radars can predict the impact point of a hostile SLBM within about twenty-five miles and thus characterize the nature and intent of an impending attack with considerable detail. The $100 million program, carried out by Raytheon's Equipment Div. as the prime contractor and IBM as the software developer, will be linked to NORAD's Cheyenne Mountain Complex, the National Command Authorities (NCA), NORAD, and SAC to provide SLBM information. Space information will also go to NORAD.

Initial alignment and calibration of the system's nearly 3,600 antenna elements at the Otis site are in progress, and construction is under way at Beale AFB, according to Colonel McLoud. Raytheon has operated the radar at the Otis site at low-duty cycles and low average power densities while aligning the antenna arrays. However, they are expected to reach full power and duty cycles during the summer months for integration and test. PAVE PAWS radiation levels are not expected to differ measurably from those caused by radio and TV broadcasts in all areas off the Otis installation. A suit by environmentalists against the government in connection with PAVE PAWS is pending.

ESD's peacetime Joint Surveillance System (JSS) is currently in design verification, carried out by the Hughes Aircraft Co. Pegged at about $160 million, JSS is a new North American radar and control center network that performs peacetime airspace surveillance





Right: The phased-array PAVE PAWS system will provide rapid warning and attack assessment of SLBM launches. Below: COBRA JUDY phased-array radar is being installed on the USNS Observation Island.

for the Aerospace Defense Command, the Alaskan Air Command, and Canadian Forces. It will replace the existing SAGE system. In Alaska, JSS will do double duty by serving also as a tactical air control system. About forty radar sites of JSS will be operated by the FAA (Federal Aviation Administration), according to Colonel McLoud, thus reducing the system's life-cycle costs by more than $100 million annually. Information from the system's civilian and military radar sensors feeds into ROCCs (Region Operations Control Centers), where data processing, display, and command and control functions are carried out. In wartime, JSS, a "soft" system, would be replaced by the E-3A AWACS.

SEEK IGLOO, an extension of JSS in Alaska, involves the installation of new long-range radars that—because of better reliability and maintainability—will cut operating costs and manning. While boosting USAF's surveillance capabilities, SEEK IGLOO is expected to save about $30 million in annual costs and make it possible to cut manning from 850 to eighty-seven personnel. SEEK IGLOO's radars reach out 200 nautical miles. Rotating a full 360 degrees, the system will provide a year-round surveillance capability.

An even more ambitious ESD radar airspace surveillance program, SEEK FROST could replace the 3,000-mile-long Distant Early Warning (DEW) Line system spanning North America's Arctic region, according to ESD's Deputy for Development Plans, Col. M. H. Alexander. The system probably will be built jointly with Canada, whose territory the DEW Line traverses, and will include detection capabilities for both manned and unmanned air vehicles.

SEEK FROST envisions the use of modern minimally attended and unattended radars to improve airspace surveillance while cutting costs. In case of failure, the automated unattended stations diagnose the fault and report the necessary details to a central maintenance depot. A repair crew would then be flown to the site by helicopter. Overlapping coverage by the robot radars provides backstopping in case of failure by one.

Another ESD program to detect bombers and other aircraft is OTH-B (Over-the-Horizon Backscatter) radar. Currently in an experimental, "proof-of-technology" state, the program was restructured because of technology uncertainties and cost implications from a single-phase development to a two-phase program. The program is likely to remain in an experimental state for another year or two, according to General Marsh. If OTH-B is cleared for production thereafter, two sites, one on the East Coast and the other on the West Coast, will provide warning against air-breathing vehicles at all altitudes out to a distance of 1,800 nautical miles. Tests of an experimental system, built by General Electric, are being carried out near Moscow/Caratunk, Me.

Advanced Space Surveillance Systems

Air Force elements, including the Air Force Geophysics Laboratory (AFGL) at Hanscom and RADC, in concert with the Defense Advanced Research Projects Agency (DARPA), are working on an experimental sensor system known as TEAL RUBY. Basically aimed at aircraft and cruise-missile detection, this new spaceborne sensor is slated to be launched by a USAF Space Transportation System (Space Shuttle) flight in 1981, according to DARPA Director Dr. Robert R. Fossum. TEAL RUBY is a part of a new infrared space surveillance technology that Under Secretary Perry stated could detect surface-to-surface, surface-to-air, and air-to-surface missiles as well as make possible "tactical surveillance of theater battlefield events."

One of the technologies underlying TEAL RUBY is multiplex spectroscopy that permits the simultaneous measurement of wavelengths that enter the spectrometer and cataloging aircraft and missile signatures in terms of engine emissions as well as airframe and sunglints. Two basic approaches are involved, detection of the active emissions of the vehicle as well as the measurement of infrared signatures against which these objects must be detected. In addition to providing target and background information from space in a number of spectral bands, the TEAL RUBY sensor will include on-board signal processing for real-time detection and tracking and a filter for background suppression, according to Dr. Perry.

Development and acquisition of the DARPA/USAF TEAL RUBY spacecraft will get under way in FY '79. The same spacecraft will be used also for two secondary experiments, a NASA-developed ion thruster for long-term station keeping in space, and an Army ultraviolet spectrometer.

Several years ago, the Air Force and other elements of the Defense Department undertook a review of the technical means for deep-space surveillance emphasizing ground-based systems. But two basic problem areas became evident and insuperable. In order to get full surveillance, at least four geographically widely separated ground stations are required. This poses difficult political problems. On the other hand, the review concluded that the cost of creating a "DEW Line" for space surveillance would be prohibitive. Conversely, by taking the platforms for deep-space surveillance themselves into space eliminates geopolitical ramifications and when used for multiple purposes could offset the otherwise higher life-cycle costs of a space-based system.

The result of the review was a tentative step toward improvements in space surveillance and toward advances and refinements of the Early Warning Satellites. Common to both missions, according to Dr. Perry, is an enhanced capability "to detect target signatures from among space or earth background clutter and, at the same time, to maintain the high

search rate required for a surveillance system." Hence, two mutually reinforcing space experiments, the USAF Mosaic Sensor Program (MSP) and DARPA's Mini-HALO scheduled for joint launch in 1983. Two performance traits characterize both systems, Dr. Perry told AIR FORCE Magazine: Better accuracy and improved sensitivity, meaning the systems "would be able to see much smaller targets."

MSP, according to Dr. Fossum, is a "natural evolution" of the existing early warning satellite infrared sensor technology. It is based on a "mosaic" technique that integrates large arrays of individual sensors. MSP, according to the DARPA Director, will be able to "stare" rather than having to scan in the manner of conventional surveillance systems. The system will be able to take a panoramic look rather than using the less sophisticated technique of sweeping like a searchlight, which allows observation of only those events that fall within the focus of the sweeping beam.

Scheduled on the same launch is the potentially more capable, technically more risky Mini-HALO. The two approaches, Dr. Fossum stressed, are not competitive, but rather "represent different levels of technological sophistication" to enable the Air Force to find the best solution for the Early Warning Satellite follow-on system. Key to the Mini-HALO demonstration is the space testing of silicon monolithic arrays as well as of the system's special spectral filters and signal processors. If Mini-HALO proves out and is accepted by USAF, Dr. Fossum said, the full-sized operational HALO is likely to be assigned multiple space surveillance missions.

HALO's ability to perform several missions rests on its wide field of view and geosynchronous altitude. Defining the precise nature of HALO, in case the Air Force selects this technology for the early warning mission, would be up to USAF. The Space Shuttle is of critical importance to HALO, which is predicated on assembling large segmented mirrors in space. This can be done only with the Shuttle.

AFSATCOM and SSS

The Air Force Satellite Communications System (AFSATCOM) I will enable the National Command Authorities to exercise rapid, efficient command and control of nuclear forces through satellite-based ultrahigh frequency (UHF) communications capable of operating at a teletypewriter rate of 100 words per minute. ESD is responsible for AFSATCOM I's airborne and ground terminals, with AFSC's Space and Missile Systems Organization (SAMSO) overseeing the system's space segment. Electronic Systems Group of Rockwell International, TRW, and Hughes are the principal contractors of this system, which is scheduled to achieve initial operational capability (IOC) next year.

The system's space segment consists of special transponders on selected DoD host satellites in equatorial, polar, and other orbits. These include, according to Dr. Perry, the Satellite Data System, FLTSATCOM (the Navy's Fleet Satellite Communications system, which allocates seven 5 kHz antijam channels to the Air Force), as well as backup transponders on "other DoD host satellites. This redundancy will provide AFSATCOM's space segment with a limited degree of survivability to physical attack." Installation of AFSATCOM I's UHF terminals on B-52, E-4B, Navy submarine communications relay, FB-111, and EC/RC-135 aircraft, and in ICBM launch control centers is under way and will be completed within three years, according to General Marsh. Some of the ground-based terminals serving SAC, Air Force Communications Service, and others can receive and transmit at the same time. The terminals aboard the bomber force are miniaturized teletype keyboard and printer units. A global C^3 system that can launch a strategic nuclear force, maintain two-way communications with the force, and internet the CINCs of the unified and specified commands must be able to withstand physical and jamming attacks. AFSATCOM I, according to Under Secretary Perry, requires improvements in both areas. "Both electromagnetic and physical survivability enhancements are planned for the Strategic Satellite System (SSS), into which AFSATCOM eventually will evolve," according to Dr. Perry.

Two Lincoln Experimental Satellites, LES 8/9, were launched into near-geosynchronous orbit two years ago to demonstrate a number of advanced technologies pertinent to MILSATCOM systems. Included were "high-power radioisotope thermoelectric power sources to increase satellite nuclear hardness and to eliminate the large radar cross section of solar panels; a new gyro that could eliminate dependence on conventional sensors for satellite attitude control, which are vulnerable to nuclear effects; new frequency bands for communications; and advanced antijam techniques," according to Dr. Perry. Possibly paramount among the "firsts" scored by the two experimental satellites is their ability to communicate reliably and directly with one another and with airborne terminals beyond the range of single satellite relay and thus dispense with reliance on intermediate ground terminals. For the moment, the ground terminal is far and away the most vulnerable "node" of strategic communications. The LES 8/9 demonstration confirmed that data links between satellites and airborne command posts can be maintained during the transattack and postattack phases of nuclear war.

The FY '79 Defense budget request seeks $33 million for the AFSATCOM program. This amount includes $13.6 million to initiate SSS and funds for the planned-for host satellites, such as DSCS III (Defense Satellite Communica-

tions System) and the Navstar GPS (Global Positioning System) Phase III spacecraft.

Purpose of the new single channel transponder is to deliver the Emergency Action Message (EAM) to nuclear-capable forces and thus provide a redundancy for AFSATCOM I.

Definition studies of the Strategic Satellite System are being carried out by ESD, SAMSO, and other Air Force and Department of Defense elements, according to the ESD Vice Commander.

General Purpose Satellite Communications System

A major, ambitious satellite communications system, the General Purpose Satellite Communications System (GPSCS), is currently under extensive review. It is meant to enable the Defense Department to communicate on a global scale with mobile forces from all services. The program—at present in concept validation—probably will involve four operational satellites in synchronous orbit with additional standby satellites to provide backup for both increased capacity and survivability. A key requirement is high jam resistance, a trait not easily obtainable with UHF (ultrahigh frequency) communications. Yet general purpose mobile, or easily transportable, ground terminals and tactical aircraft as well as man-portable units, favor the use of UHF since long-haul, high-data-rate communications satellites require larger and heavier antennas. A number of advanced techniques, including "crossbanding" and different frequency ranges, are being considered to provide high jam resistance while retaining compatibility with UHF ground terminals.

The Air Force Geophysics Laboratory (AFGL) at Hanscom AFB is a key participant in the joint USAF/NASA Spacecraft Charging Technology Program that probes the charged particle fluxes affecting and endangering satellites and communications at geosynchronous and other high orbital altitudes. Generated by geomagnetic storms, energized electrons can induce voltage differentials of more than 10,000 volts on exposed spacecraft surfaces. Under certain conditions the consequences can be destructive by breaking down the spacecraft's thermal insulation and then causing a lightning-like discharge. AFGL is not only developing models of these particle fluxes and their intensity variations, but is also working on protective measures. An important step in this regard will be the SAMSO/AFGL SCATHA (Spacecraft Charging at High Altitude) satellite scheduled for launch next year.

SCATHA's instrumentation will include electrostatic analyzers, charged particle flux spectrometers, and electron and ion beam systems to assess the feasibility of actively controlling satellite charging and discharging. AFGL Commander Col. Bernard S. Morgan told this writer that rather than permit the buildup of positive or negative charges of possible catastrophic consequence on the spacecraft, AFGL's system will discharge or equalize the electrical potential. Measurements to be taken by SCATHA will also help in establishing the characteristics of the particle fluxes and thus the degree of disruptive and destructive effects of spacecraft charge buildup on military satellites. Until USAF has come up with a reliable model of these phenomena, it must provide military satellites and their circuits with electrostatic shielding that may be excessive.

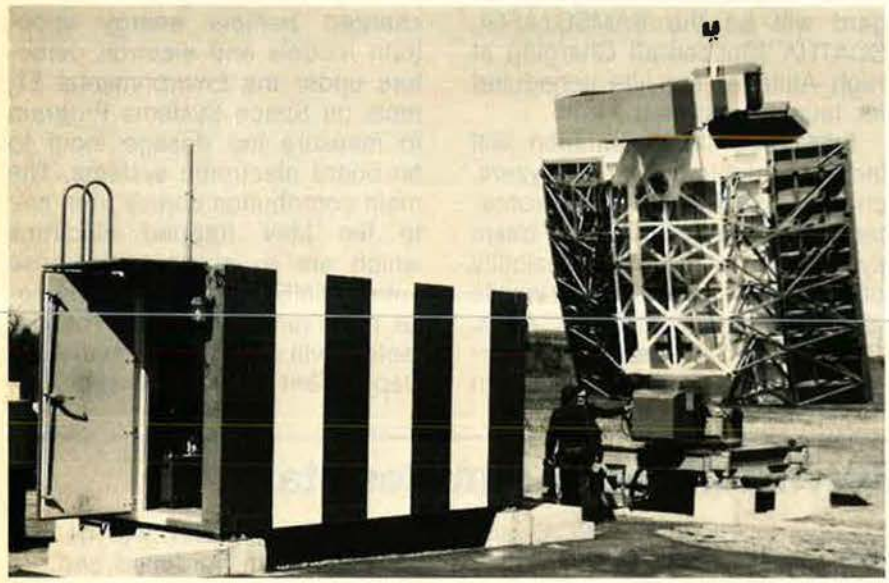
In connection with microelectronics vulnerability to the natural radiation environment, AFGL is actively developing a series of charged particle energy spectrum models and electron detectors under the Environmental Effects on Space Systems Program to measure the dosage input to on-board electronic systems. The main contribution comes from one to ten MeV trapped electrons which are expected to increase substantially in number as the solar maximum is reached. The detectors will be flown on numerous Department of Defense satellites.

SACDIN—Survivable and Jam-Resistant

The SAC Digital Network (SACDIN), along with AFSATCOM, a key component of the Defense Department's World-Wide Military Command and Control System (WWMCCS), is vital for improved data communications capabilities for CINCSAC, according to General Marsh. The program, previously known as SATIN IV, was scaled down last year in response to congressional demand for lower costs. Purpose of the system is to furnish highly responsive, functionally survivable, and secure communications between SAC's Commander in Chief, the NCA, and SAC missile and bomber/tanker command posts.

Under contract to the Defense Communications Div. of International Telephone & Telegraph Corp., the revised SACDIN program is under review by Congress. The system eventually will link the alternate National Military Command Center at Fort Ritchie, Md., with various SAC command posts and ICBM launch control centers. The latter are tied in with Minuteman III's Command Data Buffer system that permits rapid retargeting. SACDIN will be deployed in both hardened and unhardened sites and will be protected against nuclear effects to the same degree as the Minuteman capsule.

Another key ESD program to improve the effectiveness and survivability of the nation's strategic C^3I capabilities is the Advanced Airborne Command Post E-4 aircraft. This system already has replaced the older EC-135 National Emergency Airborne Command Post aircraft and is scheduled also to perform the SAC "Looking



Top: USAF's new High-Performance Precision Approach Control Radar, the AN/GPN-22 HI-PAR, is under development by ESD. Above: HI-PAR is shown undergoing tests at Raytheon Co.'s Wayland, Mass., facility.

Glass" assignment in the future.

Col. R. H. Hansen, E-4 Program Director, told AIR FORCE Magazine that flight testing of the system's "B" version is being carried out by Boeing, the prime contractor. Upon completion of the flight-test program, the Air Force will conduct an independent forty-five-day test to be followed by a three-month test of the system's nuclear hardness. The "A" version of the system uses the basic C^3 equipment of replaced EC-135s.

The E-4B configuration incorporates newly developed C^3I equipment in addition to the C^3I equipment installations and aircraft modifications performed by E-Systems of Greenville, Tex. The system uses long trailing antennas for its VLF (Very Low Frequency) communications that resist disruption by nuclear effects to a high degree. Adapted from a US Navy aircraft that communicates with submerged submarines, the E-4 uses an antenna that, depending on need, can reel out a lower wire up to five miles in length and an upper wire up to one mile long, according to Colonel Hansen.

The nature and capacity of the E-4's future automatic data processing equipment—on-board computer, data storage, and link to WWMCCS—continue to be the subject of studies by ESD and other Defense Department agencies. A recently approved Defense Department recommendation (*see June '78 issue, "Focus On . . ."*) calls for a fleet size of six aircraft. The program's price tag will reach about $1 billion, according to Defense Secretary Harold Brown. The aircraft can be used for either the NCA or the CINCSAC mission with only minor equipment changes, Colonel Hansen said.

ESD's CINC mobile Airborne Command Center (ABCC) program, according to General Marsh, is under high-level review in the Pentagon centering on grafting onto the system WWMCCS requirements for a rapidly deployable ground-based C^3 facility. The primary purpose of ABCC is to give theater CINCs an advanced, highly mobile C^3 system to manage contingency situations. ESD plans to submit specific recommendations concerning aircraft suitable for the ABCC mission as well as the initial C^3 package to the WWMCCS Council in the near future. Full program definition would take place thereafter, he said.

Candidate aircraft for the ABCC mission include the C-141, 707, and C-135. If the requirement for a fast-reaction, mobile ground system is incorporated, the C-141 appears to be the only choice, Colonel Alexander said. The ground-based system would require a roll-on/roll-off capability for at least the core elements of the Army's C^3 needs, thus providing an initial surge capability.

(Continued on p. 57)

Accurate command decisions e obviously vital at all levels of e nation's military forces.

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The Westinghouse AN/ALQ-153 Tail Warning Set provides increased protection from these threats. Designed for tactical and strategic aircraft commonality, this solid-state, digital system will give F-15, B-52, and F-111 crews advanced warning and accurate identification of threats approaching from the rear. The ALQ-153's extensive fault isolation and built-in test features are designed for high user confidence and reduced maintenance and support costs. The superior performance characteristics of the Tail Warning Set have been demonstrated during comprehensive ground and flight tests against live threats at Eglin Air Force Base.

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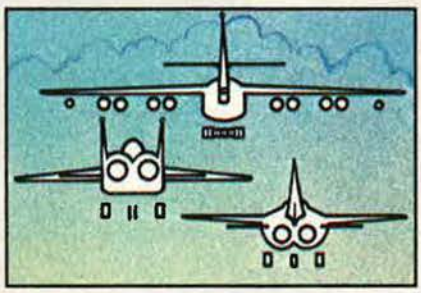


Westinghouse. A powerful part of defense

The E-3A AWACS

The Air Force's broadly capable E-3A AWACS, an ingenious combination of jam-resistant radar and flying computer, "is a program that is going exceedingly well," General Marsh told this reporter. Seven production aircraft, built by Boeing, have been delivered. These seven Tactical Air Command E-3As are operational at Tinker AFB, Okla. USAF is scheduled to operate thirty-four E-3As, Iran has ordered seven, and a decision by NATO to buy a significant number for use by several member countries is pending.

The system, a Boeing 707 jetliner equipped with an advanced "look-down" Westinghouse radar linked to sophisticated data processing, is, as General Marsh pointed out, "more than just a radar in the sky." With its ability to survey and monitor in real-time more than 250,000 square miles—and the airspace above—as well as to transmit what it sees to ground commanders, AWACS promises a revolution in tactical command and control. In a recent test operation involving an E-3A operating in the western regions of the US the panoramic view of what its radar saw was transmitted by TV to the ground and relayed to displays on the East Coast.

An important strategic mission that the E-3A is meant to perform involves support of US air defense requirements in wartime. To accomplish this, the E-3A will deploy to ADCOM bases and train with both the current SAGE and later the Joint Surveillance System's Regional operational control center personnel, according to General Marsh.

In connection with both its theater and ADCOM missions, AWACS is undergoing tests to assess its capability to detect and track cruise missiles in ground clutter. So far, General Marsh said, the limited testing is insufficient to draw definitive conclusions on its capability against low-flying cruise missiles.

Occasionally questions are raised about the advisability of equipping the E-3A with a self-defense capability. "I believe we can defer that decision, since we have the potential for doing so. In the meantime, the system has intrinsic, indirect self-defense capabilities. We can go below the horizon, we can call in interceptors, and we can direct friendly SAMs against airborne threats. Eventually, of course, it may become necessary to deploy an organic self-defense capability, but that need is not yet in sight," according to General Marsh.

The E-3A's "connectivity" with other C^3 systems through video and other data links extends now to the Tactical Air Control System (TACS) in Europe and, thereby, to NATO's Air Defense Ground Environment (NADGE) system. According to Harry Richter of ESD's Deputate for Control and Communications Systems, an interim buffer system, SALTY NET I and II, which matches up different computer message formats and transmission speed rates between AWACS and ground-based USAF and other NATO tactical air control systems in Europe, is now in operation. The full system, SALTY NET III, will be operational late this year.

Tactical C^3 Systems

An important element of the AWACS program is the system's linkage to the Joint Tactical Information Distribution System (JTIDS). Flight testing of the E-3A JTIDS waveform "A" terminal was completed successfully late last year. Testing of the operational waveform "B" is now under way. The JTIDS program is a major joint service effort carried out by ESD, to exploit modern time division multiple access, and other even more advanced technologies for multiservice jam-resistant communications networks. JTIDS, General Marsh pointed out, opens the door to "fusing all tactical battlefield C^3I into a cohesive structure and thus making it possible to correlate and manipulate the data flow between all sensors and weapons on the battlefield."

Expected to evolve into a $2 billion-plus program, JTIDS involves the development of three classes of terminal equipment. Class I is for large aircraft, such as the E-3A, and surface ships. These units weigh about 330 pounds and are the size of a small refrigerator. Class II terminals are meant for small aircraft and ships with volume constraints. These units are being developed under Navy auspices, weigh about ninety pounds, and occupy about two cubic feet of space. Such fighter aircraft as the F-14, F-15, and F-16 will use these terminals. Class III involves the development of battery-powered backpack and missile terminals that weigh no more than twenty-five pounds. Forward air controllers and selected Army personnel will use these units. Their deployment aboard some theater missiles is also planned.

ASIT, or Adaptable Surface Interface Terminal, is another major JTIDS component currently in engineering development. IBM, Mr. Richter said, was awarded a contract to build thirteen ASIT terminals over the next two years. Purpose of ASIT is to tie the Class I JTIDS terminal to existing C^3 systems, such as NADGE. It also has potential application to the Army tactical control system. In order to ensure interoperability with allied forces, the Defense Department has offered JTIDS to NATO for its ECM Resistant Communications System. Two JTIDS terminals were delivered early this year to the SHAPE Technical Center for extensive testing.

JTIDS uses TDMA or an advanced, hybrid DTDMA (Distributed Time Division Multiple Access) to transmit digital data over jam-resistant broad bandwidths. As the term denotes, TDMA di-

vides time rather than frequency to communicate with individual participants on a noninterference basis. Since it "frequency hops" across a wide spectrum, it is highly jam-resistant. Each unit of time is divided into a large number of time slots, and a precise synchronization arrangement allocates the slots to individual users for the transmission of short bursts, or "pulses," of digital data. All participants have linkage, called "connectivity," with all others, and there are no central nodes whose disruption or destruction could cause a system-wide failure. Messages are encoded so that each user can select only those categories of information that interest him.

DTDMA is even more complex and permits several users to transmit at the same time by interleaving their transmissions on a pulse-by-pulse basis, with special receivers sorting out the pulses from the various users and reassembling them into messages.

JTIDS, according to General Marsh, can be hardened against nuclear effects "as much as any other C^3 system." A full-fledged status report on the JTIDS program was forwarded to the Defense Systems Acquisition Review Council (DSARC—the Pentagon agency that grants or denies go-ahead on major programs) this spring prior to a DSARC I decision, according to Mr. Richter.

Last year, the Defense Department and a number of other relevant government agencies conducted an extensive joint evaluation to verify the electromagnetic compatibility of JTIDS with FAA air traffic control systems. Key contractors of the JTIDS program are Hughes, ITT, and Singer-Kearfott.

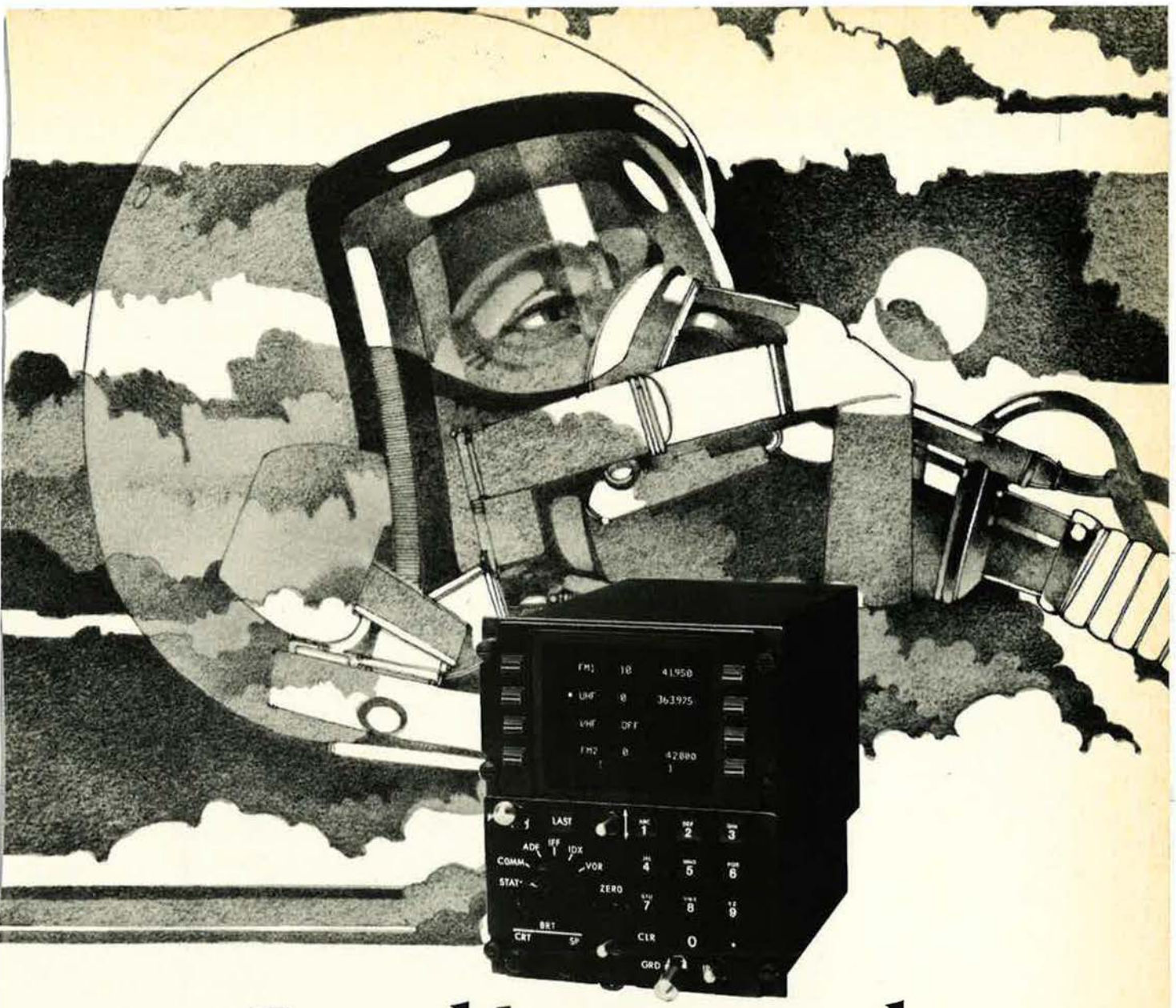
Separate from JTIDS but performing a complementary role are two other ESD programs, HAVE QUICK and SEEK TALK. Both supplement the demand for jam-resistant, secure voice communications. HAVE QUICK will provide tactical aircraft with stopgap air-to-air and air-to-ground-to-air jam-resistant UHF voice communications. This interim system is limited to near-term EW threats. By about 1985, ESD's jam-resistant, secure voice communications SEEK TALK, a spread spectrum-pseudo-noise system, is scheduled to take over from HAVE QUICK, according to Mr. Richter.

SEEK TALK is currently in Phase I study involving four contractors: Hazeltine, General Electric, ECI Division of E-Systems, and Magnavox. These studies are to be completed late this summer and should lead to the definition of a base line system. Phase II involves procurement of several competitive advanced development models. Objective of the third phase of SEEK TALK, according to Mr. Richter, is the parallel pursuit of engineering development models that will undergo both development and initial operational testing and evaluation. The final phase, to be reached in about five years, involves production of the operational systems.

SEEK TALK is tailored for operation in future high-threat, ECCM (electronic counter-countermeasure) dependent environments by providing tactical airpower with a voice communication system that features high jam-resistance, the ability to communicate in a conference fashion, and security from enemy monitors, in that order of importance. SEEK TALK will perform about the same operational functions as the present tactical UHF-AM radios. One of the key requirements of the program is to retain major features of the currently used tactical radios.

The Air Force is attempting to integrate JTIDS, SEEK TALK, the Global Positioning System (GPS), and the Inertial Navigation System (INS) of tactical fighters under its CNPI program (communication, navigation, and positioning integration). Managed by ESD, the goal of CNPI is to minimize cost and maximize operational advantages through avionics systems that have commonality, modularity, and compatibility.

This Lear-36, under contract to the Air Force Geophysics Laboratory, has been modified extensively for advanced atmospheric research.



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Cost of ownership? Lower, thanks to fewer avionics controls, less weight and multiplex wiring. You get high reliability, too.

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For details, contact Collins Government Avionics Division, Rockwell International, Cedar Rapids, Iowa 52406. 319/395-4412.

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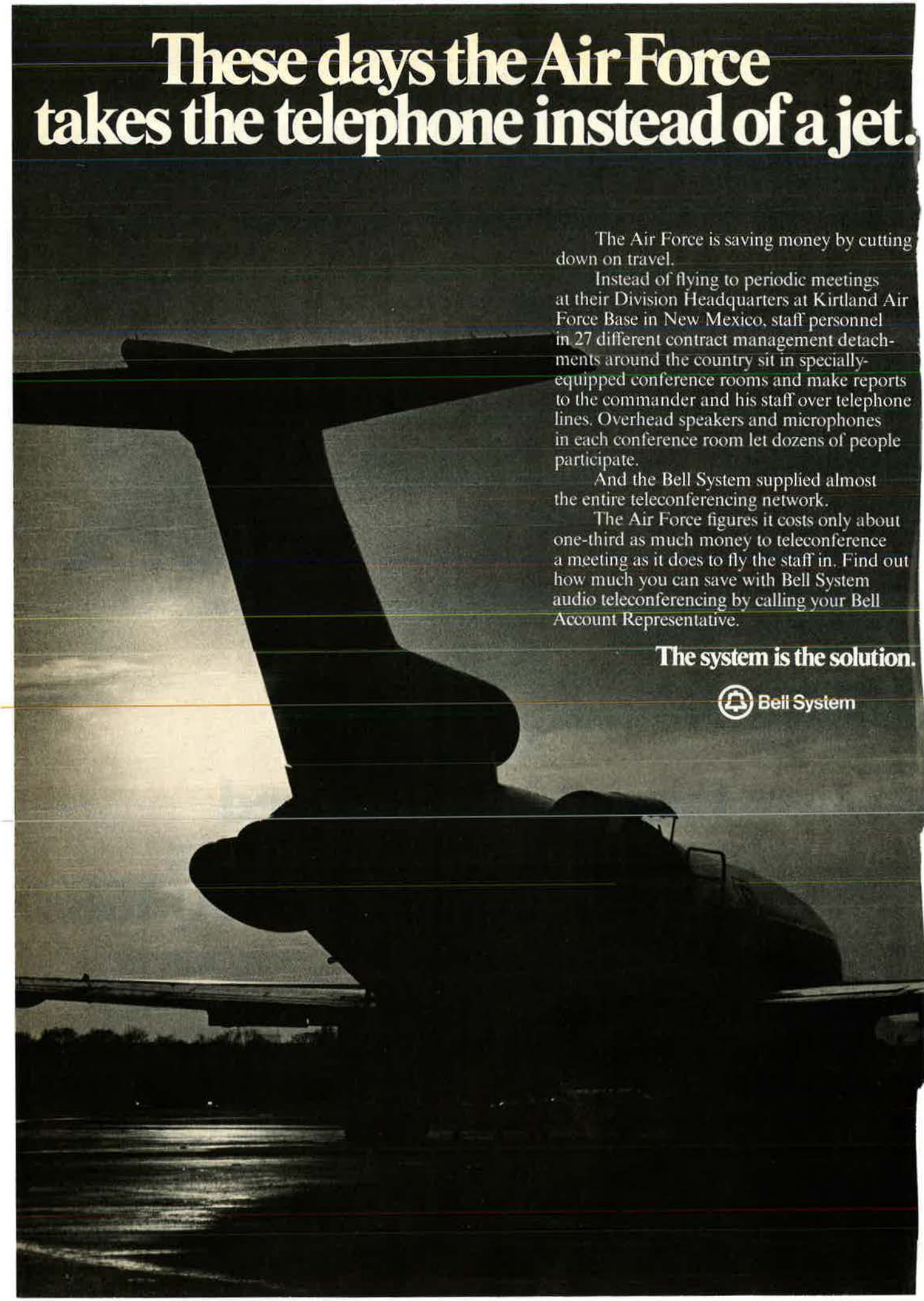
These days the Air Force takes the telephone instead of a jet.



The Air Force is saving money by cutting down on travel.

Instead of flying to periodic meetings at their Division Headquarters at Kirtland Air Force Base in New Mexico, staff personnel in 27 different contract management detachments around the country sit in specially-equipped conference rooms and make reports to the commander and his staff over telephone lines. Overhead speakers and microphones in each conference room let dozens of people participate.

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The Air Force figures it costs only about one-third as much money to teleconference a meeting as it does to fly the staff in. Find out how much you can save with Bell System audio teleconferencing by calling your Bell Account Representative.

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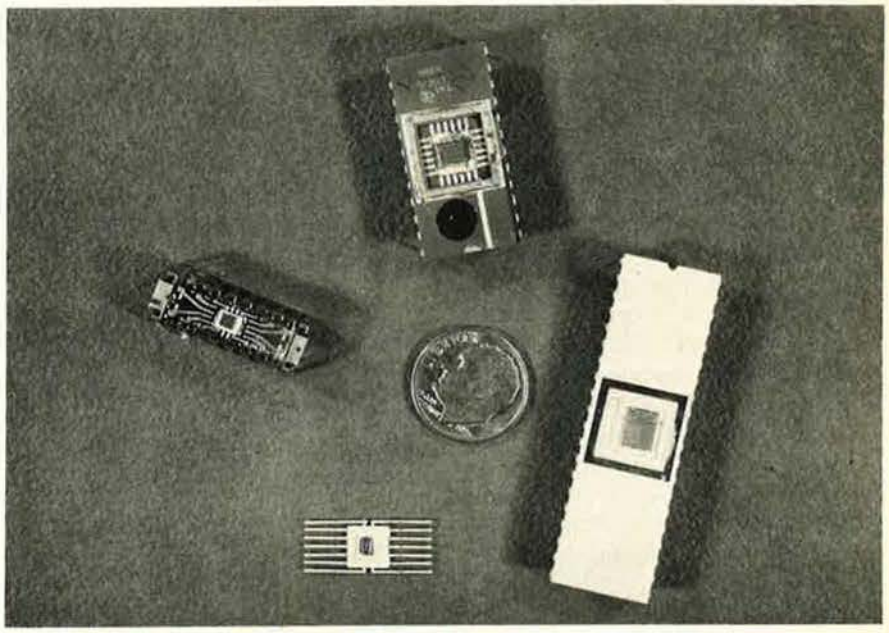
NATO-Oriented Systems

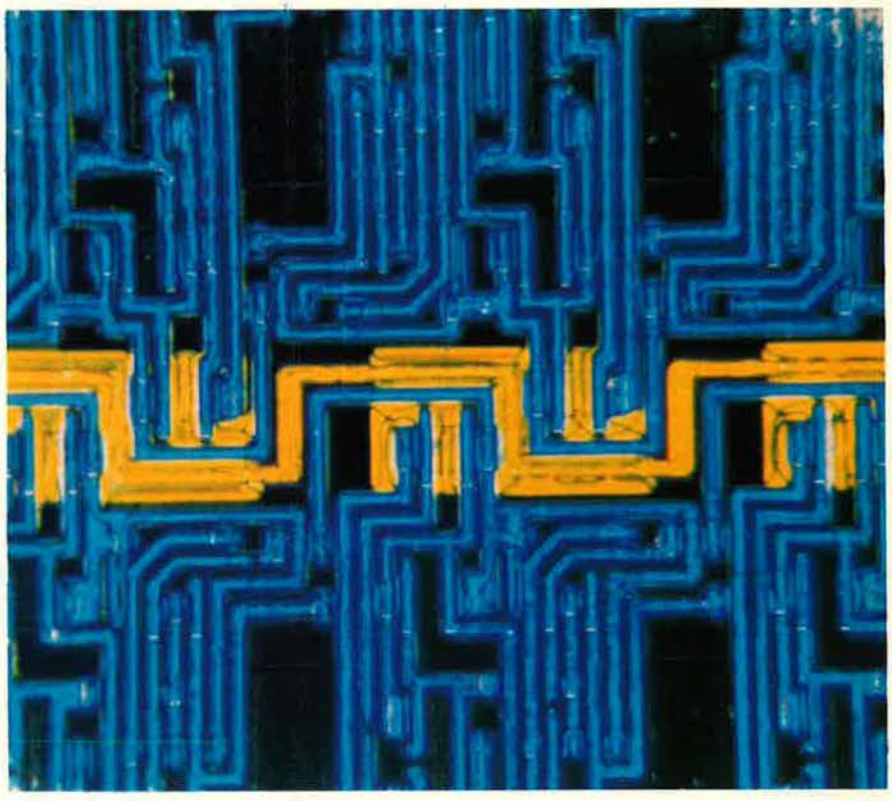
The Digital European Backbone (DEB) program, carried out by ESD on behalf of the Defense Communications Agency, will provide US forces assigned to NATO with a wide-band (time division multiplex/pulse code modulation), bulk-encrypted, ground-based, defense communications system extending from the boot of Italy to the British Isles. Key objectives of DEB are replacement of obsolete line-of-sight radio systems, changeover to digital—and thus secure—standards, connectivity with the US Defense Satellite Communications System (DSCS), and greater survivability through redundancy.

DEB will be carried out in four stages, with completion of the entire system envisioned for 1984. Stage I will provide a digital mainline from Coltano, Italy, to Hohenstadt, Germany, as well as spurs within the two countries. Stage II extends DEB into the western portions of Germany to provide a digital link between various USAF and US Army elements and USCINCEUR as well as DSCS ground terminals in Germany and Italy. Stage III brings DEB to key headquarters in Britain and establishes links to SHAPE. Stage IV consists of lateral communications links to serve high volume and priority users as well as to prove alternate routing.

DEB can be tied to the European military satellite communications system and other networks used by NATO tactical forces. DEB, by operating at different radio frequencies, will double the number of channels available now and reduce interference while relieving communications traffic in the conventionally used bandwidths. Eventually, DEB will operate more than 100 digital microwave transmission sites. DEB also includes emergency backup or expansion capabilities in the form of special communications relay vans. Two of these vans are now operational—one in Germany, the other in Italy.

Another major improvement of tactical C^3 is the Combat Theater Communications program scheduled for completion in the mid-1980s. It is an important element of DoD's Joint Tactical Communications program known as TRI-TAC. TRI-TAC's purpose includes development of highly mobile, secure communications equipment that is usable by all services and capable of automatic switching and theater-wide interoperability. TRI-TAC begins the transition from analog to automated digital communications systems on a DoD-wide basis.





Top: Packaged electronic chips smaller than a dime represent USAF's miniaturization trends. Above: RADC's liquid crystal technique for circuit testing.

Automating Intelligence

ESD's $200 million TIPI (Tactical Information Processing and Interpretation) system, along with related programs, uses computers to speed up the sorting and analysis of tactical intelligence to provide only essential information in understandable form to the decision-makers.

The rapidly mounting profusion of data from a widening range of battlefield and theater sensors—from side-looking airborne radar to forward-looking infrared to moving target indicators—creates processing bottlenecks of major proportions. Crucial information that doesn't get to the "consumer in time is useless information." Further, as Dr. Perry pointed out, this profusion of information must be "assimilated into a usable comprehensive perspective of the combat situation—a timely and specific picture of enemy strength, disposition, and movement." A key program here is BETA (Battlefield Exploitation and Target Acquisition). A joint eighteen-month effort by the Army, USAF, and DARPA, BETA was initiated last year by Dr. Perry to develop a test-bed consisting of three mobile fusion centers for near-real-time integration of data from surveillance sensors. The objective is to give better targeting information to the Army's corps and division headquarters and USAF's Tactical Air Control Centers.

ESD's mini-TACAN can transmit bearing and distance information over a seventy-five-mile range.

AFGL's Modular Automated Weather System uses microprocessors for short-range predictions of conditions critical to takeoff and landing.

BETA, DARPA's Dr. Fossum explained, is the synthesis of all tactical intelligence and cross-connected sensor information produced by the Army, USAF, and possibly other NATO forces by "fusion centers."

Beyond furnishing tactical commanders with up-to-date overviews of the battle situation, BETA also is to demonstrate the feasibility of computer-assisted decision-making. Two specific areas to be explored are recommendations to the tactical commander concerning how and where he might use his surveillance and reconnaissance forces most effectively as well as about the priorities of specific targets and which weapons could be used. The BETA Joint Project Office is being operated by the Army with close USAF participation. TRW is the system's prime contractor with support from Bunker-Ramo and BDM.

Principal objective behind BETA is not to develop and deploy an operational system but to furnish a realistic test-bed that can help point the way toward future "closed-loop" tactical C³I systems spanning the spectrum from target acquisition and establishing attack priorities to near-real-time attacks by a variety of highly accurate weapons under all weather conditions and, when necessary, from standoff positions. As Under Secretary Perry pointed out, zero CEP technology is "truly revolutionizing the way we use our weapons. When it is possible to fire a 155-mm artillery shell against a moving tank with a high kill probability, lining up 300 tanks on the road and sending them down to make an assault on an enemy position is going to be not a very practical thing to do."

The logical extension of BETA is the Assault Breaker concept that ties together target acquisition and attack missions with the help of a ground-based data fusion center. *(See p. 39, June '78 issue.)* The driving force behind BETA, Assault Breaker, and similar concepts, is the rapidly advancing state of electronic technology—in the main VLSI (Very Large Scale Integrated) circuits—that according to Dr. Perry makes possible both greatly increased performance and sharply lower costs of weapon and C³ systems. (RADC is the principal Air Force agency assisting in the definition of the Assault Breaker concept.)

As Colonel Dillon pointed out, the only real bargain left for weapons designers is the decreasing cost and increasing capability of

We fly ramjets supersonically at high altitudes on a hillside in California.

These simulated flights take place at our modern Ramjet Test Facility where CSD is conducting advanced development of an integral rocket ramjet propulsion system for the Air Force's Advanced Strategic Air-Launched Missile (ASALM). Our team of experts, supported by United Technologies' Hamilton Standard Division and the United Technologies Research Center, is working closely with several of the country's major airframe contractors to use the powerful capabilities of ramjet propulsion to meet the requirements of the ASALM mission.

CHEMICAL SYSTEMS DIVISION

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SCIENCE/SCOPE

The concept for an air-to-air missile half the size with twice the performance of the AIM-7F Sparrow has been proved feasible in a recent program conducted by Hughes under contract to an Air Force/Navy joint system program office. Using new technology and improved state-of-the-art, AMRAAM (Advanced Medium Range Air-to-Air Missile) will provide a "launch and leave" capability plus the option of launching several missiles at multiple targets. The Hughes design features a patented solid state power combiner, which is the key to the active radar seeker, and takes full advantage of the latest digital technology and micro-miniaturization of electronics. It will be compatible with the F-14, F-15, F-16 and F-18. AMRAAM also features a low-smoke, high-impulse rocket motor which reduces the chances of an enemy pilot sighting either the launch or the oncoming missile and taking evasive action.

A new kind of instrument will help meteorologists gauge more accurately the direction and speed of winds at all altitudes when the first of three Hughes-built weather satellites is launched from the Space Shuttle in the early 1980s. The Visible Infrared Spin-Scan Radiometer Atmospheric Sounder (VAS), built by Hughes, will produce day and night pictures of the Earth's cloud cover, and determine the three-dimensional structure of atmospheric temperature and humidity. The Geostationary Operational Environmental Satellites (GOES-D, E and F) are U.S. entries in an international weather-watch program that includes Europe, Japan and the Soviet Union. NASA manages construction and launch of GOES for the National Oceanic and Atmospheric Administration, which operates the satellite system.

Classified and unclassified messages can now be sent and received simultaneously without breaking security. A new voice switching system for the U.S. Navy, which completely eliminates crosstalk, has been successfully demonstrated. Now being developed by Hughes under a subcontract from Litton Data Systems, Single Audio System (SAS) is a solid state design for use aboard ship. It can transmit or receive multiple messages to or from shore, other ships, or aircraft. SAS can be used effectively on large, intermediate and small ships simply by changing the number of modular circuit cards and cable assemblies.

XM-1 tank and Fighting Vehicle System (FVS) slated for advanced Thermal Imaging System (TIS). The system for the XM-1 features Electronic Multiplexing (EMUS) which provides a CRT display of the target image that includes reticle patterns, boresight adjustment, symbology and built-in test information. The EMUS approach is used to process the output of the common module integrated microcircuits in the imaging system. Deliveries to Chrysler began last summer, with a total production of approximately 7000 units anticipated.

An advanced FVS gunner's periscope, containing a daylight viewing channel, TOW missile tracker and thermal imaging channel is under development by Hughes. In this system, the visual display is formed by the LED array module.

For the first time in the history of space technology, a single electronics system will perform both radar and communications functions aboard NASA's Space Shuttle Orbiter. Meshing the "eyes, ears and voice" functions into a 260-pound hardware package results in a significant reduction in weight and space. Major components such as the transmitter, receiver, antenna and servo mechanisms perform dual roles.

As a radar, the unit searches for, acquires, tracks and delivers spatial data needed for Orbiter to effect a quick, efficient rendezvous with other space vehicles. As a communications system, it provides high-quality transmission and reception with ground stations via two relay satellites. The Ku-band subsystem will be built by Hughes for prime Space Shuttle contractor Rockwell International.

electronic components: "We are using a chip on MX that costs $10 yet has greater computational capability than the previous generation's microprocessor costing $10,000. The implications to the Air Force of these continuing trends are vast," from moving target indicators that can categorize targets in terms of their rate of speed to computers serving as decision aids and for identifying and cataloging "voice prints" for intelligence purposes.

Decision aids, General Marsh warned, don't mean that "the machine tells the commander how to direct the battle, but it would give him another tool—a more complete one than he has ever had before—to complement his own assessment of the situation." Computers, he pointed out, can enable commanders to project the probable consequences of specific options. A commander might "use the machine to play his decision in fast time, and in five minutes see the next twelve hours of war as he is about to direct it."

All of ESD's efforts in the tactical arena, its Commander said, coalesce, in the sense of systems architecture, into a master plan involving TAC, USAFE, and PACAF. Known as TAFIIS, for Tactical Air Forces Integrated Information System, it represents an "integrated picture of where our C^3 systems stand, how they work together, the alternatives we have, and where we intend to go in the near term and far term."

How successful the Air Force and other elements of the Defense Department will be in preserving the nation's lead in C^3I over the long run depends largely on whether the nation as a whole can maintain its present preeminence in integrated circuit technology. But there is, as Deputy Under Secretary Davis points out, reason for concern: "We have been complacent about our lead in integrated circuits, or ICs, assuming that our rapid advances would keep us well ahead of the Soviet Union. However, recent information has indicated that our lead has been eroding rapidly." A key reason for this erosion, according to Dr. Davis is "that we have relied on the consumer-oriented electronics industry to meet our needs in ICs where DoD now constitutes only seven percent of the IC market. But we need specialized high-speed ICs not in demand in the consumer market."

Possibly the most decisive military electronics program of this era is the Defense Department's effort to redirect industry's attention toward military needs for very high-speed integrated circuits. Classified as a major five-year program, its goal, according to Dr. Davis, is "to shorten the time to achieve these very high-speed ICs in from five to ten years ahead of present industry projections." As DARPA's Dr. Fossum commented, it would be next to impossible to overstate the "military leverage that accrues to us from our lead in information processing."

Retention of this lead may very well turn out to be the single-most important national security requirement within the field of technology. ■

ASK THE RIGHT QUESTION . . .

Mealtimes during Basic Cadet Training at the US Air Force Academy have always provided upper-class cadets an opportunity to quiz new basic cadets on the things they are supposed to be learning during their first days at the Academy.

Already somewhat uncomfortable because of the traditional posture and etiquette rules in effect at mealtime, many a "basic" has squirmed a bit more under the direct questioning of a stern upperclassman.

One day during my Basic Cadet Training, I was especially hungry, and had just started eating when the dreaded questioning began:

"Mr. Anderson!"

Fork down, hands in lap, food swallowed, my eyes went to the upperclassman at the head of the table.

"Yes, sir!"

"Mr. Anderson, can you tell us what the Air Force abbreviation NCOIC stands for?"

I thought for a moment, but wasn't sure.

"Sir, I do not know."

"Well, then, what does PCS stand for?"

"Sir, I do not know."

"How about TDY?"

Embarrassed, I wracked my brain, but couldn't remember. I began to wonder if I would ever get to finish my meal.

"Sir, I do not know," I replied.

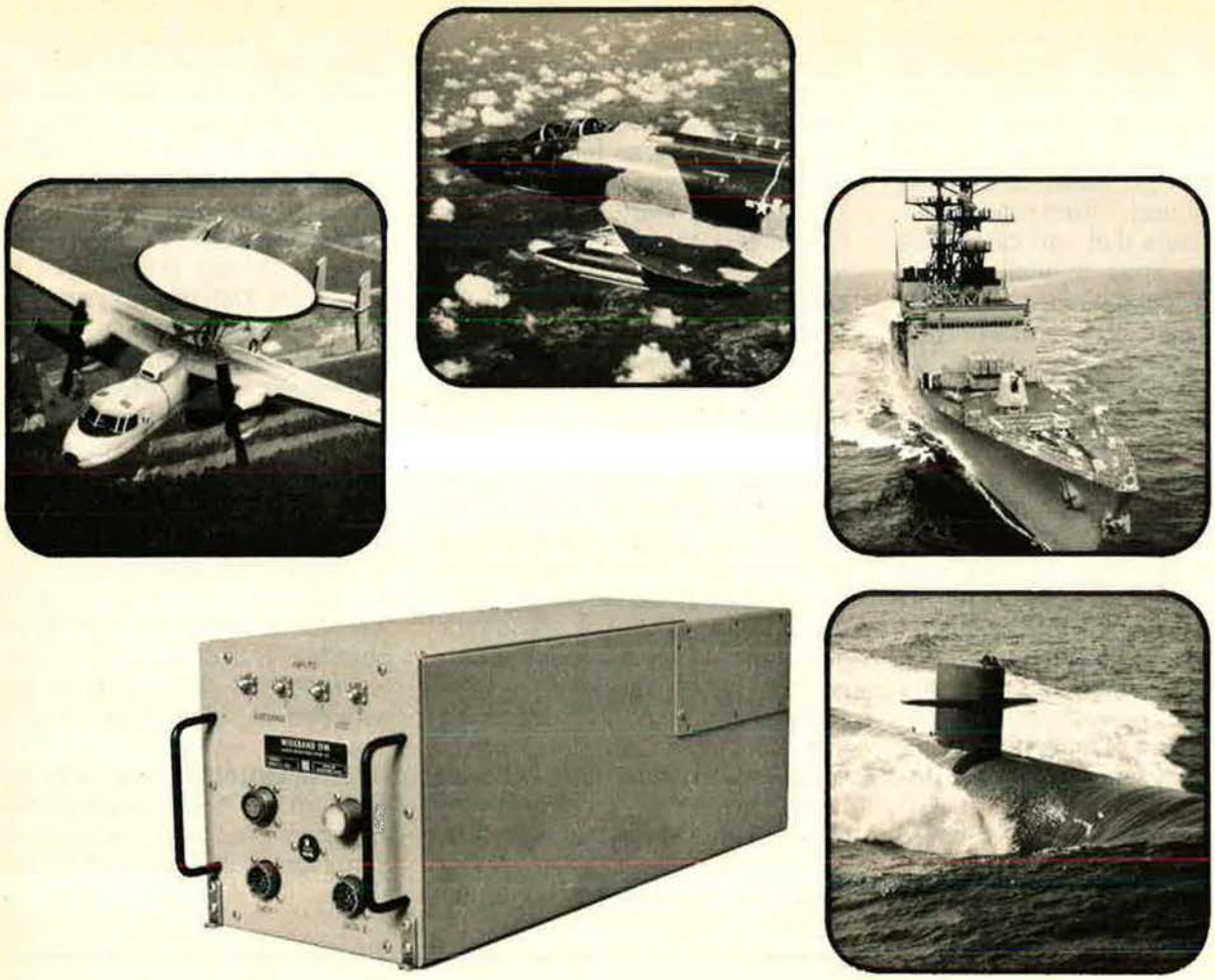
Clearly annoyed, the upperclassman thought for a few moments, then asked, "Okay, mister, what does SIDNK stand for?"

And again I answered, "Sir, I do not know."

"Well, you finally got one, Anderson," he replied with a smirk, and added gruffly, "Now eat."

—Contributed by Capt. Gregory J. Anderson, USAF

(AIR FORCE *Magazine will pay $20 for each anecdote accepted for publication.*)



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What's Happening in Electronics at ESD

A CHECKLIST OF MAJOR ELECTRONICS PROJECTS

SYSTEM NO.	NAME AND MISSION	STATUS	CONTRACTOR
404L	**Traffic Control and Landing System (TRACALS)** TRACALS encompasses fixed and mobile ground facilities and equipment, with associated avionics, to update the USAF air traffic control function. Major systems being acquired include terminal navigation aids, radar approach control equipment, landing systems, and air traffic control simulators.	Continuing Acquisition	Many
411L	**E-3A Airborne Warning and Control System (AWACS)** This system provides survivable airborne air surveillance capability and command control and communications functions. Its distinguishing technical feature is the capability to detect and track aircraft operating at high and low altitudes over both land and water. Used by the Tactical Air Command with Tinker AFB, Okla., as the main operating base, aircraft may deploy throughout the United States and overseas to provide surveillance, warning, and control in a variety of peacetime and wartime situations.	Acquisitional and Operational	Boeing Aerospace Co. (Westinghouse is radar subcontractor to Boeing; Redifon for simulator)
414L	**Over-the-Horizon Backscatter Radar** The program provides long-range detection of aircraft approaching North America as part of the NORAD air surveillance and warning capability. Distinguishing technical feature of OTH-B is its ability to detect targets at all altitudes and at extended ranges. The present program is to build and test a prototype radar.	Development/ Validation	General Electric
427M	**NORAD Cheyenne Mountain Complex Improvements** Involves acquisition of data-processing equipment, software, displays, and communications for the NORAD Cheyenne Mountain complex. The core processing segment, modular display segment, and the communications system segment will provide NORAD with an integrated, responsive capability and a growth potential over a projected ten-year life span without major changes to equipment or software.	Acquisition	Ford Aerospace and Communication Corp.
428A	**Tactical Information Processing and Interpretation System (TIPI)** The USAF TIPI/USMC MAGIS (Marine Air Ground Intelligence System) will provide more timely and accurate intelligence to USAF and USMC tactical commanders at various echelons. Air transportable and housed in mobile shelters, the various segments of the system employ automated aids to provide the capability for rapid processing, interpretation, and reporting of intelligence derived from airborne collected electronic reconnaissance and photographic and radar imagery.	Development, Acquisition, and Deployment	Many
433L	**Weather Observing and Forecasting System** A system for modernization of the Air Force Weather Service to provide high-quality and timely weather observations, information, studies, advice, and forecasts in support of military operations and command and control systems.	Acquisition and Operational	Cincinnati Electronics Corp.; Tasker Systems Div. of Whittaker Corp. for radio solar telescope network
450A	**Tactical LORAN** A program for development and acquisition of the AN/ARN-101 (V) Navigation/Weapon Delivery System for the RF-4C and F-4E aircraft. This modular digital avionics capability with LORAN will satisfy tactical requirements for the 1978–88 period. Development and acquisition of a Tactical LORAN C/D Ground Chain for worldwide tactical deployment to provide LORAN environment for joint service common grid positioning. Development of precise grid prediction and grid data management for joint service use.	Development and Acquisition	Sperry Gyroscope, Lear Siegler
478T	**Combat Theater Communications** A program to acquire new hybrid analog/digital and digital communications equipment both for Air Force unique tactical requirements and for the DoD Joint Tactical Communications (TRI-TAC) Program. Within TRI-TAC, the 478T Office carries out the development, test, and production of equipment assigned as Air Force responsibility and ensures that USAF requirements are met by all of the equipment procured through this joint service program. Also responsible for the interoperability of TRI-TAC equipment with other communications equipment within the tactical Air Force environment.	Definition, R&D, and Acquisition	Martin Marietta, ECI, Raytheon
481B	**E-4 Airborne Command Post** Provides the National Military Command System (NMCS) and Strategic Air Command (SAC) with an airborne command and control system that will operate during the pre-, trans-, and postattack phases of a general war. As a survivable emergency extension of NMCS and SAC ground command control centers, it provides a high-confidence capability to execute and control SIOP forces during nuclear war.	Acquisition	Boeing Aerospace Co., E-Systems
485L	**Tactical Air Control System Improvements (TACSI)** This program will give the Tactical Air Control System (TACS) increased operational capabilities for combat command and control of tactical aerospace operations. Improvements consist of mobile communications and electronic systems capable of modular worldwide deployment that are compatible with the TACS and interoperable with Army, Navy, and Marine Corps tactical data systems.	R&D and Acquisition	ITT, Goodyear, Applied Devices Corp., General Dynamics
496L	**SPACETRACK Augmentation** Mission of the SPACETRACK system is to detect, track, and identify man-made objects in space. Improvements are needed in areas of extended range, greater coverage, better accuracy, and more timely reporting. Several efforts are under way to determine future requirements for modifications to the sensor network, on-site data processing, operating procedures, and system communications. Large ground radars and electro-optical systems are being considered for deep-space surveillance. Initial improvement is the Ground Electro-Optical Deep Space Surveillance (GEODSS), which will extend SPACETRACK surveillance to synchronous altitudes. This will be a global network of five sites to optically detect, track, and identify satellites in earth orbit.	Acquisition	TRW (for GEODSS)

SYSTEM NO.	NAME AND MISSION	STATUS	CONTRACTOR
616A	**Air Force Support of MEECN** Upgrade of the Air Force Survivable Low Frequency/Very Low Frequency (LF/VLF) System as part of the Minimum Essential Emergency Communications Network. The LF/VLF System is designed to meet the requirements of CINCSAC and the Joint Chiefs of Staff.	Development and Acquisition	Westinghouse
633A	**COBRA DANE** Installation of a phased-array radar on Shemya AFS, Aleutian Islands, Alaska, to collect intelligence data on Soviet missile development tests. Corollary missions are early warning and satellite tracking.	Operational	Raytheon
633B	**COBRA JUDY** Acquisition and deployment of an instrumentation ship.	Definition	Study contracts to General Electric, RCA, Raytheon
634B	**Joint Tactical Information Distribution System (JTIDS)** A program to develop a high capacity, reliable, jam-protected, secure digital information distribution system that will provide an unprecedented degree of interoperability between data collection elements, combat elements, and command and control centers within a military theater of operations.	Engineering Development	Hughes, ITT, IBM, Singer-Kearfott, McDonnell Douglas
681E/ 1823	**DoD Base and Installation Security System (BISS)** An evolutionary program for a DoD standard electronic security system for physical security of DoD resources worldwide. This system's major components include sensor, imaging, entry control, and command and control equipments. The system concept emphasizes maximum commonality of major items and a variety of supporting subsystems. It offers a flexible choice of equipments that can be tailored to the unique physical characteristics of the location and to the threat.	Advanced Development and Engineering Development	Many
968H	**Joint Surveillance System (JSS)** The JSS program is to acquire and deploy a peacetime air surveillance and control system to replace the Semi-Automatic Ground Environment (SAGE) system for the US and Canada. For Canada, the mission is expanded to include support of wartime air defense functions, and in Alaska the mission includes the performance of tactical air control functions.	Design Verification Study	Hughes Aircraft
1136	**SAC Digital Information Network (SACDIN)** A program for an integrated SAC command-wide digital record communications system to meet, with updating, requirements for command control and support data transmission into the 1990s.	Development	ECI, ITT, IBM
1144	**Automated Technical Control (ATEC)** A coordinated Defense Communications Agency program which, when deployed, will provide computer-assisted performance assessment, fault isolation, and reporting on circuits, equipments, networks, and links of the Defense Communications System (DCS). It is a part of the Technical Control Improvement Program to improve technical control, increase reliability, and maximize performance of the DCS. ATEC consists of development and production of computer-controlled equipment and sensing devices.	Engineering, Development, Production	Honeywell, GTE Sylvania, Computer Sciences Corp.
1205	**Air Force Satellite Communications System (AFSATCOM)** A program for acquisition of UHF airborne/ground force terminals, airborne/ground command post terminals, ancillary equipment for operational control and communications transponders on selected Air Force satellites. The associated family of modular UHF transceivers will provide a command communications capability in the line-of-sight mode. The full-grown family of modular UHF radios will result in a common base to provide the transceiver for the satellite SIOP and force communications terminals.	Development and Acquisition	Rockwell, Linkabit Corp.
2059	**PAVE PAWS** Two dual-faced phased-array radars, one to be deployed on the East Coast and one on the West Coast. This system will be operated by the Aerospace Defense Command and will provide warning to the National Command Authorities of a sea-launched ballistic missile attack against the continental US.	Acquisition	Raytheon
2128	**Ground-Based Deep Space Surveillance Radar** A program to verify the feasibility of ground-based radars for use in deep space surveillance. Results of this investigation will provide inputs to an Air Force decision on the configuration of a deep space surveillance system.	Conceptual	General Electric
2167	**SPADATS Improvements** The Air Force Space Detection and Tracking System provides the primary national capability for surveillance, tracking, and identification of man-made objects. This includes cataloging, precision tracking of high-interest payloads, intelligence support, space object identification, maneuver detection, satellite decay and impact prediction, weapon-systems support, and support for national space programs.	Advanced Development	Hewlett-Packard, Magnavox
2189	**Air Force Program for Joint Interoperability of Tactical Command and Control Systems (AFJINTACCS)** Centralized analysis, planning, technical support, preliminary systems engineering, modification, and joint test support for Air Force command and control systems designed to participate in the JCS-directed JINTACCS program. Activities will focus on increased compatibility, interoperability, and operational effectiveness.	Planning, Test, and Demonstrations	None
2206	**Digital European Backbone (DEB)** A program to incrementally transition portions of the European Defense Communications System from an FDM multiplexed system (analog) to a time division multiplexed system (digital) with higher reliability components. This will provide an economic wideband digital bulk-encrypted alternative routing capability between Defense Satellite Communications System's earth terminals and major commands.	Validation, Acquisition, and Deployment	Many
2294	**SEEK SAIL** Involves acquisition of radar sensor for SPACETRACK in the Western Pacific area. Implementation of this sensor will provide information to the Aerospace Defense Command on new satellites during the initial orbit. This sensor will extend the system coverage and provide data for updating the SPACETRACK catalog.	Development	None
2394	**Operational Application of Special Intelligence Systems (OASIS)** Improvement of tactical command control and communications capabilities through the application and interfacing of appropriate surveillance and special intelligence systems. Initially im-	Development and Acquisition	None

YSTEM NO.	NAME AND MISSION	STATUS	CONTRACTOR
	provements to the USAFE Tactical Fusion Center (TFC) in its support of Allied Air Forces Central Europe will be addressed. Although the OASIS program will initially concentrate on needs of the TFC, the program will, as required, develop operational applications of special intelligence systems for other commands.		
2433	**SEEK IGLOO** Upgrading or replacing all thirteen USAF long-range radar sites in Alaska on a Minimally Attended Radar concept with maintenance by no more than three medium-skill radar technicians and no on-site radar operators. A major objective is a large-scale reduction in the life-cycle cost of Alaskan radar surveillance systems.	Design Validation	None
27596F	**Air Force SAFE Program** Includes acquisition and deployment to some 100 USAF bases and sites of physical security equipment that is commercially available or is developed under the DoD BISS Program. These systems will protect mission-critical and high-value resources such as weapons storage sites, strategic/tactical alert aircraft areas, special mission aircraft parking ramps, and specified command posts.	Acquisition and Deployment	Fourdee Inc., Honeywell, Dewey Electronics
64708F/ 2093	**Wind Sounding Capability** An airborne system to measure the vertical profile of pressure, temperature, humidity, and horizontal wind velocity between flight level and the earth's surface. The system is to be deployed on weather reconnaissance aircraft (WC-130s) and combat airdrop aircraft (C-141s).	Development	None
	Air Force World-Wide Military Command and Control System (AFWWMCCS) Involves systems planning and engineering for Air Force elements of the World-Wide Military Command and Control System. Activities will focus on intersystem engineering of selected AFWWMCCS existing and planned assets.	Conceptual, Validation, and Development	None
	BMEWS Tactical Operations Room Upgrade Modifications to the Tactical Operations Room (TOR) of the Ballistic Missile Early Warning System. At Site I (Greenland) and Site II (Alaska) new operator consoles will improve operating efficiency and reduce personnel required. A proposed follow-on will provide new computers, improve resolution capability of radar electronics, and upgrade the TOR at Site III (England).	Analysis	RCA
	COMBAT GRANDE Maintenance of Spanish Air Force air defense system; provide additional communication links; and improve existing communications, command control, and weapons control.	Operational	COMCO (Hughes Aircraft and CECSA)
	Air Force Data Element Dictionary Message Catalog Provides the automated digital exchange of command management information among the elements of the tactical forces through data communications.	Continuing	None
	Defensive EW/ECCM Functional Area Improvements An electronic warfare (EW) office within ESD to act as the ECCM focal point, with the prime responsibilities of ensuring that electronic counter-countermeasures (ECCM) are fully considered during the conceptual and developmental phases of C^3 systems acquisition.	Continuing	None
	Enhancement of TACS Ground Target Strike Control Capability Development and maintenance of a time-phased plan for significant improvements in the capability of the Tactical Air Control System to provide real-time control of strike, defense suppression, electronic warfare, and air defense aircraft in support of the ground mission objectives in a given area.	Continuing	None
	Enhancement of TACS Air Surveillance and Control Capability The development and maintenance of a time-phased plan for significant improvements in the capability of the Tactical Air Control System to provide real-time air surveillance of the tactical theater and control of air intercept resources.	Continuing	None
	Identification of Hostile Aircraft The objective of this program is to define system performance requirements, compare alternative identification systems, and perform a conceptual design of the optimum system selected. The study will focus on identification of hostiles in Central Europe and will rely on the integration of data from several sensors for positive identification.	Conceptual	None
	Improved Administration Capability Test (IMPACT) Design, implementation, test, and evaluation of a prototype automated office system for Air Force Systems Command. Objective is to introduce modern office technology to management and support functions for greater economy.	R&D	None
	Modular C^3 Interface Analysis Involves the development of a preliminary design for a flexible interconnect to be used in tactical C^3 centers.	Conceptual	None
	SEEK FROST A program to replace the existing Distant Early Warning (DEW) Line with a system of totally unattended short-range radars and supporting equipment and facilities to provide enhanced coverage with higher probability of detection of bomber attack in the northern approach regions to the North American continent.	Conceptual	None
	SEEK SCORE To develop and produce a radar bomb scoring system for SAC for training and evaluation of aircrews in a realistic operational environment.	Development	None
	Tactical Air Forces C^3 Architecture Description of the evolutionary development of command control and communications and intelligence capabilities for tactical forces. Contains current, programmed, and desired capabilities and shows a budget-constrained program to achieve improved tactical operations.	Continuing	None
	TACC AUTO The Tactical Air Control Center (TACC) is the senior element of the Tactical Air Control System (TACS) and operates as the facility through which the deputy for operations exercises control of the tactical forces. The objective of TACC AUTO is to provide levels of data automation capabilities to the TACC and other elements of TACS through the incremental introduction of digital data links, automated data base, and rapid access displays.	Development	General Dynamics, Computer Sciences Corp.

Long term cost reduction and better skill development are dual goals of Honeywell maintenance trainer programs.

The idea of computer based maintenance training is new, but the reasons for it are very old—to reduce costs and deliver a better qualified technician to the fleet, squadron or brigade.

Training on operational equipment is expensive, risky and it takes vital operating hardware out of service. In the long run, a simulator is far less expensive and it does a better job of training.

With a Honeywell maintenance trainer, the instructional staff has the flexibility to modify and change a program so that the trainee is exposed to a wide variety of faults, malfunctions and equipment problems.

More students can be trained at one time and the instructor can monitor each student's progress—stopping to correct mistakes as they occur. The Honeywell system also produces a hard copy performance report which can be used to evaluate student progress.

Technicians will learn F-16 systems on Honeywell maintenance trainers.

Technicians will soon be able to learn F-16 systems maintenance on a Honeywell computer based maintenance trainer.

The trainer will be a computer driven system, which will train "O" level mechanics to identify and locate equipment problems at the "black box" level.

Systems incorporated in the Honeywell trainer include the environmental control system, the flight control and instrument system, the fire control system, the hydraulic system, the navigation system, the electrical system, the weapons control system and the engine system including starting, operating and diagnosing.

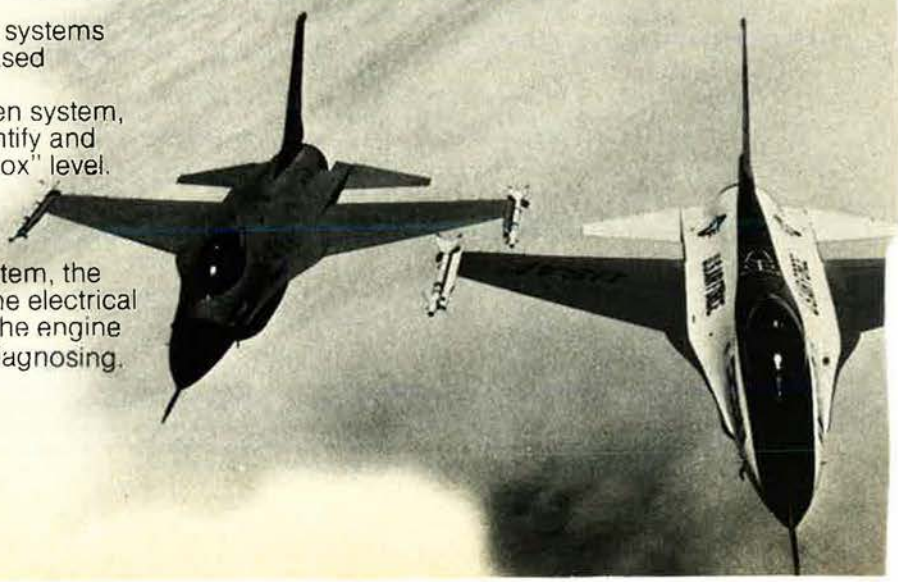
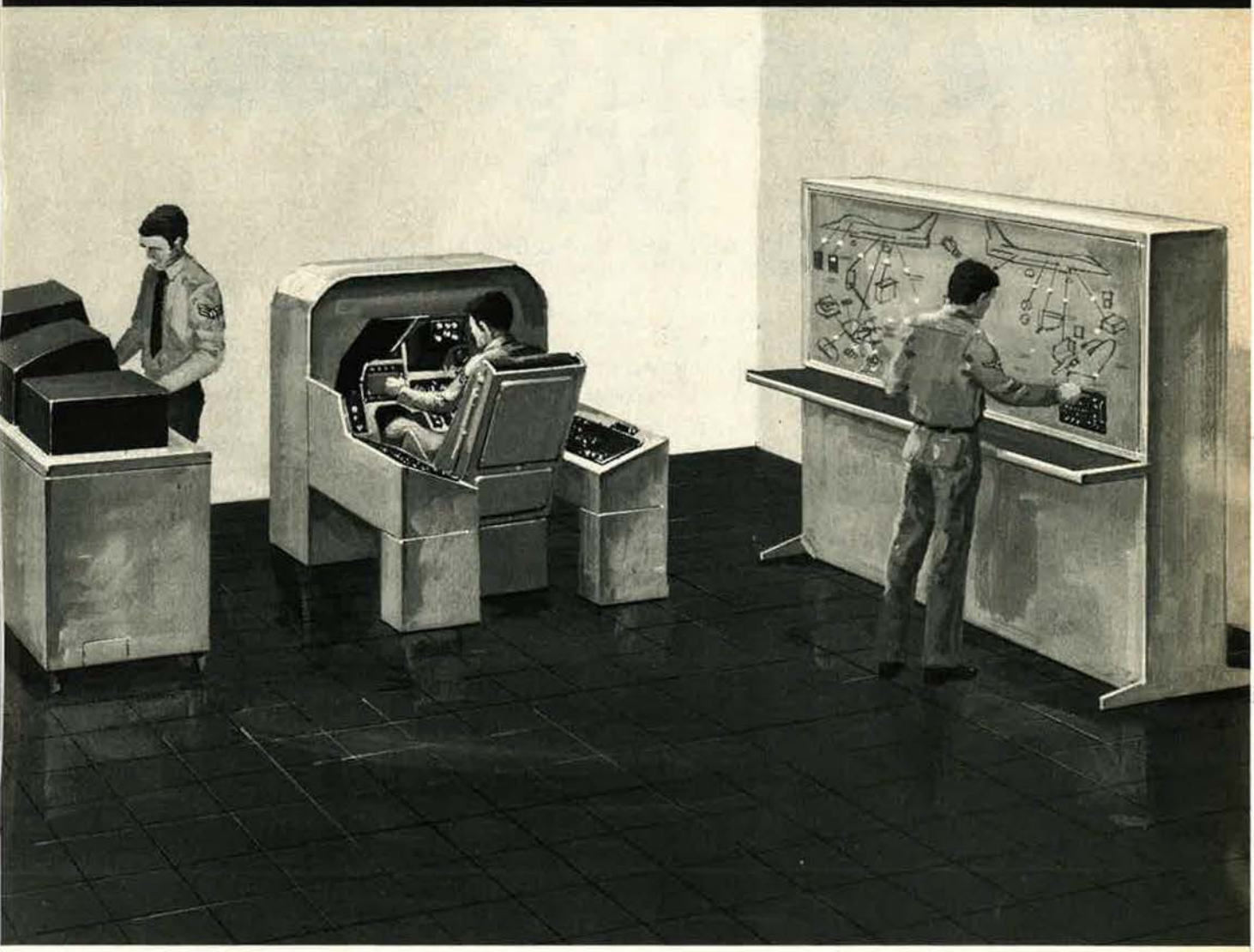
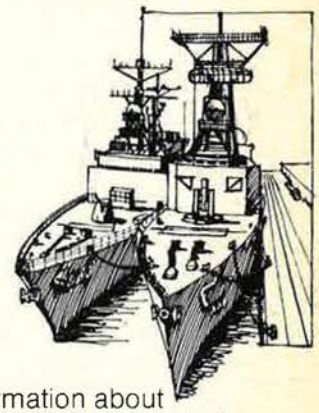


Photo courtesy of General Dynamics

rainers of tomorrow are at Honeywell today.



Honeywell advances maintenance training with new computer and instructional techniques.



Future combat needs will require quick response with highly sophisticated, fully operational equipment. To achieve these vital goals, maintenance technicians will have to have a better understanding of the equipment they're responsible for.

Computer simulated maintenance training frees operational equipment for the field and enables instructors to teach significant equipment malfunctions and how to correct them.

Honeywell's front end analysis results in simulation that is tailored to specific customer requirements. The research Honeywell is doing today could be tomorrow's shipboard electronic maintenance trainer for Spruance Class Destroyers or systems trainer for XM-1 tank crews.

If you'd like more information about Honeywell Training Systems, contact the Marketing Dept., Honeywell Defense Electronics Division, 1200 East San Bernardino Road, West Covina, California 91790. Phone 213/331-0011. Telex 670-452. Branch offices in Australia, England, France, Germany, Italy, Japan and Sweden.

Honeywell

The Second-Generation DCS

BY LT. GEN. LEE M. PASCHALL, USAF
DIRECTOR, DEFENSE COMMUNICATIONS AGENCY

Under Defense Communications Agency supervision, new generations of components for the Defense Communications System are being developed to provide vastly increased capacity, jam-resistance, security, and interoperability, at lower operating cost.

THE Defense Communications System (DCS) provides the basic long-distance communications structure used for the worldwide command and control of United States military forces. The Defense Communications Agency (DCA) manages that system whose assets are owned, operated, and maintained by the military services. The Air Force operates about forty percent of the DCS and is the largest single user of DCS services.

The Defense Communications System was created eighteen years ago by merging the separately growing Army, Navy, and Air Force long-distance communications systems. Thus, the first-generation DCS was born in some controversy. Selected ideas and communications networks of the military services were further developed under DCA leadership to form the several networks whose names have become familiar today. Among these are AUTOVON, the worldwide direct distance dial telephone network; AUTODIN, the worldwide data and narrative message network; and AUTOSEVOCOM, a largely manual secure voice network of limited size and quality.

AUTODIN, for example, was derived from the AFDATACOM or COMLOGNET, which was a data communications network originally designed to provide Air Force logistics communications. Today, of course, AUTODIN provides major command and control as well as logistics, administrative, and intelligence communications functions. The Improved Emergency Message Automatic Transmission System (IEMATS) operates through AUTODIN, replacing the old EMATS system, which used dedicated circuits.

The circuits that tie together the headquarters, bases, and units, as well as the communications switching centers of AUTOVON, AUTODIN, and AUTOSEVOCOM are provided through a worldwide transmission system that is largely analog today. This transmission network of microwave and troposcatter radios, landlines, and satellites provides both special-purpose circuits dedicated to a single function, such as BMEWS, as well as general-purpose switched networks, such as AUTOVON.

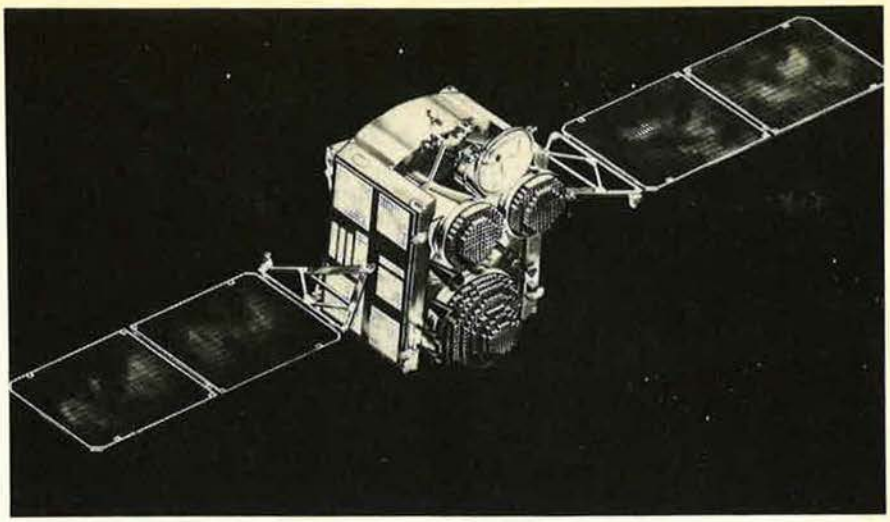
The first-generation DCS has demonstrated remarkable ability to evolve in such a way as to provide the new services required by today's command and control concepts and the modern automated management systems of DoD. However, it is manpower intensive, not sufficiently secure from communications intercept activities, and lacks significant capability to survive a determined electronic jamming attack. Over the past several years, we have been able to systematically plan a second-generation Defense Communications System in a manner quite different from that required by the consolidation activities of the early years.

Analog to Digital Transmission

The first critical decision with

Planning objective for the second-generation DCS is to meet future needs of both management and C³ systems, including the E-4 Advanced Airborne Command Post.

respect to the second-generation DCS was selection of the transmission network to be used. We made a deliberate choice, for both economic and operational reasons, to convert from analog to digital transmission. The conversion actually began three years ago with a test system installed in Germany by the Army. The first large-scale implementation will be by the Air Force Electronics Systems Division and Air Force Communications Service, using Army-procured radio equipment in the four-phase Digital European Backbone program. Additionally, the current Defense Satellite Communications System—the space segment of which is procured by the Air Force—will also be converted to all-digital transmission over the next three years, using Army-procured and -installed equipment in earth stations operated by the Army, Navy, and Air Force. The conversion from our present analog transmission to digital form has been compared to the conversion of aircraft from reciprocating to jet engines. The communicator will experience many of the same traumas characteristic of that conversion, plus the high costs of a hybrid analog-digital period; but the benefits of digital transmission are dramatic. The economic benefits alone would in time justify the conversion but the ability to bulk-encrypt complete radio links and to provide highly reliable circuits of very high quality almost independent of distance are military operational benefits of enormous significance.



Chief among advantages of the DSCS III Defense Communications Satellite is its 100-to-one improvement over present satellites in resistance to jamming.

AUTODIN II

AUTODIN II is the next element of the second-generation DCS. Today's AUTODIN system performs exceptionally well in handling narrative and data messages. It does not do as well handling interactive data traffic between computers and between terminals and their host computer. The technique chosen for AUTODIN II is the packet switching technology developed by the Defense Advanced Research Projects Agency (DARPA), which is directed primarily at the data communications needs of the future. AUTODIN II will fully meet requirements for high-speed bulk transfer of data between computers and the interactive query-response activities that we expect to be characteristic of future command and control as well as management systems.

AUTODIN II will have two features not found in the current DARPA network. The first of these is a security module that will segregate and protect all classes of Defense information passing through the network. It will not solve the host computer multilevel security problem, but will guarantee delivery of traffic only to those terminals previously cleared to receive messages of specified security classification. Secondly, AUTODIN II has a priority scheme that will enable the premium traffic to move more rapidly and ahead of lower-priority traffic.

AUTODIN II will begin operation in the United States in mid-calendar year 1979. The Air Force is the lead military department for the implementation of AUTODIN II in the United States. These functions are being performed by the Air Force Communications Service. AUTODIN II, while it has major operational benefits, was primarily justified on the basis of the cost-effectiveness of a packet-switched network where data traffic is dominant. The network will be financed by the Communications Services Industrial Fund managed by DCA, and users will pay a subscriber rate for connection to the system.

The subscriber rates have been devised in such a way as to be competitive with any commercial offering and most dedicated network arrangements presently available to DoD users. It will serve both command and control as well as other administrative and logistic systems. The SAC data network, once called SATIN IV (now SACDIN), and the Advanced Personnel Data System (APDS) are examples of both command and control and administrative functions to be served. Extension of this system overseas has not yet been defined in detail, but it is clear that as the demand for data services grows in overseas areas, AUTODIN II service will be extended into the overseas environment. A decision on the programmed overseas extension will probably be reached by the end of this calendar year.

DSCS III

The next major part of the second generation DCS structure is the next-generation Defense Communications Satellite (DSCS III). This satellite is being developed and acquired for the DCA by the Air Force's Space and Missile Systems Organization (SAMSO), which has contracted the satellite and certain ground equipment to the General Electric Co. The first of these new-generation satellites will be launched in the summer of 1979, together with a replenishment DSCS II satellite. In the early 1980s, the Defense Satellite System will be a mixture of DSCS II

The FSC-78 satellite antenna is the heavy ground terminal for defense communications satellites.

and DSCS III satellites. The DoD objective is to have four operational satellites in geosynchronous orbit, together with two on-orbit spares. By the mid-1980s, we should have an all-DSCS III space segment.

The benefits of DSCS III are substantial. At the risk of oversimplifying a rather complex issue, there will be about a two-to-one improvement in on-orbit life expectancy, compared to the DSCS II, and about a three-to-one improvement in capacity. Both of these have economic benefit such that the life-cycle cost of the DSCS III with its much greater capabilities will be slightly less than the life-cycle cost of today's DSCS II space segment.

In addition to the economic benefit, there are operational benefits. There is about a ten-to-one improvement in flexibility and a five-to-one improvement in control capability. Today we depend largely on a single control facility for on-orbit station-keeping and similar functions. The DSCS III system will incorporate in selected earth stations the ability to perform not only communications control but also selected on-orbit spacecraft control functions that are now normally done only by the Satellite Control Facility at Sunnyvale, Calif.

But the most important benefit we expect to gain from the DSCS III and its unique new antenna system is a dramatic improvement in our ability to operate through an enemy jamming attack. The improvement here is on the order of 100-to-one over the present communications satellite system. This dramatic improvement in electronic survivability will be largely the result of the ability of the multiple-beam antenna to detect and null powerful enemy jamming stations.

The need for antijamming capability in the DSCS III is critical, since the World-Wide Military Command and Control System (WWMCCS) selected architecture calls for its use to provide WWMCCS jam-resistant secure communications capabilities for WWMCCS command centers to include secure voice and graphics conferencing. To achieve very high on-orbit availability, we are programming four operational satellites plus two on-orbit spares. We have, thus, partially adopted the commercial practice, where INTELSAT, for example, provides one spare for each on-orbit operational satellite. Premature satellite failures are rarely noticeable in the commercial networks for that reason. By programming conservatively, we can provide a guaranteed space segment for the increasingly vital uses being made of the military satellite communications system.

Even so, we will not rely solely on the military space system. The DCA policy today for transoceanic communications circuits is to use a mix of media consisting of approximately one-third provided by the military satellite system (plus surge capacity), another third by leased underseas cable, and another third by leased commercial satellite. This diversity provides reasonable assurance that at least one means of communications will remain even though cables can be cut and commercial satellites have neither antijamming features nor protected command and telemetry channels.

Since all communications satellites can be intercepted over wide areas of the earth, cryptographic protection of satellite communications becomes very important. The military satellite system will, of course, be bulk encrypted like the terrestrial digital communications of the second-generation DCS. We have also embarked on a program to replace individual voice circuits provided on commercial satellites with wideband encrypted digital data streams from which we can derive ordinary voice circuits. Again, the benefits of digital transmission become apparent because the first such lease between the West Coast and Hawaii provides twenty-four AUTOVON voice circuits from a bulk-encrypted digital data stream and at the same time saves approximately $500,000 per year in circuit rental costs. The cost of the equipment installed at military communications facilities needed to derive the voice channels and provide the bulk encryption is approximately $80,000. Thus, the investment payback period is very short, considering that such a significant operational benefit is derived.

AUTOSEVOCOM II

The last major element of the second-generation DCS has been the most difficult problem we have confronted in planning for the future. Despite the many improvements in communications security that will result from digital transmission and bulk encryption, our greatest military communications weakness remains the lack of a widely available, easy-to-use secure voice network. The present AUTOSEVOCOM I network is made up of several equipments developed and fielded by the Army and Air Force in the mid-1960s. It serves a limited number of subscribers, is manpower intensive, and has rather poor quality. We have been able to make some significant improvement by adding wideband circuits that provide very high quality secure voice. However, these wideband circuits are quite expensive and the switching facilities limited as to the number of circuits they can terminate.

Thus, an AUTOSEVOCOM II program was defined to serve up

to 10,000 subscribers, as compared to the approximately 1,500 currently served, in a worldwide secure voice network much easier to use and of much better quality. Our design goal was to provide a secure voice system that was directly interoperable with the equipment being developed in the TRI-TAC program for use by tactical forces of the Army, Navy, Air Force, and Marine Corps. There are a number of different communities that require secure voice service, and there is no single technical solution that will allow the needs of the several communities to be met without encountering significant degradation when subscribers in the different communities must be interconnected. Our design goal, then, was to achieve direct interoperability with the tactical military forces at the expense of easy interconnection with civil government subscribers and certain military users who can only use high-frequency radio.

The General Accounting Office and the Congress have questioned the desirability of that approach primarily based upon cost and the fact that in the United States there is also a substantial civil sector need for secure voice service, which must operate over the commercial Direct Distance Dialing (DDD) and civil government Federal Telecommunications System (FTS) telephone networks. Thus, the 95th Congress withheld funds for the development of the planned AUTOSEVOCOM II and directed instead that the DoD develop a military system compatible with that being developed for the civil government sector. It appears that it will be necessary to implement a hybrid system that is compatible with the tactical forces overseas and which uses a different technology to achieve compatibility with civil government users in the United States. Tying these two different technologies together will be a command and control overlay for those military subscribers who have a command and control requirement to directly interoperate with the tactical military forces overseas. The AUTOSEVOCOM II system design is still under study, and the future shape of the program is yet to be finally determined.

Lt. Gen. Lee M. Paschall was appointed Director of the Defense Communications Agency in July 1974. He also serves as Manager of the National Communications System and Chairman of the Military Communications Electronics Board. General Paschall, a native of Colorado, previously served as Director of Air Force Command Control and Communications and Commander of the AFCS United Kingdom Communications Region.

DCS—A Vital Element of Deterrence

Our planning objectives for the second-generation DCS have been to improve its communications security, its electronic survivability, and its ability to match the communications needs of the future for both management systems as well as for command and control systems. It must be capable of serving as the primary communications medium for the World-Wide Military Command and Control System for the full range of military activity from crisis management to general war. Additionally, by exploiting digital technology to the fullest, we expect the second-generation DCS to be cheaper to operate and maintain, particularly by reducing manpower requirements.

Our society places great premium on protection of its citizens and their property wherever they may be. Our national strategy requires that military forces involved in crises be centrally controlled so as to prevent escalation to higher levels of conflict. Our doctrine is that military forces in a high state of readiness to deploy and, if necessary, to fight are the best deterrent to war. For a world power holding those views, the value of a large general-purpose communications system, which serves military forces deployed on a worldwide basis and which is capable of rapid extension, is incalculable in today's dangerous world.

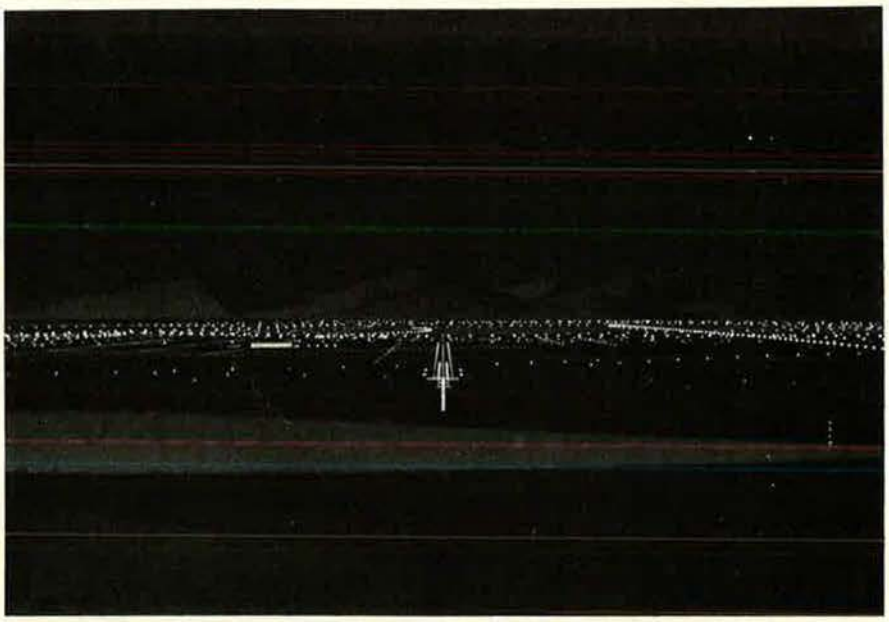
It also complicates the task of the designers of that general-purpose system because the driving need for worldwide system integrity may conflict with the perceived needs of the different geographic areas and of their command and control requirements. Great emphasis on interoperability with NATO forces and their command control and communications structures is essential to force readiness in Europe. But to achieve that goal at the expense of the worldwide integrity of the Defense Communications System could work to our disadvantage in the Pacific ocean basin.

There have been many challenges in designing the second-generation DCS. Many more remain before it can be implemented. These challenges can only be overcome by the teamwork that has become the hallmark of today's defense communications community. The Air Force, together with the other military services and the defense agencies, has played a major role in the design of the second-generation DCS and will play an even larger role in its implementation, operation, and maintenance. ■

Simulators: A Mixed Blessing?

BY BONNER DAY, SENIOR EDITOR

Computer-controlled motion and visual systems make flight simulators more realistic than ever before. These innovations have sparked a debate over how much the total flying hours can be cut.



Computer-generated images such as the simulated airport above are being used with ground trainers to give student pilots realistic instruction.

BREAKTHROUGHS in electronics are making available to the Air Force a completely new family of flight simulators.

The new training devices, however, are causing a wide debate over how much flying time can be eliminated through their use.

The new generation of trainers, using the latest in computers, simulates aircraft missions so realistically that enthusiasts say they teach better and quicker than actual flight.

Some hours in Air Force flight training have already been cut. Students learning to fly in the Air Force's undergraduate pilot training fly forty hours less than students in years past. The Air Force plans also call for cuts in flight hours for B-52 bomber and KC-135 tanker crews.

The advances made in simulators are widely recognized, but at the Defense Department and in Congress there is a deep split over whether they will allow Air Force pilots to stay proficient with fewer flight hours.

Veteran military men are concerned that flight hours will be reduced further when the latest simulators become available. Some officers say flight hours may have been cut already to critical levels.

It is another one of those disputes between cost-conscious policymakers and unit commanders concerned with performance. At stake are millions of defense dollars and hundreds of thousands of barrels of jet fuel on the one hand, and, on the other, the safety and proficiency of Air Force flight crews. The Air Force burns 250,000 barrels of jet fuel a day, and in a war the total could rise to 1,000,000 barrels a day or more.

In 1967, the Defense Department's scientists, aware of the dramatic improvements in simulator technology, directed the Air Force and the other services to expand simulator programs to improve training and cut training costs.

One result of that order is the Air Force's Advanced Simulator for Undergraduate Pilot Training, a research model that today represents the state of the art in simulation. It was delivered to the Air Force in 1975 after studies begun in 1968.

Defense Department Goal

When the fuel shortage hit in 1973, interest in simulators increased dramatically at the Defense Department. That year the Pentagon set a goal of reducing flight hours twenty-five percent by 1980 through the use of simulators. At the same time, flight hours were curtailed sharply to save on fuel.

In the period since, studies have caused many in the Air Force to have reservations over whether or not the goal is a realistic one, particularly in light of the flight hours that already have been eliminated.

Some argue that simulators should be used instead to gain additional training experience and

to compensate for the flight hours given up before and after the 1973 fuel crisis.

Air Force pilots today average twenty hours of flight time a month, compared to fifty hours or more in earlier years.

Air Force veterans agree that simulators are a valuable training device. And they are conscious that flying training stands out in the Air Force budget because of the high individual training costs in people, time, money, and equipment. Some studies show that two hours of simulator training are equal to one hour of actual flight. In some training, the ratio is reversed; instructors find they can teach faster with simulators. But the big attraction of simulators is that they are up to ten times cheaper to operate, depending upon the aircraft.

Veteran military pilots are aware of this, but they are concerned that there may be some learning that cannot be transferred to simulators. And they are worried that too many training hours will be transferred from flight to simulators.

Higher accident rates in F-111 and other units in recent months are being watched closely to see if this is an indication that too many training flight hours have been given up.

The New Simulators

Today's Air Force simulators make maximum use of new technology. A sampling of those now being added to training programs is described on page 79.

The latest simulators in use or in production are capable of almost exact duplication of the flight characteristics of modern aircraft.

The basic elements of flight simulators are a cockpit replica, a hydraulic motion system that can move the cockpit into flying attitudes, a visual system to give the student the illusion of flight, and a computer that puts the separate elements together so that the motion and visual systems respond to controls in the cockpit.

The latest simulators also realistically reproduce aircraft radar, electronic countermeasures, and weapons delivery systems.

A television camera, above, responds to student pilots at a flight simulator's controls, passing over a model board to create the illusion of flight, shown at right.

Simulator manufacturers have branched out into areas other than flight. The Air Force, for example, teaches strategic missile crews by simulators. Simulators also are made to teach the operation of military tanks, locomotives, nuclear power plants, and oil refineries.

But it has been in flight simulation that the advances have been the biggest and most noticeable.

Early Simulators

Flight simulation is not new, but only in recent years has there been a major push to replace flight time for advanced military training with simulator hours. Historically, simulators have been used primarily as safety devices in the training of new pilots.

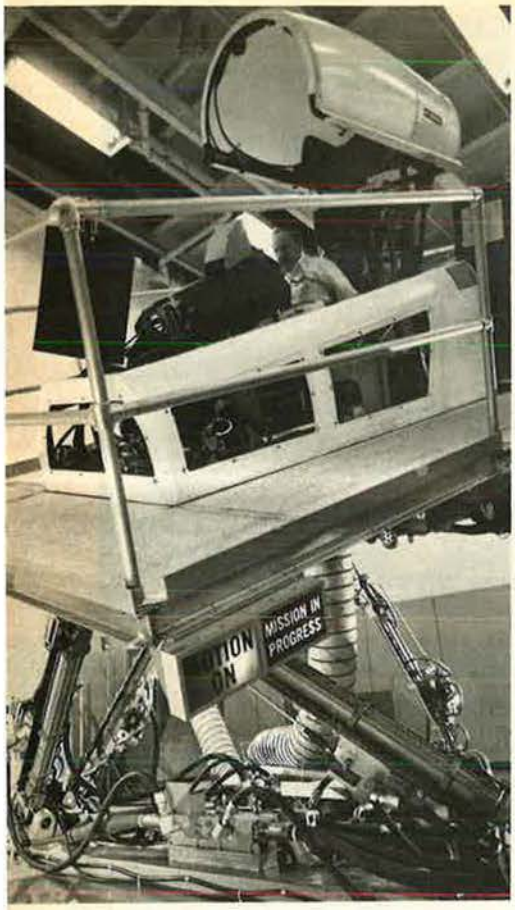
Two of the earliest known examples of flight trainers, or simulators, were in use in England in 1910, only seven years after Orville Wright's famous North Carolina flight off Kill Devil Hill. These simulators were mounted on a base that allowed them to pitch, roll, and yaw.

By the late 1920s, aircraft development had accelerated and complexity had increased. Instrument, or blind, flying was introduced, emphasizing the need for more sophisticated ground trainers. In 1929, Edwin A. Link filled this demand with the "Pilot Maker."

By the beginning of World War II, the Link Trainer was used extensively in commercial and military aviation training. The early Link Trainer, a mechanical device, was gradually replaced during the late 1940s with trainers using electronic advances.

Flight simulators using some of the early analog computers were developed in the 1950s and used almost exclusively until the development of the digital computer. Simulators were built during this period for the A-4D, the F-4, and the C-130.

In the early 1960s, the digital computer was used to provide real-time simulation of flight. Simulators using early digital computers were developed for the



This late-model flight simulator acquaints pilots with almost all of the maneuvers of the F-15 Eagle.

C-141 and F-111. The use of a terrain model board and television to provide the visual illusion of flying was a second breakthrough in simulation during this period. In these simulators, a television camera is moved over a three-dimensional model of an airfield by the cockpit's controls. The changing picture is projected in front of the cockpit on screens to give the illusion of flight. The commercial airlines were quick to adapt terrain boards in their training.

A second generation of digital simulation came on the scene in the early 1970s, sparking further advances. These simulators, using the latest technology, can generate images of flight by computer. They also can move in what the technicians call six degrees of freedom—pitch, roll, yaw, and vertical, lateral, and horizontal movement.

Training programs conducted at the Flight Training Academy of American Airlines require as little as 1.2 hours in actual flight to train an experienced pilot to fly an unfamiliar plane.

Until 1973, the military services, including the Air Force, had been slow to follow the lead of the airlines. One study in 1967 showed that at six Air Force flight training bases not a single visual simulator was in use, though models were available.

But in the years since, the Air Force has been making up ground. Building on simulator technology used by the airlines, the Air Force is adding unique training devices to simulate air war techniques. The Air Force simulators, now in use or in development, reflect its different and more sophisticated training problems.

Civilian, Military Comparisons

Civilian airlines train pilots who are already highly experienced to fly different types of aircraft. Also, airline pilots average four times as many flying hours as military pilots.

The Air Force, in contrast, trains novices, many of whom have never flown any airplane before going on active duty. Air Force pilots must be able to operate high-performance aircraft, and must be able to perform a variety of complex military missions while being tracked or shot at by the enemy.

The typical Air Force pilot in a flying unit has much less experience than an airline pilot. He has an average of 1,500 flight hours, compared to 15,000 hours for an airline pilot.

Because of these differences, Air Force officers say it is impossible to make valid comparisons with the airline industry.

This does not mean, however, that the Air Force cannot use simulators to increase pilot proficiency. Officers say simulators have these advantages:

- **The Combat Environment.** Enemy defenses can be simulated for the more realistic practice of air war tactics.
- **Safety.** The potential for aircraft accidents is reduced during the high-risk period when aircrewmen are at the early learning stage. There are dangerous maneuvers that require much practice, such as enemy evasion techniques and engine problems. These maneuvers can be taught in simulators without risking aircraft or student.
- **Time.** Because of today's congested airways, practice areas are usually a considerable distance from the airfield. In the simulator, no time is wasted going to and coming from a practice area.
- **Repetition.** A push of the button sets the simulator for repeated maneuvers, such as landings, until the skill is demonstrated satisfactorily by the student.
- **Weather.** Instrument flying in adverse weather conditions is necessary for pilot qualification. Simulators provide practice in specific cloud heights and varying degrees of visibility.

Simulator Research

Research for USAF simulators is carried out by Air Force Systems Command's Human Resources Laboratory and the Simulator System Program Office. Some aircraft program offices, such as those for the F-15 and the AWACS, develop their own simulators.

Scientists now are exploring how best to provide wide-field-of-view, high-resolution visual systems for simulators.

Another area of concentration is the simulation of sensors, such as low-light-level television, infrared, and radar.

Perhaps the most critical area of study today, however, is in training. How much realism is needed in motion and visual simulation? How effective are simulators in replacing flight hours? The answer to these questions will determine how far the Air Force can go safely in trimming expensive flying hours, not only from undergraduate pilot training but also from continuation training designed to maintain and sharpen the skills of veteran flyers.

Air Force officers say this area will require a lengthy period of study before conclusions can be drawn. An extended learning period is necessary, they say, to measure the performance of pilots trained under new guidelines against the performance of pilots trained without the new simulators.

The Air Force is not optimistic that many more flight hours can be saved.

Brig. Gen. W. B. Ratliff, Air Force Deputy Director of Operations and Readiness, is a top Air Force advisor on simulators. He says:

"My conviction is that we have cut flight programs as far as we dare. I hope we will use simulators to improve the readiness of crews, rather than to cut flying hours further."

Air Force Secretary John C. Stetson contends that Air Force pilots already are not getting enough flying time. Says Secretary Stetson: "We have reduced our actual training and flying to the point where if we reduce it further, it's going to get counterproductive."

But on one point there is general agreement: The Air Force needs the new advanced simulators. Pilots say these training devices can help to improve combat proficiency in peacetime, when dangerous aerial maneuvers are restricted for safety reasons. And Defense policymakers say simulators are an inexpensive way to train pilots and to maintain proficiency at a time when fuel costs make additional flying time economically prohibitive. ■

A New Family of Simulators

The Air Force over the next four years will be accumulating new flight simulators for its air fleet that represent a major step forward in the art of flight simulation.

Some of the simulators on order:

• **Beginning Flight Simulator.** The Air Force has begun accepting new trainers to teach cadets to fly. One trainer, called the Undergraduate Pilot Training–Instrument Flight Simulator, is built by Link Div. of the Singer Co. It comes in two versions, to prepare students to fly the two principal Air Force jet trainers—the Cessna T-37 and the Northrop T-38 Talon.

Each simulator complex consists of four cockpits of the same type of aircraft, mounted on hydraulic legs to provide realistic flight motion. The simulators allow pilots to practice takeoffs, landings, and instrument flight in simulated weather. Students using the simulators can also practice such emergency conditions as engine failures, fires, fuel problems, blown tires, and electrical failures.

The first T-37 simulator complex of four cockpits became operational at Reese AFB, Tex., in August 1977. The first T-38 simulator was accepted in April 1978, also at Reese AFB. The Air Force plan calls for twenty-two of these simulator complexes to be delivered at six locations by 1980. American Airlines is building the terrain model visual system for the first twelve complexes.

The contractor for a night-only computer image generation visual system for the remaining ten complexes is scheduled to be chosen by competition. The new simulators will cut actual training flight hours from 210 to 170, under the current curriculum being tested, at a savings estimated at $17,000 per student.

• **Bomber-Tanker Simulators.** The B-52/KC-135 Weapon System Trainer is being designed to train crews to fly B-52s and KC-135s. Two companies, Boeing Wichita Co. and Link, are competing to build seventeen B-52 and three KC-135 simulators. Each company is building a simulator complex consisting of one B-52 and one KC-135 cockpit replica. These pilot models will be evaluated by the Air Force in the fall of 1979.

The B-52 simulators will have three crew stations: a flight station for the pilot and copilot, and two stations to train the navigator, radar operator, electronic warfare officer, and gunner. Each KC-135 simulator will have two crew stations, one to train the pilot and copilot and the other for the navigator.

Crew stations in the simulators may function independently or they can be used together to simulate a complete aircraft. The new simulators will imitate aircraft motion, and simulate worldwide navigation and electronic warfare. For visual effects, they will be equipped with a computer image generation visual system. The new simulators will replace current trainers that provide cockpit procedures training, but give little or no simulation of flight. Air Force officials estimate that the number of flight hours for continuation training will drop from 264 to 204 hours, and simulator hours will increase from twenty-four to 143 hours, when the new models are available.

• **A-10 Simulator.** The A-10 Operational Flight Trainer is being built by Reflectone, Inc., of Stamford, Conn., for delivery to Davis-Monthan AFB, Ariz., in mid-1979. The $7 million Air Force contract calls for the purchase of two and an option for four more simulators. The A-10 simulator includes a cockpit replica, an instructor station, a radar warning receiver, a limited field-of-view visual system, and a limited motion system that will provide buffeting and vibration.

• **F-16 Simulator.** The F-16 Weapon System Trainer is designed to supplement and improve training in this new fighter. A $15 million Air Force contract with Link provides for one trainer with options for seven additional units for the Air Force, five for the four European countries also buying the aircraft, and five for other countries that buy it. Each simulator, in addition to imitating flight, will provide training for many F-16 combat skills. Each will be equipped with seats and flight suits that simulate gravity forces. For continuation training, Air Force officials estimate F-16 pilots would require 387 hours a year without simulators. The plan is to cut this to 325 hours with simulators.

• **Fighter-Attack Visual System.** This advanced visual system is designed to upgrade the F-16 and A-10 simulators. A number of the leading simulator companies are competing for the contract, which is scheduled to be awarded this fall. Up to twenty dual-cockpit visual systems are planned in the Air Force buy. The visual system will display scenes for the simulation of air-to-air combat, air-to-ground weapon delivery, formation flight, air refueling, as well as takeoffs and landings.

• **F-15 Trainer.** Seven F-15 Operational Flight Trainers are being built for the Air Force by the Goodyear Aerospace Corp. under a $50 million subcontract from the McDonnell Douglas Corp. The last trainer is scheduled to be delivered in 1980. The cockpit is a replica of the F-15 and has aircraft motion and sounds. Aircraft systems, including hydraulic, mechanical, armament, and airborne electrical displays, are simulated, but there is no visual system. A computer also provides realistic training in electronic warfare, weapons delivery, and the use of radar.

• **Aerial Refueling Trainers.** The Air Force Aeronautical Systems Division's Computer Center is building a KC-135 Boom Operator Part Task Trainer for delivery this year. Other Air Force units assisting include the Flight Dynamics Laboratory and the Avionics Laboratory. The simulator is a replica of the pallet a boom operator lies on while guiding the boom in refueling operations.

A second trainer for refueling, the B-52 Part Task Trainer, is being built under a $5 million Air Force contract with Redifon Flight Simulation Ltd. This simulator will be a replica of the cockpit of a B-52. The visual system, using a television camera and a model KC-135, will display clouds, a horizon, and the image of a KC-135.

• **On Order.** Similar flight simulators are on order for the C-130, C-5, C-141, and E-3A AWACS aircraft. The Air Force has on order 206 simulators, costing an estimated $1.8 billion, for delivery over the next four years.

THE ELECTRONIC AIR FORCE

Electronic Systems in Space

The Defense Department's and USAF's dependence on space systems to support this nation's and allied forces around the world continues to grow at a rapid, steady rate. This growth takes place against the background of Soviet exploitation of space for military purposes involving intensity of effort and size of investments significantly above this country's. The Pentagon, nevertheless, is confident that the US now enjoys a position of technological superiority in space in almost all areas where comparisons can be made.

The reason for the US lead clearly stems from unsurpassed US capabilities in electronics design, manufacturing, and packaging. The Air Force Systems Command's Space and Missile Systems Organization, SAMSO, is the Defense Department's pivot for capitalizing on US electronics prowess for the purpose of maintaining the national lead in military space capabilities.

In the following articles, officers assigned to SAMSO describe, for more technically inclined readers, the technologies of two space systems under development by SAMSO that are likely to secure US superiority in the exploitation of space for years to come.

One system is the Navstar Global Positioning System. When deployed, Navstar will provide the armed forces with a panoply of new, improved capabilities that extends from blind bombing to artillery siting, missile delivery, and satellite location. Its job is to make possible position fixing and velocity determination in three dimensions with unprecedented accuracy and versatility.

AFSATCOM, the other system, represents a giant step forward in C³ capability. This system, also global in scope, links the National Command Authorities to the strategic forces through secure, reliable, two-way command control and communications nets.

—THE EDITORS

NAVSTAR

By the mid-1980s, this spaceborne Global Positioning System should be fully operational with twenty-four satellites in orbit.

ON February 22 of this year, a major aerospace event took place: Navstar-1 was launched by an Atlas-F booster from Vandenberg AFB, Calif. Following a series of operational occurrences, including establishing the spacecraft in a twelve-hour circular orbit at an altitude of 11,000 nautical miles, earth and sun acquisition, payload turn-on, and final station acquisition, the navigation satellite was declared operational on March 31.

Built and tested by Rockwell International Space Div., Seal Beach, Calif., Navstar-1 is the first of six such spacecraft to be launched over the next two years. This initial

AFSATCOM

Initial Operational Capability for this revolutionary C³ system is scheduled for May 1979, with planning for a follow-on already under way.

WITHOUT command control and communications (C³), deterrent forces are just so much useless hardware. Our adversaries will not be deterred by weapons that cannot be alerted, directed, and redirected. Deterrence requires that the National Command Structure exercise positive control over a nuclear-capable force —the Triad—which is always poised for immediate reaction. Positive control of strategic forces means the ability to respond quickly in all phases of conflict, and that depends on sustained communications during the trans-attack, postattack, and reconstitution phases of a nuclear war.

BY COL. DONALD W. HENDERSON, USAF, AND CAPT. G. D. SMELTZER, USAF

constellation of satellites will test and validate the program concept.

Contract management for the Navstar program, headquartered at the Air Force's Space and Missile Systems Organization (SAMSO), Los Angeles, Calif., is provided by an all-military service joint program office (JPO) staff and representatives from the Defense Mapping Agency. Soon, the JPO will have representatives from NATO countries integrated into the office as partners in the development of user equipment.

In addition to satellite development and launch, orbital, and control operations, the JPO is responsible for developing user equipment sets for multiservice users as well as the concept validation testing. Earlier navigation payload concept validation was obtained through operation of the Navy's Navigation Technology Satellite (NTS-II). Follow-on procurements call for replenishment of the initial constellation and, finally, the procurement of twenty-four satellites, making the Navstar system fully operational by the mid-1980s.

When operational, the Navstar system will ensure continuously updated navigation information, accessible on a worldwide basis. Navstar satellites will broadcast continuous time and position messages, enabling properly equipped users anywhere on or around the world to determine their locations within meters and in any weather condition without revealing their own position.

The Navstar spacecraft consists of seven major subsystems providing command, control, power, and operation of the payload or navigation subsystem and employs several state-of-the-art technologies. A general description of the salient features of each of the various Navstar subsystems follows:

• **Electrical Power Subsystem:** The Electrical Power Subsystem consists of equipment designed for generation, storage, control, and distribution of electrical power to the various spacecraft subsystems. Specifically, the spacecraft has two solar arrays, consisting of series/parallel redundant silicon solar cells capable of generating approximately 580 watts of beginning-of-life power at the nominal 27.4 main bus voltage. Sun acquisition and tracking are maintained by feedback through redundant pitch and yaw sun sensors located on each wing.

An electronic Power Conditioning Unit (PCU) provides regulation and control. The PCU senses the spacecraft bus and boosts power by augmenting with stored battery energy, or shunts power for battery charging with excess solar

(*Continued on following page*)

BY MAJ. EDWIN L. ARMSTRONG, USAF

This capability has been provided by a network of landlines and terrestrial radio links, ranging from very low frequency (VLF) to ultrahigh frequency (UHF). These links are vulnerable to jamming and to destruction. Communications options that minimize the possibility of interdiction or of reliance on overseas facilities are very attractive to command and control system planners. Also, reliance on worldwide, immediate, secure command and control demands the most dependable communications system our current technology and resources can muster.

Primary AFSATCOM Objectives

The Air Force Satellite Communications (AFSATCOM) System is the first system specifically developed to capitalize on the advantages of satellite communication for command and control of the Triad of bombers and both land- and sea-launched ballistic missiles. The Triad is made up of a large number of widely dispersed individual force elements and a few centralized control points.

AFSATCOM is the responsibility of the Space and Missile Systems Organization (SAMSO) in Los Angeles, Calif., and is under Program Director Col. James W. Reynolds. Terminals for the system were developed and are being procured by the Associate AFSATCOM Program Office at Electronics Systems Division, Hanscom AFB, Mass.

The primary objective of AFSATCOM is to develop UHF satellite communications terminals for use with a family of spaceborne transponders by the late 1970s and to install these primary transponders on Navy's FLTSATCOM and Air Force's Satellite Data System (SDS) vehicles. A secondary objective is to provide backup transponders on host vehicles, primarily to disseminate the National Command Authorities' (NCA) directives to the Triad. The latest generation of these backup transponders is designated as Single Channel Transponders (SCTs).

The terminals are in production, SDS satellites are available to provide twenty-four-hour coverage, and the first FLTSATCOM satellite was successfully launched in February of this year. Initial Operational Capability (IOC) for the basic AFSATCOM System is scheduled for May 1979. This capability will provide two-way communications with worldwide coverage and enough capacity to support existing and planned terminals and to survive enemy threats. Single Channel Transpon-

(*Continued on p. 84*)

array power. Excess solar array power generated during periods when the supplied power exceeds the demand is shunted by a dissipator located on each wing. Periods where the demand exceeds the supply, such as eclipse operation, are handled by delivering stored energy from three 15-amp-hour nickel cadmium batteries. High-quality filtered DC power for critical navigation subsystems components is provided by a DC/DC converter.

• **Attitude, Velocity, and Control Subsystem:** The AVC subsystem provides the sensing, signal conditioning, and processing necessary for establishing and maintaining effective spin-stabilized control during early orbit operations and three-axis stabilization during final orbit configuration. (The spacecraft attains and maintains an earth-pointing attitude with solar arrays always sun-pointing during final orbit operation.) The key element of the AVC subsystem is a Combined Earth Sensor, consisting of state-of-the-art infrared static earth detectors, spinning earth sensors, and associated signal-processing electronics. The spinning earth sensors in combination with redundant spinning sun sensors and a rate gyro provide information with respect to the spacecraft's position during the initial orbital and earth acquisition sequences where the spacecraft is in the spin-stabilized mode.

The Navstar acquisition sequence is unique in that earth capture is attained initially while the spacecraft is in the spinning mode. Earth capture thus provides roll and pitch control. Then the solar array panels are deployed from their launch or stowed position, the sun is acquired and yaw control is established, and thereby three-axis stabilization is obtained. The static earth sensor senses the earth's hot infrared disk and provides error control signals to the Combined Electronics Assembly (CEA). The CEA commands thruster fire pulses during initial three-axis stabilized operation and controls thruster firing for relief of spacecraft momentum buildup in the spinning reaction wheels during mature orbital operation.

Colonel Henderson is SAMSO's Program Manager for Navstar. Previous assignments include instructor duty in the Manned Orbiting Laboratory astronaut training program at the Aerospace Research Pilot School, Edwards AFB, Calif.; Assistant Director of Program Control in the SRAM Program Office at Wright-Patterson AFB, Ohio; and duty at Hq., Air Force Systems Command. He holds two master's degrees in engineering and one in systems management.

Captain Smeltzer is Chief of SAMSO's Spacecraft Test Branch for the Phase I Navstar satellite. He earned his bachelor's degree in civil engineering under the Airman's Education and Commissioning Program in 1968, and a master's degree in systems engineering in 1970. He has served in the civil engineering field and as an Air Force plant representative at the General Electric facility, Valley Forge, Pa.

• **Telemetry, Tracking, and Command Subsystem:** The TT&C subsystem provides the capability for spacecraft ranging, command, control, and measurement, using the Air Force Satellite Control Facility standard Space-Ground Link System (SGLS) communication network. Both uplink and downlink communication are obtained through redundant transmitter/receivers and switchable forward (earth pointing)/aft conical spiral and bicone horn antennae. The on-orbit command uplink is capable of operating with a minimum of 250 watts, easily obtained from the several remote tracking stations. The secure uplink format command structure is processed by a Signal Conditioning Unit (SCU), decrypted and subsequently decoded by a Dual Command Decoder for routing to various vehicle subsystems. Downlink telemetry is processed by the SCU, coded and multiplexed by a Pulse Code Modulator, and transmitted to the ground through SGLS downlink. The tracking or ranging function is accomplished with the transponders by "turning around" the SGLS ranging signal. The system is heavily redundant with considerable cross-strapping options available.

• **Thermal Control Subsystem:** The Thermal Control Subsystem provides the equipment necessary to maintain the spacecraft component temperatures within narrow limits. Active control is maintained through thermal louvers that regulate the heat radiated into the space environment and thermostatically controlled electric heaters. Passive control is obtained through the use of multilayered insulation blankets, coatings, reflective/absorptive surfaces, etc.

• **Structural Subsystem:** The Structural Subsystem consists of a rigid aluminum frame and honeycomb panels that provide mounting and support for components and rigidity to the spacecraft. The Structural Subsystem also includes solar array deployment mechanisms. Emphasis during early design and fabrication was placed on surviving launch stresses, repeated loads, thermal fatigue, and creep deformations.

• **Reaction Control/Orbital Insertion Subsystem:** The RC/OI Subsystem provides the components for maneuvering the spacecraft during early orbit and station-keeping operations. The Orbital Insertion Subsystem Solid-Propellant Apogee Kick Motor circularizes the elliptical transfer orbit provided by the launch vehicle. The Reaction Control Subsystem consists of five-pound and 0.1-pound thrusters, associated lines, tanks, valves, and hydrazine supply. The five-pound thrusters are used during the spin-stabilized mode to adjust the spacecraft's attitude and provide the necessary velocity adjustments to the initial drift orbit. The 0.1-pound thrusters are used to despin the vehicle, to provide initial three-axis control, and to relieve momentum buildup as a part of the normal station-keeping function.

• **Navigation Subsystem:** The heart of the Navstar spacecraft is the navigation payload, which generates the dual L-Band navigation signal to the user. The Navigation Subsystem consists of the Pseudo Random Noise Signal Assembly (PRNSA) and advanced technology Rubidium Frequency Standards. The triply redundant Rubidium

Frequency Standards provide an on-board precision frequency reference. Frequency stability of Navstar-1 is on the order of five parts in 10^{13}, or less than a one-second variation in 63,400 years. Navstar-4 and follow-on spacecraft will experiment with Cesium Frequency Standards that will provide errors less than one part in 10^{13}, or less than a one-second variation in 317,000 years.

The frequency standards provide an input RF 10.23 MHz signal to the PRNSA synthesizer and baseband units. The 1,575.42 MHz L1 and 1,227.6 MHz L2 signals are common synthesized from the 10.23 MHz precision frequency reference. These L-Band signals serve as the carriers for transmission of downlink navigation data. The 10.23 MHz also feeds triply redundant baseband units that generate a Precision (P) Code at a 10.23 MHz chipping rate and a Coarse/Acquisition (C/A) Code at a 1.023 MHz chipping rate. Each of these codes is modulo two summed with a fifty-bit/second navigation data stream provided by the triply redundant navigation processor.

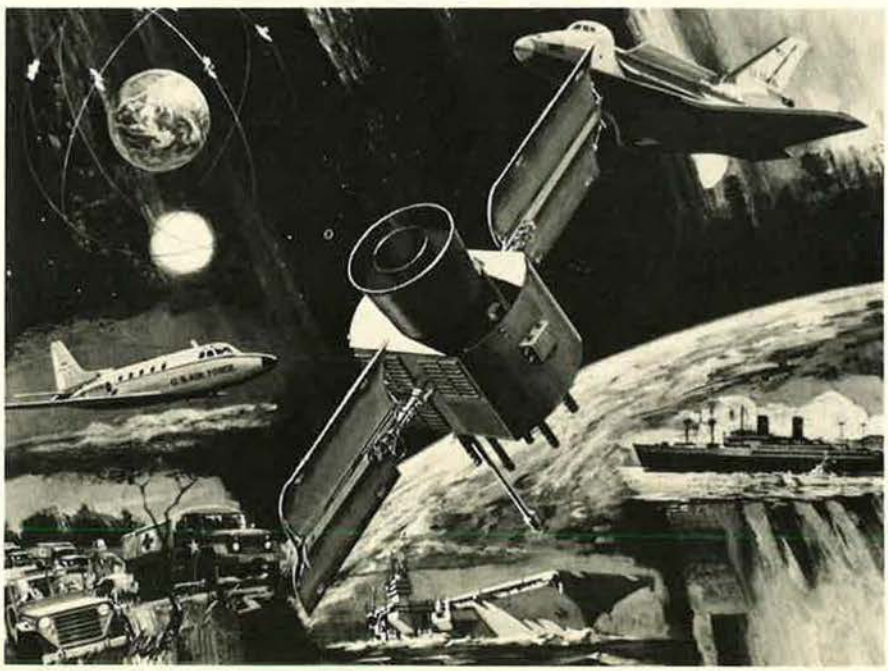
The processor serves as the brains of the navigation subsystem by storing time-tagged ephemeris information from the ground and, at the proper time, passing this information to the baseband as part of the fifty-bit/second Nav Data Word. Additionally, the processor stores, reformats, and provides to the baseband other information required by the user to solve for his position. The resulting composite P and C/A code with the Nav Data superimposed are quad-phase-modulated onto the L1 Carrier by the L1 Modulation Incremental Power Amplifier (Mod IPS). By selection, the P or C/A bit stream is modulated onto the L2 Carrier by the L2 Mod IPA. Subsequent power amplification stages provide the required RF power output.

The downlink signal is transmitted through a twelve-element beam-shaped, phased array and appears to the user as a composite waveform, consisting of the P Signal and the C/A Signal transmitted in phase quadrature. The P Signal is a continuous biphase modulated carrier, which resists jamming and multipathing. The C/A Signal serves as an aid to acquisition of the P Signal required by the more precise user and also provides a navigation signal for users who do not require the accuracy of the precision system.

Satellites are uploaded daily from the Navstar Master Control Station at Vandenberg AFB, Calif. To date, ten-meter accuracies have been obtained using one satellite on orbit and simulated satellites

Army troops will be able to get from Navstar a position accurate to within fifty feet, using a manpack that weighs about twelve pounds.

or "pseudo-lites" from Navstar's Yuma Testing Range. User sets mounted in various high-dynamic environments are obtaining positions accurate to within meters and velocity vectors accurate to within tenths of meters per second. With a four-satellite operational constellation expected by the first of the year and Defense Systems Acquisition Review Council go-ahead expected shortly thereafter, the future looks bright indeed for Navstar. ■



This montage suggests some of the many uses to which the Navstar Global Positioning System may be put by properly equipped military and civilian users when the system is fully operational.

der capability is planned for Defense Satellite Communications System (DSCS) III and Global Positioning System (GPS) satellites.

The objective of the Single Channel Transponder program is to provide backup communications for the most critical AFSATCOM function, transmitting the Emergency Action Message (EAM) with increased reliability and survivability. It will complicate the total jamming and physical attack problem for the enemy. The initial components will be deployed late next year. Design is complete on the DSCS III SCT, and breadboard testing is in progress. Design is also complete on the GPS SCT, and engineering model hardware fabrication has begun.

AFSATCOM provides command and control to essential nuclear-capable forces of the Army, Navy, and Air Force. The major participating authorities and forces involved are the National Command Authorities, the Commanders in Chief (CINCs) of the Unified and Specified Commands, and major force components of the CINCs. The force elements are primarily Single Integrated Operations Plan (SIOP) bombers, reconnaissance forces, and both land- and sea-launched ballistic missiles.

The channel of communications for execution of the SIOP and other time-sensitive operations is from the NCA through the Chairman of the JCS, to the executing commanders. The operational requirement dictates direct-to-the-forces communication on a global basis. These requirements differentiate AFSATCOM from other military and commercial communication satellites. In order to fulfill the AFSATCOM mission, spacecraft must be available at all times, hardened against nuclear effects, and able to provide secure communications links during all phases of conflict.

Development Constraints

AFSATCOM faces several significant constraints in its development. The number of SIOP element (aircraft, ICBM, SLBM) terminals of AFSATCOM is greater than the number of command elements. This created an overriding requirement to minimize the technical complexity of the SIOP force element terminals and rely on the command terminals to carry the burden of system control, command, timing, and information handling. The most important constraint, and the one most likely to influence satellite communications designs of this nature for years to come, is the user terminals. The majority are highly mobile aircraft that are restricted in space, weight, and electrical power available for allocation to a communications system.

Mobility dictated an omnidirectional antenna (one with no gain and therefore no requirement for pointing) to provide upper hemisphere coverage for maximum communications channel availability as the aircraft maneuvers through its flight profile. State-of-the-art UHF radios were adopted to assure force element terminals at reasonable cost. These radios have 100-watt transmitters with highly sensitive receivers. Electrical power available aboard spacecraft, coupled with the requirement for distributing power over several channels in order to meet operational connectivity requirements, dictated a relatively low data transmission rate for reliable multiple-user service. This rate is seventy-five bits of digital information per second, which equates to 100 words per minute. The data is entered into the system for transmission, and received through teletypewriters providing record copy at the average reading rate. An antijam capability, sufficient to beat the demonstrated threat, was also provided.

AFSATCOM has three elements of control involved in assuring reliable service. The elements are (1) spacecraft control—the functions associated with the spacecraft bus; (2) communications mode control—the control of various spacecraft communications modes of operation; and (3) network control—the control of the communications capability serving the various user networks. This is a function of user command terminals, each of which has a control circuit capability that permits internetwork coordination and reallocation of communications resources in event of a spacecraft malfunction.

Future Systems

The AFSATCOM System was designed to meet the threat projected into the 1980s. Any future satellite communications system should be extremely sensitive to projected threats and have the flexibility to evolve against a counterthreat, should one develop. The primary constraints, when assessing solutions to deficiencies projected for the current system, are hardware and operational concepts. Maximum use of existing terminals is essential, especially for the force element terminals. Any change must allow for a smooth electronic and operational transition from the old system with minimum modification, training, and degradation or interruption of service.

Any new system should achieve the balanced goals of electromagnetic and physical survivability, continuity of service, and the ability to evolve with no impact on desired operational concepts except for improvements in operational capability (*e.g.*, global coverage, etc.). Interoperability between and among strategic and tactical communications systems as well as NATO systems should be a goal insofar as it does not degrade minimum requirements for strategic command and control.

Several years ago, the AFSATCOM Program Office began evaluating existing data in order to determine the features needed to defeat the projected threat. Contractor studies were initiated to investigate evolutionary systems

Major Armstrong, a 1965 graduate of USMA, was Director of Space Systems and Plans in SAMSO's AFSATCOM Program Office until his reassignment to the Office of DCS/Research and Development on July 1. He holds a master's degree in aeronautical engineering and has served as a weapon systems engineer at AFLC's Sacramento Air Logistics Center. He also has had two tours in civil engineering, one of them in Southeast Asia.

with sufficient antijam protection. At the same time, it was recognized that any improvement in antijam capability should be compatible with, and should not hinder any improvement in, physical survivability. There should be no "Achilles' heel" in either area. A substantial amount of research on satellite physical survivability has been conducted with support from industry and the Federal Contract Research Centers (FCRCs), specifically Rand, MIT Lincoln Laboratory, MITRE, and Aerospace Corp. A Survivability Analysis Group (SAG) was formed, composed of representatives from these FCRCs and chaired by the AFSATCOM Program Office.

The primary objective of the SAG was to investigate and evaluate physical survivability concepts for AFSATCOM. Although several such concepts already existed in various stages of definition, their relative merits were not agreed upon, and little comparative system-level analysis had been performed. A primary goal of the SAG was to develop new survivability concepts and improve the earlier work. In this respect, the SAG was unique. Previous survivability studies, for the most part, had attempted to apply physical survivability concepts on existing system designs. The SAG, concerned primarily with AFSATCOM mission requirements, identified appropriate physical survivability concepts and developed these into system designs.

The most important conclusion reached by SAG studies was that no single survivability technique is likely to achieve the goal of high survivability. The need to combine techniques and the uncertainties regarding what the Soviets might do leads to a "design-to-evolve" concept for the survivable follow-on AFSATCOM spacecraft system. This approach involves meeting obvious threats in the initial design of the new system but to provide flexibility sufficient to allow the US always to remain one technological step ahead. If the Soviets recognize this capability, they should be discouraged from entering a race they cannot expect to win.

Survivability of the Triad rests on the premise that a technology breakthrough that might counter one system probably will not counter the other two. The ability to use different combinations of survival techniques will provide an AFSATCOM follow-on space system this same advantage.

For these reasons, a new space segment for a follow-on system and minor modifications to the ground segment are being planned. A dedicated spacecraft is proposed. The new system will have improved antijam capability. By handling only the low data rate, critical communications traffic required for command and control of nuclear-capable forces, it can be an extremely hard, survivable system compatible with a deterrent policy. It will use several frequency bands in order to serve the specific needs of different users and, at the same time, defeat the projected jamming threat.

The bombers and other deployed force elements are, for the time being, restricted to UHF radios although research is under way to investigate the feasibility of eventually going to higher frequencies such as super high frequency (SHF) and extremely high frequency (EHF). Uplinks from larger command posts can achieve increased advantage over a potential jammer by using the SHF band. In order to provide the connectivity and worldwide coverage required by the SIOP forces, EHF crosslinks will be used. The single space segment will also facilitate interoperability between essential command elements and have the flexibility to adjust to varying force structures or policies.

Staying with the current SIOP communications capability would deprive our strategic forces of the key element they require to maintain credible deterrence in the future. The AFSATCOM System now being deployed is a giant step in strategic communications. If allowed to evolve, in pace with the threat, into a more survivable system, it will serve future SIOP forces well. ■

EVENING SERVICES

During the Mediterranean campaign, I made a staff visit to the 340th Bomb Group in Corsica. They were flying B-25 mediums and living in tents near the pierced-steel plank runway. Late one evening, while the ground crews were busy readying the airplanes for the next morning's mission, the Luftwaffe staged a surprise attack.

The warning alert sounded, and we dove out of our tents into the nearby slit trenches as the low-flying Ju-88s gave us a pretty good pasting. As the sound of their engines faded into the distance, a tech sergeant stood up and taunted, "Yaaah, but you didn't hit the outhouse!"

Seconds later came the roar of more engines at a very low level, along with the unmistakable whine of falling bombs. In the eerie flashes and earshattering explosions, I quickly observed that the latrine area had been completely clobbered. Then everything became dark and still. After a long and silent interval the sergeant spoke again in an awed tone, "Jeeeeez, I didn't think they could HEAR me!"

—Contributed by Col. Fred E. Bamberger, Jr., USAF (Ret.)

(AIR FORCE *Magazine will pay $20 for each anecdote accepted for publication.)*

THE ELECTRONIC AIR FORCE

Eye in the Sky

BY MAJ. JIM NORTH, USAF, AND CAPT. MIKE KING, USAF

Two instructors from the Mission Training Branch, 966th AWAC Training Squadron, at Tinker AFB, Okla., describe the coordinated operation of flight and mission crews in this account of an E-3A training mission over the Atlantic.

THRONGS of excited, curious visitors stood in line for hours to walk through the strange new arrival at Tinker Air Force Base, Okla.

It was in late March 1977 that the first Air Force operational E-3A taxied up to a welcoming committee. The aircraft's four powerful engines rumbled, and its circular appendage, balanced atop two thin struts above the aft portion of the fuselage, turned ponderously at one-quarter revolution per minute.

The crowd was suddenly silent, and only the muffled clatter of turbine blades could be heard as the engines wound down. A burst of applause met the first crew member as he stepped from the forward entry. The E-3A had arrived.

In the months that followed, the E-3A generated such interest that during liftoffs and landings the crew felt almost every eye at Tinker was glued to the aircraft. And how often did they hear, cruising to and from mission areas, the familiar query from air traffic control, "Edgy 12, what's an E-3A? Is it a military 747?"

These times are almost gone, but the plane hasn't lost its excitement for the crews who fly it and operate its state-of-the-art equipment. The E-3A is not a 747. It's a modified 707-320B, crowned with a radar rotodome thirty feet in diameter and six feet thick.

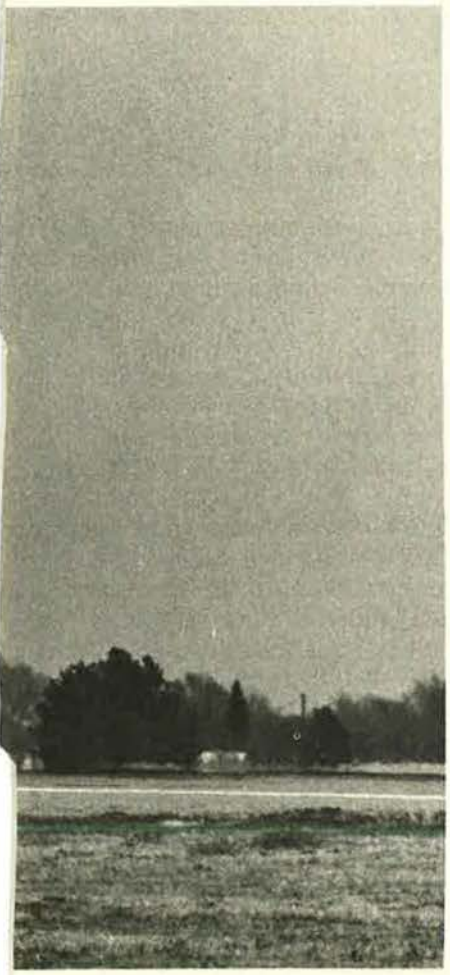
Inside the aircraft are a flight

crew of four and a mission crew of thirteen. During training missions, instructors swell the crew to more than thirty.

In the year since the first E-3A arrived, five more have been delivered. And as each new rotodome appears, the E-3A parking ramp takes on the look of a proliferating mushroom patch.

Before a student flies the E-3A, he trains in a flight or mission simulator that offers a degree of realism heretofore impossible. The flight simulator's air refueling mode, with visual display and six axes of motion, reduces the number of student training flights behind a tanker. It's not uncommon for a novice to smoothly approach the tanker and remain in contact on his first live flight. A pilot receives his initial qualification/instrument check after only four live sorties.

On the sixth training sortie, flight and mission crews fly together for the first time. A few sorties later they begin taking on a distinct group personality and start working as a harmonious unit.



Former TAC Commander Gen. Robert J. Dixon called the E-3A a revolution in command and control, "the most significant single tactical force improvement since the advent of radar."

Mission Over the Atlantic

A typical training mission starts from Tinker AFB, Okla., and proceeds to the Atlantic Ocean, just off the coast of Virginia.

Cleared for takeoff, the pilot slowly advances the throttles to the near-vertical position. He wants to assure equal spool up on all engines. "Engineer, your throttles," he says, as crew members are pushed back into their seats by the acceleration. It's cold today, and the low temperature results in greater engine efficiency; consequently, things happen more quickly, even though the aircraft's gross weight is close to the 325,000-pound maximum.

A mere 6,500 feet after brake release the E-3A reaches 147 knots, rotation speed, and the aircraft nose is pulled up smartly to the fourteen-degree initial climbout attitude. On proficiency training sorties, the figures are 3,800 feet and seventeen degrees.

After liftoff, the E-3A climbs effortlessly to cruising altitude with only a muffled rumble from the four fanjets that produce up to 82,000 pounds total thrust. The flight deck hums with activity—throttle movements, pitch changes, radio calls, navigation aids updating, and checklist challenges and responses. Eyes are rapidly scanning a multitude of instruments as systems come on line.

"Mission crew commander (MCC), this is the flight engineer. You're cleared for walkaround." As the communications and radar technicians complete their checks, other mission crew members closely monitor external temperature and equipment cooling air indicators.

When the climbout checklist is complete, the seat belt signs are extinguished and the tempo in the mission crew area quickens. Crew members secure from takeoff configuration, cooling air lights go out one by one, and soon the interphone call comes from the computer display maintenance operator to the mission crew commander. "You're cleared to power up." Nine situation display console operators check out their equipment, and the airborne radar technician begins radar wakeup and the Identification Friend or Foe/Selective Identification Feature (IFF/SIF) start-up procedures. The radio operator applies power to the mission radio transmitters, and the computer operator loads tapes to integrate radio, radar, and IFF/SIF systems with the computer.

The computer generates console situation and tabular displays, and provides guidance programs for aircraft control operations, including aerial refueling, close air support, air traffic management, intercept, combat air patrol, and air-superiority engagements. It also provides a wide range of manual and automatic air traffic identification functions. For example, it can compare live aircraft tracking data to prestored flight plans and automatically identify the aircraft.

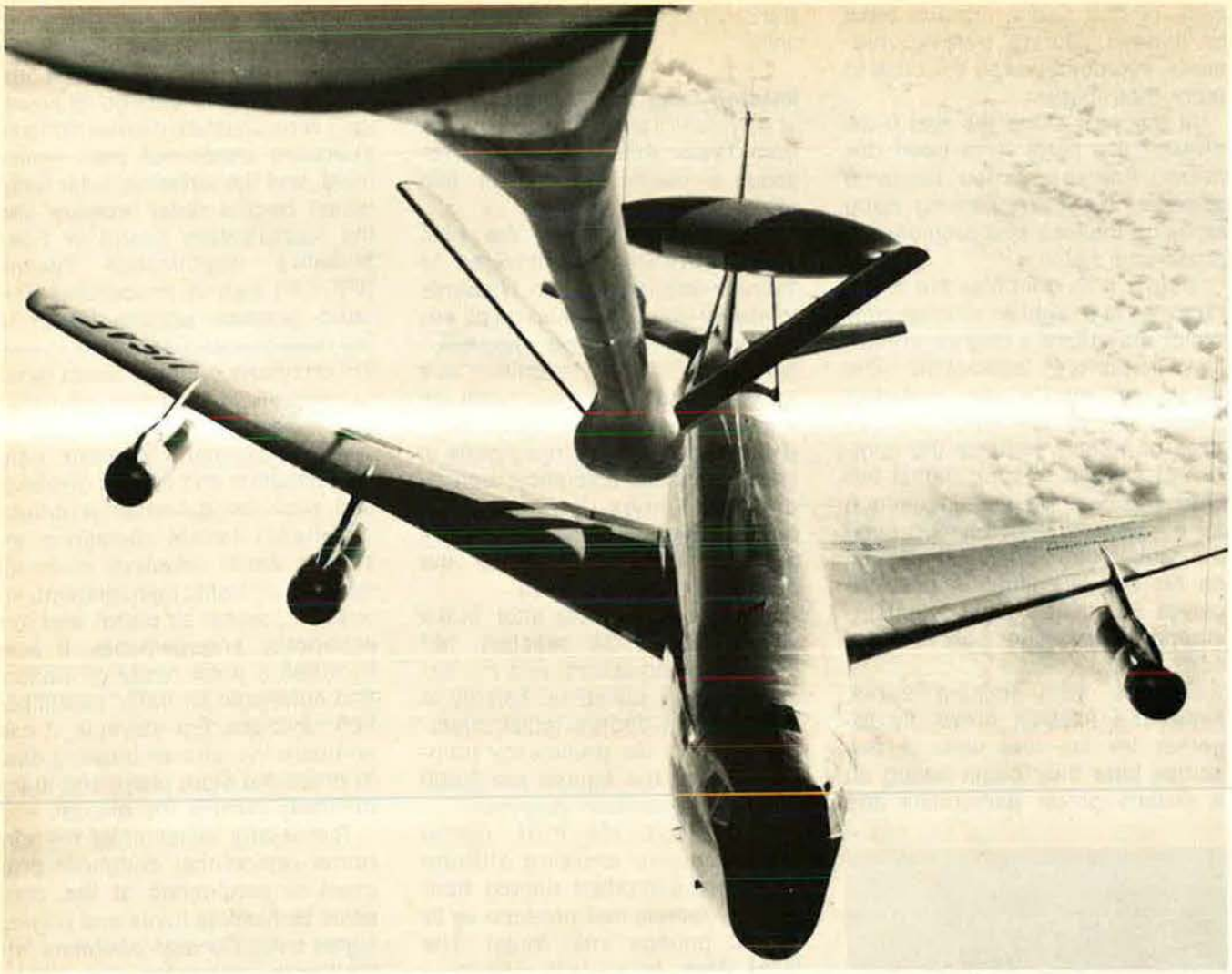
Successful initiation of the airborne operational computer program is announced at the consoles by flashing lights and ringing signal bells. Console operators immediately extinguish the lights, silence the bells, and begin establishing functional displays. After the radar and IFF/SIF "wakeup" sequence, the radar technician turns control over to the air surveillance officer. Step by step, the E-3A is becoming an airborne warning and control system, an "AWACS." Virtually nothing except flight-essential equipment will work without the computers. It is the computers that make the E-3A a combat weapons system.

Meanwhile, the flight crew prepares for refueling. The inertial navigation set, coupled to the autopilot, has been guiding the E-3A precisely to a refueling track where a KC-135 tanker waits. Their brief interlude of quiet is interrupted by a radio call.

"Edgy 12, this is Sage 54. Go standby on your beacon."

"Edgy 12, we show you at 150 nautical miles."

The flight engineer, at the pilot's request, begins the rendezvous



Refueling extends the endurance of the E-3A, which from altitude can provide a real-time picture of more than 250,000 square miles.

and predescent checklist, and the pilot calls the mission commander to advise him that air refueling will commence in approximately twenty minutes.

The navigator locates the tanker on radar, sets up the rendezvous, and makes last-minute changes. He rechecks offset, drift, and turn range because the two aircraft are speeding toward one another at nearly one mile every four seconds. Approaching head-on, and several miles to the left, the tanker responds to the E-3A navigator's command and starts a 180 degree left turn. Soon the tanker has rolled out dead ahead, slightly high, and the E-3A maneuvers into position. Within moments a gentle thump announces the boom has locked into the receptacle over the flight engineer's head.

The E-3A flys smoothly and with great stability in the air refueling envelope. This task is more difficult at light gross weights, however, because the center of gravity approaches the aft limit and aircraft sensitivity increases.

With a transfer rate of up to 6,500 pounds of fuel per minute, the E-3A quickly takes its required onload and returns to en route cruise altitude. The inertial navigation system again does the steering.

Seat belt signs are extinguished, mission crew members unstrap, seats are restored to mission configuration, and the radar system is brought back up. The orbit area is still two hours east, so some of the crew gravitate to the rear of the aircraft for an in-flight lunch. Not even commercial airlines provide a large red-and-white checkered tablecloth.

Approaching the orbit area, the copilot requests clearance and the flight engineer computes speeds, fuel flows, and engine performance rating settings. The pilot slows to the required airspeed, and the navigator programs the navigation computer system to fly a circle, racetrack, line, or figure-eight orbit.

Approaching within UHF radio range of the ground monitoring facility, mission crew members resume their duty stations. The rear compartment becomes a flurry of activity, with hundreds of tiny blinking lights, continuous radio chatter, spinning tapes, and myriad minute symbols flashing and flickering on the scopes.

The mission is to control F-15s from Langley AFB's 1st Tactical Fighter Wing during practice intercept and refueling missions, and to send air surveillance data to the North American Aerospace Defense Command's (NORAD)

Major North is Chief Instructor, Mission Crew Training Branch, 966th AWAC Training Squadron, at Tinker AFB, Okla. He has served as a weapon controller and director in several commands and was Chief Controller, Alaskan NORAD Region Control Center, prior to his present assignment.

Captain King is an Instructor Pilot with more than 3,000 hours flying time, including time in virtually all models of the Boeing -135.

20th Air Division Semi-Automatic Ground Environment (SAGE) Direction Center at Fort Lee AFS, Va. Since AWACS has not been certified as an independent military radar facility, all missions must be monitored by an established military ground radar agency.

On Station

The senior director reports to the NORAD facility on the prebriefed frequency.

"Fertile control, this is Dragnet. Do you read?"

USAF plans call for an eventual inventory of thirty-four E-3As.

"Roger, Dragnet. Fertile reads you loud and clear. Say your position and mode-three squawk."

"We're on the 103-degree radial at forty-eight miles out of Pulaski, squawking mode three, code 2271. Our flight deck call sign is Edgy 12, and they're monitoring this frequency."

"Roger, Dragnet. Fertile has radar contact."

By now the E-3A surveillance officer has established a UHF surveillance net with his counterpart at Fertile. Prebriefed "telling" procedures and priorities are confirmed. Correlation checks on randomly selected radar contacts are made to ensure the E-3A sensor system and Fertile are reporting tracks in the same position. The surveillance officer assigns each air surveillance technician a specific sector. Each surveillance technician then enters his subsector into the computer by keyboard and selects one of six modes of radar operation. Having the operator, not the maintenance technician, directly control radar configuration is another AWACS innovation.

The senior director now receives final confirmation and updates data for the computer. Fighter and tanker schedules are confirmed, airspace reservations double-checked, and the latest weather information received. Prior to the aircraft's takeoff at Tinker, the computer tapes were encoded with as much of this data as possible, but now more up-to-the-minute information is received, and weapons directors enter it directly into the computer through console keyboards. Throughout the entire mission the computer will be updated with on-board sensor and avionics inputs, and manual entries from mission crew members.

"Fertile, Dragnet assumes station at 2015 Zulu."

The surveillance section begins reporting on airborne objects over the Atlantic headed toward North America. Surveillance technicians can reconfigure the radar in their assigned subsectors to provide the best possible detection of penetrating aircraft. They evaluate each flashing sensor return, sort-

ing out aircraft from occasional radar "noise." Each radar return of an aircraft is inserted into the computer, and almost immediately the computer responds by displaying the detected aircraft's speed, heading, altitude, flight size, and position.

All activity is closely monitored by the surveillance officer. At 29,000 feet, the radar horizon is greatly extended compared to that of a ground radar. Soon the ground station has constructed an air picture that would have been impossible before AWACS.

"Dragnet, this is Fertile. Lima Lima Zero One [LL01] flight is airborne at 2025 Zulu."

"Roger. Dragnet has radar contact."

The E-3A radar detects a flight of F-15 Eagles as soon as they break ground. The leader's mode two SIF code is on file in the E-3A computer, which has continuously monitored the airfield at Langley for a matching return. The computer automatically identifies the F-15s and displays this information on a panel tube.

"Dragnet, LL01 flight is entering assigned airspace."

"Roger. Dragnet assumes control."

The activity level for weapons directors increases as the E-3A takes control of the flight of F-15s. The wingman is vectored for separation from the leader and is "tagged" with his own symbology. Each fighter is individually paired against the day's simulated target aircraft, a B-52, which has just entered the airspace from the opposite end.

The weapons director relays computer-generated intercept guidance commands to each fighter, monitors fighters and target on radar to ensure a smooth intercept, and makes necessary corrections.

Soon both fighters have called "Fox one," a simulated air-to-air missile firing, and are vectored for another pass.

The tempo has also picked up in the surveillance section. Special tracking priority is established for the B-52 to ensure that changes in speed, heading, and altitude are immediately detected.

Soon, a second flight of F-15s leaves Langley, and then a third. Now all three weapons directors are busy. The one controlling the first flight vectors the fighters toward a refueling rendezvous. A special refueling guidance program is stored in the computer, allowing the controller to select either a "receiver turn" to a position behind the tanker, or a "tanker turn" to roll out in front of the receiver.

For this "hookup," the weapons director selects a tanker turn. Within seconds computer guidance data is displayed on his console for relay to each aircraft. Halfway through the tanker's 180-degree turn the fighters spot the tanker. As the KC-135 rolls out, the fighter pilots switch to the boomer's frequency. For the weapons director, there's a little magic in the moment.

After refueling, the first flight is vectored back to the intercept training area for more work against the B-52. Simultaneously, the second flight of F-15s heads for the tanker. The intercept-refuel-intercept cycle continues until the last flight of F-15s is "bingo" and ready to return to base.

Mission Accomplished

"Fertile, LL05 flight is RTB."

"Roger. Fertile has radar contact and assumes control."

"Navigator, this is MCC. We'll depart station in ten minutes."

The navigator changes the inertial navigation system waypoints, and the copilot coordinates clearance with air traffic control. Once cleared, the pilot pushes buttons on his inertial navigation system to get the E-3A pointed back to Tinker. The flight crew has already updated en route and terminal weather and recomputed fuel requirements. Final weapons and surveillance coordination is completed by establishing times for telephone debriefings the following day.

The sun, now low on the horizon, sends a golden shaft along the fuselage interior, spilling through the left overwing hatch window as the E-3A banks and heads home.

"Fertile, Dragnet is off station at 0015 Zulu."

Controllers and surveillance technicians pass duty logs to the senior director and surveillance officer, and head aft to the remains of their box lunches. The mission commander receives all mission crew logs and reports, and begins compiling his mission summary.

For the computer and radar technicians, however, the real work is just beginning. A unique feature of the E-3A is its ability to diagnose computer and radar problems in flight. As with nearly everything else on board, the computer is in charge. The diagnostic program runs continuously throughout the mission, pinpointing and displaying sources of malfunctions and instructions for corrective action. Finally, all faults and malfunctions are recorded.

When the E-3A leaves station, computer and radar technicians also conduct an additional maintenance analysis routine, using both manual and computer-generated inputs. The program not only double checks all previous maintenance actions, but checks some system components not included in the automatic diagnostic program. By landing time, a stack of computer printouts will be ready to give to maintenance people during debriefing.

While the technicians complete their chores, the rest of the mission crew relaxes in the knowledge that for them all that remains is the mandatory debriefing.

The flight crew begins its predescent checklist. For mission crew comfort during diagnostic operations, the descent is begun as far as 200 nautical miles from home station.

Radar vectors now place the E-3A on final ILS approach to Tinker.

Shortly thereafter, a squeak signals the main gear has touched down after nearly twelve hours in the air.

Following maintenance and crew debriefings, the sortie will be complete. Months of intensive training and long hours of mission planning have ended in another successful AWACS training flight. ■

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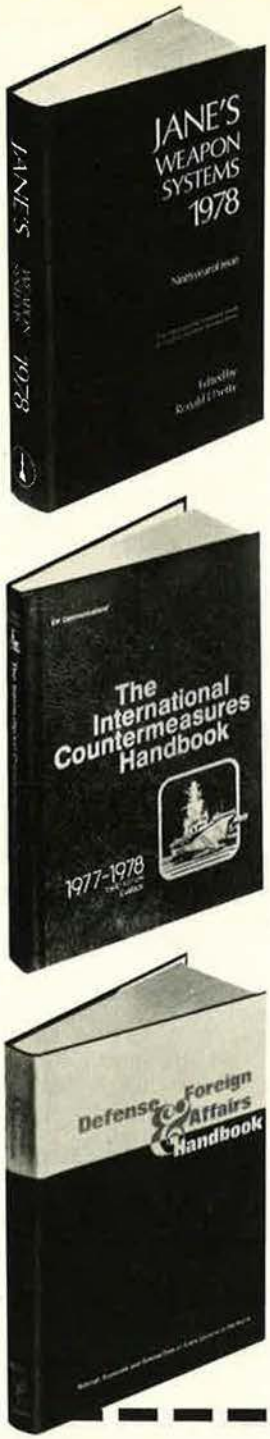

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THE ELECTRONIC AIR FORCE

ECM: A Look Ahead

By COL. BERT HARBOUR, USAF

The effectiveness of air operations lies in electronic countermeasures (ECM) and the future of ECM lies in power management systems, with increased reliance on software-managed techniques coupled with extremely high energy sources.

MANAGEMENT, traditionally, has many definitions. However, in the course of air war, management is perhaps best defined as the ability to get things done with aircrew members through a multitude of people; or, better put, the ability to control a situation as it develops to the best interest of the multitude and the aircrews involved. Inherent in that definition is the assumption that information flow is unrestrained. Without information, there is no need for management, for, indeed, there is no management.

What is known since man's appearance on this globe involves human participation. No matter how sophisticated the technology or how numerous the weapon systems, human management will continue to be involved. Further, the quality of human management will be dictated by the information available and the time constraint dictated by the situation.

When one reviews the situation in the European theater and notes the amount of sophisticated equipment of our Warsaw Pact adversaries, there is a tendency to dwell on the awesome task of information-gathering and decision-making confronting our forces, from aircrews to field commanders. However, we must not overlook the fact that the other side has exactly the same tasks. War is a confusing task; those who are the least confused have the greatest chance for survival and ultimately victory, and that's what information systems are all about.

Lessons of Vietnam

With the advent of radars in World War II, the "what direction, how many, and when" information system a commander needed for defense against attacking aircraft became available. Thus, the information an enemy wanted to keep secret came by radar. Confuse the enemy radar information source and you confuse the enemy, and your chances of survival and thus victory are greatly enhanced.

While our World War II allies in Great Britain most effectively used radar for defensive purposes, they also confused the developing German radars with chaff corridors and simple noise jammers, and gave birth to the wonderful and growing world of electronic countermeasures (ECM), counter ECM, counter-counter ECM, etc., etc. Today, ECM is good and getting better of necessity, because information necessary to the survival of fighting forces is getting more and more difficult to confuse.

In the post-World War II and Korean War years radar information systems progressed steadily. Development of monopulse, frequency modulation, and pulse-doppler systems appeared, growing more and more sophisticated and expensive. However, ECM systems successfully avoided significant technical improvements except for studies of the requirement, which concluded we didn't understand the threat well enough to develop the ECM. It took the Vietnam War to fully renew our awareness that the enemy's information systems—his long-range acquisition radars—contributed monumentally to our aircraft loss-rate in the air war.

In this environment we relearned that basic noise jammers were essentially a one-on-one detractor; that is, one jammer per enemy radar for maximum effectiveness. A game of numbers; more radars and more jammers, and so on. ECM was getting better and more expensive, but "expensive" was far outstripping "better." Fortunately,

The EF-111A, with its high radiating power, is expected to be the most powerful and sophisticated airborne electronic warfare system for years to come.

by 1970, we recognized that "better" and "expensive" must be kept on a par and technology of higher power levels, steerable antennas, and modulation techniques that would allow one aircraft to jam multiple radars became a reality. All this was good; all this to deny or to confuse the enemy information and provide a higher probability of survival and victory for us. "Better" was maintaining par with "expensive."

US Navy EA-6B Prowler aircraft from Tactical Electronic Warfare Squadron 134, another step toward the power management systems that the author foresees as ECM's future.

Today's need for information flow is paramount to the Warsaw Pact nations. Anyone vaguely familiar with the growing threat in Eastern Europe has only to consider the increasing numbers of netted radars to recognize the value the Pact places on getting information concerning our attacking forces in the event of hostilities in that theater. Netted radars permit the exchange of information between radars and thus form a counter to radar jamming. The Pact numerical superiority in aircraft, tanks, men, etc., as reported in most periodical literature, should quickly convince one that denying these potential foes the information from their netted radars is paramount, and why ECM must get better. We must now deal with all electronic communications systems, not just radar. ECM intentionally interferes with the interaction between electronic communications devices that radiate and/or receive information. Deny the enemy the ability to receive, sort, and disseminate any portion of that information and the postulation that ECM is good and getting better comes alive.

In Vietnam, the enemy watched our forces on his long-range radars from about gear-up through air refueling and initial penetration of his airspace. Simply put, he knew when we were coming, where we were coming from, how many of us there were, and where we were going. Not much surprise there. In fact, the time element involved from gear-up through refueling and initial penetration of his airspace provided for a leisurely response on the enemy's part. And why? Because he had the information he needed to be ready. Deny that or make the accuracy of the information questionable, and the human element of battle, already tense and ner-

Colonel Harbour is EF-111A System Program Director at Aeronautical Systems Division, Wright-Patterson AFB, Ohio. He has served as an Electronic Warfare Officer in B-52 and B-58 wings and at SAC headquarters. He flew 100 missions in EB-66s in Southeast Asia and has had assignments on the Air Staff and as a staff assistant to the Deputy Director for Test and Evaluation, Office of the Secretary of Defense.

vous, is a cinch to commit errors.

Of course, when you have the element of surprise, the aircrew and aircraft have a greater chance for survival. After all, the real game for the crew member is getting bombs on target and getting the aircraft home to fight another day. By providing the crew member a better chance to get home, ECM indirectly provides substantially higher strike sortie levels through reduced aircraft losses. By reducing aircraft losses, the ECM gets less expensive. And, lastly, since bombs-on-target is the game to the aircrew, ECM greatly increases his confidence that he (and maybe soon she) are not targets in a shooting gallery and allows them full concentration on the job at hand.

ECM in Transition

The world of ECM is in a transitional phase that is, in reality, its steady state. ECM that exists today is a legacy of stop-and-go efforts generated by sporadic scares, quick reaction capability programs, and spurts in technology, with the resulting proliferation of diverse equipments. Although electrons, the stock-in-trade of ECM, are completely reusable, the equipment to make the ECM electrons flow is very susceptible to obsolescence. Double-digit inflation has driven up both weapon systems' development and acquisition. It's very difficult for the aircrew member and management to accept ECM-dedicated aircraft as weapons platforms that increase the confusing task of the enemy just as the bomb-carrying, cannon-shooting attack aircraft do. ECM is difficult to visualize and its effects difficult to measure. But who said it was going to be easy?

We and our potential enemies have paid a heavy price for information systems (many, and netted, radars) only because we and they believe the return value in information is well worth its cost. Unconstrained, the radar information system investment pays a handsome reward. Make no mistake about it—electrons do kill because they provide information that puts a missile with a name on it at the right place, at the right time.

ECM is getting better, but at a price. To be sure, if we are able to counter the enemy information system today, it is certain he will up the ante by technology and through ever-more-sophisticated tactics. Our reaction in the past has been to go along with the ante, but this is not good enough. We must get out in front just as we do with ships, guns, planes, and tanks. To do this we must accept ECM weapon systems as full-fledged partners with the bomb-carrying, cannon-firing weapon systems in warfare. So long as we and our adversaries depend on radar information systems, ECM has to be good and must get better and will be expensive.

ECM must become a part of our synergistic force of multiple systems performing diverse missions, each enhancing the other. How can we keep "better" on a par with "expensive"? The cost of ECM systems can be reduced by commonality of equipment through joint service ventures in research and development and procurement. That philosophy must persist through good common-sense management. While we don't want ECM to be expensive, we cannot afford to let it be cheap. ECM *can* get both better and less expensive.

What's Ahead?

Now that we know where we are, where do we go from here? Generally speaking, a crystal ball is not required to sense the direction of better ECM. The United States has worldwide commitments. Therefore, we must be able to force data-rate-reduction (confusion) in all enemy weapon systems. Counters to command control and communications and netted environments including acquisition, Ground Controlled Interception (GCI), and terminal radar information systems in the tactical situation worldwide are a must. This means we must deny the enemy the use of his electronic information systems and force him to the basic walk-and-talk communication level.

The wave of the ECM future will be power management systems. As the radar information systems proliferate and become more sophisticated, applying ECM power at the right time and right place will be essential. The threshold of ever-expanding technology is upon us. The Navy's EA-6B and the Air Force's EF-111A can provide the platform from which this iterative process will flow and make what is now good ECM get better at a reasonable cost.

The direction that new developments will take is dictated by fiscal and physical constraints and is, therefore, generally predictable. In order to provide maximum degradation of hostile command control and communication-netted defense environments and to ensure effective interruption/reduction of data rate flow, tactical ECM systems for the foreseeable future will increasingly rely on software-managed techniques coupled with extremely high energy sources. Rising costs and increasing technological complexities dictate that joint efforts and common equipment, within the Department of Defense, are an absolute requirement to ensure timely acquisition of the best possible weapon systems while precluding accusations of military profligacy.

In any event, future ECM will be expensive. However, it will be less costly to spend "now" dollars to counter future information systems than to study the problem, then wait and spend tomorrow's dollars to buy ECM systems that counter yesterday's information system techniques. ECM will get better if we believe it must. ■

Airman's Bookshelf

Memoirs of an Insider

Silent Missions, by Vernon A. Walters, Doubleday & Co., Inc., New York, N. Y., 1978. 654 pages, including index. $12.95.

Like his life, Walters's book starts quietly and builds up to a crescendo. The result is an extremely interesting account of an insider at some of the turning points of history.

Walters was on the scene when the CIA was brought into the Watergate coverup. He was in Paris when the US opening to China was prepared. And he was with former Secretary of State Kissinger when the secret negotiations for a Southeast Asia peace were going on.

In this book of recollections, Walters tells of experiences as a translator and intelligence officer that began when he enlisted as a private before World War II. He retired in 1976 as an Army lieutenant general.

Along the way he witnessed some of the grand gestures and petty acts of American and foreign leaders, from Eisenhower and de Gaulle, to Khrushchev and North Vietnam's Le Duc Tho.

Readers will be familiar with most of the events—some seemingly as current as yesterday's newspaper. But the book provides a new perspective, and insights on the principal players.

Through it all, Walters comes through as a loyal military officer who would not let his personal political beliefs interfere with a strong sense of duty and integrity.

To keep the CIA out of the coverup attempt on Watergate, Walters had to threaten to resign on several occasions. Walters, deputy director of the CIA at the time, was awarded a special citation for his conduct during this trying period by then-CIA Director James Schlesinger.

Walters writes of the episode:

"To this day, I believe Mr. Nixon harbors the idea that someone in the CIA tried to do him in, or acted in some way against him. He is wrong in this belief. The CIA simply could not act against any President. The people in the organization simply would not tolerate it."

Walters also discloses the ticklish diplomacy used to hold secret talks between Kissinger and the North Vietnamese government in Paris.

Walters arranged for these talks, and later, for the secret talks with the Communist Chinese. By President Nixon's order, the talks were conducted without the knowledge of the State Department or the US Ambassador in Paris.

The success of Walters's career was grounded on his proficiency in French, Spanish, Italian, and German, acquired when he lived for ten years in Europe as a boy. When he enlisted in the Army in May 1941, he gravitated to intelligence and translator assignments. This gave him an opportunity to meet many of the world's military and civilian leaders during World War II.

He served as a liaison officer in Italy with the Brazilian forces in that war and became friends with two future Brazilian presidents.

As an aide to Gen. Mark Clark he met General de Gaulle and Prime Minister Churchill.

Shortly after the war, he was with President Truman at the signing of the Rio defense pact in Brazil.

Walters was with Nixon in 1958 when a Venezuelan mob stopped their car and began beating out the windows with clubs and stones. The incident is well known, but Walters adds an interesting sidelight.

When Walters and Mr. Nixon returned to Washington, President Eisenhower and a large crowd met them at the airport.

In Walters's words: "The next day a high government official took me aside in the White House and said, 'I think the world and all of Dick Nixon, but tell me, how did he really behave when they were trying to get at him in the car?' This man was close to the upper level of government officials, and I was irked that he would ask me such a question. I replied stiffly, 'All I can tell you is that as an American, I was proud of the Vice President of the United States.' "

Walters accompanied Arthur Schlesinger, an aide to President Kennedy at the time, when he called on President Antonio Segni in Rome and asked Segni what he personally thought of the major Italian political leaders. Walters reports that when Segni hesitated, Schlesinger repeated that the information was for President Kennedy alone. The information later was made public by Schlesinger, which caused demands for Segni's resignation.

Walters's portrayal of the North Vietnamese and their methods of bargaining will be one of the most interesting passages for Southeast Asia veterans. In Walters's words:

"I can never forget the day in September 1971 when I walked up the steps of their villa with Kissinger and saw Le Duc Tho standing at the head of the steps. He smiled triumphantly down at Kissinger and said, 'I really don't know why I am negotiating anything with you. I have just spent several hours with Senator McGovern, and your opposition will force you to give me what I want.' "

For military men, as well as for diplomats and intelligence experts, Walters's fascinating memoirs provide an important inside look at US history and the men behind the events.

—Reviewed by Bonner Day, Senior Editor.

Romantic Realist

Autobiography of Values, by Charles A. Lindbergh. Harcourt Brace Jovanovich, Inc., New York, N. Y., 1978. 423 pages with maps, photos, genealogy, select bibliography of the author's writings, and index. $12.95.

In December 1926, Charles Lindbergh carefully filled out a three-page application for active duty with the Air Corps to begin "on or after May 1, 1927." Flying the At-

lantic had been on his mind for months, but it now looked as if he would not be able to raise the money he needed.

After two emergency parachute jumps that fall, Lindbergh had had enough of flying the air mail in decrepit DHs. He had just been promoted to the rank of captain in the reserves. If he could not go to Paris, the one thing he wanted to do the most was to serve as a pursuit pilot. The Air Corps evidently did not need his services that spring. Lindbergh, of course, managed to finance the Atlantic flight.

This sidelight into what might have been is not mentioned in Lindbergh's last book. It is not an autobiography in the usual sense, but a series of essays in which he recounts how his beliefs and values evolved over a lifetime. The results are uneven and sometimes repetitious. Death intruded before Lindbergh could polish his manuscript. Meticulous to the end, he wondered if it were worthwhile publishing. William Jovanovich, his publisher, agreed to edit and organize various drafts into a dozen or so themes. The intricate editing is admirably done.

Lindbergh was a restless spirit, an intellectual nomad forever looking for new realms to explore. The airplane was his magic carpet. In 1937, he flew to India to study "mystical phenomena." He prepared for his trip by reading reports on fakir and yoga practices. In his last years, Lindbergh was intrigued by the discovery of a small, primitive tribe still living in the stone age in the Philippines. Sleeping on the ground beneath the tribe's cave in a rain forest, he felt he was in a "twentieth-century Garden of Eden."

Lindbergh was a very complex man. He was both a practicing romantic and the most practical of realists. People unable to reconcile these two sides of his enigmatic personality have often misread Lindbergh and his motives. In his book he often alludes to "the conflict between values of instinct and intellect that was carried through my entire life."

Relying on instinct, Lindbergh never hesitated to shoot the rapids of danger or controversy if he thought it would serve some good purpose. At the same time, he had a strong intellectual bent for logic and consistency, qualities that could backfire in situations influenced by other than purely rational forces, such as World War II. Once committed, it was extremely difficult for him to change course or admit defeat.

Even death itself is regarded as being anything but a defeat in this book. "Man feels instinctively that something beyond life exists for him—a continuation, a direction," Lindbergh writes. For him, the answer lies in "an immortal life stream." The individual may die, but the species lives on. Death is not the end but a transformation. The book ends on this cosmic note: "After my death the molecules of my being will return to the earth and the sky. They came from the stars. I am of the stars."

Considering the attacks and pressures Lindbergh experienced over the years, his book is remarkably free of rancor and recriminations. Only a few pages are devoted to the kidnapping and murder of his first son, who was "twenty months old, blond, blue-eyed, and just beginning to talk." The man convicted of the crime is never referred to by name. Lindbergh is satisfied to write that the evidence against him was "overwhelming."

Lindbergh's vain effort to keep the country out of World War II receives scant attention. "America First" as an isolationist group is not mentioned, nor are the names of its more prominent members such as Gen. Robert E. Wood. Lindbergh describes his own role as that of "an independent citizen." The charges made during his campaign that he was an anti-Semite and Nazi sympathizer are ignored. Lindbergh is evidently content to leave the final verdict to history.

He does recall that "the Royal Air Force was inadequately equipped and the French Air Force almost nonexistent," at the time of the Munich crisis in 1938. He believed then, as did most Allied leaders, that war would have meant the swift destruction of London and Paris. Lindbergh, so the story goes, had been brainwashed by the Germans into making frightening estimates of their air might. Judging from this book, his alarm stemmed from a real sense of personal responsibility for the ominous way in which aviation had developed.

"I found myself symbolizing aviation," Lindbergh writes of the aftermath of his flight to Paris. A decade later he saw aviation as "advancing the destruction of civilization." He felt impelled to use his influence to warn of the dangers of aerial warfare. Ironically, his first warning was addressed to the Germans.

"We, who are in aviation, carry a heavy responsibility . . . ," Lindbergh said in a Berlin speech on his first visit there in 1936. "Our libraries, our museums, every institution which we value is laid bare to bombardment. Aviation has brought a revolutionary change to a world already staggering from changes. It is our responsibility to make sure that we do not destroy the very things we wish to protect."

The Germans did not appreciate the advice. They notified Maj. Truman Smith, the US Military Attaché who had arranged Lindbergh's visit: "He can see anything he wants but no more speeches!"

Oddly enough, Lindbergh overlooks this speech in his book. From aviation to conservation, he crusaded for many causes but never his own. He turned instead to "the core of life" for serenity and strength. "One should return frequently to the core, and to basic values of the individual—to natural surroundings, to simplicity and contemplation," he advises.

Charles Lindbergh, it turns out, was always what they said he was—a Lone Eagle. It would seem right somehow that he should be out there soaring in some distant galaxy. Who can say that he isn't?

—Reviewed by Raymond H. Fredette, who is writing a biography of Lindbergh.

New Books in Brief

Aces, Pilots & Aircraft of the 9th, 12th and 15th USAAF, by David Weatherill. More than 200 black and white photos from the pilots' own collections accompany this biographical survey of American fighter aces and pilots who fought over the Mediterranean and Europe during the war. Includes sixteen pages of color photos and paintings of aircraft and markings. Lists aces, squadrons, and groups of the 9th, 12th, and 15th. Bibliography. Kookaburra Technical Publications, 214 Kenmark Road, Newark, Del. 19713, 1978. 144 pages. $18.95.

Blue-Collar Soldiers? Unionization and the Military, edited by Alan Ned Sabrosky. The editor admits the

Airman's Bookshelf

issues are complex, the arguments on both sides many, and the consequences uncertain. But if one seeks a balanced understanding of military unionization, this is the book to read. It is the product of the Foreign Policy Research Institute's conference on military unions and includes papers on the issues, the case for and against, implications from the European experience and US public-sector unions, a sociological analysis, and excellent introductory and concluding remarks by the editor. Index, appendices. Westview Press, 5500 Central Ave., Boulder, Colo. 80301, 1978. 168 pages. $14.50.

Bradley: A Soldier's Story, by Gen. Omar N. Bradley. The author had one purpose in writing this book: to explain how war is waged in the field. It is midway between the conference table and the foxhole that strategy is translated into battlefield tactics, where the cost of rivers, roads, and hills is calculated in terms of guns, tanks, and tonnage, and in lives and limbs, he says. Here is his personal account of the conflicts, personalities, and behind-the-scenes maneuvering from battlefield trenches to high-level strategy sessions. Maps, photos, appendices, index. Rand McNally & Co., Chicago, Ill. 60680, 1978. 618 pages. $10 hardbound; $6.95 paperback.

Cowboys and Indians, by Jeff Ethell. Here is the story behind Keith Ferris's stunning, huge mural of B-17s that graces the National Air and Space Museum's World War II hall. Includes information on how the mural was researched and painted, plus details on the 303d Bomb Group the mural depicts. Available from the author: 2403 Sunnybrook Road, Richmond, Va. 23229. 16 pages. $1.25 plus postage and handling.

Flying IFR, by Richard L. Collins. Everything you need to know about flying on instruments in light planes is in this volume by the author of *Flying Safely.* Includes exercises and common-sense suggestions to take you through an actual IFR flight. Index. Delacorte Press/Eleanor Friede, New York, N. Y., 1978. 272 pages. $9.95.

Marine Corps Aviation: The Early Years 1912–1940, by Lt. Col. Edward C. Johnson, USMC. After only two hours and forty minutes of instruction, the Marine first lieutenant soloed. His brief flight in the summer of 1912 marked the beginning of Marine Corps aviation. Here in text and pictures is the story through 1940. Photos. History and Museums Division, Hq. US Marine Corps, 1977. Available from the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402. 106 pages. $1.70.

The Observer's Book of Aircraft, by William Green. This is the twenty-seventh edition of this highly popular pocket reference that describes the world's aircraft currently in production, under test at press time, or scheduled to be tested during 1978. Each entry includes a photo and three-view drawing plus country of origin, type, powerplant, performance, weights, armament, status, notes, and dimensions. Frederick Warne & Co., Ltd., 40 Bedford Square, London WC1B 3HE, England, 1978. 253 pages. £1.25.

The Observer's Spaceflight Directory, by Reginald Turnill. The world's incredible space adventures from Sputnik to the moon and beyond are described in this small-size volume. Includes space logs from US and Soviet flights, space programs around the globe from Australia and Indonesia to the US and Russia, plus details on astronauts. Photos, drawings, and lists of manned, unmanned, and planetary flights. Index. Frederick Warne & Co., Ltd., 40 Bedford Square, London WC1B 3HE, England, 1978. 384 pages. £7.50.

On the Shoulders of Titans: A History of Project Gemini, by Barton C. Hacker and James M. Grimwood. Because Gemini was the middle child, born between America's first steps into space and the spectacular Apollo series, its accomplishments are less well known. Still, they were many: first astronaut-controlled maneuvering in space; first rendezvous in space; first docking of one spacecraft with a propulsive stage and use of that stage

to transfer man to high altitude; first extended manned flights of a week or more; first extended stays of man outside his spacecraft; first controlled reentry and precision landing; and more. NASA, 1977. Available from the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402. 625 pages. $8.25.

The Secret of Stalingrad, by Walter Kerr. How the Russians could grind the Nazi drive for Stalingrad to a halt in less than a year was incomprehensible. The massive Russian counteroffensive took the whole world by surprise, and speculation continues to this day since German documents were destroyed after the war and the Russians have kept their secret. After ten years of research, the author sheds new light, arguing that the battle was won by a masterful deception that led to a deepening rift between Stalin and his allies and brought the world closer to the cold war. Bibliography, index. Doubleday & Co., Inc., New York, N. Y., 1978. 274 pages. $10.

Signal: The Years of Triumph, 1940–1942, edited by S. L. Mayer. Hitler's wartime picture magazine was a self-puffing but professionally done periodical printed primarily for neutral and subjected peoples. During and after the war, *Life* Magazine imitated many *Signal* features. This book is a collection of editions published during Hitler's most successful years. They provide an enduring social document of life in Europe under the swastika. Bison Books, Inc., Englewood Cliffs, N. J. 07632, 1978. $12.95.

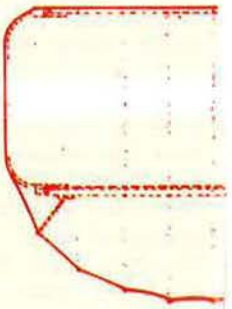
United States–Latin America: A Special Relationship?, by Edmund Gaspar. Will Latin America maintain traditional cultural and economic bonds with the West or become a leading force in the emergence of the Third World movement? This and other questions are explored in this volume. American Enterprise Institute for Public Policy Research, 1150 17th St., N. W., Washington, D. C. 20036, 1978. 90 pages. $2.75.

Wilmot's Space-A Guide to Europe for the Military Traveller, by J. Charles Wilmot. A step-by-step, complete guide to lead readers by the hand to Europe and back, taking full advantage of their Space-A (space-available) privileges. Published by and available from: J. Charles Wilmot, P. O. Box 12842, Tucson, Ariz. 85732. 100 pages. $4.95 plus postage.

World Armaments and Disarmament: SIPRI Yearbook 1978, Stockholm International Peace Research Institute. Ninth edition of this annual reference that details major quantitative and qualitative changes in the world's arsenals through 1977. Topics include nuclear weapons development, new approaches to disarmament, nuclear arsenals, threats of nuclear proliferation, the military use of outer space, world military expenditures, international arms trade, and disarmament and development. Published by Taylor & Francis, Ltd., London. Also available from Crane, Russak & Co., Inc., New York; N. Y., 1977. 518 pages. $35.

—Reviewed by Robin Whittle

75TH ANNIVERSARY OF POWERED FLIGHT



1978 marks the 75th anniversary of powered flight.

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In commemoration of these two important events, AIR FORCE Magazine is planning a very special anniversary issue.

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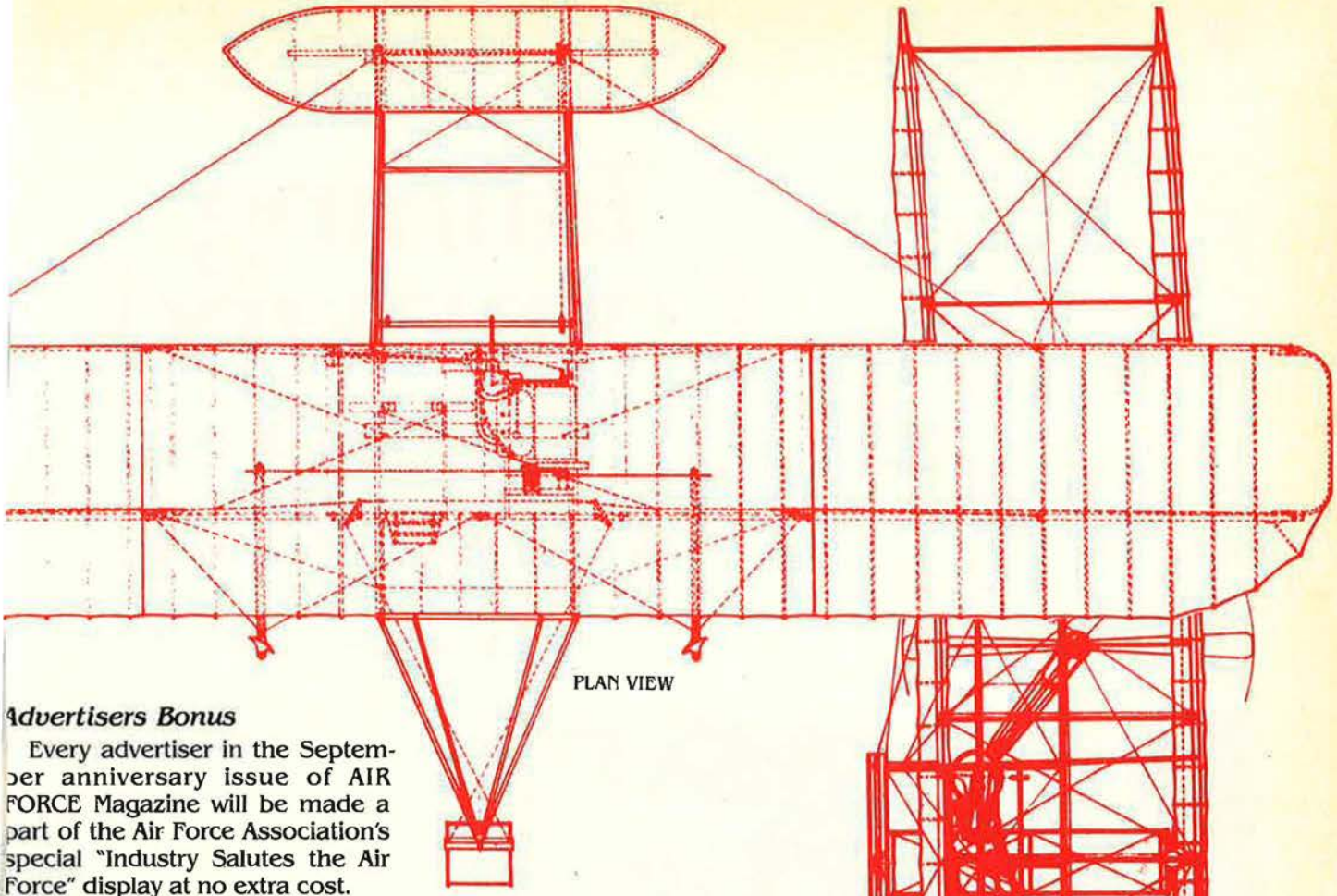
US AIR FORCE ANNIVERSARY ISSUE



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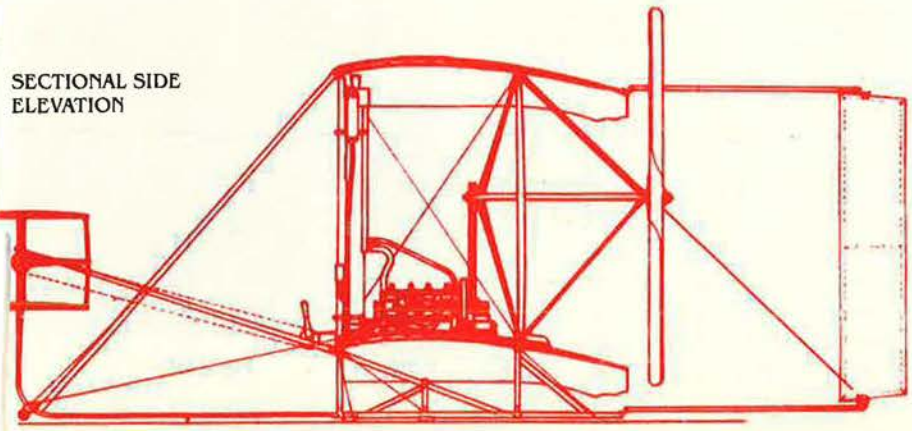

SECTIONAL SIDE ELEVATION

FRONT ELEVATION

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Training Command Turns Thirty-Five

BY BOB REED

WHEN Gen. Henry H. "Hap" Arnold, Chief of the Army Air Forces, created the AAF Training Command thirty-five years ago, on July 7, 1943, he wasn't pulling a brand-new organization out of a hat.

Two previously existing commands were combined in the process —the Flying Training Command (FTC), with three Training Centers; and the Technical Training Command (TTC), made up of five Districts. So the new organization, today known as Air Training Command, fell heir to more than a million people assigned to 600-plus training installations where the vast numbers of flying crews and technicians needed in World War II were being turned out.

The prewar (1939) training goal had been 300 pilots and 30,000 technicians annually. By 1941, that had skyrocketed to 30,000 pilots and 600,000 technicians a year. It soon became apparent that if all training elements were to be administered and coordinated effectively, responsibility had to be centered in one command reporting directly to Air Forces headquarters. General Arnold selected Maj. Gen. Barton Yount, who had headed Flying Training Command, to run the new, consolidated Training Command.

These airmen were among the 600,000 students trained each year in World War II at the 600-plus installations later consolidated under the new Air Training Command.

The names of early training fields and schools like Blytheville, Keesler, Tyndall, and Williams conjure up differing memories to the hosts of Americans who passed through them. Some were dust bowls; others were swamps. For one draftee, a desolate spot in Oklahoma filled both bills. "All I remember about that godforsaken place," he recalled, "was wading hip-deep in mud with dust blowing in my eyes."

When ATC came into being, the philosophy of training was changing dramatically. The time previously available for extensive classroom instruction was no longer affordable. Almost overnight, three-dimensional or actual equipment was placed in classrooms for students to work on; student practice replaced formal lectures; and trainees searched technical orders for answers instead of just asking questions. In short, the emphasis switched from students *being taught* by an instructor to *learning*, largely through self-teaching. In 1950, ATC would dub this concept (with refinements) as the "developmental approach" to training, and

The T-28 was the undergraduate pilot trainer in the '50s and, modified, a COIN fighter-bomber in Vietnam.

Above, student and instructor in a T-38 at Williams AFB, Ariz. Left, an avionics maintenance student at Keesler AFB, Miss. Below, women recruits in basic training at Lackland AFB, Tex.

apply it to instruction command-wide.

The end of the war brought a decline as dramatic as the buildup had been. By 1947, the force of experienced instructors had tobogganed to the point that ATC tried to compensate by shifting to broader technical training, often grouping several courses into one.

Then, in 1948, came the Berlin Airlift and a demand for more flying and technical personnel, followed by a simmering down until June 1950 when the pot boiled over once more —this time in Korea.

When the annual pilot and technician goals mushroomed to 7,000 and 37,000 respectively, ATC put its six schools on multiple shifts and added a seventh at Amarillo, Tex. At the same time, the command was putting 40,000 enlistees through "basic" while receiving 3,500 new recruits daily.

These strains proved so great that ATC set up three major subcommands: The Flying Training Air Force, referred to familiarly as FLY TAF, at Waco, Tex.; the Technical

Before joining Air Training Command's Office of Information as an editor in 1971, Bob Reed produced and directed several national radio and television programs, including, at age twenty, the first "Major Bowes' Original Amateur Hour" shows on the NBC radio network. He also directed the first radio broadcasts of "Name That Tune" and later aired his own radio program on Washington's WRC. He also has headed programming and production for San Antonio's WOAI radio and TV stations and was a civilian information officer for the 433d Tactical Airlift Wing. His reminiscences of radio's "Golden Era" are expected to be published soon.

Training Air Force at Keesler AFB, Miss.; and the Crew Training Air Force, or CREW TAF, at Randolph AFB, Tex.

Meanwhile, in 1946, ATC's headquarters shifted from Fort Worth, Tex., to Barksdale AFB, La. Later, in 1949, it moved again when Strategic Air Command took over the base. For a while it looked as if it were headed for Randolph, but that idea got sidetracked and on October 17, 1946, the headquarters opened for business at Scott AFB, Ill.

The next few years were difficult ones. Recognition of how "people" programs benefit morale and retention was yet to come—eighty percent of both skilled and unskilled airmen were getting out at the end of their first enlistments. During those trying times, the majority of ATC technical training was handled by schools at Amarillo, Sheppard, Keesler, Scott, Lowry, and Chanute AFBs. From Chanute, mobile training units fanned out worldwide to instruct men at their home bases, while other expert instructors familiarized combat command technicians, also on site, with new aircraft engines and other equipment.

As noted, most ATC training had been geared whenever possible to producing technicians with broad backgrounds. But by 1955 this approach had to be modified, because of the huge turnover of skilled craftsmen. ATC shortened many of its courses, giving students "hands-on" training earlier. Later, if an airman signaled at least a tentative decision to "go for twenty" by reenlisting, he was given advanced training. ATC still follows this approach.

ATC headquarters finally made it to its current home at Randolph AFB, Tex., in June 1958. For a time, student volume wasn't heavy. But then the war clouds began to thicken over Vietnam. At first the Air Force had no trouble manning its few combat support units there. But the Gulf of Tonkin incident in 1964 forced ATC to shift undergraduate pilot production into high gear, because from then until 1967 more than 13,000 World War II-trained pilots would be retiring.

ATC met the challenge by turning out almost 23,000 fixed-wing and helicopter pilots from 1965 to 1971. When, in July 1965, the Air Force decided to recruit 88,000 new airmen (to be followed by another 107,000 the next year), ATC once again placed its five Technical Training Centers on six-day, round-the-clock schedules. The result: By the end of June 1966, 145,000 technicians had been trained.

Last year the Air Force elevated the position of ATC commander to the grade of general, with Gen. John W. Roberts serving as the first four-star commander. The command will continue to administer all basic Air Force military, technical, and flying training at its fourteen bases and five Technical Training Centers. It is also responsible for the Officer Training School, a Noncommissioned Officer Academy, recruiting, survival training, and the Community College of the Air Force.

In addition, after an Air Force realignment in May, ATC assumed responsibility for Air University, headquartered at Maxwell AFB, Ala. The consolidation of AU's vast educational activities with ATC's training programs places all formal Air Force academic education and training within a single command.

Over the years, ATC training has kept abreast of technological advances by developing and introducing countless new methodologies and techniques. These have included self-paced and programmed instruction, computer-assisted teaching, and videotaped lessons.

Many of these and other innovations would have been considered "far out" when ATC was born thirty-five years ago. But it's a safe bet that thirty-five years hence, on ATC's seventieth anniversary, the chronicler of the command's history will be writing about training hardware and techniques that are hardly conceivable today. ■

REMARKABLY PILOTED VEHICLE?

Your excellent article about unmanned, Remotely Piloted Vehicles *("RPVs Are Fearless," by Maj. Joe Tillman, April 1978 issue)* reminded me of an actual incident that occurred during the Vietnam War.

A USAF RPV, in which I had an official interest, was hit far up over North Vietnam and went into a gentle glide toward the sea. Major Tillman's bird with "nerves of steel" and no "expensive life-support gear" was going down.

Then, some minutes later, we received a message from the US Navy operating from Yankee Station: Our bird had ditched in the Gulf of Tonkin.

Eureka, it was safe! Then came, from the Navy, the *pièce de résistance*: "And, the pilot was floating nearby safe in his dinghy."

No further comment.

—Contributed by Col. Frank J. Harrold, Jr., USAF (Ret.)

(AIR FORCE *Magazine will pay $20 for each anecdote accepted for publication.*)

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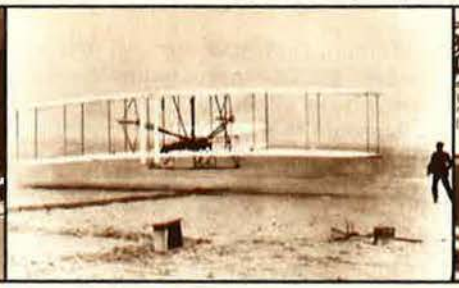

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* Tickets to Salute to Congress available only to AFA Convention Delegates accompanied by their Congressman.

The Bulletin Board

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

Per Diem Equalizer Pushed

Inequities in military personnel programs generally get corrected, sooner or later. One that hasn't been put to rights is the tricky enlisted per diem allowance situation. It's particularly glaring when officers and enlisted men go TDY together and are paid differently for billeting and meals. For instance, if a dining hall is available, enlisted men on TDY can't be reimbursed, and their basic allowance for subsistence (BAS) is deducted. In one widely publicized case, an officer and an E-8 went TDY together for two weeks; the officer was reimbursed $165 and the NCO $48. This caused a lot of heartburn in Air Force circles.

The Air Force Association for years has urged that the government make TDY rates the same for officers and enlisted men. But until recently the Defense Department farmed the problem out for study, first in 1974 to the Third Quadrennial Review, then last year to the President's Commission on Military Compensation. The Commission, in its recent report, ignored the problem entirely.

The Defense Department is now preparing a legislative proposal designed to give EM a better shake, although not 100 percent equality with officers. In addition, Rep. William L. Armstrong (R-Colo.) introduced a bill on May 15 that, he told the House, would "make the payment of per diem allowances basically the same for officers and enlisted personnel." Armstrong noted that all along the Air Force has favored correcting the problem but the other services have not. The Air Force has been particularly concerned about Military Airlift Command crews.

Despite the long delay in tackling the inequity and the efforts to do something that now are under way, insiders doubt that remedial legislation will be enacted this year.

Several other key military personnel bills that AFA has endorsed have also been delayed. The bewhiskered bill to give trailer users full reimbursement mileage at transfer time hadn't gotten past a House Armed Services subcommittee. The bill that would halve the Social Security offset provisions of the Survivor Benefits Plan and give widows covered by the Retired Servicemen's Family Protection Plan a raise remained stuck in the Senate Armed Services Committee, even though the House approved the measure last year.

The bill to let military bandsmen moonlight as musicians, endorsed months ago by the House Armed Services Committee, still hadn't cleared the full House.

House Armed Services Committee hearings on junior enlisted travel benefits ended with members strongly in favor. However, there was apprehension that the plan might be torpedoed by the House Appropriations Committee.

On the Senate side, Sen. Thomas Eagleton (D-Mo.) fired a broadside at travel allowances, military commissaries, and other personnel and hardware programs. His attempt to cut them out of the FY '79 budget failed.

There were several new personnel bills of note:

- **H.R. 12392** (Price—Ill. and Wilson—Calif.) would set up a Defense Department military retirement fund to strengthen the retirement system. No fund exists now. Retired pay comes out of annual appropriations. The bill prohibits deductions from the pay of military personnel.
- **H.R. 12576** (Price—Ill. and Wilson—Calif.) would okay advance payments of station housing allowances for members who are assigned abroad.
- **S. 2986** (Chafee—R. I. and others) would deny October's cost-of-living pay raise to members of Congress, high-salaried executive branch officials, and Supreme Court justices. "Let us show that we are willing to do our part, with a voluntary sacrifice, in the battle against inflation," Chafee told his colleagues, who, along with House members, voted themselves a $12,900 pay raise last year. The House Appropriations Committee, meantime, approved pay freeze legislation similar to the provisions of the Chafee bill.
- **S. 2965** (Anderson—Calif.) would provide for "more equitable distribution" of military and Defense Department civilians among the states. The bill's goal, to be arrived at by transferring people, would assure that at least 1,000 such persons are stationed within each state.

HIRE Hit, but Veterans' Unemployment Drops

The Department of Labor's attempts to find jobs for unemployed Vietnam-era veterans continue to draw fire from Congress, newspaper editorials, and even critics from within the Administration. Charges of mismanagement of vet-hiring programs have plagued Labor for months.

Particularly under the gun is HIRE (Help through Industry Retraining and Employment), a well-ballyhooed Labor program begun last year and funded with $140 million. It was aimed at getting 100,000 jobless veterans trained by private firms and put on their payrolls by September of this year. The money was to reimburse the corporations for the training.

HIRE's strong supporter, the National Alliance of Businessmen, told President Carter that, as of March 31, companies participating in HIRE had submitted 83,000 job pledges and hired 24,500. "We'll meet the target date," ABA declared. A spokesman for the organization told AIR FORCE Magazine that those figures had grown, as of May 10, to 91,000 pledges and 44,900 hires.

But it develops that these statistics apply mainly to HIRE's "voluntary" job-placement program, not to the "reimbursable" on-the-job training phase. Estimates vary, but a NAB spokesman says that there had

been 2,024 such hires by May 10.

About the same time, however, Rep. Robin L. Beard (R-Tenn.) said that only 446 persons had been hired, at a cost to the government of $40 million, and that most of these weren't even veterans. Beard, in a blistering denunciation of Labor's veterans employment programs, was testifying before a House Veterans' Affairs subcommittee. He also scored Labor's ground rules for HIRE, saying they discouraged employers from participating in the training program. He wants to let the Veterans Administration monitor Labor's handling of veterans hiring programs. A bill before the subcommittee, H.R. 11043, would do just that.

A knowledgeable source close to the Labor Department situation told AIR FORCE Magazine the voluntary part of the HIRE program "is a sham—its lofty pledges and hiring statistics are merely part of the participating corporations' normal hiring activities."

Meanwhile, Labor's official figures for April put total unemployment among Viet-era vets (age twenty to thirty-four) at 4.5 percent, against 6.5 percent for nonvets in the same age group. In the big problem group, the age twenty to twenty-four veterans, 10.7 percent were unemployed in April, compared with 8.8 percent of the nonvets in the same age group. For the country's entire work force, unemployment in April was put at six percent.

AFA Believes . . .

Senator Goldwater on 'Double Dipping'

Sen. Barry M. Goldwater (R-Ariz.) has a unique facility for stating an issue in plain language. It is always clear where he stands. For that reason, we thought that the following extract of his remarks from the Congressional Record *of May 5 would be of interest to our readers:* —J. A. McD.

Mr. President, so much of a furor has been raised lately about the so-called practice of double dipping or, to put it plainly, retired military people getting jobs with companies or with the government, that I think it is time to take a look at another side that might make the picture a little more complete.

To begin with, where can a bureau of our government, particularly in the technical fields, and where can manufacturers, find better trained, better equipped men and women to serve them than those who have retired from the service? Remember, these are not men and women in their seventies. These are men and women generally in their late forties or early fifties who have many productive years left.

Now, I have long faulted the military for allowing people to get out at these young ages and maybe we'll correct it, but that is beside the point. . . .

But is this the only side to this rather well-publicized coin? No—let's look at another one.

People come to Washington to serve in the House of Representatives or in the Senate. Some of them stay a long, long time. Others stay a relatively short time and then are either defeated or retire, but do they go home? No. Many of them, not the majority, but many of them stay and find employment [with] firms which can use the contacts that the former Member of the Congress has developed. . . .

It's virtually impossible to find out how many of these former Members of Congress are gainfully employed today in matters affecting the government, and let me make it clear, I hold nothing against them for this. I do know, offhand, that in 1977, there were at least seven former Members who were representing foreign countries.

But I want to get into this matter of the so-called double dipper to show how unfair this whole thing has been to the military person. . . .

Section 801 (Title 37, USC) prohibits the payment of retired pay for three years after retirement to retired regular officers who are engaged in selling supplies or war materials to the Department of Defense, the Coast Guard, the Environmental Science Services Administration, or the Public Health Service. In effect, a retired military officer loses his retired pay for three years if he engages in selling this material to the government.

Section 281 bans any retired officer of the armed forces from selling anything to the government through the Department in whose service he holds a retired status. This means a retired Naval Officer is forever prohibited from selling to the Navy. . . .

Now, Mr. President, when most people talk about the "double-dipper" law, they are referring only to Section 5532 of Title 5, United States Code. This is the Dual Compensation Law, which reduces the retired pay of former [Regular] officers of the uniformed services.

But few people have ever heard of the much more stringent restrictions against retired officers in Sections 801 and 281. And, may I remind you that those sections apply only to retired officers of the regular services. They do not have general application throughout the government.

Why, I ask, are retired regular officers set aside from everyone else in the federal government? They are certainly not the only category of government personnel involved in budgeting, contracting, and purchasing decisions. Almost all branches of the Executive bureaucracy do that.

Why are there no similar statutes as Sections 801 and 281 applying to former Secretaries of Defense, Army, Navy, etc., or to former political employees heavily involved in contractor selection and dollar allocations? . . . And why no such statutes for civil servants or elected officials out of office, or retired judges? . . .

Why is the man in uniform or formerly in uniform, legislated as untrustworthy in retirement when no one else is? The answer that is continually heard is that retired regular officers are still federal officers, subject to recall, and as such cannot be involved in anything relating to selling to the Defense Department.

Well, I have to say that many of the men and women out of uniform wonder, if they are supposed to still be federal officials, what are their responsibilities and duties? They have none of the authority of a federal official.

Let's look at a silly situation. A man can lose his retired pay under Section 801, even worse, go to jail under Section 281 if he so much as sells a case of beer to the PX at any military establishment or a case of Coke to a public health service facility. Their employment opportunities, in my opinion, are unduly limited. I don't think any regular or retired . . . military person believed or understood years ago that their post-retirement opportunities would be so severely limited by law. . . .

If a man has the ability, the ambition, and the desire to work, why should he be penalized just because he once wore a uniform?

Why shouldn't the man who once wore the toga of a Congressman be denied employment opportunities in a similar situation? . . .

The Bulletin Board

Last fall, nearly nineteen percent of the twenty- to twenty-four-year-old vet group were out of work. For the entire twenty- to thirty-four-year-old group, 7.4 percent were jobless at that time.

"Cooperative Care" Plan Readied

The Defense Department is about to launch a "Cooperative Care" health project that will enable patients to use combinations of care from CHAMPUS, military hospitals, and other programs. The project is designed to reduce costs for patients and the government.

A detailed new directive outlining the plan, from the office of Maj. Gen. Benjamin Baker, the Pentagon's top CHAMPUS executive, is scheduled for release this summer.

The plan contains procedures for transferring patients, when a service hospital can't provide the care, to CHAMPUS, Medicare, the VA, or elsewhere. The relationship between military hospital commanders and operators of the other health programs is spelled out.

The changes are retroactive to June 1, 1977. This means, Defense says, that numerous dependents who have received adverse determinations from CHAMPUS contractors under the old rules can get them reviewed and possibly honored under the new ones. In other military health care developments:

- A new CHAMPUS contractor, Blue Cross of Washington-Alaska, will process all CHAMPUS claims from beneficiaries in Alaska, Idaho, Montana, Oregon, Utah, Washington, and Wyoming. And the Wisconsin Physicians' Service is the new contractor for CHAMPUS beneficiaries in Missouri. Dr. Baker said he expects the new contractors to provide speedier service than the ones replaced. The changes were effective July 1.
- The Senate Armed Services Committee has voted to raise CHAMPUS reimbursements rates from the present seventy-five percent to the old ninety percent. The House Armed Services Committee took similar action earlier this year. But the apparent favorable change which officials say would reduce medical payments by CHAMPUS users and attract more doctors to participate in CHAMPUS, may not materialize, even if Congress authorizes it. There is fear that the appropriations committees may not put up the necessary funds to support a ninety percent reimbursement.
- The Defense Department has established a CHAMPUS study group that is seeking ways to improve the program. Vice Adm. John G. Finneran, USN (Ret.), is heading the study. Admiral Finneran, who before his retirement last year was Deputy Assistant Defense Secretary for military personnel policy, is working with a small group of officials from each service.
- Lt. Gen. George E. Schafer, USAF's Surgeon General, reported that the Air Force's physician-recruiting drive is in trouble. Only ninety-four physicians signed up during the first seven months of FY '78. The full year's goal is 430.

Flaw in Readiness

According to an Air Force survey, an alarming number of USAF par-

Ed Gates . . . Speaking of People

The Financial Beating of Families Abroad

Once upon a time, military people eagerly sought tours in Europe and the Far East. The dollar covered a lot of territory, and most of those overseas lived well. Few lower-ranking members were married. Few hardship cases were reported.

That's ancient history. Today all the services are reporting that many of their families abroad are taking a financial beating, especially the junior-grade enlisted families about whom Pentagon officials have become extremely but somewhat belatedly concerned.

It's clear that military authorities have taken several steps to ease the sting of the dollar's erosion overseas. Unfortunately, the really significant moves, the ones with real clout, require congressional approval. And, in spite of the good intentions of numerous lawmakers, the Congress as a whole, on about ninety-nine percent of military personnel measures, moves with agonizing slowness. There is just no sense of urgency with people-type measures.

This is hardly any relief for the money-strapped US families abroad. And they're not located just in Germany.

Assistant Air Force Secretary Antonia H. Chayes (Manpower, Reserve Affairs and Logistics) recently told the House Armed Services Compensation subcommittee, which is probing the problem, that USAF families arriving in Japan must pay three months' rent in advance for private housing. The practice plunges arriving lower-ranking families into immediate debt, from which they never recover.

Just back from Far Eastern and European base tours, she described prices in Japan as "exorbitant." She denounced the long-existing system that denies household goods shipment, temporary lodging allowance, and other travel benefits to married lower graders.

Ms. Chayes's disclosure that in the Philippines and Korea, dependents who are not sponsored by a command "are denied access to commissaries, exchanges, and other services because of military interpretations of congressional instructions" dismayed the subcommittee members. Chairman Bill Nichols (D-Ala.), asserting that the subcommittee opposed such denial, said he'd look into the matter.

Secretary Chayes also told of miserable housing conditions families of lower graders must endure in Turkey. She reported that Air Force families renting on the economy in Iran must plunk down $1,500 in advance rent.

To help ease the financial woes of families abroad, the Pentagon in recent months raised the cost of living allowance (COLA) and Housing Allowance (HA) several times. It also boosted the COLA of junior marrieds from their previous "without dependent" rate to the higher "with dependent" stipend. It has encouraged families to eat in base dining halls, where prices are modest.

The Defense Department has sent Congress legislative proposals that would:

- Give junior enlisted families abroad full travel-transportation entitlements. This is the cornerstone of the government's assistance drive.
- Allow advance payment of the HA; currently it is not

nts have not made plans for moving their families if the whistle should blow. The study says the recent Child Care Survey for Single Parents and Military Couples reveals that:

1. Thirty-three percent of single member female parents and military couple female members surveyed, who are subject to mobility/deployment, "have not made arrangements for child care in the event of mobility/deployment."

2. More than fifteen percent of the single member male parents and thirty-one percent of the military couple male members surveyed who are subject to mobility/deployment also haven't made any plans for care of dependents.

Headquarters called on Air Force commanders to urge subordinates to make emergency plans.

Commissions Available

The Air Force has some commissions coming up for civilians and airmen as administrators in the Medical Service Corps. Those interested should contact AFMPC/SGCP, Randolph AFB, Tex. 78148, by July 21, or call AUTOVON 487-2167/3589 or AC (512) 652-2167/3589. A board will gather in October and selectees will be notified in November. A BA degree with a major in health services administration, business administration, or a related field is required. The appointment grade depends on age and experience, but airmen are at a definite disadvantage because the Air Force does not consider "enlisted military experience" in determining the commissioning grade, a rule that AFA finds inappropriate, at least.

UFOs Returning?

The Air Force hasn't probed flying saucer and other UFO reports since 1969. During the previous twenty-one years, under Project Blue Book, it investigated 12,618 reported sightings. It determined that 11,917 of them were balloons, aircraft, lightning, stars, hoaxes, etc. Only 701 were unexplained. In the final year the reported sightings dropped to 146, only one of which was not explainable. And a University of Colorado UFO study threw cold water on the whole idea of saucers, foreign objects, and extraterrestrial beings.

So the Air Force closed down Blue Book and shipped the mountain of records to the National Archives, 8th and Pennsylvania Ave., N.W., Washington, D. C. 20408, where saucer enthusiasts can examine them. UFO probing seemed over for good.

Late last year President Carter suggested it might be a good idea to resume UFO investigations. (NASA and Air Force didn't go along and the idea appears dead.) Early this year NBC-TV launched "Project UFO," a weekly show that has been extended to twenty-two weeks.

Those events, particularly the TV show, have sparked renewed interest in UFOs, an Air Force spokesman said. To assure that base information offices can respond to queries, the Office of the Air Force Secretary recently sent them a detailed, updated eleven-page UFO fact sheet. Ask a question about previous UFO probing and it will probably provide the answer.

Will Blue Book or something like it return? NASA, which looked into the President's suggestion, said "no" and Air Force agrees. However, the Air Force Secretary's office says that if "firm evidence is

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payable until after the expense is incurred. Advance payment, officials contend, would help individuals meet the "extraordinary" deposits foreign landlords demand. It should help many young airmen to avoid going into debt. This plan, it should be understood, does not provide more money; it only redistributes present funds.

- Amend the tax laws to give families abroad an earned income credit of up to $400 a year.

Approval of these three items will ease the money bind for many overseas families, Defense officials say. The Nichols group and the full House Armed Services Committee appear sympathetic; their endorsement seems likely. The big questions are what will the rest of Congress do and how soon?

Besides listening to Defense and service witnesses, the Nichols subcommittee queried enlisted members recently returned from abroad.

The Air Force, meanwhile, has urged Defense to increase from 225 to 500 pounds the maximum weight limit junior enlisteds may ship abroad at government expense. This, too, would help. And Hq. USAF also has a special task force of personnel officials looking at other steps Air Force could take on its own. These include recomputing the COLA and HA to give junior members a better shake; getting the Air Force Aid Society to loosen up on its bulging treasury and turn loose more grants and interest-free loans; and providing low-cost bus service between bases and outlying housing areas at USAF sites overseas. The latter idea aims at helping families who live too far away to take advantage of inexpensive base services.

These and other minor moves under consideration are fine, but so far the net result has been insufficient to put young families assigned to the high-cost countries on anything resembling the economic footing they maintained in the states.

Defense's Dr. John P. White, the Pentagon's top personnel executive, told the lawmakers of a recent Army survey. It shows that sixty-eight percent of young soldiers' wives in the Washington, D. C., area work and that fifty-seven percent of the soldiers themselves "moonlight." These figures probably reflect the situation Defense-wide. Yet, White said, living costs in Germany are much higher than in Washington, D. C. He spoke of other surveys which show that about half of all military spouses in the CONUS work.

It all adds up to an urgent need for jobs overseas for wives and for lower-ranking members who want to moonlight. But few jobs are available, and officials also are quick to point out that the language barrier also creates employment problems.

White attributes the overseas job lack in Germany to "economic and political restrictions." That's undoubtedly true, though some observers wonder why host governments, in view of Uncle Sam's massive contributions to the defense of other nations' people and real estate, don't take steps to alleviate the problem. Or why the US government doesn't apply modest pressure on the host governments to do so.

Similarly, one wonders why host governments seemingly do little or nothing to scale back excessive rents charged US service families. Why outrageous advance lease and utility charges are permitted. Why sky-high auto insurance premiums, structured on the natives' appalling driving habits, can't be reduced for safety-conscious American service people. Other examples of the absence of US firmness in negotiating for a fair shake for its military families abroad, such as the Status of Forces Agreements, could be cited.

Solving, or at least easing, the economic difficulties of American service families overseas shouldn't be a one-way street. The US government is making a major effort to provide relief; the nations that enjoy the security US forces stationed within their boundaries provide also have a responsibility to assist. ■

The Bulletin Board

found justifying further investigation, an appropriate agency will be directed to undertake the effort."

There's a footnote to the revival of UFO interest. When the Hollywood studio planning the "Project UFO" TV series asked the USAF to recommend a technical advisor, they received the name of Col. William T. Coleman, Jr., a USAF retiree living in Florida. And with good reason, for Coleman, during the long years of UFO probing, was the Hq. USAF official most closely identified with the whole business. His nickname was "Mr. Blue Book."

Well, Mr. Blue Book is now the producer of the NBC-TV series and, his friends report, doing extremely well in the process.

Community College Screening

The Community College of the Air Force has chalked up further registration and graduation gains, but many registrants are not participating. So, officials plan to notify those who haven't been involved during the past year and a half that they'll be disenrolled at the end of a specified period, if there is no evidence of activity.

The disclosure came at a spring meeting of CCAF's Advisory Committee at Lackland AFB, Tex. Officials said total CCAF registration had reached 96,941, of whom 18,928 have left service. Forty percent of USAF's master sergeants and fifty percent of its chief master sergeants are participating.

CCAF graduates now number 2,936, counting the April class that graduated 622 persons. They received associate degrees in applied sciences. Members of that group average about thirty-three years of age and have been pursuing post-secondary education for twelve years, officials said. The Committee also discussed reducing CCAF's four graduation dates a year to two.

It was noted at the meeting that the first 1,000 CCAF graduates averaged sixty-seven semester hours. Fifty-two percent of their credits were derived from military service, the remainder from civilian schools. This division, authorities said, contradicts the mistaken belief of civilian educators that CCAF is trying to provide all the required semester hour credits.

AFA's Executive Director James H. Straubel, a member of the CCAF Advisory Committee, participated in the spring meeting.

An EM Home Governor?

The job of governor of the US Soldiers' and Airmen's Home is open. And for the first time in its 127 years of existence, former enlisted members, as well as ex-officers, are eligible for the top post, which pays $40,000 a year. Also, under a recent ruling of the Air Force JAG, ex-enlisteds are eligible for the Home's other top jobs: deputy governor, secretary-treasurer, surgeon, quartermaster, and secretary to the board of commissioners.

The new governor will replace retiring Lt. Gen. F. T. Unger, who has held the post for seven years. The secretary-treasurer billet is also opening up. The Home, which among other amenities has its own golf course, has 2,300 residents and 1,030 employees.

Baggers, Hear This

Anyone who since May 1, 1974, has bagged groceries and carried out patrons' purchases in Stateside military commissaries for tips may now get the minimum wage and possibly overtime for the periods they worked. But the claims must be fully documented and include such things as dates worked, tips received, names of commissary officials in place, name of the head bagger, and copies of parental permission slips. This may be tough to do, a Defense Department spokesman said. The Civil Service Commission earlier ruled that baggers are covered by the Fair Labor Standards Act and, starting July 30, will receive the minimum wage, currently $2.65 per hour.

Claimants can file claims at CSC regional offices.

The entire staff and faculty of the NCO Academy-East, McGuire AFB, N. J., joined the Air Force Association during AFA's 1978 membership drive. Here the new members enjoy the April issue of AIR FORCE Magazine. From left are TSgt. Robert N. Mann, TSgt. Edward W. Pitcock, CMSgt. Larry D. Huyett, who is director of education, Patricia Williams, MSgt. Richard W. Fluke, TSgt. Michael C. Kurth, and SSgt. Ralph T. Wilson, Jr. All graduates of the Academy receive complimentary one-year memberships in line with AFA's practice of extending free memberships to grads of all USAF NCO Academies.

Short Bursts

If all goes according to expectations, those long-delayed hearings, crucial to the Air Force, on the **Defense Officer Personnel Management Act** (DOPMA) will be over by late June. There had been speculation that with recommendations on compensation and personnel management awaiting Defense Department evaluation of the President's Pay Commission report, DOPMA might be held over until next year. "Not so," Defense's Maj. Gen. Stanley M. Umstead told AIR FORCE Magazine. "We're pushing hard for it now." He is the Pentagon's personnel policy chief.

All ERAers, gather round. Rep. Larry McDonald (D-Ga.) doesn't exactly cotton to coed service academies. He's introduced a bill "to **limit eligibility** for appointment and admission to any US service acad-

emy **to male individuals."** Its chances of passage, of course, are zero.

The Air Force recently announced it is looking for the following officer volunteers: **Recruiting Service**—fifteen O-3s this year and sixty O-3s through O-5s next year; **OTS Flight Commanders**—twenty O-3s this year and more than thirty-six O-1s through O-4s next year; **AFROTC Instructors**—180 O-3s and O-4s and twenty O-5s, all for duty starting next summer. The Air Force Manpower and Personnel Center, Randolph AFB, Tex., has all the details.

As of late last year, there were 157 USAF officers and 4,871 airmen on board who were **not citizens of the United States.**

The next board to pick women officers for **undergraduate navigator training** meets later this month. The quota: two.

The **Air Staff** at the Pentagon is undergoing manpower reductions and reshuffling. One major action finds the office that handles full colonel assignments, long a fixture on the Pentagon's fourth floor, will move to the expanding Personnel Center at Randolph.

The Air Force Uniform Board recently okayed a proposal that the service develop an **improved sweater** for both male and female troops. In doing so, the Board rejected an optional pullover like the Marine Corps "wooly-pully." The latter, a stylish, trim-fitting dark green sweater, is a smash hit with the guys and gals of all ranks at Marine Corps Headquarters near the Pentagon. ■

Senior Staff Changes

PROMOTIONS: To Major General: James A. **Abrahamson;** Anderson W. **Atkinson;** Max B. **Bralliar;** Van C. **Doubleday;** Daryle E. **Tripp.**

RETIREMENTS: B/G George C. **Cannon, Jr.;** B/G Harold E. **Gross;** B/G Don M. **Hartung;** B/G Frederick C. **Kyler;** Chaplain M/G Henry J. **Meade;** B/G Benton K. **Partin;** B/G Berry W. **Rowe;** L/G George E. **Schafer.**

CHANGES: B/G James P. Albritton, from Cmdr., 50th TFW, USAFE, Hahn AB, Germany, to Special Asst. to ACS/Studies & Anal., Hq. USAF, Washington, D. C. . . . **B/G Robert E. Buhrow,** from Chief, House Liaison Office, SAF/LL, Washington, D. C., to Dep. Cmdr., 22d NORAD Region, North Bay, Ontario, Canada, replacing retiring B/G George C. Cannon, Jr. . . . **Chaplain B/G (M/G selectee) Richard Carr,** from Dep. Chief of Chaplains, Hq. USAF, Washington, D. C., to Chief of Chaplains, Hq. USAF, Washington, D. C., replacing retiring Chaplain M/G Henry J. Meade . . . **B/G John T. Chain, Jr.,** from Cmdr., 1st TFW, Langley AFB, Va., to Mil. Asst. to Secretary of the Air Force, Hq. USAF, Washington, D. C., replacing B/G William W. Hoover . . . **B/G (M/G selectee) James E. Dalton,** from Dep. Dir. (Force Devel. & Strat. Plans), J-5, JCS, Washington, D. C., to Vice Dir., Joint Staff, JCS, Washington, D. C. . . . **B/G (M/G selectee) Van C. Doubleday,** from Dir. of Telecom. & Cmd. & Control Resources, ACS/CCR, Hq. USAF, Washington, D. C., to Dep. Dir. Ops. (WWMCCS & Telecom.), J-3, JCS, Washington, D. C.

B/G Jay T. Edwards III, from Asst. for Intl. Log., Hq. AFLC, Wright-Patterson AFB, Ohio, to DCS/Log., Hq. USAFE, Ramstein AB, Germany, replacing M/G Billy M. Minter . . . **M/G Howard M. Estes, Jr.,** from DCS/Plans & Pgms., Hq. AFLC, Wright-Patterson AFB, Ohio, to Dep. Chief, Central Security Service, & Dep. Dir. for Field Mgmt. & Eval., NSA/CSS, Washington, D. C. . . . **B/G William H. Greendyke,** from Cmdr., USAF Med. Center, MAC, Scott AFB, Ill., to Cmdr., Malcolm Grow Med. Center, MAC, Andrews AFB, Md., replacing B/G Kermit Q. Vandenbos.

Col. (B/G selectee) Titus C. Hall, from Dir. Materiel Mgt., San Antonio ALC, AFLC, Kelly AFB, Tex., to Dep. for Sys., ASD, AFSC, Wright-Patterson AFB, Ohio, replacing retiring B/G Benton K. Partin . . . **B/G Francis A. Humphreys, Jr.,** from Cmdr., 20th NORAD Region, & Cmdr., 20th AD, ADCOM, Ft. Lee AFS, Va., to Dep. Dir., J-3, US REDCOM, MacDill AFB, Fla., replacing B/G David E. Rippetoe. . . . **Col. (B/G selectee) John R. Lasater,** from Exec. Officer to Dep. CINC, EUCOM, Vaihingen, Germany, to Cmdr., 4th AD, SAC, F. E. Warren AFB, Wyo., replacing retiring B/G Harold E. Gross.

B/G William G. MacLaren, from Cmdr., Pac. Comm. Area, AFCS, & DCS/C-E, Hq. PACAF, Hickam AFB, Hawaii, to V/C, Hq. AFCS, Scott AFB, Ill., replacing B/G William R. Yost. . . . **B/G James H. Marshall,** from Insp. Gen., Hq. AFSC, to Cmdr., SAMTEC, AFSC, & Dep. DoD Mgr. for Space Shuttle Support Ops., Vandenberg AFB, Calif. . . . **M/G James E. McInerney, Jr.,** from Dir., Mil. Asst. & Sales, DCS/S&L, Hq. USAF, Washington, D. C., to Cmdt., Industrial College of the Armed Forces, Ft. McNair, Washington, D. C. . . . **B/G Edward Mendal,** from Dep. for Readiness Devel., AFALD, AFLC, Wright-Patterson AFB, Ohio, to DCS/Plans & Pgms., Hq. AFLC, Wright-Patterson AFB, Ohio, replacing M/G Howard M. Estes, Jr. . . . **M/G Billy M. Minter,** from DCS/Log., Hq. USAFE, Ramstein AB, Germany, to Asst. DCS/S&L, Hq. USAF, Washington, D. C., replacing M/G (L/G selectee) Gerald J. Post . . . **M/G Paul W. Myers,** from Cmdr., Wilford Hall Med. Center, AFSC, Lackland AFB, Tex., to The Surgeon General of the Air Force, Hq. USAF, Washington, D. C., replacing retiring L/G George E. Schafer.

M/G (L/G selectee) Gerald J. Post, from Asst. DCS/S&L, Hq. USAF, Washington, D. C., to Dir., Defense Logistics Agency, Washington, D. C. . . . **Col. (B/G selectee) Graham W. Rider,** from Dir. of Plans, DCS/Plans & Pgms., Hq. AFLC, Wright-Patterson AFB, Ohio, to Asst. for Intl. Log., Hq. AFLC, Wright-Patterson AFB, Ohio, replacing B/G Jay T. Edwards III . . . **B/G David E. Rippetoe,** from Dep. Dir., J-3, US REDCOM, MacDill AFB, Fla., to Cmdr., Pac. Comm. Area, AFCS, & DCS/C-E, Hq. PACAF, Hickam AFB, Hawaii, replacing B/G William G. MacLaren . . . **Chaplain Col. (B/G selectee) Jeremiah J. Rodell,** from Office of Chief of Chaplains, Hq. USAF, Washington, D. C., to Dep. Chief of Chaplains, Hq. USAF, Washington, D. C., replacing Chaplain B/G (M/G selectee) Richard Carr.

B/G Richard V. Secord, from Chairman, Air Sec., MAAG, Teheran, Iran, to Dir., Mil. Asst. & Sales, DCS/S&L, Hq. USAF, Washington, D. C., replacing M/G James E. McInerney, Jr. . . . **B/G William L. Shields, Jr.,** from Dir., Office of Space Sys., SAF, Washington, D. C., to Insp. Gen., Hq. AFSC, Andrews AFB, Md., replacing B/G James H. Marshall . . . **Col. (B/G selectee) Edward L. Tixier,** from Exec. Asst. to Chairman, JCS, Washington, D. C., to Cmdr., 20th NORAD Region, & Cmdr., 20th AD, ADCOM, Ft. Lee AFS, Va., replacing B/G Francis A. Humphreys, Jr. . . . **B/G Kermit Q. Vandenbos,** from Cmdr., Malcolm Grow Med. Center, MAC, Andrews AFB, Md., to Cmdr., Wilford Hall Med. Center, AFSC, Lackland AFB, Tex., replacing M/G Paul W. Myers . . . **M/G Charles L. Wilson,** from Chief, Sp. Projects Office, SHAPE, Casteau, Belgium, to V/C, Air Force Acquisition Log. Div., AFLC, Wright-Patterson AFB, Ohio . . . **B/G William R. Yost,** from V/C, Hq. AFCS, Scott AFB, Ill., to Dep. Dir. of Space, DCS/R&D, Hq. USAF, Washington, D. C. ■

Iron Gate Chapter's Frfteenth National Air Force Salute

On Saturday evening, April 8, AFA's Iron Gate Chapter presented its Fifteenth National Air Force Salute at the New York Hilton Hotel in New York City.

More than 800 military, civilian, and aerospace leaders attended, including many dignitaries from the Congress, the Diplomatic Corps, and the Department of Defense.

During the formal program, the Chapter's Maxwell A. Kriendler Memorial Award for 1978 was presented to Gen. David C. Jones "for his dynamic leadership as Chief of Staff, United States Air Force, during a period of austere funding—and critical equipment, personnel, and operational requirements—thus strengthening decisively the ability of the United States Air Force to fulfill its mission on behalf of our freedom and world peace."

The Chapter also recognized twelve of its members, each of whom has served as Chapter President and/or Salute Chairman, by naming them Jimmy Doolittle Fellows. Sen. Barry Goldwater of Arizona, the Chairman of the Aerospace Education Foundation's Board of Trustees, presented each a Doolittle Fellow Plaque.

Net proceeds from the annual $150-a-plate fund-raising function go to the Air Force Aid Society, the Air Force Enlisted Men's Widows and Dependents Home, the Air Force Village, the Falcon Foundation, the Air Force Historical Foundation, and the Aerospace Education Foundation. The Salutes have raised more than $900,000 for these organizations.

The accompanying photos tell the story of the 1978 Salute.

—BY DON STEELE

Iron Gate Chapter President Burl W. McLaughlin, right, presents Air Force Chief of Staff Gen. David C. Jones, left, the Chapter's Maxwell A. Kriendler Memorial Award.

AFA National President Gerald V. Hasler, second from right, congratulates Gen. David C. Jones on being named by President Carter to be the next Chairman of the Joint Chiefs of Staff and, also, on receiving the Iron Gate Chapter's Maxwell A. Kriendler Memorial Award. Chapter President Burl W. McLaughlin, Maj. Gen., USAF (Ret.), is at left, and Salute Chairman Tom Boyd is at right.

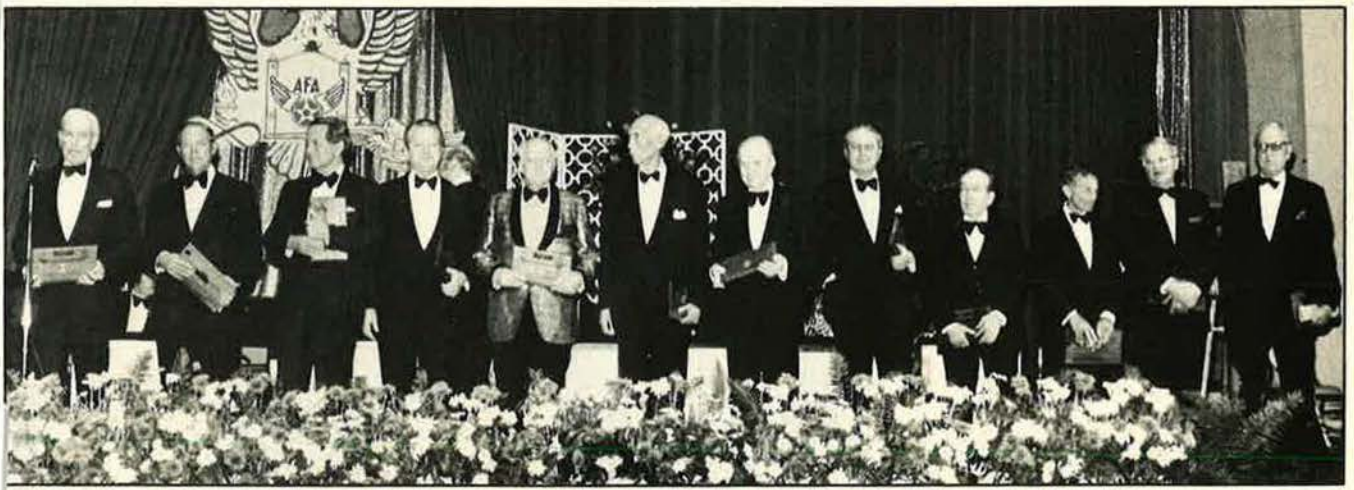
Visiting with Air Force Chief of Staff Gen. David C. Jones and Mrs. Jones, right, during the Salute reception are Mr. and Mrs. William T. Seawell, left. Mr. Seawell, an Honorary Chairman of the Salute, is Chairman of the Board of Pan American World Airways.

Among the Air Force and AFA leaders who attended the Salute were, from left, Mrs. Hasler; AFA President Gerald V. Hasler; Mrs. Davis; Lt. Gen. Bennie Davis, Deputy Chief of Staff for Personnel; AFA Executive Director James H. Straubel; and Mrs. Straubel.

During the Salute reception, Gen. Russell Dougherty, right, the recently retired Commander in Chief of the Strategic Air Command, visited with Lt. Col. (colonel selectee) Lee Butler, left, Assistant Deputy for Operations, 416th Bomb Wing, Griffiss AFB, N. Y., and his wife, Dorene.

G. F. Santini, a New York City businessman and a donor to the Salute program, and Mrs. Santini visit with Iron Gate Chapter President Burl W. McLaughlin and Mrs. McLaughlin during the Salute reception.

Air Force Reserve leaders who attended the Salute included, from left, Maj. Gen. Gilbert O. Herman; AFA Board Chairman George M. Douglas, a Reserve major general; Mrs. Douglas; Maj. Gen. William Lyon, Chief of Air Force Reserve; and Mrs. Lyon.



The twelve former and current Chapter leaders named by the Chapter to be Jimmy Doolittle Fellows are, from left, J. Gilbert Nettleton, Jr.; retired Air Force Maj. Gen. Burl W. McLaughlin; John R. "Tex" McCrary; retired Air Force Brig. Gen. Richard A. Knobloch; Herbert O. Fisher; Kenneth Ellington; Milton Caniff; Carter L. Burgess; Tallmadge "Tom" Boyd; J. Raymond Bell; J. William Bailey; and James W. Austin.

AFA News

By Don Steele, AFA AFFAIRS EDITOR

Units of the Month

THE OKLAHOMA STATE ORGANIZATION AND ITS CENTRAL OKLAHOMA (GERRITY) CHAPTER . . . cited for extremely effective programming in support of the missions of the Air Force and AFA.

More than 100 members of Oklahoma's 36th Legislature participated in the Oklahoma Legislators' Day at Tinker AFB. The event, which was cohosted by the Oklahoma State AFA, the Central Oklahoma (Gerrity) Chapter, and the Commander of the Oklahoma City Air Logistics Center, included a briefing on the role and mission of the Air Force, the operations and missions of the Center, and a general updating of Air Force activities both in Oklahoma and around the world. Shown are, from left, Spencer T. Bernard, President Pro Tempore, Oklahoma House of Representatives; Maj. Gen. Cecil E. Fox, Commander, Oklahoma City Air Logistics Center; Gene C. Howard, President Pro Tempore, Oklahoma State Senate; and Oklahoma State AFA President David Blankenship. In recognition of this outstanding program, AFA President Gerald V. Hasler names the Oklahoma State AFA and its Central Oklahoma (Gerrity) Chapter as corecipients of the "Unit of the Month" award for July.

—Official USAF Photo

The Alaska State AFA's 1978 Convention was hosted by the Midnight Sun Chapter in the Eielson AFB Officers' Open Mess and featured an address by Gen. James E. Hill, Commander in Chief of the North American Air Defense Command (NORAD). Shown with General Hill, right, following his address are, from left, Lt. Gen. M. L. Boswell, Commander, Alaskan Air Command; and AFA National Secretary Jack Price of Clearfield, Utah.

Principals in the Texas State AFA's Spring Executive Committee, which was hosted by the Lubbock Chapter, included, from left, AFA National President Gerald V. Hasler, the dinner speaker; Col. "Ish" Ingram, Director of Information at Air Training Command Headquarters, and the luncheon speaker; and State President Tim Glasgow.

The Tennessee State AFA's First Convention was hosted by the H. H. Arnold Memorial Chapter at the Air Force Systems Command's Arnold Engineering Development Center, Arnold AFS, and featured an address by the Hon. Jim Sasser, US Senator from Tennessee. During the program, Toulmin Brown, right, Vice President for AFA's South Central Region, presented Tennessee State AFA Vice President Jack Westbrook an AFA Medal of Merit. Seated from left are, Don Steele, AFA's Associate Executive Director for Field Operations; State President Tom Bigger, who was reelected for another term; and Senator Sasser.

chapter and state photo gallery

Vhile visiting Tactical Air Command Headquarters at Langley AFB, Va., luring a tour of active duty, AFA Board Chairman George M. Douglas, left, a major general in the Air Force Reserve, representing AFA President Gerald V. Hasler, presented a personalized plaque to the retiring Commander of TAC, Gen. Robert Dixon, right. The plaque included a picture of General Dixon and a chronological listing of his various duty assignments.

Rep. Thomas B. Evans, Jr. (R-Del.), was the principal speaker at the Delaware Galaxy Chapter program held as a prelude to the Chapter's AFA membership drive at Dover AFB. Following his address, Chapter President Jack Strickland, left, presented Congressman Evans a one-year membership in AFA. Distinguished guests included Delaware Gov. Pierre du Pont IV; Dover Mayor Charles A. LeGates; Gary B. Patterson, aide to Sen. William V. Roth, Jr., of Delaware; and George H. Chabbott, Vice President for AFA's Central East Region.

AFA National Director Herbert O. Fisher, of Kinnelon, N. J., one of aviation's veteran test pilots and pioneers, received an honorary doctorate of Aeronautical Science degree during the Embry-Riddle Aeronautical University's recent commencement on the university's Daytona Beach, Fla., airport main campus. Shown during the ceremony are, from left, William W. Spruance, Chairman of the University's Board of Trustees, an AFA National Director, and a member of the Aerospace Education Foundation Board of Trustees; Mr. Fisher; and Dr. Jack R. Hunt, President of the University and a member of the Foundation's Board of Trustees.

COMING EVENTS

Texas State AFA Convention, Kahler Green Oaks Inn, Fort Worth, July 28–30 . . . **AFA's 32d Annual National Convention,** Sheraton-Park Hotel, Washington, D. C., September 17–20 . . . **AFA's Aerospace Development Briefings and Displays,** Sheraton-Park Hotel, Washington, D. C., September 19–21 . . . **AFA National Symposium,** Los Angeles, Calif., October 26–27 . . . **Seventh Annual Air Force Ball,** Century Plaza Hotel, Los Angeles, Calif., October 27.

Rep. Thomas J. Downey (D-N. Y.), a member of the House Armed Services Committee, was the guest speaker at a recent meeting of AFA's Suffolk County Chapter, N. Y. Congressman Downey, left, is shown addressing the Chapter. Vincent F. O'Connor, President of the Chapter, is seated at right.

This Is AFA

The Air Force Association is an independent, nonprofit, aerospace organization serving no personal, political, or commercial interests; established January 26, 1946; incorporated February 4, 1946.

OBJECTIVES

The Association provides an organization through which free men may unite to fulfill the responsibilities imposed by the impact of aerospace technology on modern society; to support armed strength adequate to maintain the security and peace of the United States and the free world; to educate themselves and the public at large in the development of adequate aerospace power for the betterment of all mankind; and to help develop friendly relations among free nations, based on respect for the principle of freedom and equal rights to all mankind.

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Endicott, N.Y.

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Denver, Colo.

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Chicago, Ill.

Joseph L. Hodges
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Vic R. Kregel
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Thomas G. Lanphier
La Jolla, Calif.

Jess Larson
Washington, D.C.

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Newport Beach, Calif.

Carl J. Long
Pittsburgh, Pa.

Nathan H. Mazer
Roy, Utah

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Washington, D.C.

J. B. Montgomery
Los Angeles, Calif.

Edward T. Nedder
Hyde Park, Mass.

J. Gilbert Nettleton, Jr.
Washington, D.C.

James O. Newhouse
Dayton, Ohio

Martin M. Ostrow
Beverly Hills, Calif.

John H. Pronsky
Kingwood, Tex.

R. Steve Ritchie
Golden, Colo.

Julian B. Rosenthal
Sun City, Ariz.

John D. Ryan
San Antonio, Tex.

Peter J. Schenk
Arlington, Va.

Joe L. Shosid
Fort Worth, Tex.

C. R. Smith
Washington, D.C.

William W. Spruance
Marathon, Fla.

Thos. F. Stack
San Mateo, Calif.

Edward A. Stearn
San Bernardino, Calif.

Arthur C. Storz
Omaha, Neb.

Harold C. Stuart
Tulsa, Okla.

Zack Taylor
Lompoc, Calif.

James M. Trail
Boise, Idaho

Nathan F. Twining
Hilton Head Island, S.C.

A. A. West
Newport News, Va.

Herbert M. West, Jr.
Tallahassee, Fla.

Sherman W. Wilkins
Bellevue, Wash.

Jack Withers
Dayton, Ohio

Steven L. Chambers
(ex officio)
National Commander
Arnold Air Society
St. Paul, Minn.

Rev. Msgr. Rosario L. U. Montcalm
(ex officio)
National Chaplain
Holyoke, Mass.

Capt. Clyde J. Downey, II
(ex officio)
Chairman, JOAC
Washington, D.C.

CMSgt. Walter E. Scott
(ex officio)
Chairman,
Enlisted Council
Dixon, Calif.

VICE PRESIDENTS

Information regarding AFA activity within a particular state may be obtained from the Vice President of the Region in which the state is located.

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(904) 385-9032
Southeast Region
North Carolina, South Carolina, Georgia, Florida, Puerto Rico

chapter and state photo gallery

FA's Air Capital Chapter of Wichita, Kan., and the Family Services nd the Air Force Sergeants Association at McConnell AFB, cosponsored a isit to the Wichita Veterans Administration Center in observation of No reater Love Day, a day set aside to visit hospitalized veterans throughout he nation. The group, shown above, visited each ward and presented alentine bouquets to the veterans. Kansas State AFA President Cletus J. ottebaum is at the right end of the front row.

The Colorado State AFA recently honored Brig. Gen. Andrew Pringle, Jr., departing commander of the Lowry Technical Training Center, with an AFA Citation for his "outstanding support" of the State AFA. Making the presentation were, from left, State AFA Secretary Shirley Sowa; General Pringle; State President Ed Marriott; and Silver and Gold Chapter President Steve Brantley.

AFA's Los Angeles Airpower Chapter sponsored the trophies for the Southern California AFJROTC Invitational Drill Meet recently held in Anaheim, Calif. Chapter Councilman Al Mayer, left, is shown awarding a rophy to Cadet Alfred Farrell of the AFJROTC unit at the Canoga Park, Calif., high school.

Steve Brantley, right, President of the Silver and Gold Chapter, Colorado, presents a certificate to Shirley Cleland, representing the Chapter's newest Community Partner, Mountain Bell. She is an employee of Mountain Bell and Vice President of the Colorado State AFA.

Georgia State AFA Vice President Bobby Jackson, left, a major in the Air orce Reserve's 94th Tactical Airlift Wing, kicked off the AFA membership ampaign at Dobbins AFB by presenting an AFA Life Membership to irman John O. Copeland, right. Mr. Jackson said the eighteen-year-old eservist is the youngest AFA Life Member in Georgia and probably the ntire Air Force Reserve.

Chief Master Sergeant of the Air Force Robert D. Gaylor was the featured speaker at the Midwinter Conference of the Indiana American Legion. Following his presentation, Indiana State AFA President Roy Whitton, a former Indiana Legion Vice Commander, on behalf of the governor of Indiana, made Chief Gaylor a Sagamore of the Wabash, the highest honor the Indiana governor can bestow on a native son. Shown, from left, are Mr. Whitton, Chief Gaylor, and Central Indiana AFA Chapter President Thomas E. Correll.

NEW FOR MEMBERS UNDER 30 — MAJOR BENEFIT INCREASES!

Now . . . The Sixth Major Benefit Increase f

$85,000 STANDARD PLA

Other Important Benefits

COVERAGE YOU CAN KEEP. Provided you apply for coverage under age 60 (see "ELIGIBILITY") your insurance may be retained at the same low group rates to age 75.

FULL TIME, WORLD WIDE PROTECTION. The policy contains no war clause, hazardous duty restriction, combat zone waiting period or geographical limitation.

DISABILITY WAIVER OF PREMIUM. If you become totally disabled at any time prior to age 60 for at least a 9-month period, your coverage will be continued in force without further payment of premiums as long as you remain disabled.

FULL CHOICE OF SETTLEMENT OPTIONS. All standard forms of settlement options, as well as special options agreed to by the insured and United of Omaha, are available to insured members.

CONVENIENT PAYMENT PLANS. Premium payments may be made by monthly government allotment (payable to Air Force Association), or direct to AFA in quarterly, annual or semi-annual installments.

DIVIDEND POLICY. AFA's primary policy is to provide maximum coverage at the lowest possible cost. Consistent with this policy, AFA has provided year-end dividends (16.67% for 1977) to insured members in thirteen of the past sixteen years, and has now increased basic coverage on six separate occassions.

Additional Information

Effective Date of Your Coverage. All certificates are dated and take effect on the last day of the month in which your application for coverage is approved, and coverage runs concurrently with AFA membership. AFA Military Group Life Insurance is written in conformity with the insurance regulations of the State of Minnesota. The insurance will be provided under the group insurance policy issued by United of Omaha to the First National Bank of Minnesota as trustees of the Air Force Association Group Insurance Trust.

EXCEPTIONS: There are a few logical exceptions to this coverage. They are: **Group Life Insurance:** Benefits for suicide or death from injuries intentionally self-inflicted while sane or insane will not be effective until your coverage has been in force for 12 months.

The Accidental Death Benefit and Aviation Death Benefit shall not be effective if death results: (1) From injuries intentionally self-inflicted while sane or insane, or (2) From injuries sustained while committing a felony, or (3) Either directly or indirectly from bodily or mental infirmity, poisoning or asphyxiation from carbon monoxide, or (4) During any period a member's coverage is being continued under the waiver of premium provision, or (5) From an aviation accident, either military or civilian, in which the insured was acting as pilot or crew member of the aircraft involved, except as provided under AVIATION DEATH BENEFIT.

Eligibility

All active duty personnel of the Armed Forces of the United States and members of the Ready Reserve* and National Guard* (under age 60), Armed Forces Academy cadets*, and college or university ROTC cadets* are eligible to apply for this coverage provided they are now, or become, members of the Air Force Association.

*Because of restrictions on the issuance of group insurance coverage, applications for coverage under the group program cannot be accepted from cadets or Reserve or Guard personnel residing in Florida, New York, Ohio or Texas. Members in these states may request special application forms from AFA for individual policies which provide coverage quite similar to the group program.

Please Retain This Medical Bureau Prenotification For Your Records

Information regarding your insurability will be treated as confidential. United Benefit Life Insurance Company may, however, make a brief report thereon to the Medical Information Bureau, a nonprofit membership organization of life insurance companies, which operates an information exchange on behalf of its members. If you apply to another bureau member company for life or health insurance coverage, or a claim for benefits is submitted to such a company, the Bureau, upon request, will supply such company with the information in its file.

Upon receipt of a request from you, the Bureau will arrange disclosure of any information it may have in your file. (Medical information will be disclosed only to your attending physician.) If you question the accuracy of information in the Bureau's file, you may contact the Bureau and seek a correction in accordance with the procedures set forth in the federal Fair Credit Reporting Act. The address of the Bureau's information office is P.O. Box 105, Essex Station, Boston, Mass. 02112. Phone (617) 426-3660.

United Benefit Life Insurance Company may also release information in its file to other life insurance companies to whom you may apply for life or health insurance, or to whom a claim for benefits may be submitted.

CURRENT BENEFIT TABLES

AFA STANDARD PLAN

PREMIUM: $10 per month

Insured's Attained Age	Basic Benefit*	Extra Accidental Death Benefit*	Total Benefit
20-29	$85,000	$12,500	$97,500
30-34	65,000	12,500	77,500
35-39	50,000	12,500	62,500
40-44	35,000	12,500	47,500
45-49	20,000	12,500	32,500
50-54	12,500	12,500	25,000
55-59	10,000	12,500	22,500
60-64	7,500	12,500	20,000
65-69	4,000	12,500	16,500
70-74	2,500	12,500	15,000

Aviation Death Benefit:*

Non-war related	$25,000
War related	$15,000

AFA HIGH OPTION PLAN

PREMIUM: $15 per month

Insured's Attained Age	Basic Benefit*	Extra Accidental Death Benefit*	Total Benefit
20-29	$127,500	$12,500	$140,000
30-34	97,500	12,500	110,000
35-39	75,000	12,500	87,500
40-44	52,500	12,500	65,000
45-49	30,000	12,500	42,500
50-54	18,750	12,500	31,250
55-59	15,000	12,500	27,500
60-64	11,250	12,500	23,750
65-69	6,000	12,500	18,500
70-74	3,750	12,500	16,250

Aviation Death Benefit:*

Non-war related	$37,500
War related	$22,500

*The Extra Accidental Death Benefit is payable in the event an accidental death occurs within 13 weeks of the accident, except as noted under **Aviation Death Benefit** (below).

***AVIATION DEATH BENEFIT:** The coverage provided under the Aviation Death Benefit is paid for death which is caused by an aviation accident in which the insured is serving as pilot or crew member of the aircraft involved. Under this condition, the Aviation Death Benefit is paid in lieu of all other benefits of this coverage. Furthermore the non-war related benefit will be paid in all cases where the death does not result from war or an act of war, whether declared or undeclared.

OPTIONAL FAMILY COVERAGE

(may be added to either Standard or High Option Plan)
PREMIUM: $2.50 per month

Insured's Attained Age	Life Insurance Coverage for Spouse	Life Insurance Coverage for each Child*
20-39	$10,000	$2,000
40-44	7,500	2,000
45-49	5,000	2,000
50-54	4,000	2,000
55-59	3,000	2,000
60-64	2,500	2,000
65-69	1,500	2,000
70-74	750	2,000

*Between the ages of six months and 21 years, each child is provided $2,000 coverage. Children under 6 months are provided with $250 coverage once they are 15 days old and discharged from hospital.

Association Military Group life Insurance

$27,000 HIGH OPTION PLAN

APPLICATION FOR AFA MILITARY GROUP LIFE INSURANCE

United of Omaha

Group Policy GLG-2625
United Benefit Life Insurance Company
Home Office Omaha Nebraska

Full name of member _____
Rank Last First Middle

Address _____
Number and Street City State ZIP Code

Date of birth Mo. Day Yr.	Height Weight	Social Security Number

Please indicate category of eligibility and branch of service.

- ☐ Extended Active Duty
- ☐ Ready Reserve or National Guard
- ☐ Air Force Academy
- ☐ Air Force
- ☐ Other _____ (Branch of service)
- ☐ _____ Academy
- ☐ ROTC Cadet _____ Name of college or university

Name and relationship of primary beneficiary

Name and relationship of contingent beneficiary

This insurance is available only to AFA members

- ☐ I enclose $13 for annual AFA membership dues (includes subscription ($9) to AIR FORCE Magazine).
- ☐ I am an AFA member.

Please indicate below the Mode of Payment and the Plan you elect.

HIGH OPTION PLAN		Mode of Payment	STANDARD PLAN	
Members Only	Members and Dependents		Members Only	Members and Dependents
☐ $ 15.00	☐ $ 17.50	**Monthly** government allotment. I enclose 2 months' premium to cover the period necessary for my allotment (payable to Air Force Association) to be established.	☐ $ 10.00	☐ $ 12.50
☐ $ 45.00	☐ $ 52.50	**Quarterly.** I enclose amount checked.	☐ $ 30.00	☐ $ 37.50
☐ $ 90.00	☐ $105.00	**Semiannually.** I enclose amount checked.	☐ $ 60.00	☐ $ 75.00
☐ $180.00	☐ $210.00	**Annually.** I enclose amount checked.	☐ $120.00	☐ $150.00

Names of Dependents To Be Insured	Relationship to Member	Dates of Birth Mo. Day Yr.	Height Weight

Have you or any dependents for whom you are requesting insurance ever had or received advice or treatment for: kidney disease, cancer, diabetes, respiratory disease, epilepsy, arteriosclerosis, high blood pressure, heart disease or disorder, stroke, venereal disease or tuberculosis? Yes ☐ No ☐

Have you or any dependents for whom you are requesting insurance been confined to any hospital, sanitarium, asylum or similar institution in the past 5 years? Yes ☐ No ☐

Have you or any dependents for whom you are requesting insurance received medical attention or surgical advice or treatment in the past 5 years or are now under treatment or using medications for any disease or disorder? Yes ☐ No ☐

IF YOU ANSWERED "YES" TO ANY OF THE ABOVE QUESTIONS, EXPLAIN FULLY including date, name, degree of recovery and name and address of doctor. (Use additional sheet of paper if necessary.)

I apply to United Benefit Life Insurance Company for insurance under the group plan issued to the First National Bank of Minneapolis as Trustee of the Air Force Association Group Insurance Trust. Information in this application, a copy of which shall be attached to and made a part of my certificate when issued, is given to obtain the plan requested and is true and complete to the best of my knowledge and belief. I agree that no insurance will be effective until a certificate has been issued and the initial premium paid.

I hereby authorize any licensed physician, medical practitioner, hospital, clinic or other medical or medically related facility, insurance company, the Medical Information Bureau or other organization, institution or person, that has any records or knowledge of me or my health, to give to the United Benefit Life Insurance Company any such information. A photographic copy of this authorization shall be as valid as the original. I hereby acknowledge that I have a copy of the Medical Information Bureau's prenotification information.

Date _____, 19 ___ _____
Member's Signature

7/78
Form 3676GL App

Application must be accompanied by check or money order. Send remittance to: Insurance Division, AFA, 1750 Pennsylvania Avenue, NW, Washington, D.C. 20006

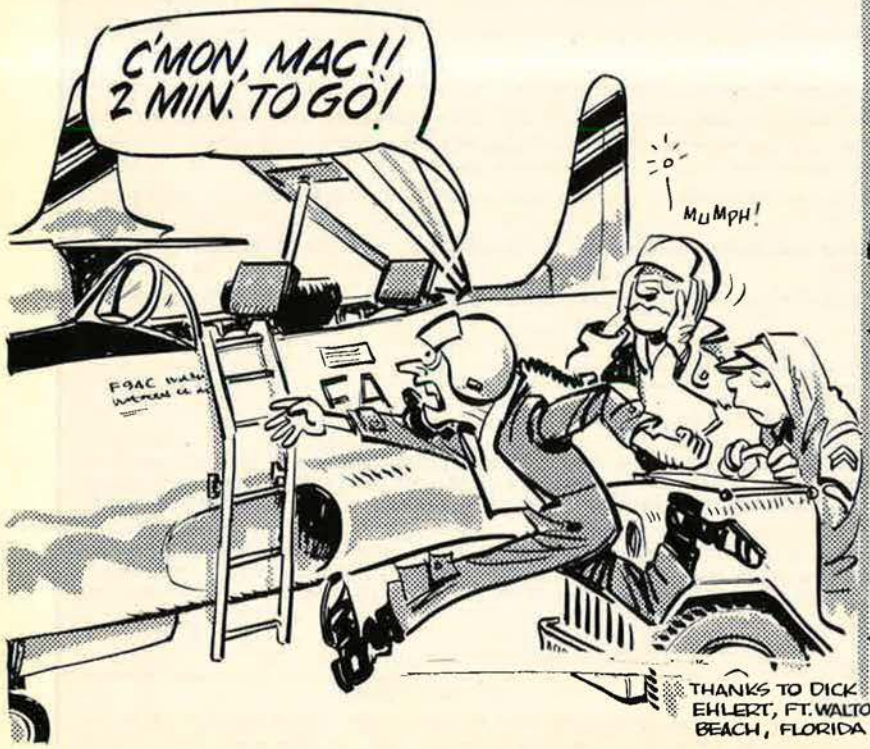
Bob Stevens'

"There I was..."

THE NIGHT FIGHTERS' LOT WAS A PRETTY LONELY ONE. SOLITARY BIRDS STALKING THEIR PREY IN PITCH-BLACK CONDITIONS. PILOT and R.O. (RADAR OPERATOR) WERE AN INSEPARABLE TEAM BOTH IN THE AIR and ON THE GROUND-*USUALLY*. IN THE HEYDAY (NIGHTS) OF ADC THIS EVENT ACTUALLY HAPPENED:

SITUATION ON A DARK and RAINY NIGHT AT McCHORD AFB:

OUR "ALERT" CREW LEAPS FROM THE JEEP TO THEIR ASSIGNED POSITIONS...



LIGHT OFF IS ROUTINE. TAXI-OUT IS SOMETHIN' ELSE...

THANKS TO DICK EHLERT, FT. WALTON BEACH, FLORIDA.

Who guides helicopters safely through Alaskan storms?

Helicopters regularly brave some of the world's most hostile weather to transport crews and supplies to offshore drilling rigs searching for oil in the Gulf of Alaska. Conventional navigation equipment simply could not operate as effectively in the Gulf, so operators installed TACAN (Tactical Air Navigation) equipment built by E-Systems.

Developed for rugged military applications, TACAN has proven to be exceptionally reliable in the Gulf. This ability to perform

is just one reason for E-Systems leadership in guidance and navigation aids, sophisticated electronic products, command and control systems, aircraft maintenance and modification, communications, and electronic warfare.

As a result, E-Systems has more than doubled sales in just five years as an independent business organization. For more information on E-Systems capabilities, write: E-Systems, Inc., P. O. Box 226030, Dallas, Texas 75266.

E-Systems is the answer.

E-SYSTEMS

Coffee, tea or JP-4?

The DC-10 from McDonnell Douglas. For years, it's been available to civilians through the major airlines around the globe. Now it's available to the military as well. The U.S. Air Force has chosen the DC-10 as its Advanced Tanker Cargo Aircraft. So Air Force planes can now carry more and fly farther than ever before to keep the peace, without having to rely on land base refueling stations. Now designated the KC-10A, it's the latest member in the long line of McDonnell Douglas transport aircraft that have enlisted to help keep the U.S. Air Force Number One in the world.

KC-10A

MCDONNELL DOUGLAS