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AIR FORCE

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MAGAZINE

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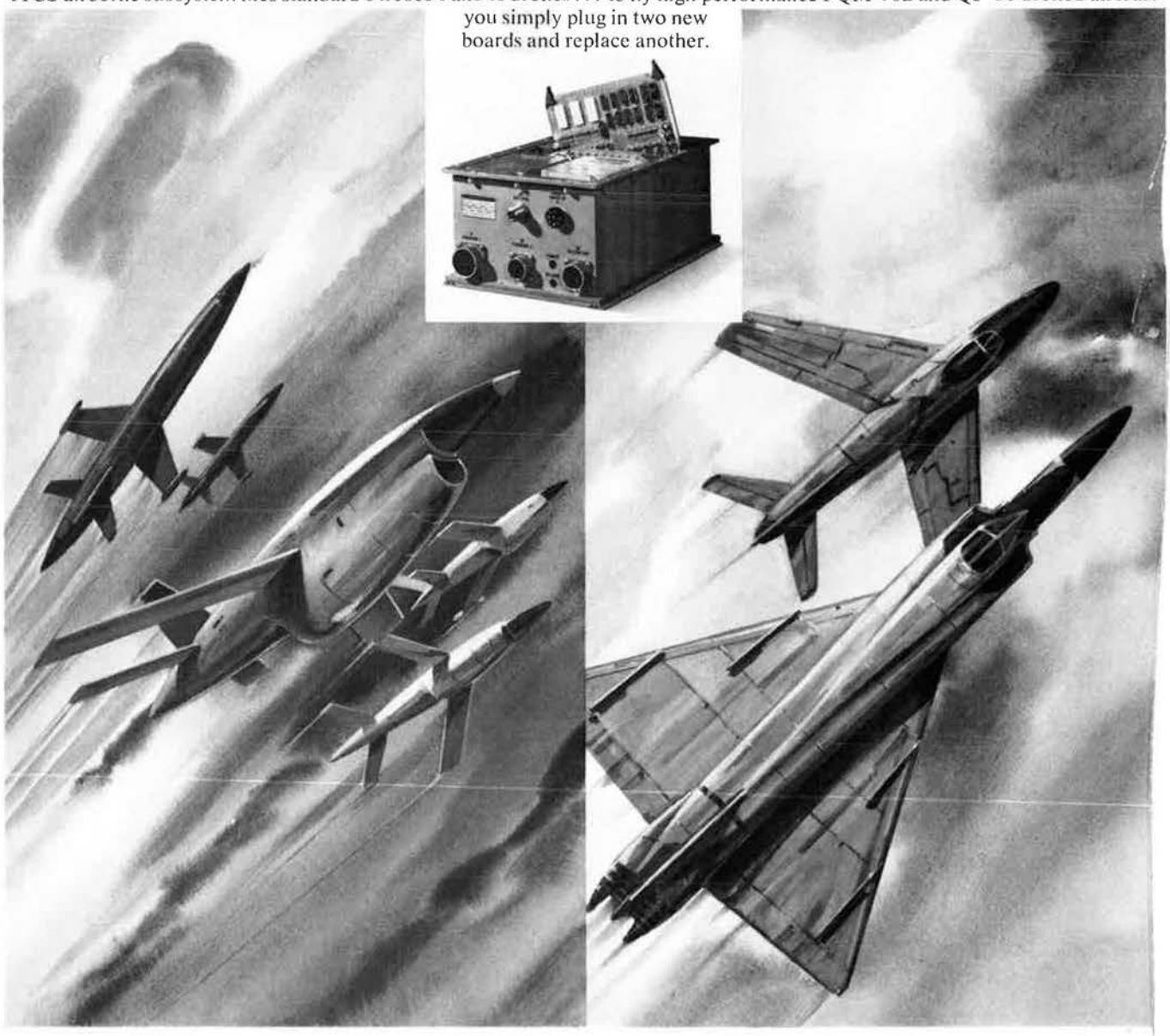

you simply plug in two new boards and replace another.

AIR FORCE MAGAZINE
PUBLISHED BY THE AIR FORCE ASSOCIATION

OCTOBER 1974
VOLUME 57, NUMBER 10

This Month

ABOUT THE COVER

The A-10, the Air Force's new close-air-support fighter now undergoing extensive testing prior to full production, is refueled by a KC-135. The A-10 is one of the new tactical weapons under development, discussed in this issue (see p. 22).

Departments

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The Deepening Shadows of Détente

By John L. Frisbee
EXECUTIVE EDITOR, AIR FORCE MAGAZINE

ONLY a year ago, when détente was just beginning to lose its seductive allure for all but the dewiest-eyed, AIR FORCE Magazine, in an editorial called "The Shadows of Détente," discussed some striking disparities between the expectations of détente's uncritical supporters and the reality of Soviet actions.

In the intervening twelve months, the shadows have deepened beyond our most pessimistic expectations. Readers of this magazine should be well acquainted with the main events of the past year that have marked the decline of détente. Only a brief review is needed.

• Less than a week after our October 1973 issue came off the press, Egypt launched the Yom Kippur War. It now is beyond dispute that the USSR knew of and approved the attack. Contrary to the Summit Agreements of 1972 and 1973, the USSR failed to inform the US of the coming attack and abrogated its pledge to work for a peaceful settlement of the Middle East problem. It also is known that for several months before the war, the USSR had urged the Arab oil producers to use oil as a political weapon against the US and our allies. They pressed the Arabs to nationalize foreign oil holdings, applauded and cooperated in the oil embargo of October 17, 1973, and counseled against lifting it in March 1974.

• Former President Nixon, still touting détente as the threshold to a generation of peace, had hoped to return from this summer's Summit Conference at Moscow with a SALT II agreement on the limitation of offensive nuclear arms. The Kremlin's total lack of interest in any agreement that would curtail its drive for nuclear superiority blasted that hope.

• Throughout the SALT II negotiations, the USSR was going ahead with accelerated development of twelve more new ICBMs in addition to the SSX-16 through -19 that Secretary of Defense James R. Schlesinger had revealed in August 1973.

• At Moscow this past summer, Messrs. Nixon and Brezhnev reaffirmed the adherence of both countries to the 1971 Four Power Agreement on Berlin, which guaranteed free access to the city for all West Germans. The words were hardly out before East Germany, surely with Moscow's blessing, began once more, on July 30, the dangerous game of interfering with traffic into Berlin.

What, then, is détente in Soviet eyes? It is a device to prevent nuclear war while the USSR achieves strategic superiority, intensifies ideological warfare, continues to support so-called "wars of national liberation," and promotes the export of US technology to the USSR in exchange for raw materials—or promises. This is not conjecture on our part. It has all been said publicly through Soviet news media.

Raymond Aron, the distinguished French historian and strategist, summed up détente this way:

In the Kremlin's view, détente is the right of the West not to be killed, provided we consent to die.

Against this realistic appraisal, it is encouraging to hear President Gerald Ford, Secretary of State Henry Kissinger, and Secretary of Defense James Schlesinger all declare without qualification that America's strength will be second to none. But here we come to a sticking point.

The US Central Intelligence Agency, noted for its conservative threat assessments, estimates that in absolute terms the USSR is now spending more on its military forces than is the US. CIA Director William Colby has told Congress that Soviet military spending is increasing at a rate of five percent (or about $4.5 billion) a year. (Other intelligence agencies believe the increase is closer to seven percent a year.) But if Congress has its way, the FY '75 US defense budget will be about $5 billion *less* than last year, in terms of purchasing power.

When one also remembers that only about twenty-five percent of Soviet military funding goes to personnel costs, compared to fifty-five percent of the US defense budget, it doesn't take a mathematical genius to figure out which side has more to spend on R&D and weapons procurement. Or which side is likely to end up in second place.

President Ford wants to work for "a positive and peaceful relationship" with the USSR. No Administration could do less, but whether that goal can be reached on terms acceptable to the US remains an open question. One thing is certain. It cannot even be approached unless the US has the political leverage provided by military posture that is, in fact, second to none. Maintaining—many would say "regaining"—that posture will not come cheap or easy. A lot more public support will be needed.

We urge the President to give the country a full accounting of conflicting US and Soviet objectives, and of the power balance that has shifted so dramatically against this country. Recent events have proved that the American people are, as in the past, capable of sound judgments when they have the facts.

What we do not need is more cosmetics that only cover over the fundamental and probably enduring blemishes of détente.

To Hercules, this is just another runway.

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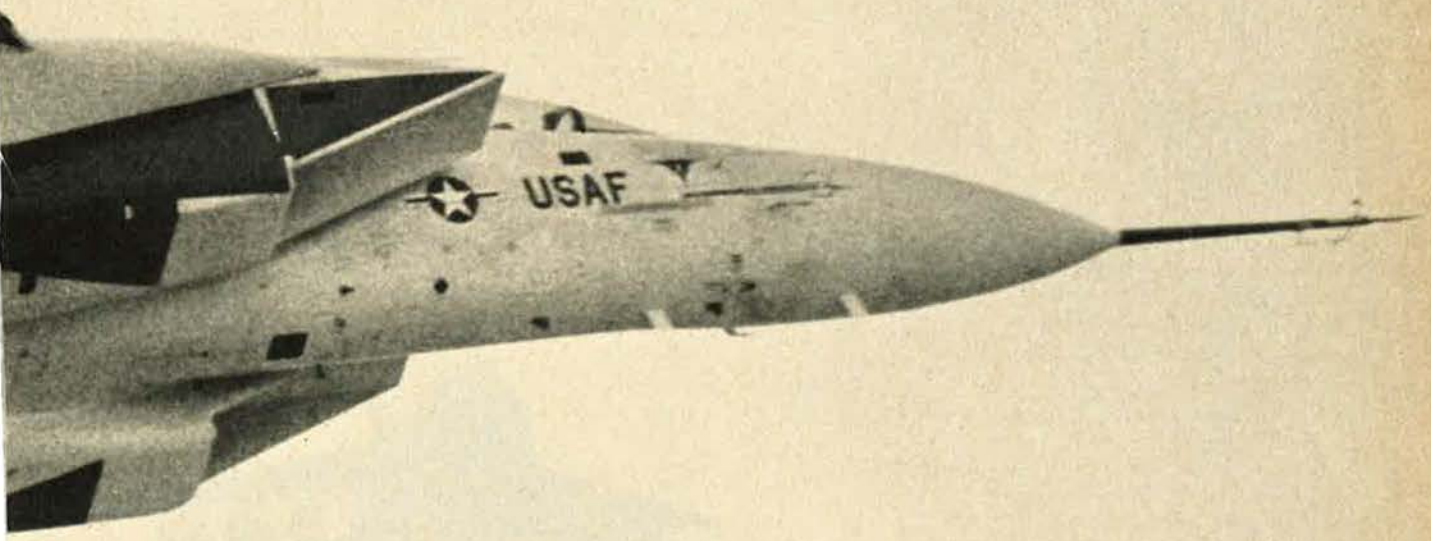
Pratt & Whitney Aircraft, Division of United Aircraft Corporation, East Hartford, Conn. 06108.



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It makes the A-7 the most accurate and cost-effective tactical air weapon system in the world.

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Airmail

Nuclear Strategy

Gentlemen: I read with interest your suggestions on "Rethinking Nuclear Strategy," in your August 1974 issue. You are to be commended for your frequent discussions of strategic issues of this kind, which go beyond and beneath the usual hardware and personnel questions.

However, I suggest that the substance of the strategy thrown out for discussion by your editors should be rejected. These are my reasons:

First: It is not at all certain, or even probable, that we would not be able to prevail over the Soviets in a Middle East nonnuclear confrontation. The fact that "the USSR outnumbers the US by at least a million troops, very likely by closer to two million," on which you base your assumption of US nonnuclear inferiority, is not relevant. The Soviets need to keep large numbers of troops in Eastern Europe at all times to ensure the subjugation of their satellites; additional large numbers are needed on the Chinese border. In any case, the number of troops either side would put into a Middle East conflict would be only a small percentage of their respective total forces. More important than total force size is the effectiveness of the force we could bring to bear and the speed with which we could do it. In this regard, I am particularly concerned that we must quickly deploy large numbers of high-performance, lightweight fighters for both the Navy and the Air Force.

Second: If the Soviet Union were, as you suggest, to "seize control of Middle East oil" in order "to bring the industrialized European nations and Japan to heel," I find difficult to understand your assumption that we would not have the active support of our European allies and use of their bases. We should not confuse this situation—in which it would be in their interest to work with us—with the October war, in which it was in their interest not to ruffle the Arabs.

Third, and most important: In my view, your suggested strategy thrusts in precisely the opposite direction from that in which we should go. It would charge headlong across the two firebreaks which are all that have saved the world from nuclear cataclysm for twenty years. It would quickly and deliberately convert a nonnuclear conflict into a nuclear conflict. Even worse, it would quickly and deliberately convert a conflict confined to remote areas into one in which the US itself would receive a nuclear attack.

At the very least, American assets and civilian lives would be lost in significant numbers. With each side determined that it not be the one to wreak the lesser destruction upon the other, and with escalation to full nuclear war only a question of degree rather than of kind, the probability of avoiding national annihilation would be small.

In summary, I cannot imagine a strategy less compatible with national security than that of escalation to a US-Soviet nuclear exchange under less than the most dire circumstances.

Robert L. Leggett
Member of Congress
House of Representatives
Washington, D. C.

Gentlemen: I read with keen interest your article of August 1974 on "Rethinking Nuclear Strategy."

This article argued that highly accurate nuclear weapons might make possible the development of a strategy that departs from Mutual Assured Destruction (MAD). The new strategy could enable a nuclear power to exert pressure on an opponent by threatening limited nuclear strikes against such targets as steel mills and hydroelectric dams rather than by threatening to attack population and urban centers on a mass basis, as would be the case in MAD.

The article also suggested that the Soviets might consider using such a strategy against the United States. This is a possibility that deserves careful consideration.

Soviet leaders continue to improve their nuclear forces, and it is prudent to assume that they will obtain the technical capability to produce weapon systems of sufficient accuracy to implement the kind of strategy described in your article.

No one can predict with certainty regarding a nation's future course of actions. We do not and cannot determine their intentions. We can, however, assess their capabilities and their potentials. The capability to implement this type of nuclear strategy would pose grave and radically different problems for our national leaders and decision makers.

We cannot hold back the technology which will permit the Soviets to develop weapons of the kind required to implement this strategy. We might, however, be able to cope with this type of strategy and confront them with options designed to persuade them to settle the issues by negotiation.

One way to prepare for this strategy is to begin thinking about and examining the problems it could pose for all aspects of national defense, including not only its impact on our military establishment and defense strategy, but also on our diplomatic strategy, our economic posture, and the preparedness efforts of our civil establishment.

You are to be commended for publishing this article, which I hope will stimulate serious discussion of the issues involved and a thorough rethinking of strategic nuclear strategy.

Daniel J. Cronin
Assistant Director for Conflict Preparedness
General Services Administration
Washington, D. C.

Army Also Participated

Gentlemen: I read Lieutenant General Schultz's "USAF Conquest of Space" and Major General Moore's "No Hiding Place in Space" in your August issue with a great deal of interest.

Without detracting from the USAF's tremendous accomplishments, I find it incredible that in both of these articles, which touch on the origins and developments of our missile and air defense programs, there is only one passing mention of the Navy and absolutely nothing about the Army. In fact, General Schultz's reference to Ex-

Airmail

plorer I and Jupiter imply that the Air Force was responsible.

How amazing selective perception can be.

Lt. Col. Paul B. Parham
Chief, Public Affairs
Hq. Sixth United States Army
Presidio of San Francisco, Calif.

Statement of Support

Gentlemen: On behalf of the National Committee for Employer Support of the Guard and Reserve, I extend my sincere appreciation to you for carrying [*p. 88*] the photograph of Sens. Barry M. Goldwater (R-Ariz.), and William Proxmire (D-Wis.), in the August 1974 issue of AIR FORCE Magazine.

It is extremely gratifying to receive such support of this very important and essential program. Through publications such as yours, vast reading audiences of the public are being reached. Since the essence of our Committee's nationwide campaign centers on encouraging employers—large and small, public and private—to sign Statements of Support for the Guard and Reserve, your assistance becomes invaluable.

Please extend our thanks to your staff as well for this boost to our efforts.

J. M. Roche
National Chairman
National Committee for
Employer Support of
the Guard and Reserve
Arlington, Va.

Higher Pay for Physicians

Gentlemen: Ed Gates's short article on the military pay system in the July issue points out the important fact that physicians must be paid more than their line counterparts to ensure continued availability of medical services within the USAF. This extra pay recognizes a supply and demand situation, where most physicians are able to pick and choose between available jobs. It also reflects a customary civilian relationship where physicians are often among the highest paid members of their communities. Then, too, physicians deserve to be compensated for the income they gave up during four years of post-graduate medical school and additional years of low-paid internship and specialty training.

Incidentally, the article understated the monthly professional pay figure. It is $350, not $250.

Capt. J. W. Christen, USAF MSC
Chief, New England Medical
Recruiting
L. G. Hanscom Field, Mass.

Roscoe's Plight

Gentlemen: I served as a Thud bear (F-105 WW Electronic Warfare Officer) from October 1972 to September 1973 at Korat RTAFB. Your features make me feel nostalgic for the old unit again.

Recently, when I attended the River Rats convention in Chicago, I heard from my old friend Maj. Tom Edge, whom I knew in the 17th Wild Weasel Squadron at Korat, that "Roscoe," the traditional SEA fighter pilot mascot, is still living and carrying on as normal. I knew Roscoe well. Tom was saying, however, that what Roscoe stands for is being forgotten. Roscoe can no longer enter the officers' club. When I was there Roscoe owned the club, if not the base. He does not have much time left on this green earth —he should be about eight years old now.

An important part of fighter pilot spirit and history is represented by the legend of Roscoe. This should not be forgotten, but the trend is in that direction now. What needs to be done about it? I'm really not sure, but I think the pilots, bears, and WSOs who were trained at Nellis would like to show that here is part of our tradition. Roscoe helped to keep our spirit up when times were rough.

Maj. Rex N. Lawson, USAF
Ottawa, Canada

• *We are certain many other ex-Thud pilots and EWOs from Korat share your concern for this grand old dog. If enough of you were to let the Wing Commander at Korat know your feelings, Roscoe might just be returned to his rightful place in Korat's social scene. Korat's APO is 96288, San Francisco.*—THE EDITORS

Story of the 55th and 398th

Gentlemen: I am currently engaged in research into the 55th Fighter Group and the 398th Bombardment Group during their period of service at Nuthampstead, Hertfordshire, England, during World War II.

It is my intention to write a book on the story of these groups ar am interested in all aspects of li at that time. I would appreciat hearing from all ranks and of a duties of any ex-members of th groups, in order to build up a dos sier on all the various trades tha existed which make it possible fc a group to function.

While interested in details o missions flown by aircrews, I an also interested in the social life a the time. If anyone has souvenirs of their stay, *e.g.*, photos, passes, patches, etc., that I may borrow, I would be most grateful. In return I shall be only too pleased to send photos of the base as it is now, although, sadly, there is little left.

However, "The Chequers" public house at Anstey Village is still almost the same as it was during the war, and several of the "locals" still have memories of the rousing evenings there during those dangerous days. One of the items recently given me was the pass card of an ex-ARC worker in the Red Cross Club, in almost mint condition. A treasured souvenir indeed.

I would also like to know if there is a 55th Fighter Group or 398th Bombardment Group association.

M. L. Osborn
Nuthampstead Airfield
Research Society
250 Kingsland, Harlow
Essex CM18 6XU, England

ER Problems

Gentlemen: The article "Tenure: Will the 'Untouchables' Be Touched?", by Ed Gates, in your issue of June 1974, interested me very much, since I was one of those snagged in the RIF of 1957. As in the case of Colonel Dougherty, I was not hurt in the long run, either in financial ways or in job prestige. Yet it was an experience of lasting traumatic effect, as I am sure it was for Colonel Dougherty and many other RIFed Reservists of integrity intelligence, and devotion to the Air Force. But clearly it was the service that was the real loser in these cases, and it is ultimately more important that the Air Force be protected from such errors than the fortunes of the individuals involved.

The abolition of "tenure" is obviously a step in the right direction. Necessary attritive action should be applied equally to all, so that the Air Force may be assured of retaining the best—whether Regular or Reserve. All officers should be evaluated on the same scale

and better means must be found to ensure that evaluations are meaningful, and that discrimination based on source of commission is eliminated.

There, gentlemen, is the rub—how to evaluate intelligently, and how to eliminate prejudice between Regular and Reservist?

In my case, my one bad ER was perpetrated by a gentleman who frankly told me that he used a different standard of evaluation for Regulars and Reservists—for a Reserve officer, he considered mine very good, so he contended. In any event, I am sure it marked me for the RIF. I derived only a little consolation from the fact that he was later himself eliminated by White Charger.

On the other hand, an Army regimental commander who happened to be a Reserve officer told me he derived considerable pleasure from leaning on any West Pointer who happened to come under his command. Obviously just as wrongheaded as the gentleman who gave me the shaft.

How, then, to eliminate such discrimination? Simply by arranging that the source of commission will not be revealed to boards set up to consider promotion, retention, or other personnel action. It can be done, and must be done.

Finally, how to ensure fair and meaningful evaluation reports? This problem has been a bugaboo for all the services since time immemorial, and God knows I cannot present a solution. I believe that adequate written comment should be required and given more weight than the bare adjectival rating. But I cannot now perceive a way to eliminate the effect of prejudices or other incompetencies—except perhaps by some method of evaluating the evaluator.

I served once under Col. Ralph W. Keller, now retired and an administrator at Stanford University. He happened also to be a Ph.D., and was much concerned with the problems of evaluation in the Air Force. He maintained that only evaluation by one's peers (officers serving with the evaluee) would prove valid, and that commanders should accept such a consensus as fundamental in preparing their reports, even though not bound by it.

I see no likelihood that Ralph Keller's ideas can be adapted to the military. I know, however, that the Air Force will continue its effort to solve the problems discussed above, for the sake of fairness to individuals—and, most important, for the good of the service. It is this sort of thing that makes RIFees proud to have been a part of the US Air Force.

Lt. Col. Edward H. Robinson,
USAF (Ret.)
San Diego, Calif.

Civil Defense a Strategic Defense

Gentlemen: I read Col. William C. Moore's article on "Counterforce: Facts and Fantasies," in your April 1974 issue, with much interest. It occurs to me that in his account of the ways in which the Soviet Union, since SALT I, has gone on enlarging and hardening strategic forces, he might usefully have mentioned civil defense—which is, after all, very much part of a country's strategic posture.

In the Soviet Union, the Civil Defense program appears very substantial indeed, involving, in theory at least, *all* the population in regular activities, including simulated "enemy" strikes with nuclear, chemical, and biological weapons. Civil Defense also has a regular place in schools' weekly timetables; and in some parts of the country gas masks, capes, and rubber boots and gloves are provided for everyone.

Elizabeth Young
London, England

Berlin Airlift

Gentlemen: I have been commissioned by my publishers, The Reader's Digest Press, Inc., to prepare a narrative account of the Berlin Airlift of 1948–49, and hope that readers might be willing to help me.

For the historical record, I am anxious to make contacts with all those who may have participated in the airlift, in any capacity.

Richard Collier
c/o John Cushman Associates
25 W. 43d St.
New York, N. Y. 10036

Operation Bodenplatte

Gentlemen: I have been commissioned by a prominent London publisher to write a book detailing the events of New Year's Day 1945, when nearly 1,000 German aircraft made surprise, low-level, coordinated attacks (code-named Operation Bodenplatte) on Allied tactical airfields in Belgium, Holland, and northern France. . . .

I am particularly anxious to obtain details of the action that took place over the south Belgian and north French sectors then defended by American air and ground units. . . .

I would be grateful if eyewitnesses could contact me. Particularly useful would be the loan of photographs, diary entries, or notes jotted down immediately after the attacks took place. I am also anxious to trace personnel who examined wrecks of German aircraft on behalf of Air Technical Intelligence, or helped interrogate the sixty-three Luftwaffe pilots captured on that day.

Richard P. Bateson
8, Lawford Road
Chiswick, London, W4 3HS
England

To Russia With Aircraft

Gentlemen: I am on a research project for the American Aviation Historical Society covering the delivery of aircraft to the Soviets in 1941–45. This project is split into three phases: the ALSIB Ferry System, the Northern Convoys to Murmansk-Arkhangelsk, and the Persian Gulf deliveries. Am seeking contact with persons having been involved in delivery of A-20s and B-25s over the South Atlantic run across Africa to Basra, Iraq, and Abadan in Iran.

Also, can someone tell me about Col. Maxwell E. Erdofy, the airport builder who, with Alcan Highway crews, is reported to have constructed airports in Siberia under Russian guards.

The loan of photographs from private sources would be welcomed. Prompt return assured.

Mauno A. Salo
12752 Annette Circle
Garden Grove, Calif. 92640

Service Down Under

Gentlemen: I am writing a book on Japanese air attacks on Australian territory between January 1942 and December 1943, and would be very pleased to hear from any members of the 49th Fighter Group and the 380th Bombardment Group, USAAF, who saw active service in the Pacific during this period.

Any members of any American Air Force unit who saw service in Northern Australia during this time are also invited to write.

James D. Rorrison
P. O. Box 64
South Brisbane
QLD. 4101
Australia

Airpower in the News

By Claude Witze
SENIOR EDITOR, AIR FORCE MAGAZINE

"Slim" and "Sascha"

Washington, D.C., September 13

In late August, within forty-eight hours of each other, Charles Augustus "Slim" Lindbergh and Alexander P. "Sascha" de Seversky, two giants in the formative era of military airpower, passed away. They were seventy-two and eighty years old, respectively.

For those of us who grew up in this era, it seems unlikely that their performances ever will be paralleled. De Seversky, who was born in Russia and lost a leg on his first combat mission in 1915, became an American citizen and a major in our Air Corps in 1927, the same year Lindbergh brought aviation out of the dark ages with his flight to Paris.

In 1927, I was seventeen years old, learning to think through typewriter keys and cutting my journalistic teeth as editor of the weekly *Survey*, student publication at the Brooklyn Technical High School, in New York. This was before the days of the Blackboard Jungle and our secondary school education was purposeful, intent, and unforgettable. There were pleasures, and one of them was an annual school excursion on the Hudson River Day Line to a recreation area at Indian Point, N. Y. The *Survey* staff loaded a mimeograph machine into a cabin on the *SS Alexander Hamilton* and published a newspaper for the picnickers.

In 1927, the annual Tech outing was held on May 20. In that day's special edition of the *Survey*, there was a short item, picked up from a shipboard radio, about a young man from St. Louis who had left Long Island and said he was flying to Paris. It was the first aviation story I ever wrote. I called him the Flying Fool, and thereby learned my first lesson about the requirement for nonadvocacy that should be inculcated in all newspapermen.

In my lifetime, it was the most important "Airpower in the News" story of all, with the possible lone exception of the flight of the *Enola Gay* over Hiroshima on August 6, 1945.

I never met Charles Lindbergh, but it is hard for me to believe I didn't. By the time I graduated from college and moved into newspaper work, the man, his accomplishments, and his personal tragedies, almost dominated the inky world of American journalism. It was a black chapter for my chosen profession. Details of the savagery need no recounting here; the important thing is the way it changed Lindbergh, and even drove him from the country.

When he returned, there was no letup, but this time the press was less at fault than the atmosphere created by our frenetic debate over the war in Europe. I had spent a large part of 1934 as an observer in Nazi Germany and was just as terrified by the Hitler machine as was Lindbergh himself. My conclusion was that we had to fight; it was inevitable and, for God's sake, let's get on with building the arsenal. The Lone Eagle took the isolationist path of America First. He was sincere, he was patriotic, but he thought we should avoid war at any cost.

General Hap Arnold wrote later that Lindbergh gave him the most accurate picture of the Luftwaffe he received. But Lindbergh's break with the Roosevelt Administration, under the circumstances, could not be avoided; it was repaired quickly once we were in the war, but not in the public eye. Lindbergh made monumental contributions during the war, under the guise of a job as a technical representative of United Aircraft Corp. He flew fifty combat missions in the Pacific and showed the US Marines and AAF pilots how to get maximum performance out of their fighter aircraft. There has been no greater example of selfless service, no more exemplary instance of cooperation between US industry and the military. The word *complex*, with its insinuations, was not applied.

Sascha de Seversky was a man I did know personally, and I have a lively file of correspondence to prove it. After our first meeting, I bought a hundred shares of

—*The National Archives*

After his 1927 solo flight to Paris, Lindbergh, who had won his wings and his commission in the Army Air Corps Reserve at Brooks Field, Tex., was jumped to the rank of colonel. He served in the Pacific during World War II, as a civilian, and flew a number of combat missions.

—*Wide World Photo*

During the latter years of his life, Lindbergh took up the causes of conservation and environment with the same enthusiasm and skill he'd demonstrated during his earlier flying career. This photo was made in 1970, on a day when he appeared as the smiling guest at a luncheon in Washington, D. C.

stock in Seversky Aircraft Corp., as a family investment; the broker thought I was either mad or had an inside tip. Sascha, a colorful and impetuous genius, was forced out by the people who turned Seversky into Republic Aircraft, but they never silenced him.

Victory Through Air Power, his most important book, was published in 1942. He lobbied in Congress, wrote scores of articles in newspapers and magazines and pounded us of the press with his convictions. He designed the prototype of the P-47 Thunderbolt. His aircraft designs won the International Harmon Trophy three times; he developed improved landing gears, the synchronous bombsight, flight instruments, and, as early as 1921, a highly successful in-flight refueling technique. He held innumerable speed records.

De Seversky gave sage advice that was ignored. In 1958, close to the eve of our mistake in Vietnam, he wrote that this country could not win "a limited war fought with traditional forces, regardless of whether conventional or nuclear weapons are used." My regret, as a newsman, was that we never got him on a platform to debate the Army's Gen. Maxwell Taylor, who had a different, and prevailing, opinion.

De Seversky was a familiar figure at Air Force Association conventions. In 1951, AFA selected him for its Arts and Letters Award. About thirty years earlier, AFA was not yet in existence to honor him when he helped Gen. Billy Mitchell prove a bomb could sink a battleship.

There is a fascinating parallel in the choices made by Lindbergh and de Seversky when they sought a domain for their energy in the declining years. The Lone Eagle turned to conservation. Never in the limelight, he is described as passionate in his devotion to the cause. He traveled all over the world and displayed a standard of scholarship that was envied by experts from every country.

De Seversky created a new business, Seversky Electronatom Corp., to tackle the problem of air pollution.

In 1947, President Truman presented the International Harmon Trophy to de Seversky (left) for his "outstanding leadership, patriotism, and unselfish devotion to the security and aeronautical progress of the US." Looking on is Secretary of War Robert P. Patterson.

His interest grew out of work in the areas of defense against nuclear attack. Fallout must be kept out of air-raid shelters. The techniques to do this, Sascha took for granted, also could be used to remove fumes and solids from smoking incinerators or industrial chimneys. At Electronatom, he kept five secretaries going at a rush pace all day. When they went home fatigued, he went out to paint the town red.

All of us have our favorite inpenetrable mysteries. Mine is the fact that our democracy can produce such men as Lindbergh and de Seversky, from as far apart as Detroit and Tiflis, and still grope in its search for competent social and political leadership. ■

The Wayward Press

The obituaries of the Lone Eagle made reference to Charles Lindbergh's strong feelings about the press and explained their origins, although that hardly was necessary.

One of the best obituaries was written by Kenneth Crawford in the Washington *Post.* He related the occasion when an auto carrying newspaper photographers forced a Lindbergh car to the side of a road in an attempt to get pictures of the family's second son. That incident helped to drive the Lindbergh family to Europe in search of seclusion.

The news of the departure was disclosed by Lauren "Deac" Lyman in the New York *Times,* in an exclusive story that won him a Pulitzer Prize. Lyman and C. B. Allen of the New York *Herald Tribune* were among the few newspapermen for whom Slim Lindbergh had any respect. Both were aviation experts.

Even in his dying, Lindbergh frustrated his ancient enemies of the press. He achieved his ultimate privacy on the island of Maui in Hawaii, where he was quietly and quickly laid to rest without benefit of clergy or columnist. The dying man himself pulled the final curtain, ignoring to the end the public right to know.

This reporter's recollection of the Lindbergh history includes my first jarring experience with sloppy newspaper work. In March of 1935, I was telegraph editor of the Hornell *Evening Tribune,* a small daily in the southern tier of New York State. My wire news came entirely from truncated Associated Press regional service.

One day, minutes before deadline, the AP bells rang. There was a "flash" from the courthouse in Flemington, N. J. Bruno Hauptmann had been acquitted, AP declared, in his trial for the murder of Charles Augustus Lindbergh, Jr.

The flash, of course, was wrong. AP corrected it, but not before I had torn apart my front page and sent printers scurrying for the biggest type in the shop to handle this unexpected turn in the news. We were able to stop only moments before the presses were to roll.

It is an incident made of the stuff that newspapermen experience in their nightmares. It was not mentioned in the Lindbergh obituaries. After all, it did not involve Lindbergh. It involved the fallibility of the press.

Aerospace World

News, Views & Comments

By William P. Schlitz

ASSISTANT MANAGING EDITOR, AIR FORCE MAGAZINE

Washington, D. C., Sept. 9

"One hour and fifty-six minutes —that's incredible!" was America's reaction on learning that an Air Force SR-71 reconnaissance aircraft had set a new and sensational New York-to-London speed record.

The aircraft, in the Air Force's inventory since 1966, has presented such a low public profile that few people outside Air Force and aerospace circles had much idea what it looked like. The average citizen is also only dimly aware of the plane's tremendous capabilities.

The SR-71 was designed and built in strict security under the guidance of the famed Clarence L. "Kelly" Johnson at the "Skunk Works"—Lockheed's equally famous facility at Burbank, Calif. Generally, the aircraft can do better than 2,000 mph (Mach 3) at altitudes in excess of 80,000 feet. It can survey 100,000 square miles in an hour. Specific capabilities remain classified.

The SR-71 has a two-man crew—in the case of the transatlantic crossing, Maj. James V. Sullivan, pilot, and Maj. Noel F. Widdifield, reconnaissance systems officer. Both men are in their thirties and are assigned to SAC's 9th Strategic Reconnaissance Wing, Beale AFB, Calif., from which the flight originated.

Upon landing at Farnborough, England, both officers—still in pressure suits with portable oxygen tanks attached—put in an appearance before media representatives attending the international air show being conducted there. (*For a report on the heavily attended show and the SR-71's reception, see p. 29. For details of the SR-71 and the earlier, related YF-12, see pp. 51–54, August '74 issue, "Jane's Supplement."*) It marked the first time that the aircraft had been on public display outside the US.

Said an Air Force official of the 3,490-mile flight: "If it hadn't been for the aerial refueling, we could have trimmed that record time further. The SR-71 has always had it, but until now just didn't flaunt it."

☆

In another flight to Great Britain, on August 26, a McDonnell Douglas F-15 Eagle hopped nonstop and without aerial refueling from Loring AFB, Me., to RAF Bentwaters—about 3,000 miles.

The demonstration of global deployment capability was made possible by new fuel pallets called Fast Packs, which provided the F-15 with 10,000 extra pounds of fuel and doubled the aircraft's usual ferry range.

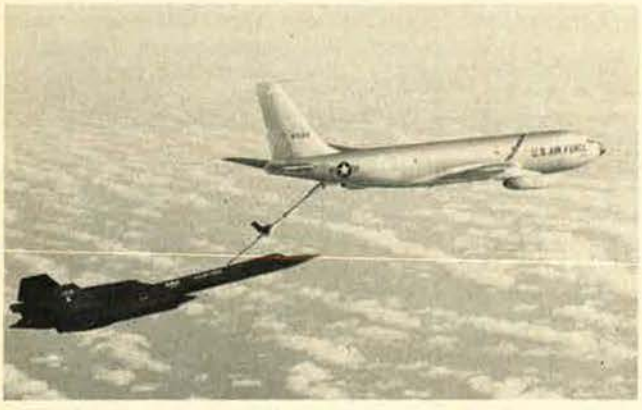
The plane, actually a TF-15 two-seat version of USAF's latest combat aircraft, was flown by Col. Wendell Shawler, Vice Commander of the 4950th Test Wing (ASD), and Irving L. Burrows, Chief Test Pilot for McDonnell Aircraft Co.

The low-drag pallets, also developed by McDonnell Douglas, nest along the side of the fuselage in the wing root area. They can take the same load and speed stresses as the basic aircraft, the company said.

Besides extending range, the company sees other uses for the pallets. For example, they might contain cameras and sensor equipment for a recce role, or other electronic gear for SAM suppression.

The pallets, according to McDonnell Douglas, can be attached and removed in about fifteen minutes.

As with the SR-71, the F-15 fol-



With aerial refueling, the Air Force's high- and fast-flying SR-71 reconnaissance aircraft is limited in range only by the endurance of its two-man crew. Here, a KC-135 Stratotanker passes fuel to an SR-71, a plane that can survey 100,000 square miles in an hour (see above).

Following the historic flight, SR-71 pilot Maj. James V. Sullivan talks on transatlantic phone with President Ford as Maj. Noel F. Widdifield looks on. At right is Sen. John Tower (R-Tex). At press time, other SR-71 crewmen planned a return record-setter to Los Angeles.

In September, President Ford welcomed planners of next year's joint US/USSR space rendezvous. From left, Maj. Gen. Vladimir Shatalov, Valeri Kubasov, Col. Alexei Leonov, Ambassador Anatoly Dobrynin, the President, Brig. Gen. Thomas Stafford, NASA Deputy Director George M. Low, Donald Slayton, and Vance Brand.

lowed its extraordinary flight with a visit to the Farnborough Air Show in England. Next scheduled stop: Ramstein AB, Germany, to acquaint USAFE personnel with the F-15 and Fast Pack possibilities.

☆

The Soviet Union experienced yet another apparent failure in its manned space program. Late in August, a rendezvous between the orbiting Salyut-3 space station and Soyuz-15 was terminated abruptly when docking maneuvers apparently failed.

The Soyuz-15, manned by two Soviet Air Force cosmonauts on their first space mission, subsequently achieved reentry and returned to earth August 29 "under difficult meteorological conditions" and at night.

Space experts believe that the hasty set-down was dictated by waning electrical battery power, necessary for major systems operation.

☆

Congress has reconvened after its Labor Day recess, and one of the first items on the calendar is a House-Senate conference on the Fiscal '75 Defense Department appropriations bill.

Before going on leave, the Senate voted, 86 to 5, for funding of about $82 billion, down $5 billion from the Administration request and $1 billion from what the House had approved.

There were efforts on the Senate floor to chop the bill further, but they were beaten off.

Sen. John L. McClellan (D-Ark.), Chairman of the Appropriations Committee, fought hard for the figures approved in his committee report. For example, Sen. Thomas F. Eagleton (D-Mo.), tried to reduce funding by another billion and won from Mr. McClellan the charge that he was "irresponsible" and using a "meat-axe approach."

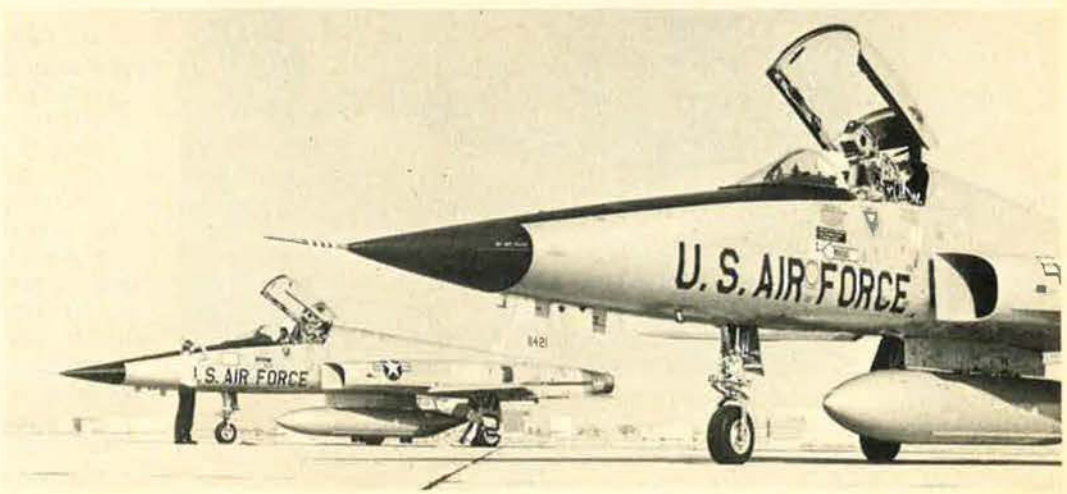
The outlook is that there will be the usual compromises. The stand of the Ford Administration does not differ much from that of the Nixon Administration on the requirement for adequate national security.

☆

The first prototype of the new swing-wing MRCA (Multi-Role Combat Aircraft) was flown for the first time in mid-August at Manching in southern Germany.

The aircraft was designed and built by Panavia, an Anglo/German/Italian company consisting of British Aircraft Corp., Messerschmitt-Bölkow-Blohm, and Aeritalia. It is the first of a planned nine prototypes and six pre-series aircraft. Two are scheduled to fly in Britain by year's end.

Set to enter service by the late 1970s, some 800 MRCAs are programmed for the RAF, the German and Italian Air Forces, and the German Navy. The aircraft's engine—the RB199-34R—is a three-spool turbofan built by Turbo-Union, also a tri-national company made up of



Two Northrop F-5E Tiger II fighters prepare to depart Edwards AFB, Calif., for Switzerland. The aircraft will undergo extensive evaluation as the final choice to modernize the Swiss Air Force. The Swiss are expected to propose the purchase of up to ninety Tiger IIs once the evaluation has been concluded, probably by year's end.

Aerospace World

Rolls-Royce, Motoren-und Turbinen-Union, and Fiat.

For a definitive look at the MRCA, its development, equipment, and expected missions profile, see p. 41 of this issue.

☆

In another test-flight program, on August 13 the Air Force flew for the first time its PQM-102 Remotely Piloted Vehicle. The former F-102 had been converted for strictly RPV operation, with no provision for manned flight—the first USAF drone fighter to be so constituted, according to officials.

The half-hour flight took place over the White Sands Missile Range in New Mexico and was followed by a perfect remote-controlled landing, observers said. Personnel from Sperry Flight Systems and the 6585th Test Group, Holloman AFB, N. M., guided the test flight.

Following a successful research program, USAF intends to have Sperry convert twenty-four F-102s to unmanned PQM-102s, with an option for ten more.

The drone fighters will be used by ADC to check the effectiveness of a variety of surface-to-air and air-to-air missiles.

Commemorating fifteen years of SAC service at Blytheville AFB, Ark., from left, Bob Littrell, head of the base/community council; Mayor Tom Little; Kennett, Mo., Mayor Dr. H. E. Goddard; Blytheville AFA Chapter Chairman Don Prevallet; and Brig. Gen. John J. Murphy, Commander of the 42d Air Division, Blytheville AFB.

For Air Force expectations concerning RPVs, see this issue, p. 22, the April '74 issue, p. 36, and cover story in the October '73 issue.

☆

For its part, the Navy has had a success with a jet drone of its own: It was shot down.

Simulating a low-flying cruise missile, the BQM-34 vehicle was fired upon and a "lethal" hit scored by an F-14 Tomcat fighter launching a Phoenix missile.

The demonstration showed that ships can be defended against cruise missiles that come in low and fast after being launched from surface vessels, submarines, and aircraft.

The F-14 was at 11,000 feet and nineteen nautical miles distant when it locked onto and fired the Phoenix at the drone, said Hughes Aircraft Co., which developed Phoenix.

Among other accomplishments claimed for Phoenix: the longest air-to-air strike—126 statute miles.

☆

The Army has extended the range of its antitank TOW missile by twenty-five percent and has demonstrated successful helicopter test firings of up to 2.3 miles.

An airborne version of the missile is currently being built by Hughes Aircraft Co. to equip Army HueyCobra helicopters. Delivery is to begin next year.

The TOW missile has already been proved in combat, however. During the Vietnam War, two Army choppers armed with the weapon knocked out thirty-nine enemy tanks and armored vehicles in one forty-five-day period.

The extended-range TOW will provide helicopter crews with just that much more of a standoff safety factor.

☆

Air Force plans to improve the accuracy of its guided glide bombs by equipping them with video-command link gear.

Under a $4 million contract Hughes Aircraft Co. will design and build two airborne data links to go into launch aircraft and thirty for the Pave Strike family of guided glide weapons.

The data links will be both transmitter and receiver, and will relay a picture of a target taken by a camera in the bomb's nose to the pilot, who can then transmit direction changes to the weapon.

Hughes originally built the Navy's

During a test flight, Sikorsky Aircraft's YCH-53E, a prototype heavy-lift helicopter under development for the Navy and Marine Corps, carries a payload of more than sixteen tons at 144 mph. The three-engine "E" is a growth version of the two-engine CH-53, in service since 1965.

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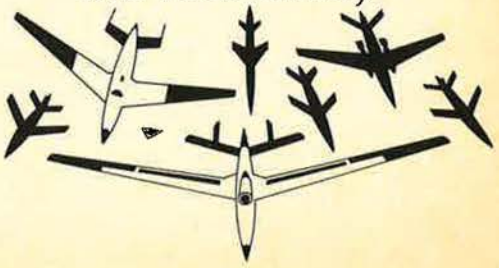

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NORTHROP

Aerospace World

Condor missile link, especially tailored for low cost, and the links to go into Air Force equipment are an outgrowth of that program. They are designed for multiservice commonality and use on a variety of weapons, the company said.

For further details on new and versatile USAF weaponry, see the March '74 issue, p. 30.

☆

USAF has initiated in-house development of a helicopter rescue system that can operate at night, in adverse weather, and in hostile geographical areas including mountainous terrain.

The system—called Pave Low III—will utilize an HH-53 helicopter airframe and off-the-shelf avionics equipment to "make possible precise low-level navigation, search, homing, and retrieval," the Air Force said.

The gear will include terrain avoidance radar, infrared sensor, inertial measuring unit, Doppler, projected map display and symbol generator coupled through a central avionics computer.

The rescue craft's development is being directed by Air Force Systems Command's Aeronautical Systems Division, Wright-Patterson AFB, Ohio. Test flights of the first prototype are expected to begin there this fall.

A Pave Low III craft is being assembled by ASD's Specialized System Program Office, the same people who gave us the outstanding AC-130 gunship. The production arrangement "not only allows the Air Force to do its own engineering, but also allows the most recent advances in technology to be incorporated as the program evolves in the testing phase," the Program Office said.

The testing program, which could lead to production aircraft for the Aerospace Rescue and Recovery Service depending on performance and cost-effectiveness, should end by the spring of 1976.

☆

In this age of extraordinarily sophisticated space research vehicles, it's back to the lighter-than-air, manned balloon for Project da Vinci.

Set for launch from Las Cruces, N. M., in mid-October, the initial meteorological research mission for the balloon is expected to last about thirty-six hours. In that span, some twenty-five interrelated scientific experiments will be conducted at altitudes between 4,000 and 14,000 feet above sea level.

Participating in Project da Vinci, besides Grumman Houston Corp., which built the advanced gondola for the seventy-foot-diameter balloon, are the US Army, the AEC, National Geographic Society, Sandia Laboratories, and the Institute for Storm Research.

☆

Tops in the 1974 USAFE "Loadeo" weapons loading competition is the 32d Tactical Fighter Squadron, Soesterberg, the Netherlands.

The 32d edged two competitors from the 20th Tactical Fighter Wing, RAF Upper Heyford, England, and the 401st Tactical Fighter Wing, Torrejon AB, Spain. The 20th had been named top load unit in the Class I—nuclear—competition and the 401st in Class II—conventional bomb—category. The Holland unit took top honors in Class III—air defense rockets—as well as overall honors.

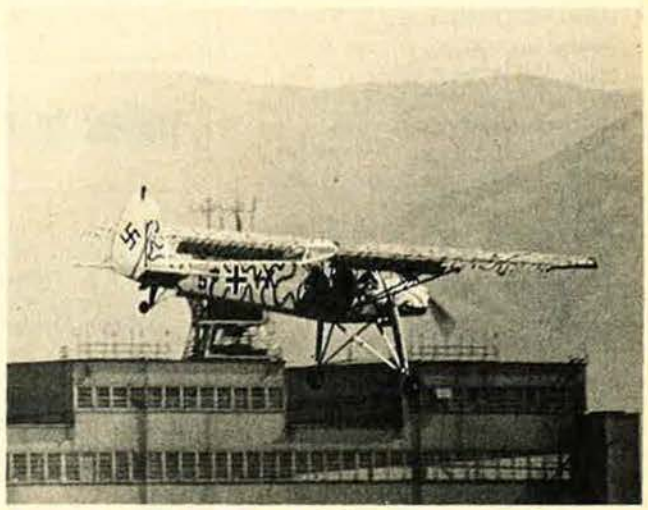
The winning load crew members are SSgt. Leonard L. Barnett, SSgt. Gary V. Hunter, Sgt. Robert H. Joyner, A1C Allen R. Ripp, and Sgt. Joseph F. Kern.

The four-day competition featured nine USAFE tactical fighter units from bases in Germany, Spain, England, and Holland.

☆

NEWS NOTES—Dr. Alan M. Lovelace, formerly Acting Deputy Assistant Secretary of the Air Force for R&D, has been appointed **Associate Administrator** for NASA's Office of Aeronautics and Space Technology, and has replaced re-

a reunion of the P-40 Warhawks Pilots' Associa- at the Air Force Museum are, from left, k B. O'Donoghue; Maj. Gen. John R. Alison, AF (Ret.); H. O. Fisher; Museum Director Col. nie Bass; D. R. Berlin; and W. O. Watson.



Latest donation to the Air Force Museum, Wright-Patterson AFB, Ohio, is this WW II Feisler Fi Storch recce plane in desert markings, recently contributed by Air Reserve Lt. Col. Perry A. Schreffler, who bought and refurbished it.

Aerospace World

tired Air Force **Gen. Bruce K. Holloway.**

Another milestone in the **B-1 program** was passed when a critical design review of Boeing's **avionics integration effort** was completed well ahead of schedule. The review covered technical, cost, and timetable aspects of the avionics for the new bomber, which is being developed by Rockwell International.

The aerospace industry reports that total civil and military **aerospace exports** may top a whopping $7 billion this year, up from $5.1 billion in 1973.

Navigator training will be beefed up at Mather AFB, Calif., with the addition of twenty-five **Cessna T-37** twin-jet trainers. This will follow the current introduction to navigator training of the **T-43,** military version of Boeing's 737 transport.

Two **Northrop** milestones in August: roll-out of its new **F-5F fighter-trainer** and first flight of its **second YF-17** lightweight fighter prototype.

Died: On August 26, **Charles A. Lindbergh,** seventy-two, whose transatlantic flight in 1927 in the *Spirit of St. Louis* electrified the world. An Air Force Reserve brigadier general, Lindbergh performed extraordinary service to the AAF during World War II, helping fighter pilots in the South Pacific extend their range. Also, on August 24, **Alexander P. de Seversky,** airpower advocate and inventive genius whose life and career paralleled the evolution of aviation, died in New York at the age of eighty. *(See p. 10 of this issue for a special report on the lives and careers of these two aviation greats.)*

Maj. Fred Meurer has joined the editorial staff of AIR FORCE Magazine under AFIT's Education With Industry program. An AFROTC Distinguished Military Graduate from Texas A&M University with a degree in journalism, Major Meurer has been a USAF information officer for fifteen years.

Died: Army Chief of Staff **Gen. Creighton W. Abrams** of cancer in Washington, D. C., in September. "An American hero in the best tradition," President Ford said of him. General Abrams was fifty-nine. He is succeeded by **Gen. Frederick C. Weyand,** who has been Vice Chief of Staff for the past year, as acting Chief. ■

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NEW MUSCLES FOR THE TACTICAL ARM

BY EDGAR ULSAMER
SENIOR EDITOR, AIR FORCE MAGAZINE

Fairchild Republic's A-10 close-air-support aircraft, powered by two GE TF34 engines, can carry an eight-ton flexible payload and is designed to deliver aerial firepower in support of friendly ground troops.

LATE this year, if present plans hold, the Air Force, upon completion of present tests and a number of design refinements, expects to receive DoD approval for full production release of the first fifty-two A-10 close-air-support aircraft.

Lt. Gen. James T. Stewart, Commander of AFSC's Aeronautical Systems Division, described this fine-tuning of the design to AIR FORCE Magazine as "more or less routine and without significant impact on production costs." (DoD has released $39 million in FY '75 funds for long-lead-time items for fifty-two aircraft, subject to satisfactory completion of the current test phase involving two prototype aircraft, and with the stipulation that contract options to procure a smaller quantity of A-10s be kept open.)

The A-10's flight testing showed that some features warrant modification, including "optimizing the bore sight of the 30-mm GAU-8 cannon. The pilots did not like the present arrangement and recommended lowering the bore sight line two degrees for air-to-ground strafing," according to General Stewart. This adjustment, he said, requires no changes of the primary structure. Another refinement involves increasing the aircraft's wingspan by thirty inches to provide lower wing loading, greater aspect ratio, reduced maneuver drag, and, therefore, increased maneuverability.

The prototype flight-test program also showed

that prolonged firing of the gun at the maximum rate can cause secondary gun gas ignition—the formation of fireballs in front of the aircraft nose. This condition, General Stewart said, will be corrected by adding a gun gas deflection device, located either on the aircraft or the gun itself. Tests determining the best location are to be completed in November of this year. Other milestones to be passed before full-scale production can be authorized include completing the engine qualification test and adjustments in the aircraft's stability augmentation system—the interconnect of the ailerons and rudder.

The A-10's General Electric TF34 engine recently completed its 300-hour Official Model Qualification endurance test, in addition to more than 800 flying hours aboard the two prototype aircraft. The first production engines, rated at 9,064 pounds thrust, are being installed in the six A-10 Development, Test, and Evaluation aircraft authorized by Congress last year and will enter flight testing by December 1974.

The program's progress, under the management of Brig. Gen. Thomas W. McMullen, General Stewart said, "has been smooth, with both the aircraft and the engines on schedule and cost."

At the insistence of Congress, the A-10 was evaluated by the Air Force and the Defense Department against the A-7 earlier this year and "the A-10 proved better suited for the close-support role." General Stewart described the evaluation as "a dilemma, because the A-7 is a good airplane that has served the Air Force well in Southeast Asia in the roles of interdiction, helicopter escort, search and rescue, and, for that matter, close support. But at the same time—assuming that our conceptual approach to the close-support mission is correct—the A-7 is not optimized for that particular role in terms of loiter, short takeoff, low-speed maneuverability, firepower, payload, and survivability. As one example, the A-10 is about one-eighth as vulnerable to small-arms fire as the A-7. These are the reasons why the Air Force has consistently opposed a so-called flyoff. The A-7 is not and could not be as good as a purely close-air-support aircraft as the A-10."

(The twin-engine A-10, built by Fairchild Republic, is designed to deliver aerial firepower in support of friendly ground troops, carrying an eight-ton flexible payload; its 30-mm Gatling cannon, manufactured by General Electric of Burlington, Vt., can destroy tanks, armored personnel carriers, and other hard targets.)

The GAU-8 gun, according to General Stewart, has "done exceptionally well" in initial flight tests and gives every indication of being extremely reliable, a trait that we expected since the gun is really a grownup M-61. The gun gas ignition phenomenon has a rather straight-forward solution—just deflect the gas so that it doesn't ignite in front of the aircraft."

The GAU-8 fires at a rate of either 2,000 or 4,000 rounds per minute, using a seven-barrel Gatling system. The twenty-foot-long gun, fully loaded, weighs about 4,000 pounds, installed. It fires fifty rounds in the first second, increasing to seventy rounds per second thereafter. The A-10 can carry 1,350 rounds. To trim both weight and cost, the GAU-8 uses aluminum cartridge cases and plastic banded projectiles. It can fire either ballistically matched target practice, high-explosive incendiary, or depleted uranium armor-piercing rounds.

Based on a programmed buy of 733 aircraft, the A-10's unit procurement cost (excluding research and development) is expected to be $2.959 million and the program unit cost (including R&D) $3.406 million, both expressed in "then-year" dollars.

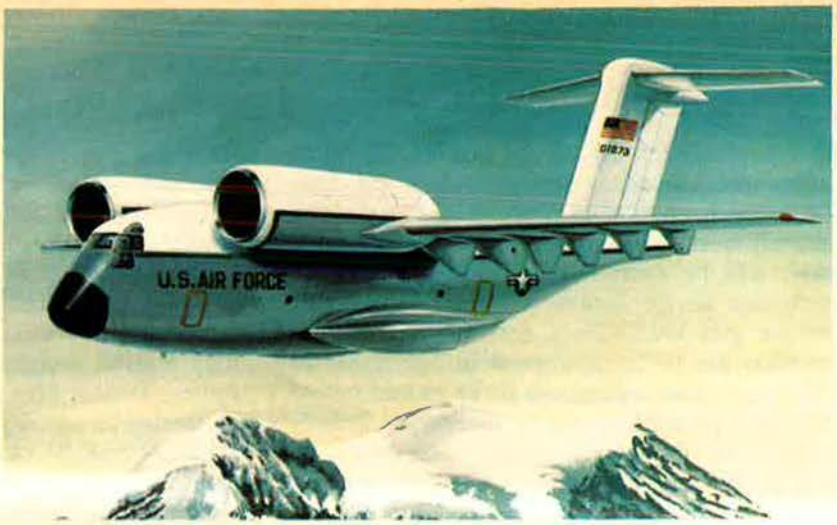
Initial international reaction to the aircraft and its emphasis on "lethal, accurate, agile, and cheap," justifies the assumption that "at least 500 A-10s will be sold abroad," according to General Stewart.

The AMST Program

AMST, the Advanced Medium Short Takeoff and Landing Transport, USAF Chief of Staff Gen. David C. Jones told AIR FORCE Magazine, is of crucial importance to the Air Force. Because of the current emphasis on strategic airlift, he said, "we realize that AMST can provide an added capability to augment strategic airlift while still meeting our tactical airlift requirements. Therefore, AMST becomes much more important now than when originally considered in only its tactical role."

General Stewart expressed a belief that AMST, currently in early prototype development, will eventually come into the Air Force's inventory as a logical extension of strategic airlift capabilities into the tactical arena. AMST, he said, eliminates the payload size and weight constraints of the currently used C-130s as well as the need for "banging the C-5 into dirt strips, something that nobody is considering seriously anyway."

AMST is rooted in the prototype, fly-before-buy policy invoked by former Deputy Defense Secretary David Packard in 1971 as an antidote to Total Package Procurement, the trouble-plagued contracting method in vogue during the 1960s. The AMST project came into being in November 1972. Its principal objectives are to design, build, and evaluate prototype aircraft that can demonstrate new tactical airlift tech-



Boeing's AMST, the YC-14, is powered by two General Electric CF6-50 engines and has an empty weight of about 117,500 pounds.

The McDonnell Douglas YC-15 AMST is powered by four Pratt & Whitney JT8D-17 fanjet engines and uses blown flaps to achieve high lift capabilities.

nologies. In part, these technologies must be capable of modernizing the tactical airlift force with a C-130-class, low-cost STOL aircraft. In the process, STOL operational rules, safety standards, and related design criteria can be defined.

In an operational sense, AMST is the distillation of the tactical airlift lessons learned in Southeast Asia and the October 1973 Middle East war. Adding to its importance is the fact that tactical airlift is now being provided by three aircraft—C-7s, C-123s, and C-130s—that were designed at least twenty years ago and are either wearing out, or can't economically be modified further.

The new tactical airlifter will cruise at normal jet speeds, between Mach 0.7 and 0.74, carry a payload two and one-half times that of the C-130 from 3,500-foot runways, or when operating in a STOL mode, land with twice the payload of the C-130 in half the distance. The wide-bodied AMST can operate from semi-prepared dirt strips and carry many combat vehicles that the existing tactical airlift fleet can't handle.

"Design to cost" is a key element of the AMST program, with the Defense Department seeking a flyaway cost of $5.0 million, for the 300th aircraft, expressed in 1972 purchasing power. AMST Program Director Lt. Col. David Englund pointed out, however, that this target figure is "subject to such variables as fundamental changes in the aircraft" that might occur if DoD and USAF decide to commit AMST to production. The prototype is confined to a "barebones demonstration" of the pacing technologies and must be fleshed out considerably before reaching operational status.

Two AMST Competitors

On November 10, 1972, the Prototype Program Office of the Aeronautical Systems Division awarded contracts to design, build, and test two AMST prototype aircraft each to the Boeing Co. and McDonnell Douglas Corp. The contracts provided for an initial ninety-day analysis and cost tradeoff phase, and a subsequent forty-four-month design, manufacturing, and test phase. The designs, as well as the contracts, differ considerably. In the case of the McDonnell Douglas aircraft, now designated the YC-15, the contract provides for cost sharing with a ceiling of $123.9 million. The government's maximum share, called limit of government obligation or LOGO, is $100.3 million. The remainder is covered by McDonnell Douglas. In return, McDonnell Douglas is entitled to one aircraft that the company may use to explore AMST's application to the commercial-transport market.

The contract with Boeing, by contrast, i a conventional cost-plus-fixed-fee (CPFF) instrument in the amount of $105.9 million (Both contracts had to be renegotiated becaus Congress cut funding from about $65 millio to $25 million for FY '74. This led to a ten month slippage in first flight and attendant cos increases. Original Air Force estimates envi sioned total program costs of about $200 mi lion, with completion by November 1975. Pre ent forecasts provide for a cost increase t

$229.1 million and a completion date of October 1977. The Air Force's funding request for the current fiscal year was for $75 million, but at this writing has been pared to $55.8 million.)

Both contracts encourage broad design latitude and promote competitive ingenuity in meeting basic performance goals. The contracts emphasize a design-to-cost effort to reduce cost and performance risks for any follow-on production aircraft.

Basic Performance Goals

After lengthy tradeoff studies, the Air Force settled *the* central performance element of the AMST project, the dimensions of the aircraft's cargo box. These are one of the few non-negotiable features of the program and have been set at 11.3 by 11.7 by forty-seven feet, adequate to accommodate the Army's self-propelled howitzers. A contract goal is the ability to handle 27,000-pound payloads from fields no more than 2,000 feet long. When operated in a conventional takeoff mode from 3,500-foot-long runways, the aircraft's payload increases to more than 53,000 pounds. AMST's mission radius is to be 400 nautical miles and its ferry range 2,600 nautical miles.

Army Secretary Howard H. Calloway recently informed Congress that "the Army's need for the AMST is manifest, and the program is supported by the Army." He added that the currently used tactical airlifters are not able to carry any of the organic field artillery of the Army's mechanized and armored divisions or the vast majority of the tactical air defense artillery. AMST requires crews of either three or four compared to five for the C-130, and because of its greater efficiency, needs only half the manpower that would be required to operate a comparable fleet of C-130s.

The Two Competitors

The Boeing AMST, designated YC-14, is a high-wing twin-engine design powered by two General Electric CF6-50 engines producing 48,300 pounds of thrust each. Empty weight is 117,500 pounds. The aircraft uses a supercritical wing design, an aerodynamic shape developed by NASA that, by optimizing the airflow over the wings, enhances lift and reduces drag at high subsonic speeds to boost range and fuel economy. The YC-14's two high-bypass-ratio engines are located forward of and above the wing so that their exhaust passes over the inboard part of the wing. This exhaust air, after passing over the upper surface of the wing and the trailing edge flap, is deflected downward by the so-called Coanda effect—the tendency of moving air to adhere to an airfoil—to create both deflected thrust and super circulation. This technique, known as upper surface blowing, means that, as the engine air is being driven over the wings, it is deflected downward to augment propulsion. The thrust deflection can be modulated by the flap section immediately behind the engine so that the pilot can adjust lift and propulsion to his needs. Augmenting this system on the YC-14 is a boundary layer control system, powered by engine bleed air that exhausts where the leading edge flap intersects with the wing.

The YC-14 is about 132 feet long and forty-eight feet high, with a wingspan of 129 feet. First flight is expected in August 1976.

The McDonnell Douglas YC-15 AMST pro-

MAJOR RPV PROGRAMS OF AFSC'S AERONAUTICAL SYSTEMS DIVISION

Program	Contractors
Defense Suppression RPV Follow-on	Teledyne Ryan
Combat Angel Improvement	Sperry, Melpar, and Teledyne Ryan
Ground Launch	Teledyne Ryan
Combat Dawn	Teledyne Ryan
Compass Cope (B)	Boeing
Compass Cope (R)	Teledyne Ryan
Compass Bin	Teledyne Ryan
Avionics Update	Lear Siegler
Interim Navigation	Teledyne Ryan
Low-Altitude Camera	Fairchild
BQM-34A Target Drone	Teledyne Ryan
Target Command Control System for BQM-34A	Vega/Motorola
BQM-34F Target Drone	Teledyne Ryan
Target Command Control System for BQM-34F	Vega/Motorola
Mid-Air Retrieval System Product Improvement Program	Pioneer
Drone Control and Data Retrieval System	RCA, Hughes, and Sperry

Above: *Two Teledyne Ryan Aero BGM-34B RPVs are surrounded by guided weapons, including an AGM-65 Maverick electro-optical missile, prior to delivery during a test.* **Upper left and left:** *Two sequential photos show delivery of an MK81 (SPASM) guided bomb from a BGM-34B strike RPV against a radar van.*

totype is a high-wing, T-tail, four-engine design that also uses supercritical wing technology. The aircraft is slightly smaller and lighter than its Boeing competitor, weighing in at about 105,000 pounds. It is 124 feet long, slightly more than forty-three feet high, and has a wing span of about 110 feet.

The YC-15's four engines are Pratt & Whitney JT8D-17 fanjets used on many commercial jetliners. Thrust is about 16,000 pounds. The aircraft relies on externally blown flaps and other high-lift technology for its STOL capability to operate from unimproved airstrips no longer than 2,000 feet with gross weights of up to 150,000 pounds.

The externally blown flaps represent a technology that NASA has been investigating intensively for about ten years. Slotted wing flaps are lowered directly into the engine exhaust to deflect the airflow downward, thereby augmenting lift. The advantage is that the arrangement produces an effect similar to increasing the size of the wing but without the penalty of increased weight and structural complexity. The YC-14 is about the same size as the DC-9 jetliner except for a much larger fuselage diameter. Like the YC-14, the McDonnell Douglas aircraft is equipped with a high-flotation landing gear for operation on unimproved fields. First flight is expected in April 1976.

Both aircraft show great commercial potential for city-center to city-center operations. (When used as an intratheater troop transport, AMST can accommodate 150 troops and their equipment, a capacity greater than most existing short-haul commercial airplanes.) Development and exploitation of the commercial market potential, as Colonel Englund pointed out, is outside of USAF's purview, but "the contractors are not constrained from cashing in on these opportunities," as long as it is not done under DoD auspices.

If an AMST is put into production, a number of ancillary military missions will be considered, including med evac, drone-launch, and gunship replacement, according to Colonel Englund.

Status Report on RPVs

Air Force Chief of Staff General Jones disclosed recently that a current USAF-wide mission analysis of future roles for remotely piloted vehicles leaves little doubt about their ever-increasing importance. Earlier this year, Air Force Secretary John L. McLucas revealed that USAF flew more than 2,500 RPV combat sorties in Southeast Asia and, "in general, the results have been outstanding." The feasibility of using unmanned vehicles in the "real world of combat has been proven," he added.

The importance the Air Force attaches to RPVs, Dr. McLucas told some 800 industry representatives at a recent symposium, is far greater than present funding levels indicate. But looking at the longer term, he said, "we see that RPV R&D funding will almost double from FY '74 to FY '75 and out-year planning shows approximately a fifty percent increase in each year for several years." Current RPV

funding, Col. Ward H. Hemenway, Program Manager of the Air Force's Drone/RPV System Program Office at Wright-Patterson AFB, told AIR FORCE Magazine is about $30 million.

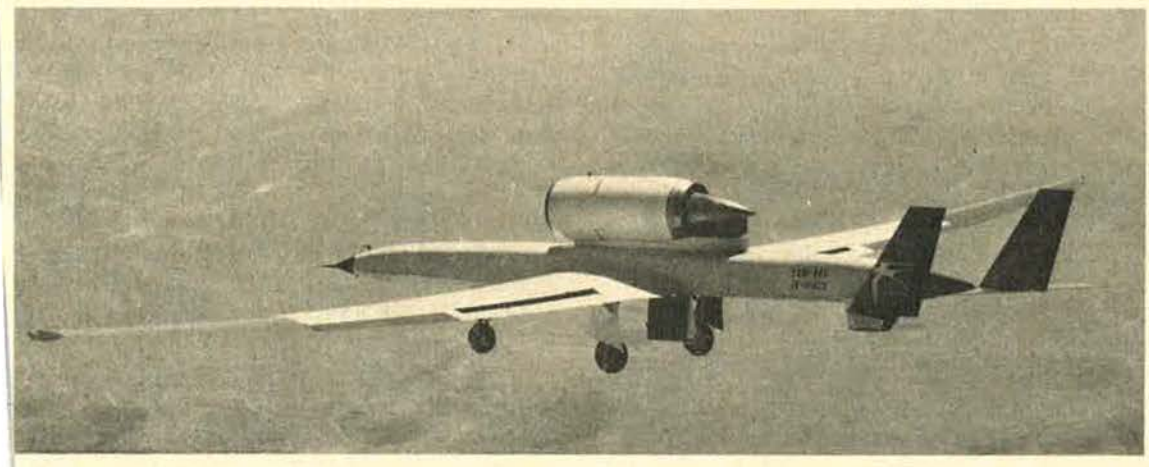
(While Air Force officials decline to discuss it, there is evidence that Israel's experience with RPVs during the October 1973 Mideast war has provided considerable impetus to US RPV efforts. This is especially true for expendable drones that proved highly effective in sucking up great quantities of Soviet-supplied Arab SAMs.)

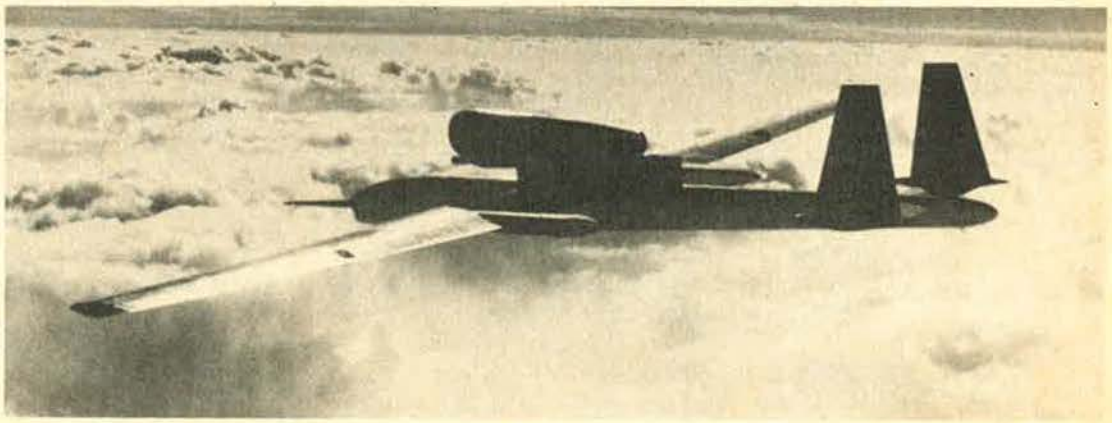
Among the most promising of current RPV programs is the BGM-34C, a modularized multimission system with three interchangeable "noses" that can operate as an electronic warfare, real-time recce, or strike RPV. "In the strike role, BGM-34B has proven extremely successful in laying down ordnance on target with great regularity. The BGM-34B RPV can strike a target and stay in the area until it has completed BDA [battle damage assessment]," Colonel Hemenway explained.

A follow-on program is the Advanced Multi-Mission RPV, which should reach operational status in the early 1980s. This program is totally different from past approaches by "starting out with a clean sheet of paper rather than adapting existing drones and subsystems," Colonel Hemenway said. According to present plans, the largest US aerospace companies will be asked to investigate total RPV systems in a two-year study of their potential in the 1980s. The program is being prepared in close concert with such major commands as TAC, SAC, and USAFE, he said.

Of major importance to the future of RPVs is the Control and Data Retrieval System (CDRS), that is now entering prototype stage. Its objective is to demonstrate the feasibility of a system that can control up to twenty RPVs reliably in the face of intense enemy jamming of the data links. This program is to act as a stepping-stone for the Advanced Multi-Mission RPV because "the ability to simultaneously control large numbers of RPVs in a hostile environment is the key to wider use of these vehicles," according to Colonel Hemenway.

There are, in Secretary McLucas' view, three principal reasons why RPVs are of so much interest to the Air Force. The first two are reducing the attrition of manned aircraft, and avoiding the political risk of crews being captured in covert recce missions. The third reason, and as the Secretary put it, "by far the most important one for the future, is to achieve





The two competing designs of USAF's Compass Cope program, the Teledyne Ryan vehicle (above) and the Boeing entry (right), are long-endurance RPVs that operate above 55,000 feet for more than twenty hours.

a significant cost advantage over comparable manned aircraft systems." This means ground launch and recovery for a large percentage of the future RPV fleet.

An Air Force effort that bears on this objective is Compass Cope (*see p. 29, October 1973 issue.*) Both the Boeing and Teledyne Ryan unmanned Compass Cope aircraft have now flown, and the Air Force plans to complete the program's prototype flight demonstration phase by the end of this year, according to Colonel Hemenway. The two companies are building and flight testing large recce RPV prototypes that can operate above 55,000 feet for more than twenty hours. They take off from and land on runways as do conventional aircraft.

The Air Force is also about to start developing a flexible catapult system, possibly based on a "stored energy, rotating device" developed in France. The purpose of the program is to reduce the operating cost of launching target drones at Tyndall AFB, Fla. The underlying principle, Colonel Hemenway explained, is a heavy flywheel that is spun with the help of an engine. Such a system will launch a dolly-mounted RPV down a track. The catapult could be either fixed or mobile. In some areas, such as the NATO countries of Europe, it could be moved around to pre-positioned ramps. Some time this fall, ground-launched drones are to begin flight tests at Edwards AFB, Calif., according to the RPV Program Director.

The Air Force also is exploring a number of new recovery technologies, including a steerable parawing and multiple parachutes similar to those of the B-1's escape capsule. For the longer term, the Air Force's Flight Dynamics Laboratory is examining the potential of air-cushion landing systems, according to Colonel Hemenway. Ultimately, he said, the Air Force might use wide-bodied jet aircraft of the 747/C-5 type as airborne RPV carriers to launch and recover unmanned vehicles.

This year, USAF's RPV R&D programs have branched out into joint ventures with the US Navy, Colonel Hemenway told AIR FORCE Magazine. In "Operation Solid Shield," two BGM-34B strike drones equipped with real-time reconnaissance capabilities were directed from the bridge of a Navy vessel standing off shore. Senior Navy and Marine Corps officers observed the shore area and such targets as pill boxes and moving tanks, picked up under cloud cover by the RPVs. "We were able to demonstrate that strike recce RPVs make it possible to stand off shore with an effective command and control system, spot targets, and attack them in support of Marine landing operations," according to Colonel Hemenway.

Neither the Department of Defense nor the Air Force "has any plans to deploy nuclear weapons on RPVs, except for the Air-Launched Cruise Missile," according to Colonel Hemenway. The latter, although called a missile, resembles an RPV.

Flying the RPVs

One of the most controversial aspects of RPV development concerns the qualifications and status of the people who will program and "fly" them. The Strategic Air Command, principal user of drones and RPVs in Southeast Asia, uses rated navigators as Airborne Remote Control Officers. The Tactical Air Command is analyzing basic concepts of RPV operation and now tends to favor rated pilots, including FACs, to control RPV strike missions.

In routine RPV operations, where one operator manages several vehicles "by exception," there appears little need for qualifications above the nonrated air traffic controller level, according to tests by the Air Force's Aerospace Medical Research Laboratory. The entire human factors area requires "exhaustive research and thought before these important decisions are made," according to Colonel Hemenway.

Electronic Warfare Capabilities

A key but classified area of ASD activities that cannot be discussed here in detail is electronic warfare systems. The Division plans to spend about $200 million this year on electronic warfare programs, involving about 100 individual projects. These range from automatic SAM killer systems to the constant updating of the defensive systems of the SR-71. Special emphasis is on modularity. New ECM pods, for instance, include the capability to accept one of five different modules, each covering a different segment of the frequency spectrum. The theater commander can thus "missionize" his aircraft to meet changing threats.

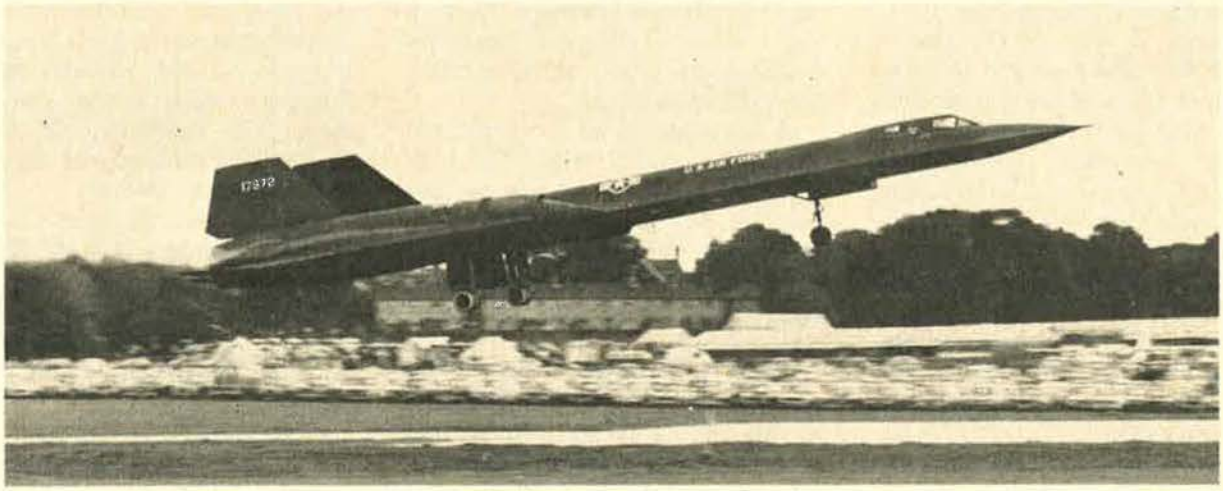
In the field of electro-optical warfare which, as one ASD expert put it, "is today in about the same state of development as ECM was at the end of World War II," advanced camouflage techniques and countermeasures to protect aircraft from high-energy laser weapons are being explored by ASD.

In this field, as in all other ASD activities, a visiting reporter comes away with one central conclusion: In a budgetary sense, the situation may be, as was said at the outset of this series of articles, bearish but the mood of the some 6,000 military and civilian staff members of the Aeronautical Systems Division is bullish. Their objective is clear—to give the Air Force the best and most cost-effective tools that advanced technology and sound management principles can provide. ■

Dominated by US equipment and technology, Farnborough International showed that American R&D investments are paying off. The SR-71 speed record capped a display of . . .

YANKEE INGENUITY IN ENGLAND

BY CLAUDE WITZE
SENIOR EDITOR, AIR FORCE MAGAZINE



USAF's SR-71 touches down with new transatlantic record, at Farnborough International '74.

LONDON, SEPTEMBER 9

THIS year, the Society of British Aerospace Companies opened its doors to the world. The Farnborough Air Show, for many years an industry display case that contained only products of Great Britain, was rechristened. Now it is called Farnborough International.

The basic reasons are simple enough. Most important is the nature of technology today and the fact that England, and most other countries in Europe, lack technological self-sufficiency. Well more than a decade ago, British politicians were responsible for a slowdown in this country's research and development effort.

In 1960, this reporter saw a Farnborough demonstration of a test rig that resulted in the AV-8A Harrier, the Hawker Siddeley VTOL transonic fighter now in service with the Royal Air Force and the US Marine Corps. The Harrier performed at Farnborough International '74 and was cheered by the crowd. It remains one of the final achievements of British technology, and British technology alone.

There is, of course, the Concorde supersonic airliner, also demonstrated here. But that is a joint project with the French, heavily loaded with American equipment. This week about seventy American companies and the Federal Aviation Administration are taking part in the Farnborough exhibition. It is the largest display of US aerospace equipment and technology ever assembled in the United Kingdom.

The show opened formally on Sunday, September 1, with the arrival here of USAF's SR-71 reconnaissance aircraft, which set a speed record of one hour, fifty-five minutes, and forty-two seconds for a transatlantic flight from New York to London. The run was 3,490 statute miles. The average ground speed was 1,817 miles per hour.

The previous record was set in 1969 by a British Royal Navy F-4K fighter at four hours, forty-six minutes, with a ground speed of 723 miles an hour. The SR-71 chopped nearly three hours off that time.

Pilot of the SR-71 was Maj. James V. Sullivan, thirty-seven years old, of Wheeler, Mont. His reconnaissance systems officer was Maj. Noel F. Widdifield, thirty-three, of Anderson, Ind. Both are assigned to the Strategic Air Com-

mand's 9th Strategic Reconnaissance Wing at Beale AFB, Calif.

Their aircraft has been on public display at Farnborough, where visitors are awed by its dull blackness and supersleek lines. However amazed by the SR-71's appearance and its performance, the average visitor is fully flabbergasted when informed that the SR-71 has been operational for ten years. One guest, a British Farnborough buff, wondered openly why the Royal Navy bothered to set a record in 1969, and how USAF, Lockheed Aircraft Corp., and the American press kept the aircraft's capabilities so secret.

The SR-71 was known as a Mach 3 aircraft. It is powered by two Pratt & Whitney J58 turbojets. Designed originally to Central Intelligence Agency specifications, it was introduced as the YF-12. That is the aircraft USAF looked to as an Improved Manned Interceptor back at the time when President Lyndon Johnson announced the development. The combat application, however, was vetoed by the Defense Department during the regime of Robert S. McNamara as Secretary of Defense.

Among other US aircraft at Farnborough, peak interest was in the flying demonstration of USAF's McDonnell Douglas F-15, the new air-superiority fighter. It was the first appearance of the F-15 Eagle in Europe and the first outside of a USAF base. The model shown is a TF-15, two-place trainer version of the Eagle. It has been on static display and each afternoon put through its paces before the air show crowd, which has been properly impressed.

The aircraft was brought to England by Col. Wendell Shawler, USAF, who flew nonstop from Loring AFB, Me., to RAF Bentwaters, more than 3,000 miles. There was no refueling. The flying demonstration was put on by Irving L. Burrows, Chief Test Pilot of McDonnell Douglas.

Both pilots say the flight from America was under realistic deployment conditions, with two Fast Packs (fuel pallets) fitted to the plane to provide 10,000 additional pounds of fuel. That nearly doubles the ferry range. With the Fast Pack installed, the F-15 can exceed Mach 2 and the handling qualities remain about the same.

The September 1 triumph of the SR-71 was marred to some degree by the tragic crash of a Sikorsky Black Hawk helicopter in front of the stands. The aircraft was giving a low-level demonstration. Some of the maneuvers, such as the fatal slow roll at low altitude, are not exercises for which a helicopter is designed. The accident is under investigation, but it seemed clear to sophisticated witnesses that the pilot did not have room to recover from the second of two rolls.

There were two men in the Black Hawk, both employees of Sikorsky and both from Connecticut. The co-pilot, Stewart Craig, was killed. The pilot, Kurt Cannon, suffered burns and fractures and later died. The men had performed the roll maneuver hundreds of times, according to a Sikorsky spokesman.

A helicopter is an economic and mechanical monstrosity. The only thing in its favor is what it can do; the feats can be duplicated by no other man-operated vehicle. Rolls at low altitude are not included in the design requirements, for any rotary-wing aircraft.

There is no denying that the competitive effort is more stimulating at this Farnborough International '74 than ever before. One visitor is William M. Allen, who carries a title as Chairman Emeritus of the Boeing Co. Now seventy-four years old, Mr. Allen recalls that his last visit to Farnborough was twenty-four years ago, in 1950. He came then, he told AIR FORCE Magazine, to see the British Comet, the first commercial jet transport, an ill-fated aircraft.

In 1950, Mr. Allen went from England to the continent, in search of airline executives interested in a new American jet transport. The reception, he remembers, was not warm. It was about seven years before his Boeing 707 made its first flight. The rest is history.

Boeing has sold nearly 900 of this aircraft, without counting the KC-135 tanker versions purchased by USAF.

For a counterpart of this saga, in 1974, best bet is the upcoming competition to provide Europe with a replacement for the Lockheed F-104G fighter plane. The race seems to dominate Farnborough conversations, thinking, and atmosphere. A decision is expected at least by January. First in line is USAF, because a major contender for the European business, which may involve a market of more than 3,000 aircraft, will be the winner of the lightweight fighter contract now facing determination at Edwards AFB in California.

The entries come from Northrop, with its twin-engine YF-17/Cobra, and General Dynamics, with its single-engine YF-16. The winner of this race is assumed to have a USAF market of at least 450 airplanes to supplement the planned force of F-15 fighters. Thus, the foreign sales possibility: there is a market at least six times the size of the US market; adoption of the airplane by our European allies would vastly increase the flexibility of USAF's potential contribution in the event of hostilities in Europe.

The airplanes, of course, are not at Farnborough. Indeed, General Dynamics Corp. is conspicuous by its absence; it is the only major US aerospace company unrepresented at this first international effort in England.

Lone showoff at Farnborough is the Swedish Saab Viggen, powered by a Swedish-built Pratt & Whitney engine. It puts on an effective air show and has a dramatic configuration, a forward canard with flaps, in front of a delta wing. The result is high speed and some STOL characteristics. The problem is the single engine, the historic neutrality of Sweden, and some skepticism about that nation's capacity to meet a monstrous requirement for flying machines and their upkeep.

The French competitor is the Dassault Mirage F.1. This reporter has not seen it, but it relies heavily on US technology. The Belgians are believed to favor the Mirage—they already have earlier models and would share in the production—but the F.1 again has a single engine, which is not favored by some members of the continental consortium. A Northrop representative in London estimates that twenty-five percent of the coming fighter purchases

will have contract requirements for two engines.

Once the USAF selection is made, between the YF-16 and YF-17, the struggle will be defined. The areas of competition involve technology, economic pressures and opportunities, and political pressures. Saab and Dassault have throbbing support already from their governments. American officials in Europe are helping, but still reluctant to push an American proposal until USAF picks a lightweight fighter.

It has been estimated that the benefits to the US, in terms of gold flow alone, will run from $9 billion to $12 billion, if an American firm can win the contracts.

If Farnborough International '74 proves anything, it is that our investments in technology—research and development—of more than ten years ago can and do pay off. To witnesses here it is unthinkable that the United States should relax its effort, as endorsed by the antitechnology camp now prominent in some circles at Washington, D. C., and Cambridge, Mass.

For show purposes, herein was the value of the SR-71 performance over the Atlantic. The airplane and its crew were not wasted, once they got here.

Majors Sullivan and Widdifield, who flew to Farnborough, were put before the cameras and the press corps in the North Exhibition Hall within minutes after landing. Sen. John Tower of Texas served as representative of President Ford and introduced the flyers.

Air Force Secretary John L. McLucas was present, along with a number of congressmen. These included F. Edward Hébert of Louisiana, chairman of the House Armed Services Committee, and Melvin Price of Illinois, who heads the research and development subcommittee of House Armed Services. There was a telephone call from Mr. Ford, who talked to Senator Tower and Major Sullivan, but reporters could not hear the conversation.

The press, of course, had a problem a couple of hours later, after the Sikorsky Black Hawk helicopter accident. It made a spectacular picture, featured by most of the plentiful London newspapers the next

A press conference, following the SR-71 flight, was held in the US exhibition area at Farnborough. Majors Widdifield and Sullivan are flanked by their wives, as reporters and TV cameras record details of their fast trip.

Majors Sullivan and Widdifield are welcomed to England by a jubilant Lt. Gen. William F. Pitts, Commander, 15th AF. The SR-71s are from his 9th Strategic Reconnaissance Wing.

On the Farnborough ramp, Congress has a session. Sen. John Tower, Air Force Secretary John L. McLucas, Rep. F. Edward Hébert, and Rep. Melvin Price greet Major Sullivan. Mrs. Sullivan is at right.

morning. An exception was the *Daily Express,* which gave the headlines to the speed record and a large front-page photo of Major Sullivan being greeted by his wife, Maggie, who is a native of Great Britain. The helicopter crash was relegated to an inside page.

As usual, the British press did not distinguish itself. At the press conference, it was brought out that the SR-71 had refueled three times after leaving California. The first was not far from the home field at Beale AFB. The plane then flew southeast, crossed over parts of Alabama and Georgia to rendezvous with a second tanker off the coast of the Carolinas. After passing the timing "gate" at its cruising altitude and speed, near New York, the aircraft descended for a quick topoff of the fuel tanks near Newfoundland. The exercise took six minutes; a normal refueling takes about twenty.

These facts, as written by Arthur Reed, Air Correspondent of the esteemed London *Times*, came out this way in his newspaper of September 2:

"The SR-71, a long, black, menacing-looking aircraft powered by two jets and able, according to United States Air Force publicity at the show, to fly faster than a rifle bullet, roared across the Atlantic at speeds over 2,000 mph and at a height of 80,000 ft. (or 15 miles), refueling in midair three times on the way."

There was, of course, a single six-minute refueling on the way across the Atlantic, a fact easily overlooked by a reporter trying to compose so complex a sentence of nearly sixty words. Mr. Reed also was left in a bit of a huff by these facts, which are accurate:

"A fly-past of the Anglo-French Concorde 01 supersonic airliner shortly afterwards went almost unnoticed by the world's press as they flocked into a conference to hear the story of the two American pilots. . . ." The world's press, Mr. Reed did not observe, has seen the Concorde perform many times and has had sample rides in it. The press never had questioned two men who had just flown from New York to London in less than two hours.

Majors Sullivan and Widdifield were a credit to USAF. They could not, however, answer questions that were not asked. The British, or world, press showed no interest in the required logistics for the cross-Atlantic mission. Col. Pat Halloran, Commander of SAC's 9th Strategic Reconnaissance Wing at Beale, gave some details to AIR FORCE Magazine.

(Colonel Halloran was the author of an article about the SR-71 in the September 1971 issue of AIR FORCE Magazine, p. 62.)

If a major problem should arise, there are more than adequate facilities available at Mildenhall, a Royal Air Force base, not far from Farnborough. Mildenhall is a home in England for our Strategic, Tactical, and Military Airlift Commands. For the show, however, support was concentrated at Farnborough.

The support was brought in from Beale in a USAF C-141 transport. What it carried was the common flyaway recovery package used by the 9th Wing for exercises and classified missions all over the world. Included are bins with all of the small parts that might be needed by men on the line. There is a starter cart, air-conditioning system, hydraulic service cart, supplies of nitrogen and the routine black boxes that will keep the electronic world of the SR-71 in orbit.

There were extra spacesuits—the SR-71 does not boast a shirt-sleeve atmosphere, although the cockpit is pressurized—and two experts on personal equipment in the initial party. Also, there were six in the first group of maintenance men who came here far in advance of the flight. A second group, building up to a total of about twenty-five, was scheduled to be in England in preparation for takeoff on the return trip. They will be prepared to take care of all potential problems in technical areas—propulsion, communications, aircraft maintenance, and the like.

Colonel Halloran, and Major Sullivan, also told AIR FORCE Magazine that, as it turned out, the single refueling was not necessary. There was a safety factor, but no requirement essential to the mission.

With all its professed expertise, the British and world press never uncovered the presence of a backup airplane. There were two SR-71s that left Beale. The backup aircraft was approximately one hour behind the Sullivan-Widdifield crew. After Major Sullivan passed the New York gate, the second aircraft turned around and went home to California.

After the Sullivan plane was clocked through the gate on this side of the Atlantic, offshore south of England, it cut a slowdown path that went over the Netherlands—high over Amsterdam—before it came down to loitering level and speed. The pilot says he was told to land at Farnborough at 2:00 p.m. He loitered for almost an hour before touching down at 1:58. Had he aborted before passing the New York gate, the backup SR-71 would have made the trip and landed precisely on time.

Why the 2:00 o'clock deadline? Because this is an air show and the Anglo-French Concorde had a place on the flying program spotted at 2:30 p.m. The SR-71 had to be out of the way.

No report from London, even one about the Farnborough air show, can be complete without a comment on the clouds. It rained almost every day at Farnborough International '74 and almost all the time on many of those days.

The other clouds are economic. The rate of inflation in England is staggering. The public is groaning; the government is terrified and ready to change; the newspapers point with alarm, even conjecturing what will happen if the English pound collapses.

Yet the pressure to cut back on essentials and spend more for welfare programs continues unresisted. The politicians are, in effect, running an auction. They are offering taxpayers' pence to buy votes. One candidate for Parliament this week came up seriously with a proposal that the government should give one pound and thirty pence each week to each British teenager as pocket money. He said he did not care if they spent it for "booze or pot"—if they did that would help teach them about financial responsibility.

There has been no evidence of a candidate who favors spending more to improve England's technological capability. Not many years ago it was the world's finest. Today, Rolls-Royce Ltd. is listed in the Farnborough program as "wholly government owned." ■

Maybe Soviet negotiators aren't bluffing, but they're not showing their hole cards either. Unfortunately for us . . .

ALL THEIR (RED) CARDS ARE IN THE HOLE

BY COL. WILLIAM F. SCOTT, USAF (Ret.)

IMAGINE a card game in which you show your opponent your own hand. You then tell him what cards you think he holds. He may disagree about one or two of the cards you claim he has, so a mutual agreement is reached about his cards—which are never displayed. He plays according to the cards you have revealed, and you play according to the cards you think he has. How would the Mad Hatter have described this game to Alice during her visit to Wonderland?

Such a game is no more strange than the conduct of our arms "negotiations" (the term is used loosely here) with the Soviets, when we tell Soviet representatives the size and composition of our own armed forces, and what we consider their own forces to be. They reveal nothing. If our estimates suit them, the negotiations continue. If they object to our estimate of their forces, new estimates are submitted by our side until the Soviets agree. During the SALT I negotiations, the Soviet representatives never revealed even the designations of their own weapon systems.

To a considerable extent, the same one-sided rules apply to nonmilitary negotiations with the Russians. For example, if our business leaders are to have worthwhile trade relations with the Soviet Union, they need information on Soviet industry. But, what would be common knowledge about an industry in the United States may be a "state secret" in the Soviet Union.

Soviet peacetime security rules are not only comprehensive, they are specific, as indicated by the following translation from a Soviet Ministry of Defense publication, *To Help the Pre-Callup* (Moscow, Military Publishing House, 1967. Pp. 93–94):

> What information makes up a government and military secret?
>
> Government secrets are made up of information of state importance: mobilization plans and operational plans and data, calculations, projects, and measures on the Armed Forces as a whole and on separate military objectives; all questions connected with the defense of the country; information about mobilization, material, and food reserves; lists of military production, and military orders and other documents of defense importance.
>
> Also considered a government secret is important economic information: the wealth of our country; on discoveries, inventions, and improvements of a nonmilitary nature in all areas of science, technology, and the economy (before their publication); information about negotiations, dealings, and agreements of the USSR with foreign governments, and also about any other measures in the realm of foreign policy and foreign trade not published in official sources; government ciphers, the content of correspondence written in cipher, and so forth.
>
> Information on the organization of the Armed Forces, their number, location, combat capability, armaments, equipment, combat training, the moral-political state of groups, their material and financial support, is a military secret.
>
> Data on the guarding of state borders; information on military inventions and improvements; about the economy, having military significance; about the location of military objects (depots, airdromes, and so forth); on the status of communications, transport, etc., also are considered military secrets.
>
> The range of questions composing military secrets in time of war, naturally, is broader.

Negotiating for high stakes with the Russians is not a game for the amateur, the ingenuous, or the uninformed. ■

The author, Col. William F. Scott, retired from the Air Force in 1972, on completion of his second tour of duty as US Air Attaché in Moscow. A US Military Academy graduate and a bomber pilot in World War II, he held several staff positions associated with the study of Soviet military affairs.

After painstaking studies, NASA and the Air Force—the latter acting in behalf of DoD—have decided on final performance and sizing specifications of the National Space Transportation System, popularly known as the Space Shuttle. Developed by NASA to serve both military and civilian purposes, the Shuttle is expected to usher in . . .

A NEW ERA OF ECONOMICAL SPACEFLIGHT

BY EDGAR ULSAMER
SENIOR EDITOR, AIR FORCE MAGAZINE

AROUND the end of this decade, the United States plans to start a new space program whose total price tag, counting research and development as well as operations and payloads over a twelve-year period, is expected to be about $50 billion. The new program, scheduled to reach operational status in 1980, is the National Space Transportation System, or Space Shuttle, meant to put the US, as NASA officials say, "into the space trucking business." *(See "US Space Program Moves Toward New Frontiers," March '74 issue.)*

The Air Force, DoD's executive agency on the Shuttle program, will be one of the key users of the system. Department of Defense payloads are expected to account for about $11.7 billion and thirty-one percent of all missions flown between 1980 and 1991, the period covered by NASA's revised and updated forecasts. (The cost of launching these DoD payloads with conventional means, according to NASA spokesmen, would be about $5 billion higher.) The Air Force will also develop an important subsystem of the Shuttle, an interim, unmanned, and presumably expendable orbit-to-orbit shuttle (OOS), or tug, that is to place military and NASA payloads into geosynchronous and other high-altitude orbits. (OOS will be replaced by the middle of the next decade by a two-way tug with greater payload capacity. It is to be developed by NASA.)

The product of a joint NASA/DoD requirement formulated in June 1969, the Space Shuttle system consists of three main components: a reusable Orbiter, with three main engines, which is a combination of spacecraft and glider; a large LOX-hydrogen tank that carries fuel for the Orbiter's main engines; and two solid-fuel rocket boosters strapped to the sides of the tank. Takeoff is like a conventional rocket or missile launch.

The Orbiter can house a crew of seven, place 65,000 pounds of payload into low earth orbit, and retrieve 32,000 pounds of material from space. Retrieval of spacecraft for repair, refurbishment, and modification is expected to revolutionize the economics of space operations, both military and civilian, once the Shuttle system becomes operational.

Total thrust of the Orbiter's three main rocket engines and those of the two solid boosters is more than six million pounds at liftoff, five times that of Titan III, the largest USAF booster system. Following liftoff, the Orbiter pitches over on its back so that it climbs into orbit essentially upside down. About two minutes into the flight, the solid-rocket boosters burn out and are parachuted into the ocean to be picked up for refurbishing and eventual reuse.

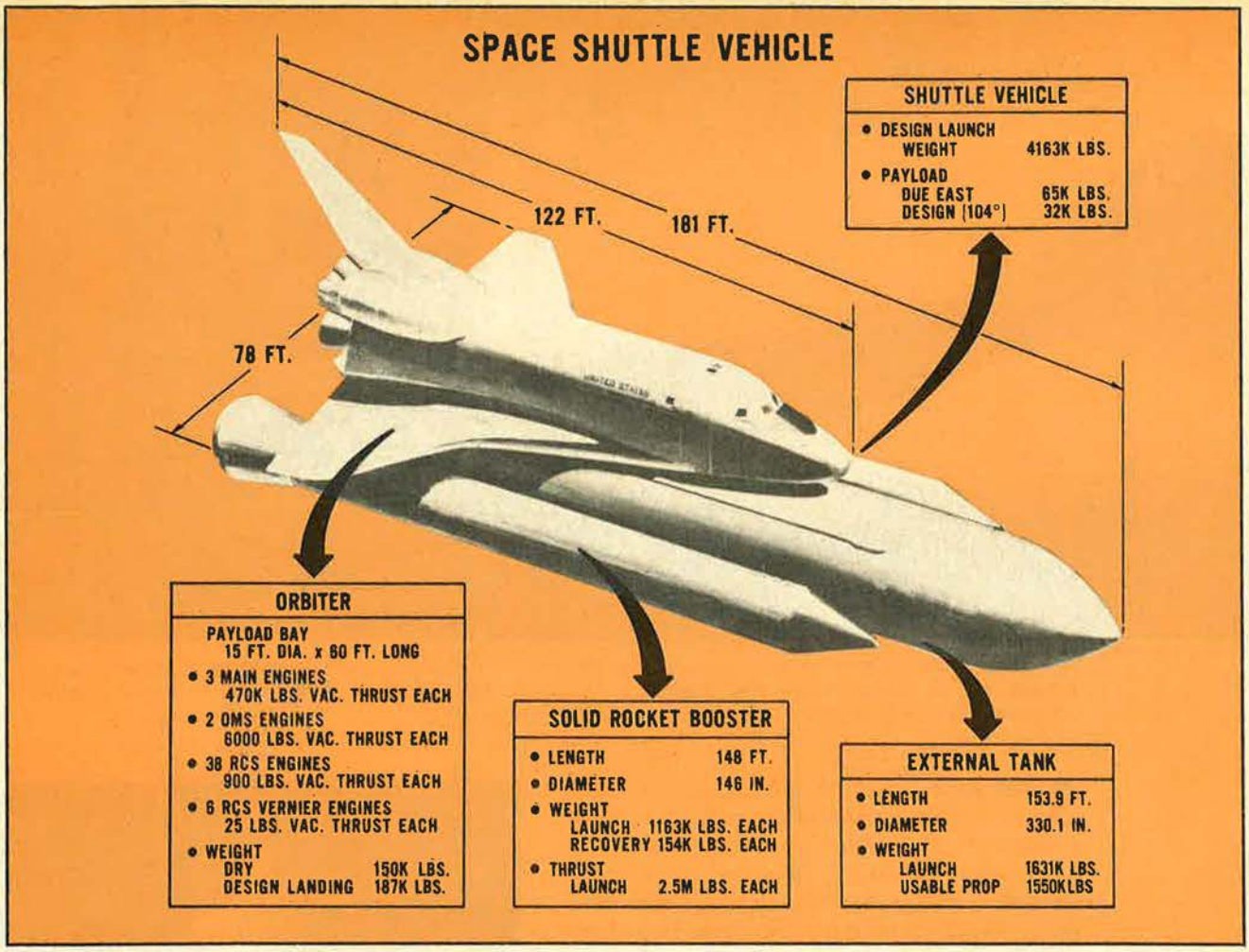
Approximately eight minutes into the flight, the Orbiter's main engines, which are used only for takeoff, cut off and the external tank that fueled them is jettisoned and falls into a remote ocean area. (The tank is the only element of the system that is not reused.) Following separation of the tank, the Orbiter, which is about the same size as a Boeing 737 or DC-9, burns its two Orbital Maneuvering System (OMS) engines for about eighty seconds to achieve an elliptic orbit and then "circularizes" its orbit through a second engine firing. The Orbiter's orbital altitude can be varied for different missions and payloads from about 100 to 650 nautical miles.

Upon completion of the mission, normally a seven-day period that can be stretched to a month, the OMS engines are used to de-orbit the craft, which enters the atmosphere at an angle of attack between thirty and forty degrees to minimize the effects of kinetic heating, and glides to an unpowered landing. The Orbiter will then be refurbished and will be ready for reuse within two weeks.

Earlier this year, NASA dropped plans to equip the

NASA SHUTTLE CONTRACTORS
(Revised by NASA as of May 28, 1974)

Main Engine	Rockwell International Rocketdyne Div. (Calif.)
Controller	Honeywell (Minn.)
Hydraulic Actuator	Hydraulic Research Inc. (Calif.)
External Tank	Martin Marietta (NASA Michoud Assembly Facility, La.)
Solid Rocket Motor	Thiokol (Wasatch Div., Utah)
Orbiter Software Programming	IBM (New York)
Shuttle Training Aircraft	Grumman (New York)
KSC Design Engineering and Support	Planning Research Corp. (Ala.)
Software Development	IBM (New York)
Engineering Operations Support	McDonnell Douglas (Me.)



Orbiter with air-breathing engines that were to assist during landings and in ferrying the vehicle inside the US, mainly between the two launch sites—the John F. Kennedy Space Center in Florida and Vandenberg AFB in California. For cost and weight reasons, NASA decided to simply ferry the Orbiter in piggyback fashion on a modified 747 jetliner. This change will not affect the Orbiter's 1,100-nautical-mile cross range, meaning the ability to maneuver within such a range following reentry.

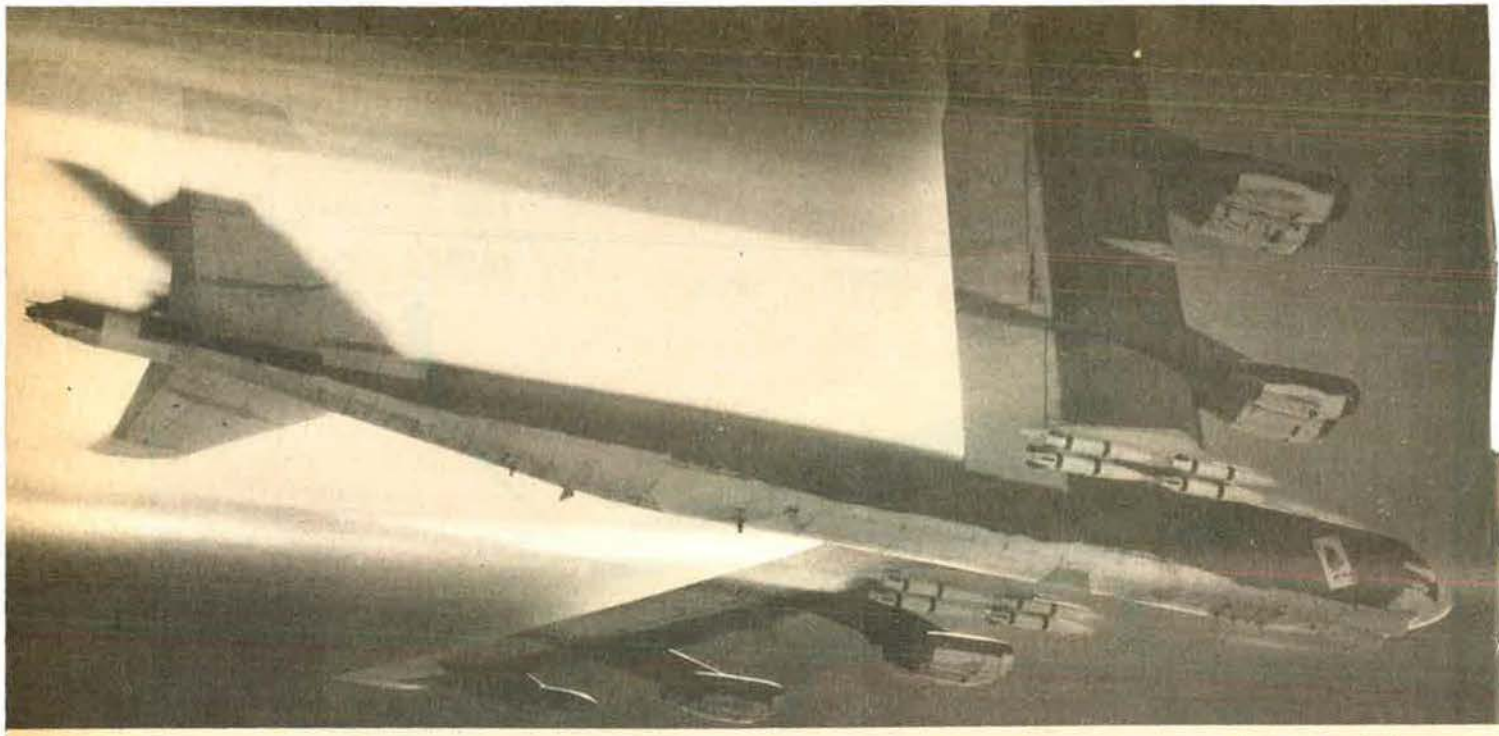
Cross range is crucial in case of abort and especially important to military missions that usually involve polar orbits flown from Vandenberg AFB. If the Orbiter is to return to earth after one orbit, either because of difficulties or for operational reasons, it must compensate for the rotation of the earth and in effect fly back to its launch site; the longitudinal distance between the point of reentry and the launch site in such cases can approach 1,100 nautical miles. If the Orbiter could not reach its launch site, it would have to be ditched.

According to the latest estimates, 725 Shuttle missions will be flown between 1980 and 1991. This will require seven Shuttle systems—five more than provided for in the R&D phase of the program, which is expected to cost about $5.2 billion in 1971 dollars. Each additional Orbiter will cost approximately $250 million, and each flight about $10 million, in 1971 dollars.

Among the more ambitious follow-on uses of the Shuttle system now under preliminary study is the disposal of nuclear waste in space. According to estimates by the Atomic Energy Commission, 200 Orbiter flights a year may be required to eject harmful waste products of nuclear power generation by the end of this century. Another proposal involves the assembly of huge solar panels in space. A forty-million-pound panel would provide the power needs of New York City. Several hundred Orbiter flights would be required for such an undertaking.

According to NASA's estimates, forty-three percent of all Shuttle missions will require an upper stage to loft payloads into high-altitude orbits. Almost half of all Air Force missions will involve orbit-to-orbit transfers. Developing a full capability tug able to deliver substantial payloads to geosynchronous orbits and retrieve them will cost at least $450 million and has been deferred by NASA until after the basic Shuttle system has been paid for.

As a result, there would be a gap between the time the Shuttle becomes operational in 1980 and the mid-1980s, when a NASA-developed, reusable tug is to be available. For this reason, the Air Force plans to develop an interim orbit-to-orbit system at a cost "significantly below" $100 million. The OOS is to be available by December 1980, must be capable of delivering payloads of up to 3,000 pounds from a low orbit into geosynchronous orbit, and probably will be expendable. Cost constraints hold OOS to a modification of existing systems, with the Centaur, Agena, Delta, Transtage, and Burner II boosters the most likely candidates. ■



The awesome B-52 has undergone numerous modifications through the years, enabling it to maintain its superior role in nuclear deterrence. Latest is the Electro-Optical Viewing System, or EVS, which greatly enhances the B-52's offensive and defensive capabilities in darkness.

SAC's B-52G and H models, which make up the greatest part of this nation's manned strategic deterrent force, are being given a new operational capability. Known as Electro-Optical Viewing System (EVS), this most recent modification of the late-model Stratoforts will enhance their ability to penetrate enemy defenses, locate targets at night and in bad weather, and operate in what is known as a "closed-curtain" environment.

The story of the development of EVS goes back several years and is a tribute to interservice cooperation in creating advanced military equipment. Much of the exploratory and developmental work that has made the Air Force EVS possible was done by Army researchers working on night-vision equipment for use by our ground forces.

Night-vision devices came into their own during the Vietnam War. They are credited with saving countless American lives, yet the general public and many military people have only a rudimentary understanding of what this equipment does and how it does it. It is worth a few minutes to trace the evolution of these miraculous devices, as an aid to understanding the "what" and "how" of the EVS now being installed in SAC's bombers.

Although night vision came of age during the Southeast Asian conflict, US armed forces experimentation with image tubes began during World War II. The subject had been investigated by US scientists even earlier than that; a scientific paper entitled "Apparatus for Transformation of Light of Long Wavelength into Light of Short Wavelength" dates back to 1934.

Of particular interest to the military was the image converter or infrared image tube. During the 1940s, the US Army began experimenting with infrared viewers for night battlefield surveillance and weapon sights.

This staged but unretouched photo shows an image as seen through a night-vision scope. Simulated light was less than starlight.

The basic invention was called a photoemissive infrared image tube converter and was capable of electro-optically demagnifying an image. In nontechnical terms, the reduction of the size of the image—without changing the existing light on the image—would, in effect, make that light brighter in relation to the reduced image. To put it another way, the tube was capable of amplifying a low-level-light source.

Mathematically, a one-sixth reduction of the image diameter increases electron density—and a resultant brightness—*thirty-six times!*

Experiments were conducted with multi-

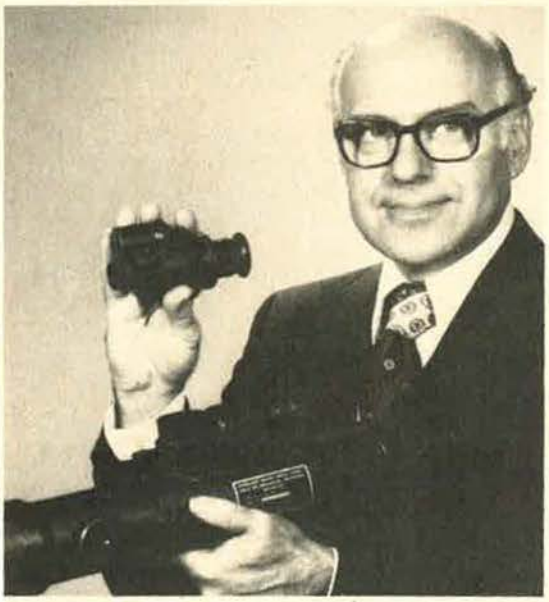
After years of darkness, use of the EVS is like "looking out a window" for curtained Stratofortress crews, even flying at night. They're busy installing . . .

NIGHT EYES ON THE B-52

BY ALLEN STORM

staged image tubes, varieties of lens materials and lens coatings, and ultimately a magnification lens system. The end product was a scope that could amplify a low-level-light source while magnifying the image of the area being brightened. This was to become the prototype of the small hand-held Starlight scope capable of ranges up to 700 meters with an amplification factor as much as 60,000 times the originating light source.

How well did the scopes work in Vietnam? On a starless night, the image presented was so clear that the viewer could tell what kind of weapon individual enemy soldiers were carrying.



Dr. Robert S. Wiseman, the "father of night vision," compares the combat soldier's first night-vision scope with the smaller, handier third-generation device.

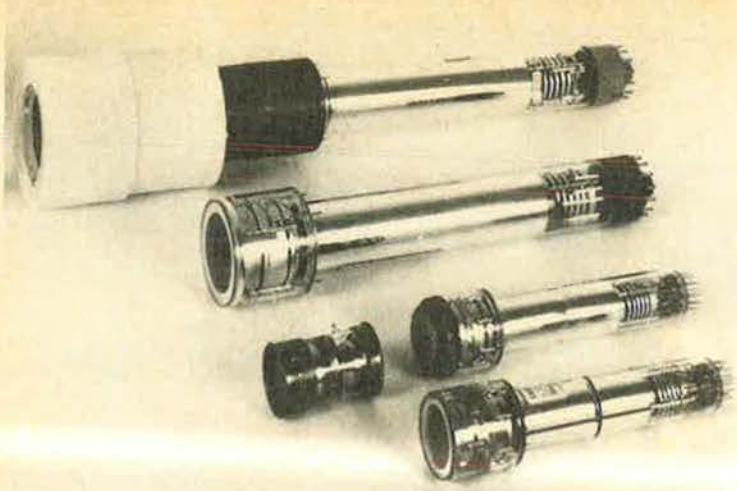
Night-Vision Pioneers

The US Army's Electronics Command (ECOM), headquartered at Fort Monmouth, N. J., and its Night Vision Laboratories (NVL) at Fort Belvoir, Va., have primary responsibility for the military research and development of image converters and image intensifiers. Dr. R. S. Wiseman, Director of ECOM's Electronics Laboratories, is acknowledged as being the "father of night vision" and was very much involved with the initial research of image intensification.

Working along with Dr. Wiseman was Army scientist Benjamin Goldberg, whose involvement with image intensification began in 1941. He ultimately took over direction of NVL in 1965.

Another night-vision visionary is Donald J. Looft, who joined the research program during World War II and added much to the evolution of the first single-stage intensification tube. Upon Mr. Goldberg's retirement in 1973, Mr. Looft became director of NVL. Today, he is chairman of the Joint Technical Coordinating Group on Thermal Imaging Systems, an organization of top Air Force, Army, and Navy personnel chartered by the Joint Logistics Commanders to develop a commonality of future night-vision weapon systems. The tri-service venture will add impetus to research and development programs and eliminate costly duplication of effort.

Robert Threlkel, another vital link in the chain of night-vision development, is a lens expert who established the Army's first photographic repair facility at Sacramento Army Depot, Calif., in 1951. The facility was to be converted to headquarters for the repair and product improvement of all night-vision devices then in the military.



Key to EVS progress was development of the low-light orthicon television tube. From top down are the intensified image orthicon; image orthicon; two-inch image orthicon with fiber optics; a 25-mm intensifier; and the two-inch image orthicon.

The first night-vision scopes issued to troops in the field were instruments of delicate balance, but there is little room for delicacy in jungle warfare. As scopes "wounded" in battle began to return to the laboratories at Sacramento, research teams at Fort Monmouth and Fort Belvoir joined forces to make the devices more battle worthy.

What ultimately emerged was a series of rugged, combat-effective, night-vision devices ranging from compact hand-held instruments to large deck-mounted scopes.

Night Vision Takes to the Air

The first formal aerial use of night vision began with a closed-circuit television system tested during the early '60s. Researchers at NVL had developed an entirely new image tube called a SEC Vidicon tube. SEC stands for Secondary Electron Conduction, and its Vidicon tube fiber is optically coupled to an image intensifier, which gives it a low-light reproduction capability.

As a result of the successful tests, NVL equipped five UH-1C helicopters that were deployed to Vietnam "for evaluation as a means of improving the Army's capability for conducting counterinsurgency operations."

With the code name "Batman," the night-flying choppers proved to be extremely effective in counterinsurgency operations, becoming the scourge of infiltrating sampans slipping into shore under the cover of darkness. So effective was the equipment that the Navy borrowed a system for use aboard a river patrol boat.

The use of night vision had long been a

SIX MONTHS LATER: BETTER THAN EXPECTED

After six months of Strategic Air Command operational service, the reliability of the AN/ASQ-151 Electro-Optical Viewing System (EVS) for late-model B-52G and H bombers has exceeded requirements specified by the Air Force Logistics Command's Oklahoma City Air Logistics Center, weapon system and procurement manager.

To date, five SAC units at K. I. Sawyer AFB, Mich.; Ellsworth AFB, S. D.; Grand Forks AFB, N. D.; Loring AFB, Me.; and Robins AFB, Ga., have been activated on schedule with EVS-equipped aircraft and ground-support equipment. (*See also related item in "Aerospace World," June '74 issue, p. 14.)*

The production program for the EVS began at Boeing Wichita in 1971 and is on schedule and within negotiated cost. The last EVS kit, for installation at AFLC depots in Oklahoma City and San Antonio, is scheduled for delivery during the first quarter of 1976. More than 270 kits will be produced, along with associated ground-support equipment, in the $212 million EVS production program.

Boeing-funded conceptual studies and demonstrations of a proposed EVS were conducted at Boeing's Wichita Division in 1965. SAC issued an EVS system requirement in late 1965. A prototype development program with Boeing Wichita as the integration contractor and industry manager was authorized in April 1969. Hughes, Westinghouse, IBM, Kaiser, and Conrac were selected to provide elements of the system.

Authorization to proceed with limited engineering and long-lead procurement for qualification test articles was given to Boeing Wichita in December 1970, and a final contract negotiated in June 1971. Also in June 1971, the Air Force decided to use computer-aided aerospace ground equipment (AGE) to automatically test and fault-isolate EVS hardware. Computer-aided depot-level AGE will be delivered to Warner Robins Air Logistics Center, Ga., in 1974 and 1975 to activate its repair capability for elements of the installed EVS.

The 1,110-hour Production Reliability Demonstration Test (PRDT) conducted by Boeing Wichita in 1973 was the first time that an entire system has been tested in a specially built environmental chamber simulating actual B-52 temperatures, humidities, and vibrations.

dream of the Air Force, and Operation Batman represented a giant step forward. However, while the close-circuit system was quite functional in a slow-moving helicopter, in its then-existing state of the art it was not adaptable for use in jet aircraft. A combat pilot must make instant judgments based upon several sources of information. He cannot devote his total attention to a single image appearing on a monitor screen. Consequently, a method had to be devised for displaying the image along with other critical navigational information, and in a manner readily understandable to the pilot of a swiftly moving jet aircraft.

Because of the demands of the Vietnam War, the Air Force could not wait for the problem to be resolved. It continued to rely upon its radar surveillance devices while the responsibility for further development of low-light, close-circuit television was given to the Army's Electronics Command.

While one group of NVL researchers was devoting its efforts to low-light, closed-circuit television, another staff of NVL electronic experts was concerned with heat-seeking radar surveillance.

Thermal sensors had reached a degree of sensitivity that could differentiate between existing basic temperatures as compared with other heat-giving masses present, and with sufficient definition to determine accurate profiles of the masses. This characteristic allows the infrared devices to penetrate a heavy ground fog, a blinding mist, or even the presence of the most sophisticated camouflage.

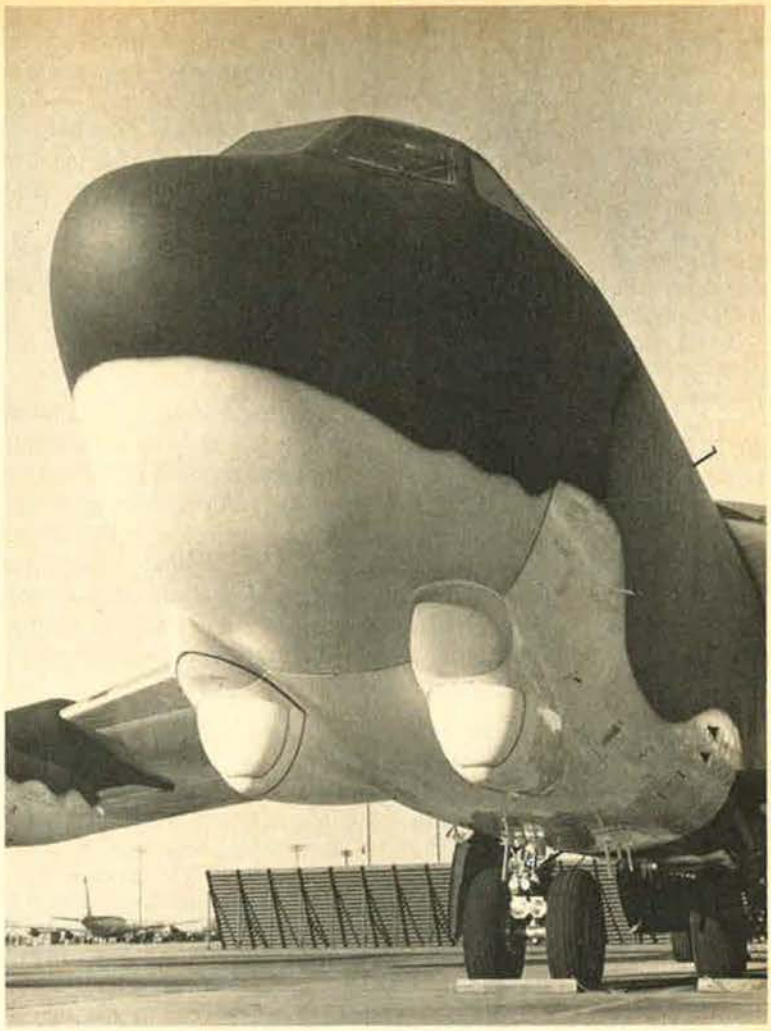
Sophistication in the use of these sensors now permits a trained viewer to determine whether the "mass" is a human, a machine, an antiaircraft installation, vehicles, a particular kind of building, a missile launching site, a munitions dump, or any combination of these. The name of the system is Forward Looking Infrared (FLIR).

EVS: LLTV Plus FLIR

It would be difficult to determine who first had the idea of combining low-light-level television (LLTV) and FLIR into a single surveillance system, but Air Force engineers were quick to recognize the advantage it would offer a combat pilot. One system would complement the other, affording the pilot the option of either visual scenic information or radar intelligence, depending upon flight conditions.

This ultimately led to the development of the Electro-Optical Viewing System or EVS, now being installed in the Strategic Air Command's fleet of B-52s. A steerable low-light-level television (STV) sensor is mounted on the underside of the aircraft. A turret gives the camera a ninety-degree steering angle. The system also includes a steerable FLIR sensor.

Two monitors, much like home television screens, are located in the B-52's instrument panel. Another is installed for the navigator, with yet another for the radar navigator. This gives pilot, copilot, and crew a blind-flying capability equal to—and in some atmospheric situations, better than—daylight flight.



Low-light-level television sensors are being mounted underneath B-52s. Turrets give cameras ninety-degree steering angles.

EVS modification of B-52Gs is being done by the Air Force Logistics Command's Oklahoma City Air Logistics Center, while the San Antonio Air Logistics Center will install EVS equipment in B-52Hs. The complete modification includes a night-vision sensor combined with low-light-level television, FLIR, interface equipment including a video distribution unit, a symbol signal generator, a servo control unit, and display monitors at four stations.

"Display" refers to the information that appears on the monitor screens. Whether picture or symbol, it is in a form readily understood by the viewer. Army research perfected the ingenious FLIR. Air Force research perfected the ingenious symbol signal generator that converts FLIR intelligence into "flight symbology," a language of symbols devised by Air Force engineers. This allows FLIR in-

The author, Allen Storm, is an Information Specialist at Hq. Air Force Logistics Command, Wright-Patterson AFB, Ohio. He first became interested in night-vision devices while serving in the Information Office at Sacramento Army Depot, Calif., where he wrote the first definitive articles on night-vision scopes that were released to the press. He has contributed articles to several magazines and has also written for network television.

formation to appear on the monitor screen along with other navigational information. Thus, the SAC crew has a readily understandable display of information relative to altitude, airspeed, aircraft attitude, heading, and time-to-go information, along with sensor and terrain-avoidance information.

No other combat pilot in the world will be armed with a like amount of immediate strategic intelligence.

The Pilot's View of EVS

A primary strategic mission of SAC combat crews is low-altitude, closed-curtain penetration to assess the status of previously hit targets and to destroy surviving targets. EVS gives the crew an immediate and accurate strike evaluation capability. When a low-level bomb run has sufficiently destroyed a designated target, weapons are withheld for an alternate target. This, of course, vastly improves weapons effectiveness.

[At a December 1971 Air Force Association Symposium, held at Orlando, Fla., in conjunction with SAC's annual Bombing and Navigation Competition, Lt. Gen. Russell E. Dougherty, then Commander of SAC's Second Air Force, explained the purpose of EVS. "In the nuclear environment in which B-52 nuclear strikes would be conducted," he said, "much of the penetration and strike routes must be flown in a 'closed-curtain' cockpit configuration, closed to protect the crew against nuclear effects—particularly flash blindness. We plan to fly penetration low-level missions with reference only to instruments and radar imagery. . . .

"This [EVS] display [will] enable the B-52 to penetrate at lower altitudes, which will increase the probability of avoiding enemy detection and intercept. Also, it will enable the crew to make prestrike assessment of the target, and to withhold, or to alter aim point, or to proceed." *(See February '72 issue, p. 62).*—THE EDITORS]

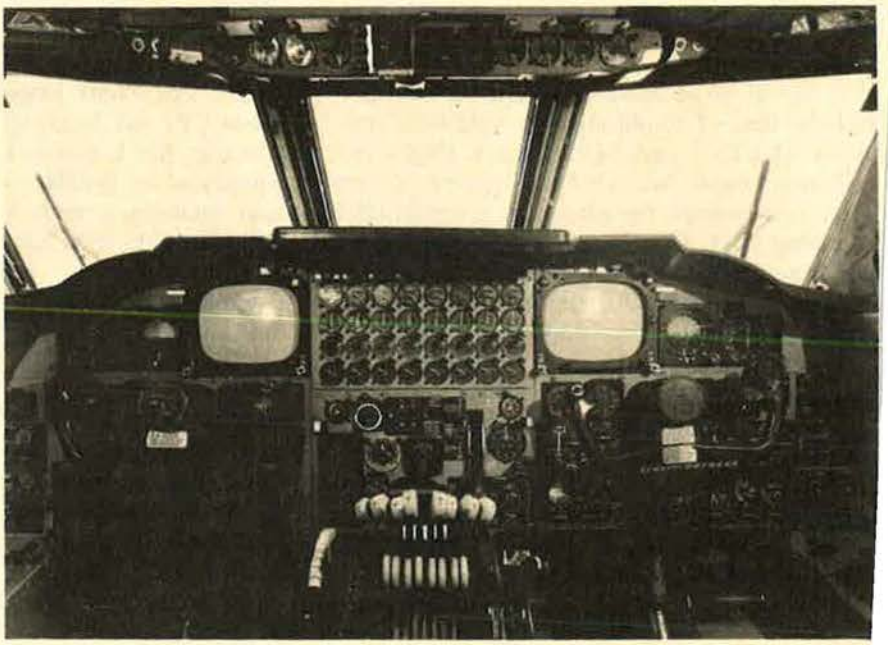
Pilots who have flown the EVS are enthusiastic about it. Maj. Charlie Rodriguez, who served as B-52 EVS Program Element Monitor for Strategic Air Command, has logged many hours of flight time, relying solely on EVS for terrain-following information.

"The only one way I can describe it," he said, "is that it's like looking out a window. You always know exactly where you are and what's going on around you."

After an eight-hour, low-level mission criss-crossing the Rocky Mountains, his summation of the flight was, ". . . strictly a rocking-chair operation. It takes the sweat out of high-speed, low-level flying. I could drop her down as low as I wanted to go—low enough to fly under any existing radar—and I was very much at ease.

"I tried the navigator's seat, too," he added, "and it's the first time that guy can actually see what's going on outside. Like I said, it's just like looking out a window." And there are additional benefits, such as improved visibility during taxi, takeoff, and landing maneuvers, as well as hazard-avoidance information.

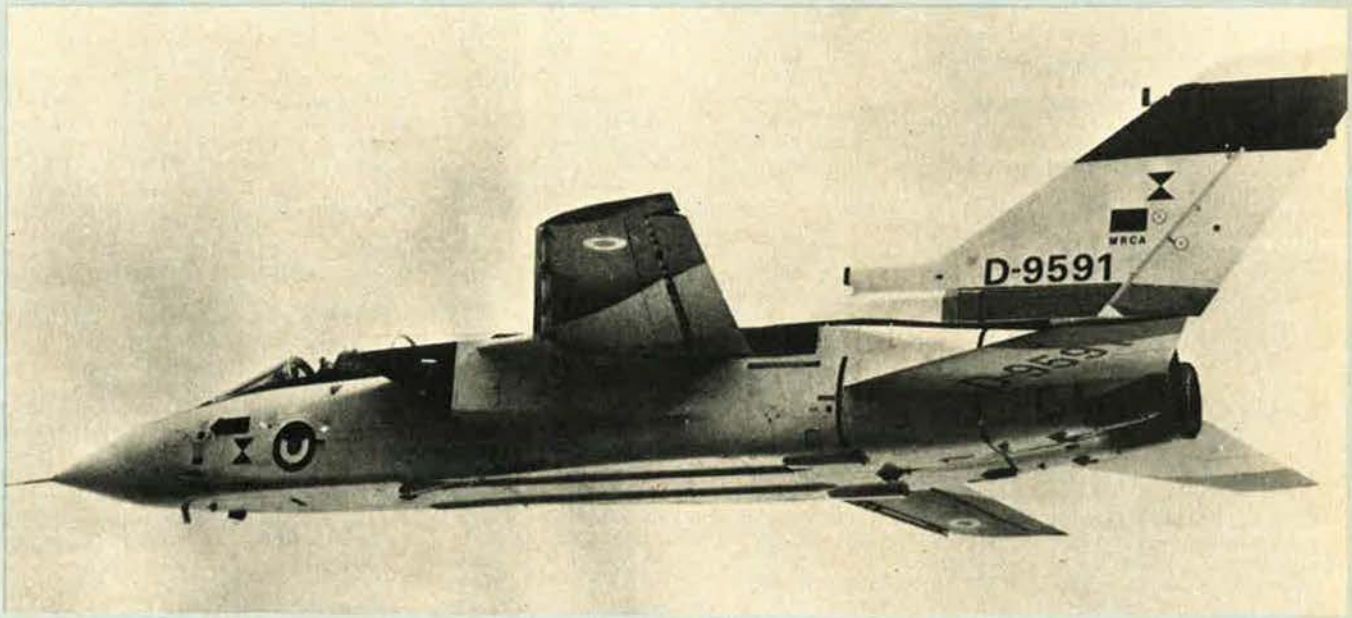
Since the earliest B-52s became operational in 1954, the Stratoforts have undergone many modifications that have enabled them to adapt to changes in strategy and tactics. The Electro-Optical Viewing System is the most recent, and one of the most important in extending the B-52's operational effectiveness until the B-1, with its even more sophisticated EVS, joins the Strategic Air Command's manned bomber deterrent force. ■



Even when "curtained" to protect against nuclear flashes, B-52 crews see EVS images on monitors much like television screens.

JANE'S

ALL THE WORLD'S AIRCRAFT SUPPLEMENT



The first prototype of the Panavia MRCA makes a successful first flight on 14 August at Manching, West Germany. The aircraft was airborne for 30 minutes and carried out its planned flight programme

PANAVIA

PANAVIA AIRCRAFT GmbH; Head Office: 8 München 86, Postfach 860629, Arabellastrasse 16, German Federal Republic

Panavia Aircraft GmbH is an international European industrial company formed on 26 March 1969 to design, develop, and produce a multi-role combat aircraft (MRCA) for service from 1977 with the air forces of the United Kingdom, the Federal Republic of Germany, and Italy, and the German navy. This programme is one of the largest European industrial programmes ever undertaken. The three component companies of Panavia are British Aircraft Corporation (42½%), Messerschmitt-Bölkow-Blohm (42½%), and Aeritalia (15%).

PANAVIA 200 MRCA

The MRCA is a twin-engined two-seat supersonic aircraft that is intended to fulfil the agreed operational requirements of its three sponsoring countries. The use of a variable-geometry wing gives it the necessary flexibility to achieve this.

The aircraft is intended to fulfil six major requirements, some of which are shared by more than one of the partners. These are:

(a) Close air support/battlefield interdiction
(b) Interdictor strike
(c) Air superiority
(d) Interception
(e) Naval role
(f) Reconnaissance

In addition, a trainer version is being built which will also have an operational capability.

The Royal Air Force is expected to order 385 MRCAs initially. These are due to begin entering service with Strike Command in 1977 and will, in the first instance, replace the Vulcan and Buccaneer in the overland strike and reconnaissance roles. Later, the air defence version will succeed the Phantom; and finally it is envisaged that the MRCA will replace the Buccaneer for maritime strike tasks. Some two-thirds of the RAF's front-line aircraft will eventually be MRCAs, according to the Chief of the Air Staff.

The Luftwaffe is to order 202 MRCAs, primarily to replace the Lockheed F-104G and, partly, the Aeritalia G91 in the battle-

The Panavia MRCA is seen from above during one of the two low-level passes it made over the runway during its initial flight on 14 August

field interdiction, air superiority, and reconnaissance roles. Four wings and one training squadron are to be equipped, starting in 1978. The 120 for the German Navy will be equipped for strike missions against sea and coastal targets, and for reconnaissance.

The Italian Air Force will use its 100 MRCAs to replace the F-104G and G91Y in the air superiority, ground attack, and reconnaissance roles.

Structural design of the prototype MRCA was completed in August 1972. Nine prototype aircraft are being built—four in the UK, three in Germany, and two in Italy—and static tests with a complete airframe were under way in the Spring of 1974.

The P-01 first prototype (D-9591), assembled by MBB, was rolled out in April 1974 and made its first flight on 14 August 1974 at Manching in Germany, flown by BAC test pilot Paul Millett and Nils Meister. The second and third prototypes were scheduled to fly in 1974, and all nine by the end of 1975. The second and third prototypes will fly at BAC's Warton aerodrome in Lancashire, the fourth at Manching, and the fifth at Caselle in Italy. Two more will fly at Warton, one at Manching and one at Caselle. Within the overall flight test programme, the first aircraft will be used for systems and handling trials; the second for flutter tests; the third will be the first MRCA to be fitted with dual controls; and the fourth will carry out initial testing of the avionics and weapon systems. The nine prototypes will be followed by six pre-production aircraft in advance of the main production stream.

Ground running of the RB.199 power plant began in September 1971; air testing under a Hawker Siddeley Vulcan testbed (XA903) started in April 1973. The 27 mm Mauser cannon is being test-flown in, and fired from, a BAC Lightning fighter. Marshall of Cambridge has modified two Buccaneer aircraft to flight test the nav/attack system.

TYPE: Twin-engined multi-purpose military aircraft.

WINGS: Cantilever shoulder-wing monoplane. All-metal wings, of variable geometry, having a sweep of approx 25° in the fully forward position and approx 65° when fully swept. Wing carry-through box is of electron-beam-welded titanium alloy; majority of remaining wing structure is of aluminium alloy, with integrally stiffened skin. The wings each pivot hydraulically, on Teflon-plated bearings, from a point in the centre-section just outboard of the fuselage. The root of the outer wing mates with the pivot pin through attachment members made of titanium alloy and fixed to the upper and lower light alloy panels of the outer wing box, and a so-called "round rib", also of titanium alloy, transmitting the normal aerodynamic force. Sweep actuators are of the ballscrew type, with hydraulic motor drive. In the event of wing sweep failure, the aircraft can land safely with the wings fully swept. High-lift devices on the outer wings include full-span leading-edge slats (three sections on each side), full-span double-slotted trailing-edge flaps (four sections on each side), and spoilers (two on upper surface on each side). Spoilers give augmented roll control at unswept and intermediate wing positions at low speed, and also act as lift dumpers after touchdown. All flying control surfaces actuated by electrically-controlled tandem hydraulic jacks. There are no ailerons. Entire outer wings, including control surfaces, are Italian-built, Aeritalia having prime responsibility for final assembly and production of these units, assisted by Aermacchi, Aeronavali Venezia, Piaggio, Saca, and SIAI-Marchetti as subcontractors. Microtecnica (Italy) is prime subcontractor for the wing sweep system.

FUSELAGE: Conventional all-metal semi-monocoque structure, mainly of aluminium alloy, built in three main sections. MBB in Germany is prime contractor (with participation by VFW-Fokker for the prototype and pre-production aircraft) for the centre fuselage section, including the engine air intake trunks and wing centre-section box and pivot mechanism. This task includes responsibility for the surface interface between the movable wing and the fixed portion, to ensure both a smooth and slender external contour and proper sealing against aerodynamic pressure over a range of wing sweep positions. The present design uses fibre-reinforced plastics in these areas, and an elastic seal between the outer wings and the fuselage sides. Responsibility for the front fuselage, including both cockpits, and for the rear fuselage, including the engine installation, is undertaken by the Military Aircraft Division of British Aircraft Corporation. Radar-transparent nose-cone by AEG-Telefunken, assisted by Aeritalia and BAC, hinges sideways to starboard. Door-type airbrake on each side at top of rear fuselage.

TAIL UNIT: Cantilever all-metal structure, consisting of single sweptback two-spar fin and rudder, and low-set all-moving horizontal surfaces ("tailerons") which operate together for pitch control and differentially for roll control, assisted by use of the wing spoilers when the wings are not fully swept. Rudder and tailerons actuated by electrically-controlled tandem hydraulic jacks. Passive ECM antenna fairing near top of fin. Ram-air intake for heat exchanger at base of fin. Entire tail unit is the responsibility of BAC.

LANDING GEAR: Hydraulically-retractable tricycle type, with forward-retracting twin-wheel steerable nose unit. Single-wheel main units retract forward and upward into centre section of fuselage. Development and manufacture of the complete landing gear and associated hydraulics is headed by Dowty Rotol (UK). Dunlop wheels, brakes, low-pressure tyres (to per-

MRCA P-01 first prototype, photographed at its roll-out in April 1974

mit operation from soft, semi-prepared surfaces), and anti-skid units. Runway arrester hook beneath rear of fuselage.

POWER PLANT: Two Turbo-Union RB.199-34R three-spool turbofan engines, each rated at 8,500 lb (3,855 kg) st dry and 14,500 lb (6,577 kg) st with afterburning, fitted with bucket-type thrust reversers and installed in rear fuselage with downward-opening doors for servicing and engine change. Four large "blow-out" doors in top of each trunk, above the wedge-shaped two-dimensional intake. All internal fuel in multi-cell Uniroyal self-sealing integral fuselage tanks and/or wing box tanks, all fitted with press-in fuel sampling and water drain plugs, and all refuelled from a single-point NATO connector. Detachable and retractable inflight refuelling probe can be mounted on starboard side of fuselage, adjacent to cockpit. System also designed to accept a buddy-to-buddy refuelling pack. Provision for drop-tanks of various sizes to be carried beneath outer wings. Dowty Fuel Systems/Lucas/Microtecnica afterburning fuel control system. AEG-Telefunken intake de-icing system.

ACCOMMODATION: Crew of two on tandem Martin-Baker Mk 10A ejection seats under Kopperschmidt/AIT one-piece canopy, which is hinged at rear and opens upwards. Flat centre windscreen panel and curved side panels, built by Lucas Aerospace, incorporate Sierracote electrically-conductive heating film for de-icing and internal demisting.

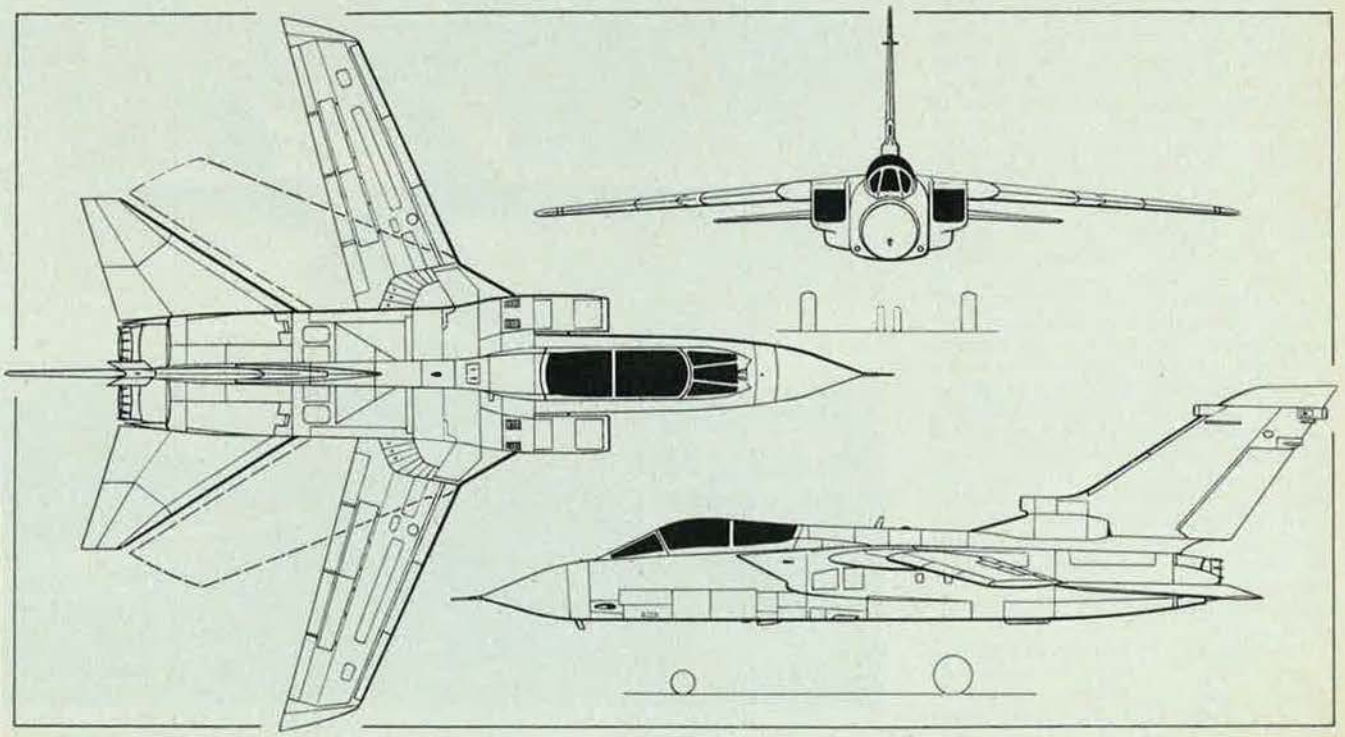
SYSTEMS: Nordmicro/HSD/Microtecnica air intake control system, and Dowty Boulton Paul/Liebherr Aerotechnik engine intake ramp control actuators. Two separate independent hydraulic systems, one driven by each engine, provide fully duplicated power for wing sweep, flaps, slats, spoilers, airbrakes, landing gear, tailerons, and rudder. Main system includes Vickers pump, Dowty accumulators and Teves power pack. Fairey Hydraulics system for actuation of spoilers, rudder, and taileron control. Provision for reversion to single-engine drive of both systems, via a mechanical cross-connection between the two engine auxiliary gearboxes, in the event of a single engine failure. In the event of a double engine flameout, an emergency pump in No. 1 system has sufficient duration for re-entry into the engine cold relight boundary. Flying control circuits are protected from loss of fluid due to leaks in other circuits by isolating valves which shut off the utility circuits if the reservoir contents drop below a pre-determined safety limit level. Duplicated AC and DC electrical power is provided by two alternators, each driven by its engine auxiliary gearbox, to two separate main AC busbars and one essential AC busbar, and through two fan-cooled transformer-rectifier units (TRUs) to two main DC busbars. Lucas/Siemens 40/60kVA 200V 400Hz three-phase constant-frequency AC generating system. Either generator can cope with the full demand of the electrical systems in the event of a single generator failure. If both TRUs fail, an on-board Varta battery supplies the essential DC busbar. In the event of a total loss of power the battery also drives an electro-hydraulic pump which provides power for the primary flying controls. Under normal conditions the battery drives the KHD/Microtecnica/Lucas T312 APU for engine starting, but a DC ground supply is provided to assist starting if required. Plessey power systems controller. Normalair-Garrett pre-cooler and cold-air unit, Marston Excelsior intercooler and Teddington temperature control system. Normalair-Garrett/Draegerwerk/OMI demand-type oxygen system, using a lox converter. KHD accessory drive gearboxes and Rotax/Lucas/Siemens integrated drive generator. Marconi-Elliott flow-metering system. Eichweber fuel gauging system and Flight Refuelling flexible couplings. Graviner fire detection and extinguishing systems. Rotax contactors. Smiths engine speed and temperature indicators.

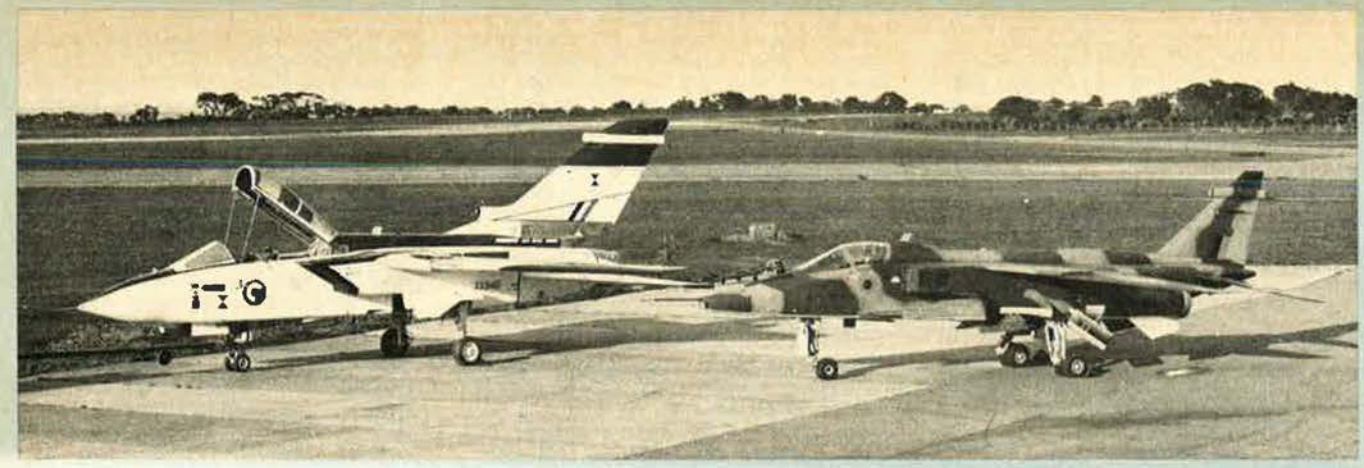
ELECTRONICS AND EQUIPMENT: Communications equipment includes Plessey (UK and Italy) or Rohde und Schwarz (Germany) UHF/VHF radio; AEG-Telefunken UHF/DF (UK and Germany only); Chelton UHF homer aerial; SIT/Siemens emergency UHF with Rohde und Schwarz switch; BAC HF/SSB aerial tuning unit; Rohde und Schwarz (UK and Germany) or Montedel (Italy) HF/SSB radio; Ultra communications control system; Marconi-Elliott central suppression unit; Epsylon voice recorder; and Chelton communications and landing system aerials.

Primary self-contained nav/attack system includes Texas Instruments multi-mode forward-looking radar (Marconi-Elliott multi-mode airborne interception radar for RAF interceptor version); Ferranti three-axis digital inertial navigation system (DINS) and combined radar display; Decca Type 72 Doppler radar system; Microtecnica air data computer; Litef Spirit 3 16-bit central digital computer; Aeritalia radio/radar altimeter; Smiths electronic head-up display with Davall camera; Ferranti nose-mounted laser ranger and marked target seeker; Marconi-Elliott TV tabular display; Astronautics, USA, bearing distance heading indication and contour map display. Defensive equipment includes Siemens (Germany) or Cossor SSR-3100 (UK) IFF transponder; Elettronica warning radar; and MSDS/Plessey/Decca passive ECM system.

Flight control system includes a Marconi-Elliott command stability augmentation system (CSAS), incorporating fly-by-wire and auto-stabilisation; Marconi-Elliott autopilot and flight director (APFD), using two self-monitoring digital computers; Marconi-Elliott triplex transducer unit (TTU), with analogue computing and sensor channels; Marconi-Elliott terrain-following E-scope (TFE); Fairey/Marconi-Elliott quadruplex electro-hydraulic actuator; and Microtecnica air data set. The APFD provides preselected attitude, heading, or barometric height hold, heading and track acquisition, and Mach number or airspeed hold with autothrottle. Flight director operates in parallel with, and can be used as back-up for, the autopilot. Automatic approach and radio height-holding modes are also available. Other instrumentation includes Smiths

Panavia 200 MRCA multi-role combat aircraft (two Turbo-Union RB.199-34R turbofan engines) (Pilot Press)





P-02 second prototype of the Panavia 200 MRCA, assembled in the UK, with a Jaguar GR.Mk 1

horizontal situation indicator, vertical speed indicator, and standby altimeter; AEG-Telefunken ADF; Lital standby attitude and heading reference system; SEL (with SETAC) or (in UK aircraft) Marconi-Elliott AD2770 (without SETAC) TACAN; Cossor CILS 75 ILS; and Bodenseewerk attitude direction indicator.

Overall responsibility for the avionics rests with the three-nation group Avionica Systems Engineering, combining the activities of EASAMS (UK), ESG (Germany), and SIA (Italy). The avionics systems, while standardised as far as possible, retain the flexibility necessary to perform the various roles required. They provide accurate low- and high-level navigation; precision visual attack on ground targets in blind and poor weather conditions; air-to-ground and air-to-air attack with a wide variety of weapons; manually controlled and automatic attack; and comprehensive on-board checkout and mission data recording; with minimisation of ground support facilities at bases and the front line.

ARMAMENT: All MRCAs are fitted with two 27 mm Mauser cannon, one in each side of the lower forward fuselage. Other armament varies according to version, with emphasis on the ability to carry a wide range of advanced non-nuclear weapons on three underfuselage attachments and up to four swivelling hardpoints beneath the outer wings. A Marconi-Elliott stores management system is fitted, and Sandall Mace 14 in (35.5 cm) ejector release units are standard. Initial weapon systems evaluation will include trials on the fourth prototype of a modified Raytheon Sparrow missile, fitted with a British warhead and fuse. The battlefield interdiction version will be capable of dropping defensive "streuwaffen" (scatter weapons), and of carrying weapons to suit "hard" or "soft" targets. The naval and interdictor strike versions will have provision for carrying additional, externally-mounted fuel tanks. The air superiority version will be able to carry a wide range of guided and semi-active homing air-to-air weapons. Among the weapons already specified for, or suitable for carriage by, the MRCA are the Sparrow and Aspide air-to-air missiles; AS.30, Martel, Kormoran, and Jumbo air-to-surface missiles; napalm; BL-755 600 lb cluster bombs; and "smart" or retarded bombs.

DIMENSIONS, EXTERNAL:

Wing span:	
fully spread	45 ft 7¼ in (13.90 m)
fully swept	28 ft 2½ in (8.60 m)
Length overall	54 ft 9½ in (16.70 m)
Height overall	18 ft 8½ in (5.70 m)

WEIGHTS (estimated):

Weight empty, equipped
22,000–23,000 lb (9,980–10,430 kg)
Max T-O weight
38,000–40,000 lb (17,240–18,145 kg)

PERFORMANCE:

Max level speed at 36,000 ft (11,000 m) above 1,146 knots (1,320 mph; 2,125 km/h)
Max level speed at low altitude approx 790 knots (910 mph; 1,465 km/h)
Combat endurance (internal fuel) 70–80 min

BOEING

BOEING AEROSPACE COMPANY; ADDRESS: PO Box 3999, Seattle, Washington 98124, USA

Looking ahead for potential replacements for its fleet of Lockheed C-130 Hercules transport aircraft, the USAF issued requests for proposals to nine US aerospace companies in early 1972. Responses were received from Bell Aerospace, Boeing, Fairchild Industries, a combined Lockheed-Georgia/North American Rockwell team, and McDonnell Douglas. From these proposals, those of Boeing and McDonnell Douglas were selected.

The advanced medium STOL transport (AMST) programme is under the management of the Prototype Program Office of the USAF Systems Command's Aeronautical Systems Division, Wright-Patterson AFB, Ohio. Its Phase 1 requirement, which had a 90-day completion period, demanded the submission of additional design/performance analysis. Both companies completed this stage of the contract in just over a month, and this enabled the USAF to give a go-ahead for Phase 2 some 30 days ahead of schedule. Phase 2 covers a 45-month period, during which each company is building and will fly two prototypes, emphasis being placed on performance and cost goals rather than rigid adherence to specification requirements.

It was hoped originally to complete the first of two Boeing prototypes, allocated the USAF designation YC-14, in time for a first

Artist's impression of the Boeing YC-14 prototype advanced medium STOL transport (AMST)

flight in December 1975. The second YC-14 was planned to follow about two months later, after which both aircraft would take part in a prototype fly-off competition with two McDonnell Douglas YC-15 prototypes over a period of about one year. The future of the AMST programme was put in doubt when Congress set YC-14/YC-15 spending at $25 million in the FY 1974 budget, as against $65.2 million requested by the USAF. However, the Secretary of the Air Force stated the USAF's intention to continue the programme at reduced rate through FY 1974 and to ask for $55.8 million for FY 1975. These developments will probably delay completion and flight testing of the aircraft.

BOEING ADVANCED MEDIUM STOL TRANSPORT
USAF designation: YC-14

One of the significant design features of the Boeing YC-14 is the use of a relatively small supercritical wing, with an overwing installation of the power plant. Benefits accruing from this layout include the presentation of a low infra-red signature to ground-based detectors; an uncluttered underwing surface, simplifying the carriage of external stores, including RPVs; efficient thrust reversal; and a reduced noise footprint. Significant improvement of cargo compartment loading efficiency will result from the adoption of the wide-body fuselage concept, which is now a familiar feature of civil air transports.

TYPE: Advanced military STOL transport.

WINGS: Cantilever shoulder-wing monoplane. Comparatively small supercritical wing of tapered planform, incorporating advanced concepts to enhance STOL capability. Wing upper-surface blowing concept requires the engines to be mounted above and forward of the wing, so that they exhaust over the wing upper surface. Wide-span leading-edge and Coanda-type trailing-edge flaps will, when extended, induce the high-speed airflow from the engines to cling to the surface of the wing-flap system and direct it downward, generating powered lift. Boeing claims that wind tunnel tests of the system have shown it to be superior to other powered lift concepts, such as externally blown flaps or vectored thrust.

FUSELAGE: Conventional semi-monocoque all-metal structure.

TAIL UNIT: Cantilever all-metal structure with high T-tail. Double-hinged rudder and elevators.

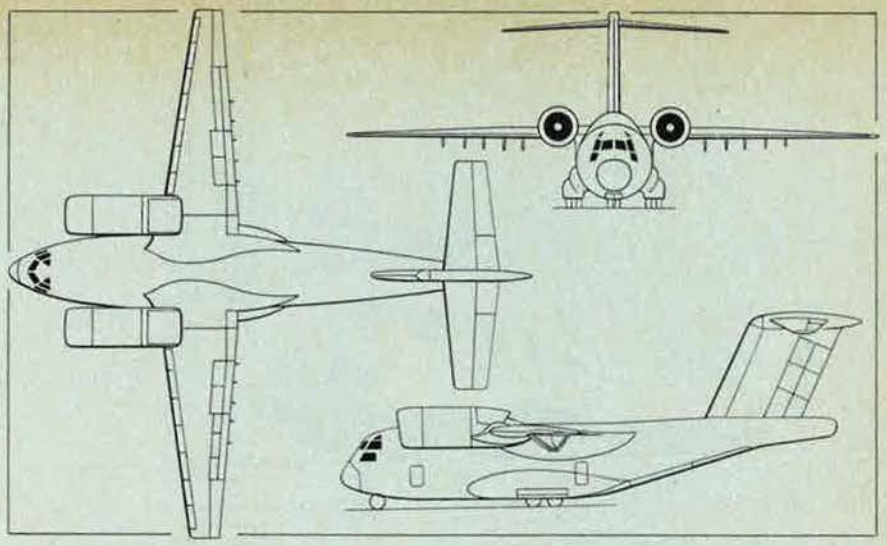
LANDING GEAR: Retractable tricycle type. Twin wheels on nose unit. Each main unit is of the four-post levered type, with twin wheels in tandem. Main wheels and nose-wheels have tyres size 40 x 18-16.

POWER PLANT: Two General Electric CF6-50D two-shaft high by-pass ratio turbofan engines, each with a maximum rating of approx 50,000 lb (22,680 kg) st. Mounting of the engines above and forward of the wing is expected to offer significant noise reduction. Mission fuel load 25,000 lb (12,340 kg) less reserves.

ACCOMMODATION: Able to carry 150 troops, or approximately 27,000 lb (12,247 kg) cargo in STOL operations, or 65,000 lb (29,500 kg) in conventional operation. Passenger door on each side of fuselage. Cargo loading ramp in undersurface of rear fuselage. Undersurface of fuselage retracts upward inside fuselage aft of ramp. Digital flight controls are triple-redundant and fail-operational.

DIMENSIONS, EXTERNAL:

Wing span	129 ft 0 in (39.32 m)
Length overall	131 ft 8 in (40.13 m)
Height overall	48 ft 8 in (14.83 m)
Tailplane span	55 ft 0 in (16.76 m)
Wheel track	18 ft 7 in (5.66 m)
Wheelbase	41 ft 0 in (12.50 m)



Boeing YC-14 AMST (two General Electric CF6-50D turbofan engines) (Pilot Press)

DIMENSIONS, INTERNAL:

Cargo compartment:	
Length	47 ft 0 in (14.33 m)
Width	11 ft 6 in to 11 ft 8 in (3.50–3.55 m)
Height	11 ft 2 in to 12 ft 0 in (3.40–3.66 m)

AREA:

Wings, gross	1,762 sq ft (163.7 m²)

WEIGHTS:

Design max T-O weight:	
STOL operation	172,000 lb (78,020 kg)
Conventional operation	216,000 lb (97,975 kg)

PERFORMANCE (estimated at STOL max T-O weight, except where indicated):

Max level speed at 30,000 ft (9,150 m)	400 knots (460 mph; 740 km/h)
Landing speed	86 knots (99 mph; 159 km/h)
T-O to and landing from 50 ft (15 m)	2,000 ft (610 m)
Range with max payload:	
STOL operation	1,000 nm (1,150 miles; 1,850 km)
Conventional operation	1,100 nm (1,265 miles; 2,040 km)
Range with max fuel, zero payload:	
STOL operation	2,300 nm (2,650 miles; 4,260 km)
Conventional operation	2,600 nm (3,000 miles; 4,820 km)

AÉROSPATIALE
SOCIÉTÉ NATIONALE INDUSTRIELLE AÉROSPATIALE; Head Office: 37 boulevard de Montmorency, 75781 Paris-cédex 16, France

AÉROSPATIALE SA 360 DAUPHIN

The first of two SA 360 prototypes (F-WSQL) flew for the first time on 2 June 1972, powered by a 980 shp Turboméca Astazou XVI turboshaft engine. After 180 flights, it was re-engined with an Astazou XVIIIA turboshaft and modified in certain respects, including the addition of small weights to the rotor blades, to eliminate ground resonance and reduce vibration to an unprecedented level, even at high speed. The aircraft flew for the first time in its modified form on 4 May 1973, having been joined by the second prototype (F-WSQX) on 29 January 1973. By the beginning of 1974, the two helicopters had logged a total of more than 400 flying hours.

Intended as a successor to the Alouette III, the SA 360 will be available to operators in about 1976. A twin-engined version, designated SA 365, is also expected to enter production at that time.

Three helicopter speed records in Class E1d (1,750 to 3,000 kg weight) were set up at Istres by the first prototype of the SA 360 on 15, 16, and 17 May 1973, piloted by Roland Coffignot. Carrying a payload equivalent to eight persons and fuel for one hour's flying, the SA 360 achieved, successively, 161.4 knots (185.8 mph; 299 km/h) over a 100 km closed circuit; 168.4 knots (193.9 mph; 312 km/h) over a 3 km course; and 163.5 knots (188.3 mph; 303 km/h) over a 15 km course.

TYPE: Turbine-powered general-purpose helicopter.

ROTOR SYSTEM: Four-blade semi-articulated main rotor and 13-blade shrouded-fan anti-torque tail rotor (known as a "Fenestron" or "Fan-in-fin"). Main rotor blades are of symmetrical NACA 0012 section, with a theoretical twist of 8° and constant chord, and are attached to the hub via a drag hinge, with damper, and flapping hinge. Each has a single leading-edge spar of polyester plastics, extending back to about 30% chord at top and bottom. The outer skin is of glassfibre, with an inner skin of carbon fibre, and the entire blade is filled with Nomex honeycomb. The leading-edge is formed by a layer of Vulkollan plastics with an outer protective shield of thin-gauge stainless steel. Tail rotor blades are of die-forged light alloy, with articulation for pitch change only. Main rotor blades can be folded manually for stowage. Rotor brake and main rotor blade de-icing optional.

ROTOR DRIVE: Main reduction gearbox forward of engine, which is mounted above the fuselage to the rear of the cabin. Output shaft enters main transmission box above the drive-shaft to the tail rotor. Main rotor rpm: 348 normal, 393 in autorotation. Tail rotor rpm: 4,700.

FUSELAGE: Conventional all-metal assembly of cabin and semi-monocoque tailboom. Cabin built on a strong box structure embodying two transverse frames and the cabin floor.

TAIL UNIT: Horizontal stabiliser mid-set on tailboom, forward of shrouded tail rotor, with endplate fins. Tailboom terminates in large fin of unsymmetrical section, housing the tail rotor. The section of this fin is such that in cruising flight it counters the torque of the main rotor; the tail rotor is thus required to provide only yaw control, with minimal variation of pitch, requiring only small power intake.

LANDING GEAR: Prototypes have Eram non-retractable tailwheel-type landing gear, with single wheel on each unit. Main legs

First prototype of the Aérospatiale SA 360 Dauphin, with original unstepped nose (J. M. G. Gradidge)

embody hydraulic shock-struts. Tailwheel carried on anti-shimmy leg which can be locked manually in central position. Dunlop main-wheel tyres size 355 x 150-4, pressure 73 lb/sq in (5.13 kg/cm²). Dunlop tailwheel tyre size 260 x 80-4, pressure 73 lb/sq in (5.13 kg/cm²). Disc brakes on main wheels. Wheel fairings standard. Two main wheels will retract forward into cabin underfloor structure on production aircraft. Provision for floats or skis.

POWER PLANT: One Turboméca Astazou XVIIIA turboshaft engine, delivering 1,044 shp for take-off. Two Kléber-Colombes bag-type fuel tanks under cabin floor, total normal capacity 104 Imp gallons (475 litres). Provision for larger tanks, capacity 145 Imp gallons (660 litres) and for two ferry tanks, one of 60.5 Imp gallons (275 litres) capacity on the cabin floor and another of 55 Imp gallons (250 litres) capacity at the back of the cabin. Tanks can be of self-sealing type in military versions.

ACCOMMODATION: Standard ten-seat version has seats for pilot (to starboard) and co-pilot or passenger in front, and two rows of four seats to the rear. Interior of the cabin is clear except for a vertical duct, housing the flying control rods, positioned centrally aft of the centre row of seats. Two large forward-hinged doors on each side. Compartment for hand baggage or coats aft of rear row of seats. Separate main baggage compartment aft of cabin, with door on starboard side. Alternative 13-seat layout has an extra row of three seats between the four-seat rows, and no space for hand baggage or coats. Ambulance version carries four stretcher patients, a medical attendant, and two crew. Mixed-traffic version carries six persons at front of cabin, with 88.3 cu ft (2.50 m³) of cargo space to the rear. The floor in this area will support a loading of 122.9 lb/sq ft (600 kg/m²). Executive versions are available with VIP interiors for four or five passengers. Cabin is heated and ventilated. Provision for 2,755 lb (1,250 kg) capacity cargo sling, rescue hoist, and a wide range of other civil and military equipment.

DIMENSIONS, EXTERNAL:

Diameter of main rotor	37 ft 8¾ in (11.50 m)
Blade chord, main rotor (constant)	1 ft 1¾ in (0.35 m)
Diameter of tail rotor	2 ft 11⁷⁄₁₆ in (0.90 m)
Length overall	44 ft 0 in (13.41 m)
Length of fuselage	36 ft 3⅞ in (11.07 m)
Width, rotors folded	10 ft 1⅝ in (3.09 m)
Height overall	11 ft 1¾ in (3.40 m)
Wheel track	7 ft 8¼ in (2.34 m)
Wheelbase	23 ft 8¾ in (7.23 m)
Cabin doors (fwd, each):	
Height	3 ft 8 in (1.12 m)
Width	3 ft 5¾ in (1.06 m)
Cabin doors (aft, each):	
Height	3 ft 8 in (1.12 m)
Width	2 ft 10¾ in (0.88 m)
Freight compartment door:	
Height	1 ft 6¾ in (0.48 m)
Width	2 ft 7½ in (0.80 m)

DIMENSIONS, INTERNAL:

Cabin: Usable length	7 ft 2¾ in (2.20 m)
Width at front	6 ft 5¼ in (1.96 m)
Width at rear	5 ft 3 in (1.60 m)
Baggage compartment volume	62 cu ft (1.75 m³)

WEIGHTS:

Basic operating weight	3,087 lb (1,400 kg)
Max T-O weight	6,173 lb (2,800 kg)

PERFORMANCE:

Recommended cruising speed	140 knots (162 mph; 260 km/h)
Econ cruising speed	124 knots (143 mph; 230 km/h)
Vertical rate of climb at S/L at AUW of 5,511 lb (2,500 kg)	1,475 ft (450 m)/min
Rate of climb at 5,900 ft (1,800 m) at AUW of 3,747 lb (1,700 kg)	2,950 ft (900 m)/min
Hovering ceiling in ground effect at AUW of 5,952 lb (2,700 kg)	10,500 ft (3,200 m)
Hovering ceiling out of ground effect at AUW of 5,952 lb (2,700 kg)	9,200 ft (2,800 m)
Range with 1,653 lb (750 kg) payload at econ cruising speed	291 nm (335 miles; 540 km)
Ferry range with 145 Imp gallons (660 litres) fuel, no payload	420 nm (484 miles; 780 km)

AÉROSPATIALE SA 365/366 DAUPHIN

Announced in early 1973, the **SA 365** will be a twin-engined version of the SA 360, powered by Turboméca Arriel turboshaft engines, each rated at 690 shp. A prototype is scheduled to fly during the first months of 1975.

The **SA 366** will be similar, except for having Avco Lycoming LTS 101 engines.

McDONNELL DOUGLAS/HAWKER SIDDELEY

PARTICIPATING AIRFRAME AND ENGINE MANUFACTURERS:

McDonnell Aircraft Company, Box 516, St. Louis, Missouri 63166, USA

Hawker Siddeley Aviation Ltd, Richmond Road, Kingston upon Thames, Surrey KT2 5QS, England

Pratt & Whitney, East Hartford, Connecticut 06108, USA

Rolls-Royce (1971) Ltd, 14-15 Conduit Street, London W1A 4EY, England

ADVANCED HARRIER

In December 1973, following an eight-month jointly-financed initial definition phase, proposals were presented to the British and US governments for an advanced version of the Hawker Siddeley Harrier V/STOL close-support and reconnaissance aircraft. These proposals were agreed, and by the Spring of 1974 the two governments had received for approval further proposals regarding the cost- and work-sharing for continuation of the programme.

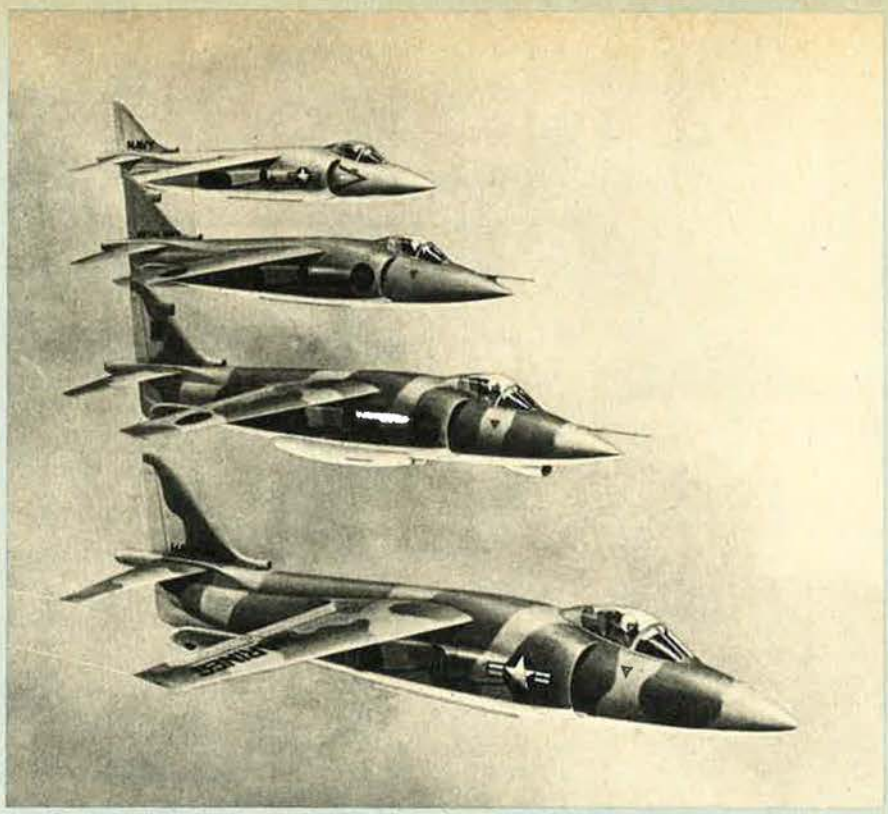
Four versions of the Advanced Harrier were projected at that time. The largest potential operator was the US Marine Corps, which has stated a requirement for 342 AV-16A Advanced Harriers for service in the 1980s. Its version would have an integrated weapons delivery system (IWDS) of the type now being developed for the AV-8A Harrier and the McDonnell Douglas A-4M Skyhawk II, four underwing hardpoints, and 20 mm underfuselage guns. A proposed RAF version would have seven stores points, two 30 mm Aden gun pods, and an undernose sensor, possibly for a low light level TV scanner. Versions projected for the US Navy and Royal Navy would each have a nose-mounted radar. The US naval aircraft, intended for operation from Sea Control Ships, would be equipped to carry Sidewinder or Sparrow air-to-air missiles, and Harpoon, Maverick, or Condor air-to-surface missiles.

By mid 1974, the UK government had signified its intention of contributing only about £120,000 ($288,000) to the joint programme during the last eight months of this year. Work is being concentrated entirely on the US Marine Corps version, with Hawker Siddeley and Rolls-Royce limited to subcontracting roles. The USMC is allocating additional funds to the programme, and is expected to request full development funding in late 1975 or early 1976.

Meanwhile, the US Navy has confirmed that the Rockwell XFV-12A prototype, with thrust-augmented wing (TAW), is prime candidate in competition with the Advanced Harrier and a General Dynamics design with lift-plus-lift/cruise engines for the Sea Control Ship application.

Essentially, the objective of the Advanced Harrier programme is to evolve a design which, without departing too far from the existing Harrier airframe, will virtually double the aircraft's weapons payload/combat radius. The major changes envisaged are the adoption of the 24,500 lb (11,112 kg) st Rolls-Royce Pegasus 15 turbofan engine, and employment of a more efficient wing.

To accommodate the Pegasus 15 engine, the Advanced Harrier will have enlarged air intakes, and a broader fuselage some 3 ft (0.91 m) longer than that of the present Harrier. Internal fuel load will be increased from 5,000 lb (2,268 kg) in the AV-8A to 6,500 lb (2,948 kg) in the AV-16A, which will also be able to carry standard 300 US gallon (250 Imp gallon; 1,135 litre) underwing drop-tanks. The exhaust nozzles will be strengthened for VIFF (thrust vectoring in forward flight), and the main landing



Artist's impression of projected versions of the Advanced Harrier for (front to back) the US Marine Corps, minus the 20 mm underfuselage gun packs and five weapons pylons that it would normally carry; the RAF, with 30 mm gun packs and undernose sensor; Royal Navy and US Navy

gear also will be strengthened to cater for the increased gross weight. The outrigger balancer wheel fairings will be moved inboard on the wings, where they will provide a third underwing hardpoint on each side if required. The cockpit canopy will be raised, to improve the all-round field of view. Two alternative wing designs have been developed independently by Hawker Siddeley and McDonnell, the former being a so-called "sonic rooftop" wing and the latter being based on supercritical wing research carried out by NASA. Both are generally similar in sweepback and planform, and have greater span and area than those of the present Harrier.

The Advanced Harrier will be able to carry a wide range of specialised modern operational avionics and equipment, according to the requirements of individual operators. It will have the same centreline stores point and underfuselage gun pod capability as the present Harrier, with either four or six underwing hardpoints as required.

DIMENSIONS, EXTERNAL (approx):
- Wing span 30 ft 3½ in (9.23 m)
- Wing area, gross 230 sq ft (21.37 m²)
- Length overall (flying attitude) 46 ft 6 in (14.17 m)
- Height overall (on ground) 12 ft 0 in (3.66 m)

WEIGHTS (approx):
- Vertical T-O weight 21,100 lb (9,570 kg)
- Max T-O weight 28,000 lb (12,700 kg)

PERFORMANCE (estimated):
- Combat speed 625 knots (720 mph; 1,157 km/h)
- Combat radius, with reserves:
  - VTO with over 2,000 lb (907 kg) payload 300 nm (345 miles; 555 km)
  - Rolling T-O with over 4,000 lb (1,815 kg) payload 300 nm (345 miles; 555 km)

COLOMBAN

MICHEL COLOMBAN. Address: 37bis rue Lakanal, 92500-Rueil-Malmaison, France

Formerly with the Morane and Potez companies, and now an aerodynamicist with Aérospatiale, M Colomban has designed and built a very small and unique twin-engined lightplane named the Cricri. Its construction required some 1,200 hours of work and cost only 5,000 francs (1971–72 prices), including the engines.

M Colomban intends to make plans of the Cricri available to amateur constructors after embodying a few design changes, mainly to the wing spar. This is considered advisable, as the aircraft's manoeuvrability is such that the spar will be redesigned for a load factor of +10*g*.

COLOMBAN MC 10 CRICRI (CRICKET)

Initial design studies for an aeroplane of only 20 hp, for economical operation, were completed by M Colomban in 1958. His circumstances at that time did not permit its construction, and it was not until September 1970 that manufacture of the Cricri began. In the intervening years, the design was refined to take advantage of new developments in technology and aerodynamics, often after tests carried out personally by the designer.

The prototype (F-WTXJ) is claimed to be the smallest twin-engined aeroplane currently flying, and the only one able to lift a useful load equivalent to 170% of its own empty weight. Special constructional features permit assembly or disassembly in only five minutes. Its light weight and small size make it particularly easy to transport on a trailer towed by car, and to store in a garage or shed.

The Cricri was flown for the first time on 19 July 1973 by Robert Buisson, a 68-year-old pilot who had already logged 12,000 flying hours. The first 5½ hours of testing revealed generally good handling qualities, except for over-sensitive controls and engine vibration.

Flight testing was halted on 29 September to permit these shortcomings to be rectified. Modifications were made to the mountings of the engines and accessories, and the engine mounting attachments to the fuselage. The ratio of flying controls to control surface movement was increased, and artificial loading was introduced to offset the earlier sensitivity.

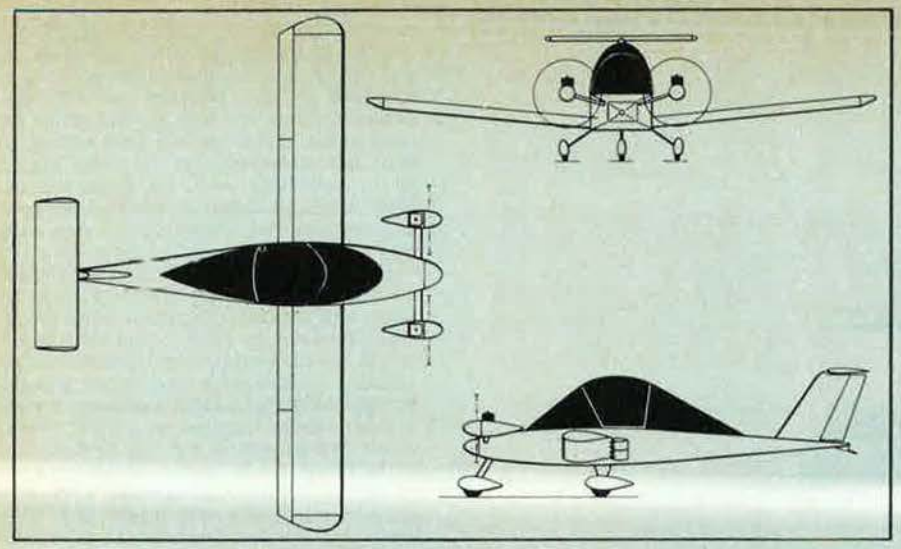
Tests were resumed on 12 January 1974, to the complete satisfaction of the pilot. Within fifteen days the Cricri had logged a total of 13 trouble-free flying hours, including rolls, renversements, split "S" manoeuvres and inverted flight, made possible by its Tillotson diaphragm carburettor. Flight tests by mid-February 1974 had been made at up to 119 knots (137 mph; 220 km/h) and +4*g*. They had confirmed that no special piloting skills are needed to fly this aircraft.

In particular, the Cricri handles like a single-engined design. This results from the fact that the two small engines are mounted close together, and from the carefully-conceived shape of the cockpit canopy which deflects the propeller slipstream over the tail surfaces in such a way that an engine failure produces no dangerous handling problems. If one engine is throttled back fiercely, with hands and feet off the controls, the Cricri is said to do no more than begin a gentle turn.

TYPE: Twin-engined single-seat ultra-light aircraft.

WINGS: Cantilever low-wing monoplane of constant chord. Laminar-flow aerofoil derived from a Wortmann section. Thickness/chord ratio 21.7%. Dihedral 6° from roots.

Colomban MC 10 Cricri homebuilt lightplane (two 9 hp Rowena two-stroke engines)



Colomban MC 10 Cricri single-seat aircraft for amateur construction (Roy J. Grainge)

No incidence or sweep. Single-spar box structure. Spar comprises a web riveted to AU4G angle-section booms. Inboard end of spar in each wing is of "forked-tongue" form, like that of many sailplanes, to permit rapid assembly and disassembly of wings. Closely-spaced Klégécel ribs are bonded fore and aft of the spar. Skin consists of a single sheet of AU4G, bonded to structure under pressure after its leading-edge has been formed. No rear spar. Wing box is closed at each end by a riveted metal rib. Entire trailing-edge is occupied by two-section external flaps of the kind fitted to many wartime Junkers aircraft, operating collectively as high-lift devices (movement −5° to +30°) and differentially as ailerons (+8° to −10°). Flaps are spar-less, consisting of a metal monocoque structure, with four metal ribs per section (at each tip and each pivot point), filled with Klégécel over the entire span and over 20% of the chord. Flaps are each actuated via a ball-joint at the root. No controls pass through the wing box, which contains only an AU4G tube as provision for any future installation of fuel tanks in wingtips.

FUSELAGE: Simple metal box structure of rectangular section. Made of AU4G sheet, riveted together at the corners without the use of angle-sections. Stiffened by Klégécel stringers, bonded in place. AU4G frames riveted in position in line with the attachments for the wings, landing gear, tail unit, and engine mountings.

TAIL UNIT: Cantilever T type, with swept-back vertical surfaces and all-moving constant-chord horizontal surfaces. Construction similar to that of wings. No tabs. Tailplane actuated by control rods, rudder by cables. Tailplane provided with artificial loading by bungee cord.

LANDING GEAR: Non-retractable tricycle type. Nosewheel fitted with bungee shock-absorption and linked to rudder bar for steering. Each main wheel carried on cantilever leaf-spring. Main-wheel tyres size 210-70, pressure 14.2 lb/sq in (1.0 kg/cm²). Nosewheel tyre size 200-50, pressure 14.2 lb/sq in (1.0 kg/cm²). Colomban disc brakes. Provision for fairing on all three wheels.

POWER PLANT: Two Rowena 6507J single-cylinder two-stroke engines of 137 cc, each giving 9 hp at 7,000 rpm and weighing 14.3 lb (6.5 kg). Tillotson diaphragm carburettor to permit inverted flight. Each engine drives a Colomban MC H1 two-blade metal propeller with ground-adjustable pitch. Laminated plastics fuel tank in fuselage, with current capacity of 3.3 Imp gallons (15 litres); space for tank of 5.25 Imp gallons (24 litres) capacity. Provision for structural tank in each wingtip, total capacity 5.25 Imp gallons (24 litres). Engines not yet cowled.

ACCOMMODATION: Single seat under large transparent canopy, hinged to open sideways, to starboard. Ventilation through port in side of fuselage. No heating.

SYSTEM: Electrical system supplied by two 19W 6V and two 5W 6V batteries.

DIMENSIONS, EXTERNAL:

Wing span	16 ft 4¾ in (5.00 m)
Wing chord, incl flap (constant)	2 ft 0¾ in (0.63 m)
Wing chord, less flap (constant)	1 ft 6¾ in (0.48 m)
Wing aspect ratio	8.1
Length overall, incl nose-probe	14 ft 9¼ in (4.50 m)
Length overall, less nose-probe	12 ft 9½ in (3.90 m)
Width, wings removed	4 ft 9 in (1.45 m)
Height overall	3 ft 11¼ in (1.20 m)
Tailplane span	4 ft 9 in (1.45 m)
Wheel track	3 ft 7¼ in (1.10 m)
Wheelbase	4 ft 1¼ in (1.25 m)
Propeller diameter	2 ft 2¾ in (0.68 m)
Distance between propeller centres	2 ft 11½ in (0.90 m)

DIMENSIONS, INTERNAL:

Cabin: Length	4 ft 3¼ in (1.30 m)
Max width	1 ft 9½ in (0.55 m)
Max height	2 ft 8¼ in (0.82 m)

AREAS:

Wings, gross	33.4 sq ft (3.10 m²)
Trailing-edge flaps	6.89 sq ft (0.64 m²)
Fin	3.88 sq ft (0.36 m²)
Rudder	1.29 sq ft (0.12 m²)
Tailplane	6.46 sq ft (0.60 m²)

WEIGHTS AND LOADINGS:

Weight empty	139 lb (63 kg)
Max T-O and landing weight	375 lb (170 kg)
Max zero-fuel weight	350 lb (159 kg)
Max wing loading	11.25 lb/sq ft (55 kg/m²)
Max power loading	20.72 lb/hp (9.4 kg/hp)

PERFORMANCE (A at AUW of 330 lb; 150 kg, engines and wheels unfaired; B estimated at max AUW, engines and wheels faired):

Max never-exceed speed:	
B	151 knots (174 mph; 280 km/h)
Max level speed:	
A	97 knots (112 mph; 180 km/h)
B	113 knots (130 mph; 210 km/h)
Max cruising speed (75% power):	
A	89 knots (103 mph; 165 km/h)
B	105 knots (121 mph; 195 km/h)
Stalling speed, flaps down:	
A	38 knots (44 mph; 70 km/h)
B	41 knots (47 mph; 75 km/h)
Stalling speed, flaps up:	
A	46 knots (53 mph; 85 km/h)
B	49 knots (56 mph; 90 km/h)
Max rate of climb at S/L:	
A	820 ft (250 m)/min
B	835 ft (255 m)/min
Rate of climb at S/L, one engine out:	
A	100 ft (30 m)/min
B	120 ft (36 m)/min
Service ceiling:	
B	11,475 ft (3,500 m)
T-O run:	
A	525 ft (160 m)
B	655 ft (200 m)
T-O to 50 ft (15 m):	
A	1,380 ft (420 m)
B	1,640 ft (500 m)
Landing from 50 ft (15 m):	
B	1,310 ft (400 m)
Landing run:	
B	655 ft (200 m)
Range with max fuel:	
A	166 nm (192 miles; 310 km)
B	215 nm (248 miles; 400 km)

This photograph illustrates the fact that the Cricri is the world's smallest and lightest twin-engined aeroplane

CAN NATO MEND ITS FENCES—AND DEFENSES?

BY GEN. T. R. MILTON, USAF (Ret.)

Life, as we all know, is full of ironies. Take Greece and Turkey, for instance.

Scarcely a year ago, the Military Committee of NATO visited both those countries in an atmosphere of cordiality and solidarity. The government of Greece was still headed by Colonel Papadopoulos. His Vice President was the austere and ascetic General Anghelis, and while Brigadier General Ioannidis was a powerful force in that government with his control of the military police, he was a shadowy figure, scarcely visible to the Military Committee.

The Papadopoulos government was detested in much of the Western world, sometimes for real, and sometimes for imagined, reasons. But—and here is the irony—it had established a sensible and, to use one of the current "in" words, pragmatic relationship with Turkey—its NATO ally and long-term adversary. The Cyprus issue seemed dormant.

Now everything is changed. The Turkish invasion of Cyprus began with the apparent, and understandable, aim of protecting Turkish Cypriot interests. If the fighting had ended a little sooner, the feelings might not now run so deep, and the prospects for NATO solidarity would be a little brighter. We can still hope that this will, in fact, come to pass, but at this moment there is reason to be gloomy about the southern flank of the alliance.

Nevertheless, things could have been worse. If the situation stabilizes without a full-scale Balkan war, as it now seems likely to do, we have some small reason to rejoice.

Whatever kind of stability emerges from the negotiations must stem from the eminently clear fact that the Turks have won a military victory in Cyprus. Increased Turkish influence in Cyprus thus becomes a *fait accompli*. This Turkish military triumph, however, was against Greek Cypriots, not against Greece itself, and that is a most important distinction.

Moreover, the announced intention of the Greek government to withdraw from the integrated military structure of NATO, while disquieting, does not necessarily close the door. Not, at any rate, while Greece remains a NATO member with a full voice in the NATO Council. We must just wait and see.

The role of NATO in this very dangerous crisis was an important one. In the jargon of international bureaucracy, this business of calling off the dogs is labeled Crisis Management. During the Cyprus crisis, this management took a good many forms.

There were ad-hoc sessions of the North Atlantic Council presided over by NATO's Secretary-General and Dutch uncle, Joseph Luns, who does not mince words in any one of his four or five languages. There were private sessions between our NATO Ambassador, Donald Rumsfeld, and his Greek and Turkish colleagues. There were calls back and forth in the night between Gen. Andrew J. Goodpaster, the Supreme Allied Commander, and the Turkish and Greek Chiefs of Staff.

While the quiet collapse of the Greek military government was a prerequisite to an early, and face-saving, settlement, it is worth noting that the return to civilian government in Greece—a move that should go a long way toward appeasing the opponents of Greece in NATO—did not include a major military shake-up. The change, in fact, could only have taken place with the agreement and cooperation of the Greek military leaders, although we may have to wait awhile to hear this echoed by Theodorakis, Mercouri, and others of the jet-set maquis. It is further worth noting that one of the stabilizing factors in this traditionally explosive situation is that many of the senior military leaders in both Greece and Turkey are civilized and knowledgeable men who understand clearly the real threat and the overriding importance of the NATO alliance.

If good sense prevails, then NATO will survive, in some ways stronger than ever, for having weathered this crisis. And two old enemies, who will continue to mistrust one another, will go back to their job of jointly defending the southern reaches of the alliance against the real and agreed threat to all of us.

Inevitably, there will be some slow-healing scars on NATO's facade. It will be some time, for instance, before Greek and Turkish officers again work together in the Allied army and air force headquarters in Izmir, Turkey. But this sort of impasse has been faced before, and it is why the Commander, Land Forces Southeast, is US Army Gen. Melvin Zais, and the Commander, Sixth Allied Tactical Air Force, is Lt. Gen. Sanford Moats, USAF. The current anti-American sentiment in Greece is a further complication, but that, as we all know, is a phenomenon that often comes with high emotions and goes when the facts are known.

That is not to say that NATO has had its crisis for this year. There are other, and more insidious, threats to this increasingly venerable alliance. There is, for one thing, détente, that delicious French word that makes the picture look so glistening to the dewy-eyed. That is just the trouble. Détente is not achieved by the dewy-eyed. It is, instead, a relaxation of tension, a lowering of the pistols when the draw is equal. Détente is not the result of one adversary throwing away his gun.

Nonetheless, the word does have a hypnotic sound to some, and the détente chant has begun to hypnotize the government of the Netherlands—that bastion of solid, hard-head responsibility. If they stay on their present course, the Dutch contribution to NATO will be sharply cut. If it is, the Belgians will almost inevitably follow.

Norway was not affected by some frivolous defense alterations the Danes carried out a few years ago. The Norwegians view their Scandinavian cousins with the same sort of bemused affection a tough old farmer might have for a playboy son who has gone to the city to paint. Maybe it is all right, but it's not for him. But with the Dutch it is something different. If they cut their defense budget, Norway will find it hard to hold the line.

The British, of course, are in trouble. Irish trouble, economic trouble, Scotch and Welsh nationalism trouble. We, I suppose, are in our own sort of trouble—all of which puts a great strain on the free-form underpinnings of this curious NATO structure.

The dream of a unified Europe seems to be fading, as oil crises, food prices, unemployment, and inflation tend to make nations introspective. Our own internal preoccupations are not a good augury for our international commitments. On the other hand, NATO is a very special commitment. It has worked awfully well for all its partners on both sides of the Atlantic, and it just might be true that we would all be sunk without it.

This next year will be perhaps a decisive one for the great experiment in mutual security. Maybe the strains will be too much, in which case we are all on our own.

But maybe not. The Cyprus affair brought out a certain evidence of the importance the thinking people of the West attach to this alliance. My guess is that NATO has a good long run ahead of it. ■

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The author, Gen. T. R. Milton, was US Representative to the Military Committee of NATO prior to his retirement from the Air Force in August. Now living in Colorado Springs, he has contributed several articles and book reviews to AIR FORCE Magazine.

Nagging concerns remain and housing is still the No. 1 problem. Yet the Air Force "does better than all the other services" and optimistically reports its . . .

HOUSING DEFICIT DOWN,

THE No. 1 concern of Air Force families and bachelors, year in and year out? The issue that provokes a steady stream of letters to military authorities, service journals, and the Congress?

It's housing—the lack or inadequacy of it, the way quarters are assigned, allowances are withheld, and so on. The special attention USAF people give their living accommodations appears more intense today than a decade or two ago, even though housing conditions have improved considerably during that span—both in quality and quantity, for marrieds and singles.

And further improvement, particularly modernization of many older quarters, is promised. But there's a long way to go, authorities concede, "before every member can enjoy adequate living facilities on or off base." That has been the Air Force goal right along.

Attaining it is something else. With construction and maintenance costs soaring, money becomes a more severe problem. Adding to the complexities are the vast dimensions of the "housing program." Quarters and dormitories are scattered among hundreds of bases. Off-base housing—"community support"—varies widely. The multitude of "housing managers" includes Pentagon officials, congressmen, engineers, architects, housing assignment staffers, referral offices, and base commanders. Planning, funding, awarding contracts, construction all take time.

Dimensions of the Deficit

Military housing is big business. Air Force alone controls about 152,000 units of family quarters. Counting those under construction, it has bachelor accommodations for 250,000 airmen and officers.

Most family quarters are two- and three-bedroom homes built since the early 1950s, though a few are mammoth structures more than eighty years old. Included in its heterogeneous inventory are 54,000 Capehart and 32,000 Wherry units, both named for senators who sponsored the legislation authorizing their construction. The inventory also includes 43,000 units, some very old, some very new, financed with appropriated funds; 4,500 leased homes, about half stateside and half abroad; and varying numbers of "surplus commodity," "rental guarantee," trailer, and other categories of units.

Nearly 10,000 of the units are officially "inadequate." Many of these are Wherries that received the inadequate label early last year, much to the satisfaction of the occupants. Instead of surrendering their entire basic allowance for quarters (BAQ), occupants of inadequate housing pay a "fair rental" normally not exceeding seventy-five percent of their BAQ. Inadequate family quarters, of course, may not be long for this world; USAF's goal is to tear them down as soon as possible.

While single members prefer living off base in private facilities, the reverse is generally true among families. "Air Force families want to live on base," officials in the Housing and Facilities branch at Hq. USAF told AIR FORCE Magazine. Among its responsibilities, that office, headed by Lt. Col. T. M. Shook, handles housing assignment policies and equal-opportunity practices in off-base housing.

A better house for less money, proximity to the BX, and other essential facilities—these are the principal reasons Air Force families prefer on-base residence.

There are not nearly enough government quarters to go around, of course, and almost certainly there never will be. But officials say that more and more service families are being decently housed in town, because the numerous pay raises of recent years have put sufficient money in their pockets. They can afford it.

Air Force explains the arithmetic of housing in terms of "requirements, deficits, and assets." Then there are "eligibles" and "ineligibles." Eligibles are married E-4s and above; lower graders have been technically ineligible for government family quarters.

A decade ago, Air Force put its housing deficit at 50,000–60,000 units. Now the figure is down to about 10,000, obtained by a complicated formula involving the 355,000 families needing housing, on-base assets, "community support" dwellings, and other factors.

Community support units are off-base private apartments and houses the Pentagon views as available, adequate, within reasonable driving distance, and not priced out of sight.

The actual current shortage, when lower graders' housing needs are considered, is about double the official 10,000 "deficit" figure. In other words, 35,000–40,000 married Air Force members in the lower grades are in the housing market, and many of them cannot afford anything even faintly resembling decent housing.

New Construction Setbacks

The Defense Department, meanwhile, has taken a first step toward building on-base quarters for enlisted families in the lower pay grades. In the FY '75 military construction program, DoD asked Congress to authorize 10,500 new houses service-wide, 3,000 of which would be earmarked for the lower-rankers.

USAF's share of the 3,000 special units (two-bedroom design carrying an average price tag of $24,800) is

BUT BY NO MEANS OUT

800. Defense's request, however, received a jolt recently when the House Armed Services Committee rejected the idea. The influential Committee held that building quarters for newcomers who might not stay in uniform isn't justified, particularly when a housing deficit still exists for higher-ranking careerists.

Despite the setback, Air Force still supports building family quarters for low-ranking members and plans to continue pushing for approval of the program.

Actually, Air Force has moved 6,000 lower-grade families into base quarters, some of which have become available through mission realignments that sharply reduced the number of higher-ranking personnel assigned to particular bases. Some of these quarters are substandard, while others, originally built for noncommissioned officers, are in good condition.

Construction of new family units is under way or nearing at eighteen bases. When completed, most within the next ten months, they will add more than 6,200 homes to the Air Force's on-base inventory. Two of the largest projects are located at Andrews AFB, Md., and Bolling AFB, D. C.

But all indicators point toward a sharp drop-off in new on-base house construction in the near future. The FY '75 construction program, with the 800 lower-grader units deleted, calls for just 1,400 new sets of quarters at six locations.

"Because the deficit of adequate family housing has been reduced to a manageable level, we believe that we are now turning the corner with regard to large-scale new housing construction programs on a DoD-wide basis," Defense housing chief Perry J. Fliakas said recently.

"In the next five years," he announced, "we will concentrate on upgrading and modernization of the existing inventory."

Other factors, *e.g.*, a declining force structure and inflated building costs, also play a role in DoD's decision to curb new on-base house building. Authorities note that it now costs an average of $30,000 stateside and $40,000 overseas to build a new family housing unit.

The comparable outlays a year ago were $27,500 and $37,000.

Since the government owns the land, these figures are misleading when compared with the price tags of new civilian housing. Uncle Sam also pays the utilities and maintenance on government quarters, which, Air Force says, average $1,300 per unit annually. This is money the typical civilian home owner digs out of his own pocket.

One Hq. USAF official, pointing to an architect's drawing of a recently built, field-grade officer housing project at a western base, said, "Place those units in a Washington, D. C., suburb and each would easily go for $65,000."

Renovating Existing Quarters

While building new family quarters will soon tail off, improvement of existing quarters is increasing. Air Force civil engineers would like to see it booming. For FY '74, Air Force received $23 million to improve 4,200 sets of family units, and it is down for another $20 million this year to modernize 3,000 more.

But Air Force housing authorities want to talk the Defense Department and Congress into providing much larger outlays in future years. USAF's top housing official, Deputy Assistant Secretary (Installations and Logistics) Rufus L. Crockett, told AIR FORCE Magazine he'll seek about $40 million in modernization funds in the FY '76 budget.

Civil engineers in the Hq. USAF Housing Division, headed by Col. John E. Catlin, Jr., would like to wrap up the refurbishing job in five years. That means updating 100,000-plus units, at an estimated cost of $275 million.

Before deciding on the specific thrust of improvements, officials listen to occupants, particularly wives. Via a recent all-service survey of 40,000 denizens of government quarters, they learned that central air-conditioning is the single most important feature families want. Roughly forty percent of USAF's houses already have it.

Air Force families also want for their quarters fenced yards, a half-bath on the first floor of two-story units, increased sound-proofing, kitchen modernization, family rooms, and more storage space.

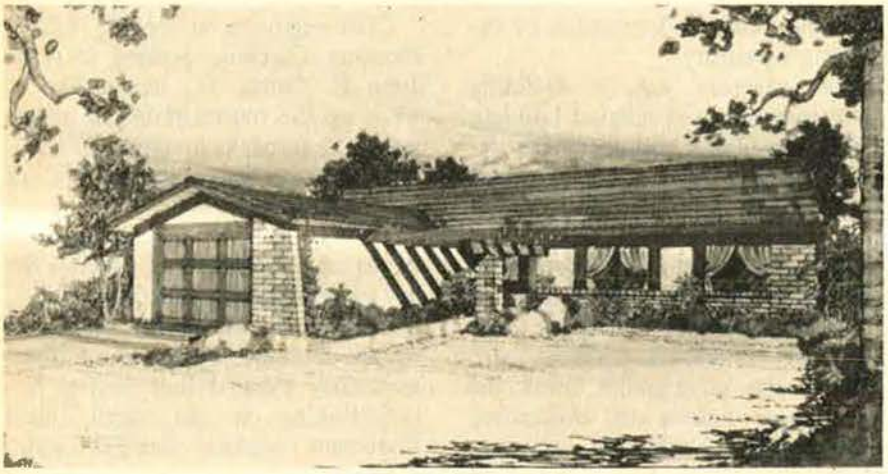
The current modernization program, recently under way, is concentrating on all of these items. The prototype project covered 200 units at Billy Mitchell Village, Kelly AFB, Tex., and modernization of an additional 640 units in the same complex will get under way soon. Improvements will follow at many other bases, including 905 units at Wright-Patterson AFB, Ohio; 500 at Williams AFB, Ariz.; 358 at Loring AFB, Me.; and 363 at Carswell AFB, Tex.

New Assignment Rules

With demand for quarters far exceeding the supply, complaints over assignment rules, which are heavily weighted in favor of rank, are inevitable. Waiting lists often are so long that many applicants for quarters never rise to the top. Severe frustrations develop.

Higher-ranking officers and NCOs long have held that housing preference is a just reward for long, dedi-

BY ED GATES, CONTRIBUTING EDITOR, AIR FORCE MAGAZINE



An architect's drawing depicts one of the 200 new airmen family housing units at Nellis AFB, Nev., which USAF civil engineers claim is one of the finest military housing projects ever built. Costing about $5.4 million, it was nearly completed in September. All units in the project are separate homes.

cated service during which they frequently endured many lean housing years. RHIP—"rank has its privileges"—is entirely proper in assigning quarters, this group has contended.

Not so, according to young, new-to-the-service members. Priority for government housing should go to those who need it the most and can least afford to pay the high rents required off base, they say. Significantly, they appear to have picked up support in recent months. Wives participating in the recent USAF Career Motivation Conference asked the Air Force to base the assignment of quarters on date of application rather than rank.

The housing assignment policy debate easily could become acrimonious.

USAF, meanwhile, is revising its housing assignment directive—AFM 30-6—to give "mixed couples"—where one's an officer, the other enlisted—an equal shot at base quarters. Heretofore, they were barred. The change recognizes the boom in officer-enlisted marriages and the service's commitment to equal treatment of women.

In other helpful new housing assignment rules, Air Force now gives preferential treatment in acute hardship cases, and extra credit on waiting lists for persons on consecutive overseas tours. Still another important rule, called "preference option," allows members to reject the first set of family quarters offered them and still retain their place on the waiting list.

Housing discrimination in communities near Air Force bases still exists, stateside and abroad, Hq. USAF authorities report. Air Force, which cracks down hard on landlords who discriminate against minority members, investigated 250 complaints last year. At year's end, "restrictive sanctions" were in effect against nearly 300 facilities involving more than 6,000 apartments and houses. Twenty percent were located overseas.

In other words, all military people were barred from renting or buying those units until and unless the landlords came around. Housing discrimination against USAF members is not confined to any geographical section, an official in the Hq. USAF Housing and Facilities office said.

Bachelor Housing—Pluses and Minuses

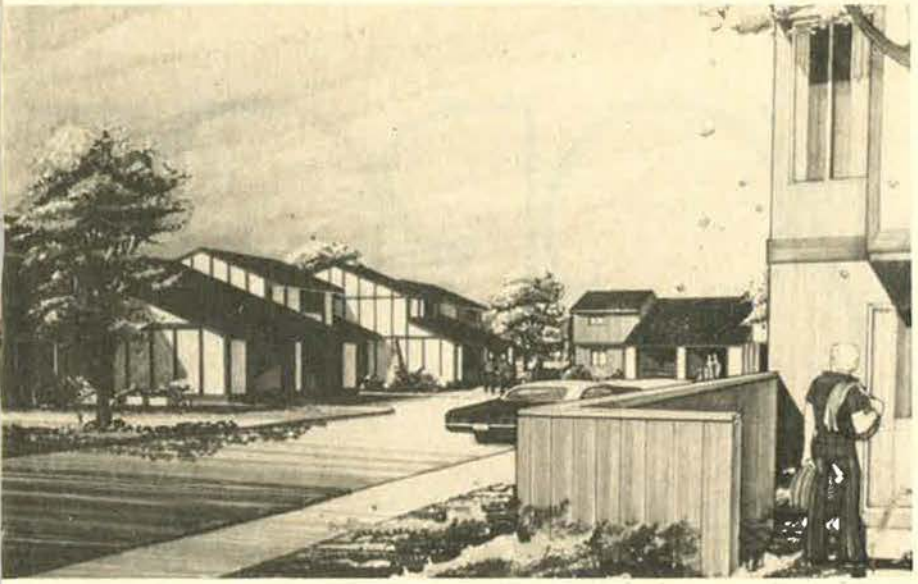
While Air Force places its bachelor quarters "assets" at nearly 250,000 spaces, just 154,600 (including 16,600 for officers) are rated "totally inadequate." The others require modernization or replacement in upcoming years, but while they stand, the law requires they be filled.

Where quarters meeting minimum standards are not available, bachelors can live off base and collect their BAQ ($60 a month for E-1s to $211.80 for O-6s, under pre-October 1, 1974, pay scales).

Until recently, single members, even though they elected to live off base and surrender their BAQ, were required to "maintain" a place in the barracks or dorm and to stand inspection. But that rule, which not surprisingly drew unkind remarks, has been modified. Major commands now need not require them to keep a place on base.

Surrendering BAQ has rankled thousands of Air Force members over the years. Protestors say it's discriminatory, that the only way to beat it is to get married. Matrimony indeed opens the door to off-base living for persons chained to the barracks.

Still, many bachelor airmen and officers move off the reservation and receive their BAQ, all legally. High adequacy standards applied to on-base quarters account for it. A bachelor lieutenant, for example, rates a private room with bath totaling at least 250 square feet. A single captain is due 400 square feet, including living room, bath, bedroom, and access to a kitchen. If on-base quarters don't meet these standards, members can live in town and collect BAQ.



An attractive new family housing project at Peterson Field, Colo., featuring 250 townhouses, was about nine-tenths completed last month. All but twenty-eight of the units are for airmen families. Although construction of more than 6,000 new family units is under way or soon to start at eighteen bases, future new housing starts are slated to drop off sharply.

The same applies to airmen. Two-man rooms for E-5s and E-6s and private room and bath, including 200 square feet of space for E-7s and above, are prescribed. If not available, the off-base option applies.

The Defense Department, at USAF's urging, set the lofty adequacy standards to attract good people and build morale. Maj. Gen. Oliver W. Lewis, the Hq. USAF Director of Personnel Programs, told Congress recently that surveys show most Air Force people lived in private rooms at home. "Seventy percent originally rated bachelor military housing worse than what they left," Lewis added.

Air Force's current bachelor housing building program is aimed mainly at lower-ranking members, although it continues to build new facilities for students and transients and at isolated bases.

An aggressive refurbishing program of single quarters is also continuing. The FY '75 budget provides $17 million to upgrade 6,500 airmen living spaces.

The higher adequacy standards, while permitting many single members to move off base and retain their BAQ, are costing the government money. General Lewis recently told a House Appropriations subcommittee that about 49,000 single airmen and officers are expected to draw BAQ this fiscal year. That's 14,000 more than in FY '74, and it will add $17 million to USAF's BAQ outlays, Lewis told the lawmakers. They responded by urging the full Congress to reduce the Air Force's BAQ appropriation by nearly $11 million this fiscal year.

Outlook: Reasonably Encouraging

Overall, Air Force housing—family and single—has come a long way the past twenty years, and at a substantial price. The hefty outlays are continuing. The current year's budget contains $355 million for Air Force family quarters, plus $46.2 million for the single members' programs.

Defense-wide, the family housing budget alone exceeds $1.3 billion this year. These figures, which cover operation and maintenance, debt payments, leasing, improvements, modernization, and construction, were being trimmed slightly by Congress at press time.

Most USAF members live better, on base and off, than did typical Air Force people in the early 1950s. And the outlook is reasonably encouraging. Mr. Crockett stated that "Air Force does better on housing than all the other services," and he intends to keep it that way.

Still, the goal of "adequate housing for everyone" is not just around the corner. Old problems such as inflated building costs and RHIP in assigning quarters remain. New programs and their inevitable accompanying difficulties keep surfacing.

Mr. Crockett, for example, notes that before long, plans for replacing considerable existing housing must be formulated. "And it is possible we may soon need to declare another group of substandard family quarters inadequate," he added. Such a step, since Pentagon policy is to tear down substandard quarters as soon as possible, would increase new housing requirements.

One thing is certain: Air Force members, married and single, will continue to keep an eagle eye on the progress, or lack of it, of new housing, modernization of old units, BAQ payments and surrender rules, and the many related matters that combine to make "quarters" a topic of extraordinary importance in the military community. ■

One of the myths surrounding military life is that of marital instability within the services. In his doctoral dissertation, the author uncovered some surprising and socially significant facts about family dissolution in the Air Force. Here is a summary of his findings on . . .

DIVORCE AND THE AIR FORCE FAMILY

BY COL. JOHN W. WILLIAMS, JR., USAF

IF YOUR experience has been the same as mine, you have probably heard throughout your association with the military about the disruptive nature of military life on the family. Is this really true or is it the result of *subjective* evaluation instead of *objective* investigation? Is it true that SAC has high divorce rates? Do rated officers have higher divorce rates than nonrated officers? Are divorce and dissolution rates for military personnel higher than rates for civilians?

These and other questions will be discussed in this article. Before looking in detail at divorce and family dissolution in the military environment, let us examine briefly this phenomenon in American society.

Almost 5,000 Americans break up their marriages every day of the year. In 1972, there were 840,000 divorces in the United States. What is even more significant is the fact that the divorce rate has been increasing in a dramatic way during the past ten years. For example, the number of divorces grew from 368,000 in 1958 to 840,000 in 1972—an increase of 128 percent. Even when using a more sophisticated technique—the rate per 1,000 of population—we see an increase from 2.1 to 3.6, suggesting that, although the increase in population may be accounting for *some* of the divorce rate increase, it certainly doesn't account for it all.

Over the past few years, there has been a popular misconception that about one of every four marriages ends in divorce; however, recent Census Bureau data show that approximately one-third of all marriages end in divorce. In California, it is closer to forty percent. Any way you look at it, there is no doubt that in America divorce rates are increasing dramatically.

Positive and Negative Factors

It will probably never be known what "causes" divorce. The best we can hope to do is specify conditions associated with divorce or point out significant interactions among several factors. One thing is very important here—the *legal* cause is seldom the *actual* cause. Most divorces are awarded on the basis of mental cruelty, desertion, drunkenness, adultery, neglect to provide, and conviction of a felony. For example, ninety-five percent of the divorces in California in 1968 were filed on the one ground of "extreme cruelty."

Social scientists have pointed out several variables associated with divorce. As these are mentioned, keep in mind your knowledge of the Air Force officer corps and how it relates to these variables.

Income is related to divorce. Sociological literature clearly points out that as income goes

up, divorce rates go down. Those who are most divorce-prone are those in the lower income brackets. Where do Air Force officers stand in the income hierarchy? Contrary to popular belief, Air Force officers have relatively high incomes. For example, in 1970 more than ninety percent of all Air Force officers made more than $10,000 a year, while only sixty-five percent of professional-technical workers made more than this amount, and only fifty-nine percent of managers, officials, and proprietors did. The mean pay for officers (nonflying) was more than $16,000, while for professional-technical it was $13,700, and for managers, officials, and proprietors, $13,300.

A second variable related to divorce is education. Empirical studies conclusively point out that as education goes up, divorce rates go down. Marital adjustment studies show that those with a high level of education have a higher level of marital adjustment than those with a low educational level. A comparison of Air Force officer and civilian educational levels shows that officers compare quite favorably. In the US population, the median years of school completed is 12.4, while for officers it is 16.5. Eighty-three percent of officers have a college degree or more, while for the population in general it is twenty-one percent. Further, twenty-three percent of Air Force officers hold graduate degrees.

A third variable associated with divorce is security. Many behavioral science studies point out that economic insecurity is one of the factors giving rise to the great amount of divorce and family dissolution. Those couples who have a good, stable income, money in the bank, little or no indebtedness, and a fair amount of life insurance are more likely to have fewer marital problems. Air Force officers should have strong feelings of security since they have a guaranteed income, free medical care for themselves and family, low-cost government and group insurance, and a high degree of job security.

A fourth variable related to divorce has to do with the kinship group. Most empirical studies show that the further the physical and psychological distance from kin and in-laws, the greater the chance for a successful marriage. In other words, the further you live away from your mother-in-law, the greater your chance for marital happiness! The very nature of service as an Air Force officer requires the family to live great distances away from in-laws, often in different countries. In-laws have very little opportunity to influence and disrupt the household.

The visibility of the marriage is important to cohesiveness. When both partners are well known and where the community can observe their behavior, there are greater restraints against social transgressions that may lead to divorce. This is tied in with community stigma. One of the barriers against divorce is community disapproval; villages and small towns have much lower divorce rates than urban areas. Air Force bases are very similar to small towns, and marriages of Air Force personnel are subject to close scrutiny.

Another variable is that of occupation. Professional and managerial occupations, generally speaking, have high marital stability. Many researchers point out that jobs that provide a high level of intellectual or creative satisfaction, good income, and some degree of prestige create conditions most favorable to marital happiness. Air Force officers appear to meet these criteria.

Some Negative Variables

There are, of course, variables that are correlated with *higher* divorce rates. These include family separation, unfaithful behavior, conflicting religious beliefs, mobility, and many others. The two most applicable to Air Force officers are separation and mobility. It is true that Air Force officers are highly mobile. What most people don't realize is that Americans in general are highly mobile and that packing up and moving is a way of life for many civilian occupational groups.

Separation may either strengthen or weaken the family. Many studies point out that the absence of the loved one and the anxieties about the welfare of family members subject marriages to far-reaching strain. Without doubt, family separation brings on some instability in the home life of the couple, especially if the separation is a lengthy one; however, it is probably true that short, periodic separations are helpful to the marriage, and being away from loved ones for short periods of time makes us appreciate them more.

After examining in depth all of these variables associated with divorce, it was my hypothesis that Air Force officers would have low divorce rates. They have high income, high education, a great amount of security, live far away from in-laws, have highly visible marriages, and hold professional status in the occupational structure. All of these are positively correlated with marital happiness and success in marriage.

Marital Status of USAF Officers, 1960–1970

To see how my hypothesis holds up, we will examine a variety of data on Air Force officers

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and divorce from 1960 through 1970. During that period, approximately one percent of all officers were divorced at any one point. The percentage ranged from 0.8 percent in 1966 to 1.2 percent in 1970. This compares to about four percent in the same age group in the overall American population. Approximately 500 officers divorce each year and about ninety percent of them remarry—many within a year of their divorce.

Those officers holding a doctoral degree, including Ph.D.s, M.D.s, and others, had the lowest incidence of divorce. Those having less than a college degree had the highest. This supports the finding of previous researchers that marital happiness is related to education.

Percentagewise, more rated majors are divorced at any one point than any other group. Rated captains have the next highest rate. Rated officers consistently have higher divorce rates than nonrated officers, but the differences are small. The only case where nonrated officers have a higher divorce rate than rated officers is with lieutenants, suggesting that the more disruptive life the rated officer's family leads has not yet had time to manifest itself in higher divorce rates.

Navigators and observers had higher rates every year than pilots, but the differences were not large. For example, in 1967 the rate for pilots was 1.1 percent and for observers 1.8 percent.

Flight nurses consistently had slightly higher divorce rates than any other group of flying officers. It is probably true that most of these officers entered service in a divorced status rather than divorcing while on active duty and remaining in service.

Many people in the Air Force are under the impression that divorce rates in SAC are exceptionally high. There is no empirical evidence to support this proposition. Available data show that the SAC divorce rate is no higher than for other commands and that the rate has shown no increase over the past twelve years. It is possible the rates were higher in the early 1950s, but we suspect this is just another one of the myths about SAC. At least the author could find no data to support such a proposition.

The rates for TAC and MAC, however, do show upward trends. For example, the percentage divorced in TAC increased from one percent in 1966 to 1.7 percent in 1970. The disruptive nature of the heavy TAC involvement in Southeast Asia during this period may be a factor here; however, we should remember that these rates are still relatively low.

Background Factors

Officers who were graduates of OCS and Aviation Cadets consistently showed up as having higher divorce rates than officers commissioned through other sources. Neither of these sources required a college degree for commissioning. The lowest rate was found among Air Force Academy graduates. This may be partially explained by the fact that the Academy graduated its first class in 1959; however, in 1970, only twenty-one of the 4,490 Academy graduates on active duty were divorced. Additionally, we know that the chances of divorce occurring are much higher in the first two or three years after marriage, so many of these graduates have "had time" to get divorced.

The data show that those officers who are Catholic or Jewish had the lowest divorce rates, while those with no religion or no religious preference had the highest rate. This supports previous research findings which indicate that being attached to some religious organization is correlated with lower divorce rates.

We find negligible differences in divorce rates among minority groups. This is quite different in American society generally, where, for example, blacks have higher divorce rates than whites. We did find that a greater percentage of female officers are divorced at any one point in time than male. We have not yet determined if these officers were divorced before entering military service.

Divorce rates for those officers who have served a tour in Southeast Asia are higher than for those who have not. There is a statistically significant difference between the two groups (1.8 percent vs. 0.9 percent). The fact that the amount of divorce among those with a SEA tour is still relatively low can be partially accounted for by the tremendous amount of support the Air Force gave the wives and families of those officers who were away from home for lengthy periods of time. Of course, the determination and dedication of the wives themselves cannot be underestimated.

On comparing military divorce rates with those of civilians, it was found that civilian rates were higher. What is more significant is the fact that civilian rates show an upward trend, while those for the Air Force officers remain fairly constant. In making this comparison, we looked at Air Force officers and the overall population, ages twenty to fifty-four, from 1960 through 1970; the number of divorced men per 1,000 married men, 1960–70; and the divorced per 100 US married males, ages twenty to fifty-four compared to Air Force officers of the same age group, 1960–70. In all cases, the officers had lower divorce rates.

Other Positive Factors

Low divorce rates among Air Force officers can be partly explained by reference to several sociological concepts. Primary among these is that of integration; *i.e.,* the societal integration

that takes place through shared norms, values, and beliefs.

In the military environment, the sharing of a common culture and adherence to common norms, values, and beliefs is profound. The Air Force officer corps is a homogeneous, stable group in which a common set of standards and goals is shared by practically all members. These norms, values, and beliefs are generally shared by wives. Although the officer force to some degree cuts across all social classes, there is a strong feeling of commonality of kind. In fact, young officers are influenced by both their peers and their superiors to direct their loyalty toward the group and toward the mission. Selfless devotion to country and to the Air Force is strongly encouraged. They are also encouraged to put away feelings of superiority and desire for individual recognition and work toward success of the squadron, group, or wing. This is integrative and leads to solidarity.

This loyalty to the country, to the Air Force, to the unit, more than likely carries over into loyalty to the wife. The Air Force husband and wife are made to feel that they are a "team" and that the accomplishment of the mission is dependent on both of them. The wife is made to feel that her role is valued. Most wives are proud that their husbands are Air Force officers and feel that they are contributing in their own way to their husband's success, as well as to the mission of the Air Force.

Marriage partners in the military are mutually involved in many external networks and clusters of interest. There are many institutionalized social activities that require the presence of the officer and his wife. There are probably more obligatory functions for the military couple than for the civilian couple. Social theory suggests that when the couple participates together in activities, strength is added to the marital bond. It is functional for the marriage when the husband and wife have many common friends and interact often with them. The fact that most Air Force couples participate mutually in many external activities, sharing the same reference group and significant others contributes to marital cohesiveness.

Finally, the "visibility of the marriage" is very important to its success. One of the barriers against divorce is community disapproval, and such disapproval is more characteristic of villages, small towns, and places where the inhabitants are personally acquainted and often see each other face to face. When both partners are well known and when the community can observe their behavior, there are greater restraints against social transgressions that may lead to divorce. Base housing presents the ideal situation for a highly visible marriage and strong community control.

It is beyond the scope of this article to go into a detailed explanation of relatively low divorce rates in the military environment. The author has written a 250-page dissertation that does go into detail and presents comparative charts and analysis of all the areas mentioned above. A copy of this book is currently on hand at the Air Force Academy library. The title is "Divorce and Family Dissolution in the Population of the United States and Among a Homogeneous Subset of that Population (U.S. Air Force Officers) 1958–1970."

In the dissertation, the hypothesis that divorce rates among Air Force officers are lower than among civilians was supported. This phenomenon is easier to understand when one considers that Air Force officers as a group are highly educated, well paid, hold professional occupational status, have a great amount of security, and meet almost all other conditions behavioral scientists have found to be correlated with success and happiness in marriage. ■

STRANGE BEDFELLOW

The potential delirium tremens case is often good for a "new" anecdote, and sometimes the subject of a missed diagnosis. During World War II while serving as a flight surgeon in the Pacific, I had one such case in a combat fighter pilot. He was drinking too much, and his commander and I had told him to slow down before he began to see pink elephants crawl across his bed.

A few days later, it happened. He came out of his shack screaming, well lit, but sure that a ten-foot snake had just crawled across his bed. We humored him by making a thorough search of his shack and even showed him where the "snake" had probably escaped through a hole in the floor. He was visibly disgusted with us because he was sure that we didn't believe him—and we didn't.

The next day, we broke camp. When the enlisted men dismantled his bed, they found a five-foot python coiled in the bedsprings. The fighter pilot was never told about it, and for the remainder of his tour he was the nearest thing to a teetotaler we had in our command.

—Contributed by Col. (Dr.) James B. Hall, USAFR (Ret.)

(AIR FORCE *Magazine will pay $10 for each anecdote accepted for publication.)*

From space-age launch control centers, SAC's Missile Combat Crews control the awesome power of the ICBM force . . .

BEHIND THE BLAST DOORS

BY LT. RALPH H. HALLQUIST, USAF

ON THEIR first visit to a Minuteman missile site, people who are accustomed to the noise and bustle of a flight line invariably are surprised by one thing—the sound of silence. These quiet, space-age surroundings are hardly indicative of the awesome power buried in steel and concrete silos, or of the vital importance of the work performed by SAC's missile crews.

Each of the six Minuteman bases in the Midwest has from 150 to 200 nuclear-tipped missiles, standing on alert in their silos beneath rather unspectacular prairie terrain. The sixty-foot missiles are connected by buried cable to underground Launch Control Centers (LCCs) several miles away, from which crews monitor the status of their "birds." Motorists passing a launch site see only a fenced-off cubicle in the middle of a grain field, and probably wonder what it is and why it's there. There are no signs, and only occasionally does someone enter a site to perform maintenance.

The missile component of SAC's strategic deterrent force provides an ideal complement to our manned bomber force by virtue of the missiles' survivability, split-second reaction time, and speeds exceeding 15,000 mph. The land-launched missiles and manned bombers combine to form a difficult force to attack. What one system

A crew on alert monitors ten unmanned, dispersed missile launchers. The two men are in contact with four other squadron teams. No center can fire without help from another crew miles away.

lacks the other possesses, making it almost impossible to knock out both with a single blow. This ensures that enough resources will survive any attack to inflict unacceptable damage upon an aggressor.

But how is this capability maintained? How has the system remained an effective deterrent since entering the Air Force inventory more than ten years ago? Half of the answer lies in the weapon itself.

In hundreds of tests, the massive launcher doors have slammed back at Vandenberg AFB, Calif., and at Cape Canaveral in Florida to emit the unmistakable flaming smoke ring, pierced seconds later by a streaking Minuteman en route to its downrange impact point.

The first Minuteman I squadron became operational during the Cuban crisis (supposedly prompting President John F. Kennedy to remark that "we've got an ace in the hole"). The system has been continuously updated through the Minuteman II, Minuteman Modernized, and Minuteman III programs. Each new system brought a decrease in reaction time and maintenance as well as increased size, range, payload capability, survivability, and accuracy.

Simple and reliable as they may be, however, all the missiles in the world and all their associated hardware are of little value without that human element so essential to flawless performance.

Truly top-notch maintenance is needed to obtain maximum performance from each missile. Launch crews must exercise an equal degree of excellence when monitoring status, handling emergencies, and launching against assigned targets, if necessary.

To get a better look at the other face of this Minuteman coin, the human side, you should observe a missile combat crew as it performs a typical LCC alert tour.

Down to the LCC

You are introduced to the two-man crew with whom you'll be visiting as they walk out of their predeparture briefing. They pick up large "crew bags" stuffed with tech data, a change of clothes, and some publications to be carried out to the LCC. You follow them to their crew vehicle for the two-hour drive to the site.

During the trip, both men talk about their job. The Crew Commander, a six-year Air Force veteran and a quiet, family type, finds the job rewarding because he can witness first-hand the protection this system offers the country.

"I feel a good deal of satisfaction because I have a role in America's security," he says. "The more you get into this job, the more you realize what the stakes are, and that makes it quite worthwhile."

His Deputy Crew Commander, a first lieutenant serving in his first Air Force assignment, voices the same sentiments. He also enjoys the frequent days off: "We usually pull four or five of these two-day alerts each month. Except for classroom training days, the rest of the time is pretty much my own, and that makes it nice for pursuing my hobbies."

Upon arrival at the site, the Commander pulls the vehicle up to a gate. After identifications are verified, it is opened by an armed security policeman. You reach the long, rather nondescript support building and go inside. Each man checks out a side arm before stepping into an elevator to descend some sixty feet underground.

There, you pass through a short access tunnel guarded by an eight-ton steel and concrete blast door. You have now entered the confines of an LCC, more commonly known as a capsule. Within this small enclosure, two SAC officers exercise direct command and control over ten missiles, with the capability of monitoring and launching an additional forty if necessary.

Visitor and veteran alike subconsciously expect to find some type of activity in the LCC that would fulfill their science-fiction images of what "rocket launching" should look like. But instead of flashing lights, clicking computers, bells, buzzers, and alarms there exists mostly . . . silence. Or, at least a surprising lack of activity, punctuated by the subdued humming of electronic equipment and the occasional crackle of voices from a loudspeaker. You find it hard to imagine the real mission of this room. The most awesome destructive power in history rests at the fingertips of these men.

Prior to being relieved by your crew, the two officers currently on duty have been studying. The commander, who is enrolled in the Minuteman Education Master's Degree program, has been poring over a textbook. His partner, meanwhile,

The launch control panel showing the status of the missiles is checked constantly by the combat crew.

studies maintenance and Emergency War Order (EWO) checklists. The holstered pistols worn whenever visitors enter the capsule give the first real hint of the serious nature of their job.

The duty crew greets its relief and gives them a briefing on the status of each missile. Next, they begin inventorying Top Secret "Go-to-War" codes that would be opened only upon Presidential order in the event of an attack. After inventory, these codes are secured in a bright red safe. White, stenciled letters state that entry is restricted solely to the crew on duty.

When changeover is completed, both members of the new crew seal the safe with individually owned combination locks. The combination of each lock is known only to its owner, preventing one person from unauthorized access to the documents.

During changeover, the technical conversation of the men is intermingled with the usual talk of men in any organization: hunting, night classes, family life, or subjects of current interest. But with changeover completed, the old crew wastes little time heading for the elevator and the support building. Once topside, they will find many of the comforts of a "home away from home"—sleeping quarters, showers, television, and a hot meal.

For the two men just coming on duty, however, it is time to prepare for their new shift. First comes a detailed inspection of equipment, followed by telephone conversations with a maintenance team at one of the sites. Finally, a computer-printed verification shows each missile is configured to its proper target. With these preliminaries completed, the crew can now "baby-sit" its missiles for the next few hours. During peacetime operations, their primary task is one of detecting faults in the missiles and in their own LCC equipment, coordinating maintenance activity, enforcing safety standards, and maintaining security of the entire weapon system.

The Minuteman system functions very effectively and, as a result, there are days when there simply isn't much to do. It is during these hours of waiting and watching that the unique aspects of crew life become apparent. The nature of their task reveals why this job is one that attracts a certain type of individual, one who prefers to work something other than the usual "eight-to-five" routine.

Challenges and Opportunities

There are very few jobs that offer the many opportunities available to missile crews who frequently have spare time on their hands. How well this time is utilized determines the rewards a crew member may receive from his job.

First, there is a built-in learning potential for crew members who want to reach instructor or evaluator status. Not only is there the opportunity to handle actual problems as they arise, but each capsule also has publications and training guides. Mastering these materials is essential to the industrious crew member who wants to excel during evaluations.

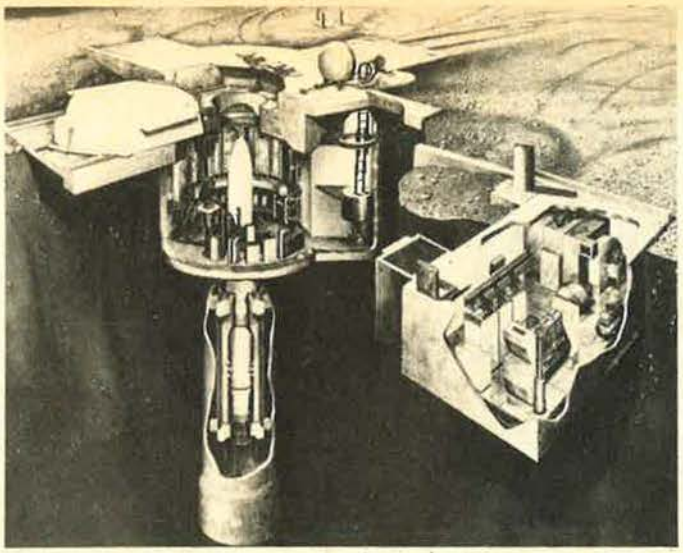
When not expanding their job knowledge, missile officers have time to pursue their own individual interests during the slack periods of an alert tour. One of the most popular pursuits among Minuteman crew members is working for an advanced academic degree. Each Minuteman base offers a free graduate degree program, taught by instructors from a nearby accredited university. And it carries no commitment to remain on active duty for a specified number of years.

But this aspect of crew life is in the nature of a career bonus. The big question is, how ready are these "Minutemen" and how effective is America's nuclear deterrent? After all, taxpayers have invested a considerable amount in the system and it wasn't with the intention of providing a place for crew members to study.

The very fact that things run so smoothly is in itself a tribute to the missiles' reliability. Yet, these missiles are only as ready as the men who control them. The technology designed into each missile must be complemented by human expertise at the operational level if the system is to accomplish its mission.

When a crew assumes alert, the indicator panel displaying the status of each missile will usually show ten green lights, meaning that each bird is war-ready and capable of launch. But at any moment a situation could arise that would shatter the silence and require split-second reaction by the crew.

In the event of major malfunctions at a missile silo or in the LCC, there isn't always time to hunt



A cutaway drawing shows the missile silo and the launch control center, which are both buried in tons of steel and concrete for protection from enemy attack.

through checklists, to ask questions, or to grope in one's memory for information. Nuclear weapons don't offer a second chance. Information must be ready and decisions must be made with confidence. This is where the human element becomes so important, and the emphasis on perfection pays off.

Each SAC missile officer is selected specifically for the important task he will perform. Before he ever pulls alert duty, the Air Force must be sure he is the right man for the job. Through the Human Reliability Program, the Air Force assures itself and the public that men in the missile force are physically, morally, and psychologically stable. The prospective missileer is screened by both a physician and a psychologist, and is interviewed by his unit commander before being certified. His stability is checked continuously throughout his tour in the missile force.

Training involves a major portion of a crew member's career. He begins with ten to twelve weeks at Vandenberg AFB, Calif., home of the USAF/NASA Western Test Range. Here he spends many classroom hours with instructors from both SAC and the Air Training Command. He learns the equipment with which he will work, missile security, and Emergency War Order launching procedures before finally stepping into the Missile Procedures Trainer (MPT) to "put it all together."

The MPT is a fully equipped LCC that is wired to a computer instead of real missiles. It can simulate almost any imaginable situation. In the MPT, lights flash, loudspeakers blare announcements, buzzers, bells, and alarms go off. The activity proceeds at a tiring pace.

But Vandenberg is just the beginning. After graduation, crew members begin another five to six weeks of upgrade training at their home bases. This involves more classroom study, more EWO, and more MPT rides to refine the student's knowledge and familiarize him with procedures peculiar to his base.

The final step is a pressure-filled "Standboard" evaluation and a certification briefing before the Wing Commander, Deputy Commander for Operations, or Squadron Commander. After a crew is declared "combat ready," it takes a place on the active alert force. Its work is by no means completed, however. Regulations require six monthly hours of classroom training in code component, weapon system, and EWO procedures as well as passing a codes test and two types of EWO tests each month. Then there are recurring MPT rides and periodic evaluations to maintain consistent proficiency levels. Promotions to jobs of increased responsibility are based on performance during training and evaluation.

A Space-Age Career Field

Missile career direction is now receiving special attention from SAC planners. Unlike most career fields, the missile force dates back only sixteen years, to the deployment of the Atlas, America's first ICBM. Gathered from various career fields during those early days, that first generation of missile officers has now progressed through the ranks to major and above. For the first time, many command positions are filled by men with solid backgrounds in missile operations.

The missile career field is still in its embryonic stages. Special emphasis is being placed on the planned development of today's second generation of missileers. Officers entering the crew force of the '70s can draw upon the experience of their predecessors and on carefully designed counseling to chart a logical career progression.

A crew member has at his disposal today the services of a unique organization known as the Missile Management Working Group, part of the Directorate of Personnel Plans at SAC Headquarters. The Working Group offers advice on future assignments, educational opportunities, and other items that will benefit one's missile career.

In addition to careful career guidance, the missile force also provides young officers with an excellent opportunity to gain operational command experience early in their careers. Officers holding command positions have always been selected for their background in operations, a knowledge obtained only by those in flying duties before the inception of missiles. Recently, however, the missile wings at both Minot AFB, N. D., and Grand Forks AFB, N. D., were headed by nonrated Wing Commanders. Command positions are not closed to nonflyers.

The many advantages of missile duty are also available to the man who may not be looking at missiles

The author, Lt. Ralph H. Hallquist, is a Missile Combat Crew Member at Malmstrom AFB, Mont. He graduated Summa Cum Laude from Moorhead State College, Minn., and has a Mass Communications degree from North Dakota State University. Commissioned through the AFROTC, he entered active duty in 1972. He has earned two Missile Combat "Highly Qualified" ratings and was selected to attend the GIANT LEAGUE Conference for outstanding Combat Crew Members.

Frequent exercises keep the Air Force missile crew combat ready.

as a career, but as an assignment to broaden his experience. He can enhance his promotion potential through the operational experience gained on the crew force. This option was previously limited to those who could qualify for flying duty.

The life of a missileer isn't always a rose garden. Missile crews face endless studying and testing, training and evaluations in the MPT, and long hours of alert duty. However, SAC has focused considerable attention on these problems and made decided progress in improving the life of today's crew member. Alert equalization programs, to take an example, assure fair distribution of alert loads among crew members.

By introducing the no-cost, commitment-free graduate degree program, SAC has provided a unique educational and career development opportunity as well as an incentive reward for service. Many of the current missile crew force hold master's degrees, as do a third of the missile squadron commanders.

During any evaluation of pros and cons, there arises a question of perspective and responsibilities. A look around the capsule at the numerous documents and publications, with their red covers stamped "Secret" or "Top Secret," and the locked safe holding the codes that everyone hopes will never be used, or listening to the unforgettable warble tone of the primary alerting system serves to remind one of the contribution he is making.

Crew members readily admit that when their turn comes to spend Christmas at home, they're glad to know that friends are looking out for them in those quiet underground rooms somewhere in the Midwest. ■

DOOLITTLE MAKES THE GRADE

When the 100th Bomb Group (H), based at Thorpe Abbots, England, completed its two hundredth mission over enemy territory, a celebration was in order, and it turned out to be a rouser. Guests of honor were Gens. James Doolittle and "Tooey" Spaatz; medals were awarded and general congratulations given.

That night in the Officers' Club, Doolittle was the center of an admiring group of pilots, bombardiers, and navigators, all eager to have their Short Snorters signed. A foolhardy lieutenant spoke up:

"General, who was your pilot when you flew over Tokyo?"

There was a horrified gasp from the group, who had seen their distinguished guest land his personal Mustang on their runway in a manner as near to perfection as it is given mortal man to accomplish.

The General regarded his interrogator with amazement. Then:

"Well, I'll be damned!" he said.

"No, wait a minute," he went on. "That's an honest question and deserves an answer. When we trained for the mission, we went out in the desert, marked off a piece of ground just the size of the carrier deck, and we practiced night and day trying to lift off a loaded plane in as short a space as possible.

"Then we had a contest. There were thirty-two of us. I was lucky enough to finish among the first sixteen—so I flew in the left-hand seat. That answer you?"

It did.

—Contributed by Lt. Col. Marvin S. Bowman, USAF Res. (Ret.)

(AIR FORCE *Magazine will pay $10 for each anecdote accepted for publication.)*

B-1 avionics is right on target.

The U.S. Air Force B-1 Bomber begins its flight test program this year.

This is one of the most remarkable achievements in jet aviation — a manned bomber that will fly at speeds in excess of Mach 2 and carry twice the payload of the B-52. A jet with a navigation system that guides the B-1 over the nap of the earth more surely than the human hand.

It's a major step in another way too. The B-1 will have a lifespan of at least a quarter-century. Principally, because it's designed to easily accommodate future advances in avionics.

Two and one-half years ago Boeing was selected as the associate contractor for the B-1 avionics systems integration. It has required integration of avionics equipment used in programs such as C-5A, SRAM, F-111 and F-14.

It has meant tight deadlines, extensive research and inventive solutions to avionics technical and cost challenges.

Professional guidance from Wright-Patterson has been superior every step of the way. And cooperation among B-1 team members absolutely tops.

Naturally, we're proud of our on-time record for this program and are pleased to be a part of the B-1 team.

We think the whole idea is right on target.

BOEING

WHILE the Sopwith Camel of World War I fame has rightfully been considered the greatest air fighter in all history, that snub-nosed little gadfly is fortunate that its victory record was compiled as a one-man operation. Every enemy aircraft shot down by its twin guns was credited to an individual pilot; there was never any argument or division of the statistics.

On the other hand, the Bristol Fighter, or Brisfit as it was called, could probably claim the victory championship, except for the fact that it was a two-seater. Rank and class distinction played a big part in the Royal Flying Corps. Victories scored by the pilot of a Brisfit, generally an officer, were credited to him. Those scored by the gunner-observer, usually a noncommissioned officer, were never credited to him. They were simply entered in the squadron record—and forgotten.

I know! I was a Bristol Fighter gunner for many months. Like most of the noncom gunners, I was a volunteer from an infantry regiment, and had come direct from the trenches. Because we were experienced machine gunners, none of us received any in-air training. I left my regiment early on a Saturday morning and went on my first patrol that same afternoon.

I was assigned to Number 22 Squadron, which at the time was flying F.E.2bs, and aboard that old pusher I went through many harrowing months of aerial warfare, among them Bloody April (1917), when the enemy plainly had the upper hand, and the pleasure of fighting on his own side of the line. I somehow lived through a hundred air battles, fighting with a Lewis gun mounted on a gas-pipe mounting, chiefly because I was a well-trained machine gunner. And I was fortunate to have transferred from the trenches in time to be ready for the Bristol Fighter when it came along.

The Brisfit originally was intended to be a corps-reconnaissance and artillery-spotting plane—an aircraft that would be able to defend itself against the Fokker menace. As the design evolved, Frank Barnwell, of the Bristol and Colonial Aeroplane Co., incorporated a fixed Vickers synchronized gun and added the cozy Scarff ring and Lewis gun for the observer. It soon was realized that, in this format, he had produced an out-and-out two-seater fighter, not a corps-reconnaissance plane.

The first experimental type made its trial flight in September 1916, and during the next few weeks varied refinements were introduced. The 190-horsepower Rolls-Royce Falcon engine was fitted with an almost oval radiator and shutters for air flow, and a four-bladed propeller. An Aldis optical sight was provided for the pilot, and a simple dual-control system for the observer.

Two Against Twenty

This, then, was the beginning of the greatest two-seater fighter of them all, a machine with the best qualities of both single- and two-seater fighters. It had great structural strength, power, speed (125 mph), armament, and maneuverability. Its appearance on the Western Front early in 1917 completely revolutionized aerial warfare, for it behaved like a scout, yet could fight with a wide angle of firepower. It was so compact that for weeks enemy airmen mistook it for a single-seater and were astonished to find that while maneuvering to get on the Brisfit's tail they would come under a withering fire from a rear gunner who hadn't been noticed.

The Bristols were flown as though they were S.E.5s, and were thrown all over the sky with gay abandon. The gunners had a field day. Before that memorable summer was out, six Bristol Fighter squadrons were hacking away at the Von Richthofen Circus.

The aggressiveness of the Bristol Fighter crews and the tactics they employed are illustrated by the following excerpt from a June 29, 1918, story by Boyd Cable, the noted correspondent of the London *Sphere:*

> Two of our two-seater fighters of No. 22 Squadron while out on an offensive patrol encountered seven enemy scouts. The two promptly attacked, each pilot selecting an opponent and diving on him with the forward gun going. Both shot their man down in flames and as they came out of the dive the observers opened fire astern, one catching a Hun nearby and putting him down in flames. The enemy were reinforced by two formations which brought their number up to twenty, but our men made no attempt to break off the combat. Instead they pressed it further. Another enemy, almost colliding with one of our machines, was shot down at a close range of a few feet as he whirled past. Others were damaged, driven down, crashed, or set on fire.
>
> The fight lasted a full half hour and only when they had run completely out of ammunition did our men break off and return safely to their 'drome. They could count only seven of their enemies left in the air at the finish. One pilot and his observer (Alfred C. Aikey and C. G. Gass) destroyed three. Two went down in flames and another crashed fully out of control. The other Brisfit team had actually downed two in flames and sent three more down completely out of control.

Cambrai: Twelve Hours a Day

Another experience by two Number 22 Squadron airmen points up the amazing activity of Bristol Fighter crews, the power of the machine itself, and in particular the epic courage of my friend, Sgt. Gunner Edward Powell. I should add, too, that his pilot was none other than Maj. (then Capt.) Andrew McKelvie, who was to become the leading Bristol Fighter ace.

This exploit took place during the Battle of Cambrai. The attack around Ypres, which had opened on June 30, 1917, subsided in a sea of mud that inundated Flanders. The General Staff finally decided to switch to higher and drier ground. General Haig's plan was to break the Hindenburg Line and to crash through as far as Burlon, then smother the Germans with a reverse movement westward and northward to the Sensee and the Scarp.

This thrust began on November 20. The new British Mark III tanks

In the glory days of World War I flying, generous daubs of whale oil kept your face from freezing and only pilots (officers)—never gunners (NCOs)—were credited with enemy kills. Because those original GIBs (guys-in-back) were enlisted men, their reconnaissance sightings needed verifications, too, as in these tales about . . .

THE FABULOUS BRISTOL FIGHTER

BY ARCH WHITEHOUSE

This prototype model of the Bristol Fighter was not yet fitted with the Scarff gun ring. The long exhaust pipes were also abandoned later.

had broken through according to plan, helped considerably by smoke and fog. The fog was a great aid to the tanks but what it did to the flight plans of Number 22 Squadron was something else. It managed to clear long enough every day for us to get in our patrols and then settled down at night and kept ground activity to a minimum.

We turned in an ungodly number of flying hours. We flew, snoozed, flew, slept, and flew some more. Only a Bristol Fighter and a Rolls-Royce engine could take this beating. The flyers staggered back and forth, too tired to eat. The gunners could be identified by the cordite pittings and daubs of whale oil that formed a pattern over the lower halves of our faces. The whale oil was to keep out the cold. There was no time for wash-ups.

Number 22 Squadron was given the job of destroying enemy balloons, road transport, and making a general low-down nuisance of ourselves. We poured Cooper bombs on antitank gun emplacements and drilled drum after drum of ammunition into the trenches. We strafed the roads, chased horse-drawn artillery over open fields, and generally played merry hell. We returned again and again for fuel, bombs, ammunition, and the encouragement of our C.O., Maj. L. W. Learmount.

On the second day of this action I logged twelve hours and forty minutes in the air and I almost went out again at night on a particular bombing show with Learmount. About ten of those hours were spent well over the enemy lines fighting like madmen.

But gradually the weather took over and on one of our attempts to win this particular chunk of the war Captain McKelvie took a chance on a solo show to make a special report on the conditions around Cambrai. Sergeant Powell, my gunner pal, went along in the back seat. At that time Powell should have been credited with eleven aircraft destroyed—but you know. . . .

They left our Estree Blanche field in fairly decent weather but, on reaching the line, conditions clotted up and they had to cross the trenches at about sixty feet. Next, they were completely blinded by the fog and had no idea where they were until a terrific explosion somewhere below almost blew them out of the sky. At that instant, Powell saw that the blast had come from an ammunition dump. They were flying so low he could identify the uniforms of the men in the area.

Intrigued by this, McKelvie decided to stooge around and see what this explosion indicated. Powell was certain it was set off purposely because no one on the ground seemed anxious to save anything. This was the first shred of evidence that the Germans were clearing out of the Cambrai area—under cover of the bad weather.

McKelvie and Powell were so intent on recording the incident that they did not notice a flight of Albatros D-III scouts roaring at them.

—Imperial War Museum Photo

—Imperial War Museum Photo

UPPER: The Bristol Fighter's battle configuration included bomb racks under the lower center section and the Scarff ring for the Lewis gun in place.

LOWER: Airmen of 22 Squadron pass personal effects to the unit recording officer before going into battle. This assured that no revealing information was carried behind German lines.

Powell had an ammunition drum shot off his gun before he realized what was going on. He quickly rammed on another and opened fire at close range. An Albatros burst into flames and almost crashed into them. McKelvie whipped the Bristol clear just in time and when another D-III crossed his sights he shot its wings away with a short snap burst.

An Albatros attacked from astern but Powell returned the fire and saw the pilot collapse over the side of his cockpit. So fast was all this action that three enemy planes were falling to earth at the same time. The whole scrap lasted less than thirty seconds. The six remaining Jerries decided to buzz home and McKelvie managed to hedge-hop the Bristol back home safely.

All very interesting and very valiant, but Powell's report on the ammunition dump got me and a few more innocent bystanders into trouble. The all-important Cambrai push was held up *for lack of information.* The balloon observers were blinded by weather and our advanced observation posts were fogged in. Powell's report was important and factual, but it was never acted upon because Powell was *only an NCO gunner!* Powell was awarded the Distinguished Conduct Medal for his part in the flight, and no one argued about the validity of his report. But no one considered it important enough—even though McKelvie had also signed it—and it was decided that someone else would have to substantiate it.

"Find Out What's Happening"

The fog was even thicker the next day but a few Bristols were dragged out just the same. At eight o'clock in the morning someone took off to check what Powell had reported the day before. The observer was an officer, of course—poor devil! An hour later we received word that they had hit the top of a slag heap outside Lens. As soon as that news came another Brisfit crew went out. We never did hear what happened to that second crew.

During all this harrowing period I couldn't stay away from the hangars. Morbid curiosity, I suppose. I walked up and down with Powell trying to figure out what he had failed to put in his report, or why his word hadn't been considered important. We were both hurt by the slight, but what could we do about it?

Powell gave up and went back to bed. I should have followed, but then I noticed a young "A Flight" pilot striding up and down. A red-tabbed staff officer was also pacing back and forth in much the same manner.

Major Learmount called me over and said: "I'd like you to go over and have a look with Lieutenant Davison, Whitehouse."

I saluted and said: "Yes, Sir," and turned to go for my flying kit.

"Wait a minute," the Major called back. "How do you feel about it?"

I heard myself saying: "I don't mind going, Sir, if Mr. Davison wants me."

"You needn't go unless you wish. It's a very nasty day."

I made the most of my position as an experienced gunner. "I'll decide how bad it is, once we are in the air, Sir. If it is too bad I'll bring him back."

"Good! I'll leave it up to you," the Major said.

I wanted to kick myself all the way across to the armament shed for being such a fool, but there was something fine and appealing about Davison. He wanted to do something to break up this stalemate and I was flattered because he had asked for me.

When I returned with my flying gear and gun the Major outlined what he wanted. "We've got to find out what is happening around Cambrai. Don't see things that aren't there, just to fill out a report. Get us the information, not just a filled-in patrol report. Understand?"

"Yes, Sir."

He shook hands with me and as we walked over to a Fighter, Corporal Barker, one of the mechanics who would help start our engine, whispered, "You bloody fool!"

The fog seemed to seep in thicker than ever.

The Fog of War

Eighty feet off the ground we lost sight of everything. The fog enshrouded us and the boom of our engine reminded me of a drum being pounded in a small confined cell. We both huddled down in our cockpits and sat it out until we had climbed to 3,000 feet. I got to my feet and peered over into the pilot's cockpit.

He was flying a true southeasterly course that would take us straight to Cambrai. We consulted our watches and I began a check-chart on my map in an attempt to figure out our progress. This was about as much as either of us knew of aerial navigation, but it worked out fairly well. Davison continued to climb and we finally came out into a pattern of streaked sunshine and watery blue. We were out of the fog but still couldn't see the ground.

We plunged on toward our goal, which I reckoned to be about fifty miles from Estree Blanche. If there were no enemy kite balloons up we were comparatively safe, but we had to risk them and their damned steel cables.

Finally, I tapped Davison on the shoulder and pointed toward the ground. My pilot looked worried but cut the engine to idling speed, and as we glided into the cottony vapor the fog streaked our goggles and left a dripping film over everything. We watched the altimeter drop from 6,000 to something just over 1,000 feet. Any minute now!

He jazzed the throttle to make sure the engine would catch as soon as we broke through, but still nothing appeared. Davison looked back at me and pulled the nose up. I fully expected we would plow through a French farmhouse, but I said: "Try it again!" and my voice sounded like a foghorn.

We eased down again, both as tense as violin strings. Another few seconds and he turned to me with a look of resignation. I was about to agree when I suddenly spotted something red and white. For a second I thought I was staring at some sort of image. Everything had an opaque, indefinable mistiness.

Then I screamed and yanked at his joy-stick arm. "Look out!"

We swished across a brown roof on the top of which was painted a bright white circle with a red cross in the center. Davison yanked back on the stick and we zoomed up into the fog again. As I turned to stare down our tail I saw we had missed

The author, then "Corporal Whitehouse" and a gunner, later became an officer and pilot.

The author, Arch Whitehouse, joined the British Army at the outbreak of World War I. In 1917, he transferred to the Royal Flying Corps as an aerial gunner, later went through pilot training, and returned to the front as a Sopwith Camel pilot. He is officially credited with downing sixteen enemy aircraft and six balloons, and at the war's end had earned the rank of Acting Captain. After the war, he became a sports writer, and during World War II was a war correspondent. Mr. Whitehouse, who now lives in Montvale, N. J., has published more than forty books, many of them about flying in the two World Wars.

The author, Arch Whitehouse, today.

the top of a Red Cross hospital by inches. I saw plenty more, too.

"Go back!" I pleaded. "They're pulling their hospital down!"

"Where are we?" Davison yelled back.

"I don't know yet but we're well on their side of the line. I saw field-gray uniforms."

My pilot dipped down gently again. I sensed we were gambling on church spires and I remembered the poor devils who had hit the slag heap at Lens. But I also remembered Powell arguing that the Germans were pulling out of Cambrai, and I wanted to make sure.

We groped down into the clear again, and both saw many portable huts being taken apart. Men worked like ants around the square slabs of lumber while others hoisted the sections up into trucks and wagons.

I scribbled in my notebook: "12:10 . . . Red Cross hospital moving."

Dogfight on the Deck

Davison circled in a friendly manner, respecting the mercy insignia. I then spotted troops—a few armored cars and a platoon of infantry marching out of a town.

"Cantaing!" I yelled as I recognized the area. "Head *that* way. Cambrai is in that direction." We roared over cyclists and straggling troops until we came to the brick-red fringe of Cambrai.

By now our presence was openly resented. The troops below began potting at us with rifles and machine guns but none of that opposition bothered us. Davison swung over the top of a building and headed for the east side of the town. One glance at the traffic along the roads forking north and east offered enough evidence for anyone. I started to make more notes but Davison was out for blood. He dived on an artillery column and opened fire at close range. The rattle of his gun seemed to be a signal for new action and the fog suddenly cleared in this area.

We should have gone home with the glad tidings but Davison was gorged with success and we both began making the usual mistakes.

I saw several mounted men tumble from their horses and some were dragged over stone walls, one foot caught in a stirrup. Others fell in squirming heaps among terror-stricken animals and were probably kicked to death. A field gun drawn by six horses broke out of the column and bolted to clear a stone wall, but the weapon fell back and a gunner hanging to the ammunition limber disappeared under the wheels.

I was now in a position to open fire over our rudder, for Davison zoomed hard and I could hear his gun chattering madly. I wondered what he was shooting at from that angle but as I fired my first long burst toward the ground I sensed that something was off schedule. I turned slightly and saw three Fokker triplanes bearing down on us. I tried to warn my pilot, but he was roaring headlong into a formation of white-winged Albatros two-seaters.

Experience warned me that my war could be over as of now but I suddenly remembered the Major's insistence on our coming back with any important information. I had it, and what was more I wanted to back up Eddie Powell.

"Clear out of here!" I screamed. I was firing with one hand, swinging my gun back and forth like a garden hose and bellowing in my pilot's ear. He took no notice of me but plunged on smack into the middle of the two-seater formation.

"Oh, well," I thought and shut my eyes, "at least we're in the vicinity of some Red Cross huts," but nothing disconcerting happened. I pressed my trigger again and continued to fan the air with the muzzle of my gun. When I opened my eyes an Albatros, flaming like a thrown torch, smashed into a Fokker maneuvering to get on our tail.

Don't ask *me* who did it.

How do I remember all this? I have it down in wriggly notes in my old black-covered patrol book which lies beside me as I type the story.

We thundered through the mass of two-seaters and I poured another long burst into one that had turned to give his gunner a shot. Our Brisfit rattled like a bucket of bolts as slugs bored into the longerons. I swore at that Hun devil and let him have a return burst. He immediately

disappeared and I saw the Albatros roll on its back to toss the gunner clear, then it went into a steep dive and smashed into one of the prettiest red-tiled farmhouses you ever saw.

"Beat it!" I continued to yell as I saw the other Jerries reforming to get us. The Fokkers were particularly annoying by now and I had to dish out two long-range bursts to keep them occupied until I could induce Lieutenant Davison to seek sanctuary in some fog.

Most reluctantly he took my advice. How long we flew in that muck I have no idea but my next notation was at 2:35 when Davison asked me where we were.

"I don't know. Let's go down and have a look," I suggested.

He Who Hesitates

As we swept through a sun-streaked hole, three green-and-white Aviatiks passed so close we could have taken the factory numbers from the rudders. We zoomed up higher and I tried to guide my pilot toward our own lines. The fog was breaking up a trifle and I finally recognized the area of Saint Quentin near Laon and with that I realized we were floundering about well south of our home field.

Davison took my notebook and scribbled: "Are we on the French front?" I nodded and peered about for details.

"We can't make it back," he yelled and pointed to the fuel gauge.

"Never mind. There's a French 'drome at Nesle—over there. We can fuel up there. I know the field very well."

In a few minutes we were landing on the old German 'drome that had been captured during the Somme push of 1916. We were greeted with only mild interest by some French officers and had considerable trouble in explaining our mission and desires, but after some delay they agreed to furnish us with *essence.*

When we arrived at Estree Blanche we learned we had been officially listed as missing in action. Needless to say, no report countermanding the announcement was ever sent, and for weeks my parents wondered whether to don their black or sit back and hope.

My report—backed by Lieutenant Davison's signature—seemed to do the trick and for several minutes we got some action, but as there were a few streaked holes in the clouds the Staff mob again decided to wait—just a few hours—to see if they could actually confirm my report *through a kite-balloon observer!*

Unfortunately, the Germans staged an unexpected counterattack from Bonavais south to Vandhuille and practically all British gains of November 20–25 were wiped out.

Had the Staff listened to a trained gunner-observer on the morning of November 20, the Allies could have walked into Cambrai without firing a shot. There is no question but that the Battle of Cambrai would have been a major military success.

Powell must have downed more than twenty Huns before they sent him home to get a commission and become a pilot. When he went back to France the following summer he simply picked up where he had left off and he did get credit for the victories he scored—as an officer.

I was to stay on, volunteering for anything, until late the following January. I loved Number 22 Squadron and that wonderful old Bristol Fighter.

She was quite a war bird!

Lieutenant Davison? Fifty-four years later, in 1971, I was aboard a transatlantic airliner on my way to a Royal Flying Corps reunion in London. One of the old boys came and sat down next to me. Believe it or not, I recognized him immediately. All I had to say was: "Remember our patrol over Cambrai in 1917?" and he gasped: "Corporal Whitehouse! My aerial gunner!"

Did we massacre Huns for the rest of that trip! ■

RANK HATH ITS PROBLEMS

Years ago, when Air Rescue Service had a fleet of long-range SC-47s, one of our practice missions was to recover aircrews at out-of-the-way locations. On one such sortie, we inadvertently ran a Gooney Bird off the runway and across an access road at the Shamrock, Tex., airport. The aircraft commander, not wanting more problems than he already had, left the aircraft where it was and called the parent unit at Norton AFB, Calif., for maintenance assistance.

Lo and behold, a massive work force, headed by the unit commander, descended upon us the following day. Necessary repairs were made, and a sizable portion of the town people assembled to await our Sunday afternoon JATO takeoff.

A young local lad, with an autograph pad in his hand, approached the squadron commander.

"Sir, could I have your autograph?"

"Why, yes, son," replied the CO, obviously flattered, and signed the book, Lt. Col. R. Seabolt.

The boy took a look at the signature, sadly tore out the page, and said to the astounded officer, "I'm sorry. My Daddy told me not to get any signatures unless you were at least a major."

—Contributed by Lt. Col. Ernest N. Willard III, USAF

(AIR FORCE *Magazine will pay $10 for each anecdote accepted for publication.)*

The idea is to get aerospace subjects into classrooms. For twenty years now, Colorado AFA groups have been . . .

TEACHING TEACHERS ABOUT AEROSPACE

BY ROBIN WHITTLE

Assistant for Editorial Promotion, AIR FORCE Magazine

LAST June, forty-four school teachers attending the 1974 National Workshop on Aerospace Education spent three weeks at Lowry AFB, Colo., to hear about, see, and experience firsthand many of the wonders and complexities of today's Aerospace Age.

Sponsored by the Colorado State Air Force Association and the Rocky Mountain Region of the Civil Air Patrol, the Workshop combined lectures by nationally known experts with field trips, films, and demonstrations. Topics covered included: aerospace education and aerospace education projects; general, commercial, and military aviation; aviation history; aviation medicine; aerospace industry; NASA; FAA; Skylab and Mariner; Space Shuttle; the social, political, and economic implications of the Aerospace Age, and flights in aircraft and gliders. The Workshop was accredited for nine quarter hours of upper division or graduate credit by Adams State College, Alamosa, Colo.

The Colorado State AFA has sponsored fifty-three such Workshops over the past twenty years, educating educators in the need to incorporate aerospace subjects into curricula. Their efforts reflect AFA national policy which, from the beginning, has argued that aerospace has a place in the classroom.

In Colorado, AFA leaders have a special interest, since their state contains a number of aerospace facilities. Noel A. Bullock, Colorado State AFA Education Director, set up the first Workshop twenty years ago, to include trips to the many aerospace facilities in the Front Range area. From Pueblo to Longmont are found the Department of Transportation Research Facility in Pueblo; a US Army aviation center at Fort Carson; the North American Aerospace Defense Command and the Air Force Academy in Colorado Springs; Black Forest Glider Port in Black Forest; Arapahoe County Airport and the Denver Martin Company (Skylab Project) in Littleton; the Air National Guard's Buckley Field (140th Tac Fighter Wing) and the Federal Aviation Administration (Rocky Mountain Region) in Aurora; United Air Lines Air University; Continental Frontier Air Lines and Lowry AFB in Denver; the National Center for Atmospheric Research and Ball Brothers (Application Satellites) in Boulder; the National Center for Atmospheric Research Aircraft (Jeffco County Airport) in Broomfield; and the Air Route Traffic Control Center in Longmont.

The design of the Colorado Aerospace Education Workshop has endured. It is a general-survey format, oriented toward the nontechnical layman.

Adams State College accredited the Workshop for elementary, intermediate, and secondary school teachers, counselors, and administrators. The Rocky Mountain Region of the Civil Air Patrol provided the Workshop manual, which served as a guide for educators in integrating what they learned into their classroom programs. Enthusiastic acceptance of this first program encouraged Bullock and others to continue it with only minor changes.

Within this format, the Aerospace Workshop is wide in scope. Aviation history is traced from mythology to present times, relating man's ancient fantasies to his current achievements. Flight is defined in relation to aerostatics, aerodynamics, aircraft nomenclature, and to man's physiological and psychological limitations. The special functions of commercial aviation and military aviation are outlined. The Federal Aviation Administration's responsibilities for aviation safety and the efficient use of navigable airspace are discussed. Dave Olds, Public Affairs Officer, FAA (Rocky Mountain Region), appeared at the Workshop this year to discuss FAA's role in aviation education in the United States and abroad.

Progress in space and the benefits accruing to the American public from it are gone into by National Aeronautics and Space Administration officials. Finally, achievements in aerospace education, notably by AFA's Aerospace Education Foundation and the Civil Air Patrol, are examined in detail.

This year, James H. Straubel, Executive Director of the Air Force Association and of the Aerospace Education Foundation, keynoted the Workshop, setting the tone for a dynamic session. He charged participants to attach a broader meaning to "aerospace education" to examine how it relates to new methods of teaching based on the application of aerospace technology to the learning process.

Also keynoting this year's Workshop was Jack V. Sorenson, Deputy Chief of Staff, Aerospace Education and Cadet Programs, Civil Air Patrol, Maxwell AFB, Ala., who described CAP activities in support of aerospace education.

None of the Workshop themes is viewed in a vacuum. Each year, they are interwoven to provide participants with a composite picture of aerospace power. Topics are expanded to take note of change and to more fully detail social, political, and economic implications resulting from advances in aerospace.

This year's event manifested the expertise gleaned from previous Workshops. It was an educational "happening" that profoundly affected those experiencing it. That, of course, was the purpose.

How well the Workshop has accomplished its purpose over the years is evident in the honors it earned for the Denver Front Range Chapter in 1973 and for the Colorado State AFA in 1974. Both were awarded AFA's Exceptional Service Plaque at its National Convention in Washington, D. C.—an unprecedented recognition of Noel Bullock and other Colorado AFA leaders who, year after year, bring to fruition AFA's goals in the field of aerospace education, and a tribute to the fact that this Workshop has been designated as AFA's national effort in aerospace education. ■

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Airman's Bookshelf

All That Glittered

Defense Policy Formation: A Comparative Analysis of the McNamara Era, by Clark A. Murdock. State University of New York Press, Albany, N. Y., 1974. 179 pages plus notes and index. $8.95.

It may be too soon after the fact to attempt the kind of study undertaken here by Clark A. Murdock, but he has made a commendable effort. He knows that Robert S. McNamara, as Secretary of Defense, tried to change the decision-making processes so criticized in the Eisenhower years. And that Systems Analysis, which brought us the Whiz Kids in the Pentagon, and a technique called Planning-Programming-Budgeting System (PPBS), were supposed to bring a new dawn. Even so practical a man as Lyndon Johnson was impressed, so much so that he ordered McNamara management concepts adopted by all federal departments in 1965. But, as Mr. Johnson and the rest of us learned, it wasn't all that good. When Melvin Laird became Secretary, he turned the clock back, particularly after taking a hard look at Total Package Procurement and the meager output of the defense industry's laboratories and factories. We had slowed to a walk.

Author Murdock correctly detects there had been a tendency "to accept what are essentially statements of aspirations for the reality itself." The men in uniform had another way of putting it. They said it would take more than a decade to repair the damage.

By way of introduction, Mr. Murdock surveys what we had under Eisenhower and finds the use of budgetary ceilings had the effect of turning policy determination over to the Joint Chiefs of Staff, where the atmosphere was both political and parochial. 'Nuf said.

Under Mr. McNamara the political realities cut no ice; highly centralized control was imposed. At one point Charles Hitch, the DoD Comptroller, was asked who was responsible for deciding on force proposals, and he replied: "The decision would have to be Secretary McNamara's. There is no one else who can make these decisions that influence so profoundly the allocation of resources among the services." And there were a lot of important factors that didn't come out of the computer because they never were put into it.

The author says that both Harold Brown, as Director of DDR&E, and Jerome Wiesner, Scientific Adviser to President Kennedy, "felt that military technology had reached a plateau." It may be that Dr. Brown changed his mind when he took over as Secretary of the Air Force, but Mr. Murdock does not say so. But he does make it clear that Brown and Wiesner were key men in the technological area, where McNamara did not feel confident of himself.

The book will fascinate our friends in military R&D and procurement, the men who have been struggling with these problems since long before McNamara and who are still at it.

Perhaps this is not the best place to mention it, but we are increasingly aggravated by books that have been fouled up by the binder. Our copy of *Defense Policy Formation* has sixteen pages missing. It is the kind of shoddy workmanship that would not be tolerated under a defense contract.

—Reviewed by Claude Witze, Senior Editor of this magazine.

An Astronaut's Literary Triumph

Carrying the Fire: An Astronaut's Journeys, by Michael Collins. Farrar, Straus, and Giroux, New York, N. Y., 1974. 478 pages. $10.

Five years after men first walked on the moon, the historians are still trying to sum up the costs and benefits of the Apollo project. They are balancing billions of dollars, years of efforts, and several lives against a substantial but hard-to-measure harvest of scientific, technological, and even emotional benefits. What started out as an exercise in national vision, determination, and engineering virtuosity might well wind up being viewed as a futile, extravagant, and wasteful wild goose chase. That would be a pity.

The impact of Apollo, despite the present pessimistic interpretations, is more than just in economics, politics, or even science and engineering. Now one of the Apollo-11 crewmen has addressed the real meaning of the moon in a sometimes poetic, sometimes pragmatic, often humorous, always fascinating narrative.

Mike Collins was Command Module Pilot in July 1969 while Armstrong and Aldrin descended to the moon. He had been an astronaut for six years (he was copilot on the Gemini-10 flight and had been removed from the Apollo-8 moonflight for spinal surgery). Following the moon landing, he left the astronaut program (turning down a chance to walk on the moon as Commander of Apollo-17) to take a job which left more time for his family. Now a brigadier general in the Air Force Reserve, Collins lives in Washington, D. C., where he is in charge of organizing the new National Air and Space Museum at the Smithsonian.

His book follows a first-person format as he explains the moon project from his own point of view. Since Collins was involved in the most important milestones in the US manned space program, *Carrying the Fire* transcends autobiography to become a lucid, witty, and insightful description of what Apollo was really like to the people involved in it. Reading the finely crafted prose (Collins wrote every word himself) leaves one with the impression of actually having lived the experiences.

What does Apollo really mean for mankind? By the time Collins tackles this question, we have had the popular image of George Goodguy, the trained, mechanical "supermonkey" astronaut transformed into a perceptive, articulate, and philosophical human being. Going to the moon, Collins suggests, is having the greatest impact both on man's

image of his own capabilities when he sets his mind to a problem and also on the fragility and delicacy of the earth, our small, beautiful green and blue oasis in the vast black desert of space. These concepts will have profound repercussions for the future, thanks in no small part to such eloquent spokesmen as Mike Collins.

—Reviewed by Capt. James Oberg, USAF.

New Books in Brief

The Battle for Berlin, by John Strawson. In early 1945, Eisenhower was intent on destroying Germany's war capabilities rather than gaining the psychological and political objective of Berlin. As this author says, "The glittering prize . . . the great political plum of Berlin was not for the plucking by Eisenhower or Montgomery. It was into Zhukov's hand that it would fall." This book is the history of the two fronts and the taking of Berlin. Charles Scribner's Sons, New York, N. Y., 1974. 182 pages with index. $7.95.

The Bombing of Nuremberg, by James Campbell. The highest casualty rate the RAF Bomber Command ever suffered was on the night of March 30–31, 1944, during its attack on Nuremberg. In a running battle with the German nightfighter force, ninety-four out of 795 Lancasters and Halifaxes were lost. The author interviewed survivors on both sides to tell the story of that night. Doubleday, Garden City, N. Y., 1974. 194 pages. $6.95.

Fair-Weather Flying, by Richard L. Taylor. An informal discussion on ways in which the VFR-limited pilot and the student can improve their flying skills and get more out of their aircraft. Among the subjects discussed are crosswind takeoffs and landings, navigating by the chart system, turbulence, twin-engine techniques, density altitude, night flying, high traffic density airports. Macmillan, New York, N. Y., 1974. 297 pages with index. $7.95.

Hero Next Door, by Frank A. Burnham. Six days before Pearl Harbor, the Civil Air Patrol was formed. The author, a long-time aerospace writer and CAP member, tells the history of the volunteer patrol which today conducts eighty percent of all air search in this country. The account is filled with dramatic rescues and heroism. Aero, Fallbrook, Calif., 1974. 208 pages with index. $8.95.

A History of Air Power, by Basil Collier. With a theme of the mixture of the good and evil that airpower has brought to the world, this history concentrates on the years of World War II as the time when the real power of the airplane was demonstrated. Air battles and strategies are discussed. Macmillan, New York, N. Y., 1974. 358 pages with index. $10.95.

Hitler's Generals, by Richard Humble. This author says, ". . . the whole macabre story of Hitler and his generals is based on the fact that between 1934 and 1939 the generals were proved wrong whenever they forecast disaster, while Hitler's plans were triumphantly proved right." This history is a study of the part the generals played during the German build-up and their relationships and conflicts with Hitler during the war. Doubleday, Garden City, N. Y., 1974. 167 pages with index. $5.95.

The Horn of Africa, by J. Bowyer Bell. Because Somalia, Djibouti, Ethiopia, and Sudan are on the horn of Africa protruding into the Indian Ocean, and are adjacent to the Arab oil-producing nations, they may someday be a strategic focal point. A paper of the National Strategy Information Center, Inc., this book is a history of the political situation in that area. Crane, Russak & Co., New York, N. Y., 1973. 57 pages.

Our World in Space, by Robert McCall and Isaac Asimov, with foreword by "Buzz" Aldrin. In this beautifully done, large format book, science writer Asimov teams with artist McCall to examine man's future in space. They describe and picture colonization of the moon and Mars, and explorations beyond our solar system and galaxy. Biochemist Isaac Asimov is well-known to most readers of science and science fiction. Robert McCall's paintings hang in the National Gallery of Art; many of them were done for the film *2001: A Space Odyssey*. New York Graphic Society Ltd., Greenwich, Conn., 1974. 176 pages. $19.95.

Revolutionary Warfare in the Middle East, by Bard E. O'Neill. An examination of Arab terrorists, the fedayeen, and Israel's efforts against them. The author, an Air Force Academy faculty member, concludes that this terrorism reflects the desperation of a failing movement. The failure is caused by lack of popular support, Arab government restrictions, and disunity among the terrorists. Paladin Press, Boulder, Colo., 1974. 140 pages. $5.95.

Ribbons and Medals, by H. Taprell Dorling. A reference book on military ribbons and medals of the world's principal nations, with both color plates and black and white photos. The text includes a short history of most medals. Doubleday, Garden City, N. Y., 1974. 359 pages with index. $14.95.

To Join with the Eagles, by Murray Rubenstein and Richard M. Goldman. In 1929, two rival aircraft companies merged, bringing together in the Curtiss-Wright Aeronautical Corp. the names of those giants of early aviation, Orville and Wilbur Wright, and Glenn Curtiss. This book is an account of the companies before and after merger. It includes pictures and descriptions of the planes built, up to the last one in the mid-1960s. Doubleday, Garden City, N. Y., 1974. 230 pages with index $15.

Two-Block Fox, by Charles M. Melhorn. The author holds the view that in the 1920s "the strategic situation of the United States in the Pacific had eroded to the point where it could not be corrected by conventional measures." The few Navy officers who recognized this fact pinned their hopes on the aircraft carrier. This book is a study of the development of the carrier from 1911 to 1929. Naval Institute Press, Annapolis, Md., 1974. 181 pages with index. $14.50.

World Military Leaders, edited by Grace P. Hayes and Paul Martell. A biographical directory of the world's senior military personnel. The first section contains the biographies with such data as rank, current assignment, date and place of birth, experience in active theaters of war, and honors. The second section is a list of personnel by nation. R. R. Bowker, New York, N. Y., 1974. 268 pages. $25.

—By Kathryn Foxhall

The Bulletin Board

By John O. Gray
MILITARY AFFAIRS EDITOR, AIR FORCE MAGAZINE

Personnel Programs Slashed

The Air Force and the other services took a drubbing in late summer when Congress, via the FY '75 military appropriations bill, cut deeply into military personnel projects. Additional curtailments loom.

Before the lawmakers took their extended Labor Day recess, both the House and Senate agreed on specific fund reductions in quarters allowances, PCS travel, and lump-sum accrued payments at reenlistment time. Officer RIF money also was withheld (*see next item*).

Additional reductions—some made by the House, others by the Senate—faced a conference committee in mid-September. Most crucial was the $177 million ($57.5 million for USAF) the Pentagon needs to extend full travel-transportation payments to lower-ranking enlisted members. The House reluctantly approved this item, but the Senate said no, and the latter is expected to prevail in the conference.

The Senate also told the services to reduce lump-sum leave payments generally and phase out enlisted superior performance proficiency pay (SPPP) within twenty-one months. The Air Force promptly halted a new round of SPPP payments pending a final decision by the conference.

At another point, the lawmakers made clear they want Defense to end the traditional practice of paying enlisted members for accrued leave each time they reenlist. Officers get the lump sum only once during a career, the legislators noted.

Also to be resolved is a decision on enlisted education-commissioning programs. The House cut Air Force funds for this long-standing program and, if the Senate agrees, nearly 300 airmen now in college face withdrawal.

Separate reports issued by the House and Senate Appropriations Committees again scorched the services for their rising travel expenditures. The Senate report "directed" the Pentagon to reduce PCS moves. And the senators underscored their point by shaving a whopping $51.6 million from USAF's FY '75 budget figure of $622.7 million. The House had voted only a $29 million reduction.

Both Houses agreed to cut Air Force quarters allowance money by nearly $11 million. This action perils Hq. USAF plans to let 12,400 more bachelor officers and airmen than received BAQ last year move off base and collect the quarters money.

The rationale given for the BAQ cut in the House Committee report borders on the incredible: "It does not seem reasonable to allow more Air Force personnel to draw quarters allowances as an all-volunteer force incentive when it is having no difficulty attracting qualified personnel."

Such statements completely ignore the point military bachelors have been trying to drive home—that they want equal quarters allowance treatment with married members.

Outstanding community programs conducted in 1973 by the 913th Tactical Airlift Gp. (AFRES) at the Willow Grove (Pa.) Air Reserve Facility won the Defense Department's Community Service Award for the unit. Col. Theodore G. Behling, center, Group Commander, accepts the award from Air Force Deputy Assistant Secretary (Personnel Policy) James P. Goode as Maj. Gen. Homer I. Lewis, Chief of Air Force Reserve, looks on.

RIF Pay Funds Withheld

Anticipating a RIF of 1,700 more junior officers late next spring, Air Force some months ago sought $28.6 million for their separation payments. Congress recently cut the request in half. And, at the same time, the lawmakers slapped Air Force for requesting substantially larger RIF funds in the past two years than it wound up using.

The lawmakers told Air Force to reduce ROTC and OTS production still further as one way of curbing the anticipated RIF, though Hq. USAF officials feel that course is not feasible.

Headquarters, meanwhile, has opened early-out doors again, this time to pilots as well as nonrated officers. Exit applications will be accepted until October 31, and officials hope for a large turnout. A likely surge in September retirements may also ease the RIF threat.

In addition, Congress has "recommended"—not mandated—per-

Volunteer medical services performed in Vietnam earned an honorary ROA Life Membership for Dr. Dan Callahan, left, a member of AFA's Executive Committee and National Board of Directors. Making the presentation is Sen. Sam Nunn (D-Ga.), Chairman of the Manpower Subcommittee of the Senate Armed Services Committee.

The Topside Aviation Club, a Washington, D. C., organization for women in aerospace, has selected Harry J. Gray, at right with Mrs. Gray, as the club's "Top Boss" of the year. With the Grays are Dottie Flanagan, left, Secretary to AFA President Joe Shosid; James H. Straubel, AFA Executive Director, and Ruth Weldon, the club's president.

sonnel strength cuts not greatly below budgeted figures. The legislators said that if the services can find the money, perhaps via reimbursement for members assigned to other agencies, there will "be no need to take a man-year or end-strength reduction in FY '75."

That all adds up to favorable news, and one high-placed authority held out the possibility that the RIF would be reduced well below the 1,700-member figure. It's always possible, of course, that the new Administration may order fresh manpower cuts of its own as an economy measure.

And that RIF money Congress withheld? It will be made available later, if needed, the lawmakers made clear. Their purpose in withholding the funds: muscle the services into inducing more voluntary exits.

Jones Reassures on OER

Officers not receiving top ratings "will remain competitive for promotions and special assignments," USAF Chief of Staff Gen. David C. Jones has told major air commanders. He was referring to the new Officer Effectiveness Report program slated to begin in November, though at press time authorities indicated starting date slippage was possible.

General Jones's message hopefully will reassure an officer corps long conditioned to such raging OER inflation that lack of a top-box rating does not necessarily mean no promotion. Eighty-nine percent of all officers currently have received the top score.

And Air Force estimates that should the old system continue, very soon "seventy-five percent . . . would have five straight top ratings in a row." Obviously, such a situation is unrealistic.

The new OER form rates all officers below star rank on ten performance factors. But the really significant new feature is a tough control system that requires no more than twenty-one percent of the officers to receive top box during any rating cycle.

No more than fifty-three percent can make the top two, while up to 100 percent can be placed in the top three boxes. There are five boxes altogether. Headquarters says it will check commands closely to see that these "maximum allowable percentages" are not exceeded.

But a few exceptions, bound to spark controversy, are permitted. Air Force says, for example, that the Hq. USAF Air Staff and a few other organizations are manned "from only the few top people in the Air Force."

Accordingly, they will enjoy a special distribution which allows thirty-eight percent to make top box and eighty-three percent to make the top two boxes. Joint command assignees and service school faculty members also will get special distribution preference.

Ratings will be staggered. Thus, if the new program flies on schedule, the first officers rated will be about one-third of the captains on November 30. Each officer will receive one rating a year. General Jones called on all commanders and supervisors to get solidly behind the new OER project.

Reserve-Officer Career Plan

Air Force has launched a Reserve Officer Career Development Program for line USAFR lieutenant colonels and below in an active pay status. First step is getting each officer to fill out a new "career objective" statement (AF Form 419). Each person will list desired training courses, assignment preferences, and related data. Forms must be completed by next March. CBPOs will work closely with Reservists in laying out members' career patterns. Reserve chief Maj. Gen. Homer I. Lewis sees the new program strengthening the "total-force" policy.

The Air National Guard has conducted a similar officer career plan for several years.

Manpower Subcommittee Surges

For years, important House-passed military personnel bills frequently gathered dust for long months in the Senate. That may be changing, following the recent formation of a Senate Armed Services Manpower Subcommittee.

Headed by Sen. Sam Nunn (D-Ga.), the new group at its first meetings in August quickly approved USAF's grade relief measure (*see below*) and the "three-way" pay bill. The latter move undoubtedly will be endorsed by the full committee and the Senate in September. It paves the way for splitting future pay increases equally between basic pay, quarters allowance, and subsistence allowance (see *"Speaking of People" column in the September issue for details).*

At the subcommittee's second open hearing, Defense Secretary James R. Schlesinger, Air Force Secretary John L. McLucas, and other top Pentagon leaders urged Congress to make no additional manpower cuts.

The Nunn group figures to play a

major role in the shaping of personnel, pay, manpower, and Reserve legislation, and without delay in most instances. Sens. Harry F. Byrd (Ind-Va.) and Peter H. Dominick (R-Colo.) are other regular members of the unit.

Several quarters in Congress, including the Nunn subcommittee, have recently renewed talk of the need for a "single salary system," "pay reforms," etc. But it appears mainly an echo of similar proposals that have popped up frequently—with no result—over the past decade.

Grade Relief Extended

Air Force got a pleasant surprise when Congress, in an unusual burst of speed in late August, passed the officer grade relief extension bill. The measure was signed by Presi-

Ed Gates . . . Speaking of People

Will the Service Academies Go Coed?

The Defense Department and the services, with justifiable pride, have boomed the new and larger roles women are playing in the military establishment.

At congressional hearings, in speeches, and in other public appearances, military officials are spreading the word about the expanded opportunities for women in uniform. And in glowing terms, such as underscoring the generally higher level of brainpower of female recruits over new male members.

Service speakers at every opportunity are spotlighting the fact that more than 5,000 young women were enrolled in ROTC units during the past school year. Defense Department authorities have told many audiences of plans to boost total female service enrollment to nearly 100,000 by mid-1975 and much higher the following years.

The military's increased reliance on women merits this broad exposure; it has won deserved public-relations points for the services.

But on the closely related matter of admitting women to the service academies, the Pentagon has adopted a tough negative position, and lost public relations points in the bargain. Although the services have won some court tests on the female admittance question, it seems clear that the longer they resist, the more lumps they will receive. The women's movement appears determined to persevere on this issue.

By demanding admittance of females at West Point, Annapolis, Colorado Springs, and New London, Conn. (Coast Guard Academy), the ladies have the services clearly on the defensive. And the military's case against admission seems to me hardly compelling.

Women in officer candidate and officer training schools? Fine, the Pentagon decided many years ago. Thousands have been commissioned since via OCS and OTS.

There was initial resistance to admitting coeds to ROTC units when that idea first gathered steam. But after a cautious beginning, predicted problems were rapidly ironed out. The effort was expanded, and the services have embraced the program without reservation.

With the exception of the academies, women are fully integrated in the services. It's on that single issue that authorities seemingly won't budge. Assistant Defense secretaries, service secretaries, and many-starred generals all have issued a resounding "no" to proposals to make the institutions coed.

One officer declared that since female officers average slightly less service than male officers, the expense associated with possible low retention of female academy graduates could be substantial.

Other opposition has centered on estimated high costs to alter physical facilities needed to accommodate women. But other opponents have acknowledged that alteration costs would be small.

Defense's main opposition to admitting women to service academies zeros in on laws and policies that bar them from combat duty.

"In view of the fact that women are precluded from serving in combat, to admit them to the service academies would alter the fundamental character of the institutions as training grounds for combat-leadership officers," Defense General Counsel Martin R. Hoffman told a House Armed Services subcommittee earlier this year.

Hoffman added, however, that if Congress changes those rules to authorize women in combat, the Pentagon would withdraw its opposition to enrolling women.

A bill to do that, plus a handful of other women-in-the-academy bills, has been introduced. The House subcommittee this past spring and summer conducted a series of hearings on the issue, and the sessions made clear the existence of strong support, not only in Congress but throughout the country, for ending the academies' all-male composition.

A subcommittee spokesman told AIR FORCE Magazine that following the congressional Labor Day recess, the subcommittee might report out a bill making clear that sex will not be a basis for rejecting academy applicants. But this measure could be delayed, or even dropped, depending on the outcome of an academy admission suit now being appealed.

The services, of course, have thwarted earlier court actions seeking to open academy doors to females. But observers seriously question how much longer they can resist successfully.

Meanwhile, another academic year has begun and the service schools remain among the dwindling number of all-male colleges in the country. Even the Merchant Marine Academy has gone coed, fifteen young women having enrolled in the freshman class.

Is the Pentagon overdoing the combat-duty issue? Many quarters think so, some even referring to it as a "phony issue." They note that the question of training for combat wasn't raised when the idea of commissioning women via the ROTC was first examined. And ROTC provides many times the number of officers the academies produce. Less than one-tenth of all new Air Force officers come from the Air Force Academy.

In the Air Force, combat applies with very few exceptions only to aircrew members. Since women don't serve on combat crews, "where's the big problem?" one official noted privately.

"We're making too big a thing out of trying to keep women out of the academies; we're too hard-nosed about it and in the process we're needlessly antagonizing many groups of people. This we don't need," he pointed out.

Also commenting privately, another prominent source said, "Female cadets won't hurt us and they can be accommodated with very little difficulty. The public strongly favors opening the academies to women, and their admittance is inevitable. We'd be smart to reverse course now, end the haggling, welcome talented coeds, and begin accepting applications."

That sounds to me like good advice. ■

dent Ford on August 29 (P.L. 93-397).

The final measure contains a reduction of 256 lieutenant colonels and 162 colonels below previously planned grade ceilings. But this bite won't have significant impact on those hike programs.

The temporary two-year extension was speeded along by the newly created Senate Armed Services Manpower Subcommittee (*see p. 75),* which heard USAF's relief extension request during its first public meeting. The group approved the measure promptly even though Sen. William Proxmire (D-Wis.) reiterated his chronic complaint of extensive grade creep in all the military services.

Approval of the extension marked the seventh time Air Force has gone to Congress for relief necessary to prevent demotions, more RIFs, and a halt in promotions.

The Manpower Subcommittee, as expected, delayed consideration of the permanent grade relief and related officer policy reforms the Pentagon wants enacted in the Defense Officer Personnel Management Act (DOPMA). Senator Proxmire blasted the DOPMA package. He called on the subcommittee to rewrite it and eliminate the sliding-scale formula on which grade ceilings have been established for two decades.

Subcommittee Chairman Nunn promised that his group would take a "fresh look" at DOPMA. But, he indicated that serious action on the package is at least a year away. Some observers would make that two.

The Doctor Shortage

Air Force in late August had received from civilian doctors, interns, and medical students 5,300 responses to a direct-mail program the service had launched in hopes of recruiting physicians to fill expected shortages. There was no early word on actual acceptances resulting from the mass mailing.

A new, related procurement plan apparently is nonproductive. This is the special dispensation the government recently gave retired Regular medical officers—to work for the services and not surrender any of their retired pay. At press time, the USAF Surgeon General's office said it had not heard of any acceptances.

The Defense Department, meanwhile, approved an "interim" medical officer bonus, and Air Force promptly identified 320 colonels, 280 lieutenant colonels, and 150 majors it said were eligible for the payments. That's less than a quarter of USAF's physician force.

The regular bonus—officially, Variable Incentive Pay, or VIP—became law last May. But differences over the size of the payments and the rules for paying have delayed implementation and infuriated medical officers.

The interim sums are paid at the medics' continuation pay rates. Regular continuation pay was cut off June 1, so the interim program in effect continues it only until the VIP payments are launched.

Retiree Pay Raise Shaved

The first partial cost-of-living raise service people retiring after October receive will not include the extra one percent normally added to COL increases. The Defense ruling accentuates the retired pay inversion snafu, under which members retiring after October 1 will receive smaller pensions than those retiring before that date. Defense earlier was rebuffed by the President's budget office when it declined to endorse a "save-pay" relief proposal to give the post-October 1 retirees equity. The Pentagon does plan to try again for relief legislation early next year, however. At press time, bills to eliminate this disparity were pending in both the House and Senate.

More Employer Support

By late July, 245,000 employers, representing 45,500,000 employees, had signed statements supporting the Guard and Reserve. That's fifty-five percent of the nation's work force. But the National Committee for Employer Support of the Guard and Reserve notes that the rate of increase of participating employers has slowed significantly. The Committee, as a result, has begun new mail campaigns.

For 'Bama AFROTC Grads

The Arnold Air Society Squadron at the University of Alabama is assembling a roster of Alabama AFROTC graduates on active duty. Alumni are asked to report their AFSC, commissioning date, and a brief biography to the Commander, Thomas H. Borders Sq., AAS, AFROTC Det. 010, University of Alabama, University, Alabama 35486.

Short Bursts

Established recently was a 7.5

The Bulletin Board

percent **cost-of-living allowance** for Air Force and other government white-collar workers on **Guam,** and the allowance in the **Virgin Islands** was increased to ten percent. . . . The COL allowances for workers in **Alaska** (twenty-five percent), **Hawaii** (fifteen percent), and **Puerto Rico** (7.5 percent) have been continued, the Civil Service Commission disclosed. . . .

USAF plans to produce **2,919 new pilots** at its eight pilot training schools this fiscal year, but only 2,000 are for the active USAF; the other 919 are Air Guardsmen, Reservists, and flyers of friendly foreign nations (including 299 for South Vietnam). Pressures are increasing for the services to **consolidate their pilot training programs,** and the early elimination of a USAF pilot training base or two would come as no great surprise. **Sen. Barry Goldwater** (R-Ariz.), speaking on the same general subject, said recently, "We are the only nation in the world that has four air forces. Can't they be trained by the same source?" . . .

Nine of every 100 Air Force non-prior-service recruits are discharged within 180 days for **unsuitability, unfitness, preservice drug use, medical problems,** etc. AWOLs (remember them) are up a bit; Hq. USAF reports that 11,585 members went over the hill in FY '74, compared to 11,281 in FY '73 (when total strength was higher). Thirty-one of those who took off during the first half of this year were on their "sixth or more" AWOL. . . .

When authorities said an early retirement under the Pentagon's new Reserve retirement bill would mean a **"greatly reduced annuity,"** they weren't kidding; the DoD-backed measure would allow a pension at age fifty of just 29.5 percent of the full rate now attainable by retiring at age sixty. . . . With officer RIF threats continuing, the **quest for Regular commissions,** with their built-in RIF protection, intensifies; meantime, USAF's recent announcement about officers making Regular brought widespread groans for the following reason: only 537 of 3,117 eligibles made the four-year list, while just twelve percent of the eligibles were chosen in the seven- and ten-year group competition. . . .

Don't take lengthy and expensive educational or technical training programs and expect to separate or retire soon after completion, USAF told the field recently in insisting on a **"fair return" for its investment.** . . . The first-term **reenlistment rate for black airmen** the past five years has been nearly double that of white airmen; during the first nine months of FY '74, for example, the figures show 29.4 percent of the white eligibles re-upping vs. 58.1 percent of the black eligibles. . . . USAF has named Capts. Richard J. **Erickson,** Bruce A. **Matis,** Lloyd R. **Lawrence,** Jr., James E. **Ray,** and Lt. Steven R. **Jones** as nominees for **America's Ten Outstanding Young Men of the Year Awards** (1975) program. . . . The Chief of Staff also named TAC's choice, **Dr. Richard T. Whitcomb** of NASA, to compete for the 1974 Wright Brothers Memorial Trophy. . . . The average service member is completely unaware of the existence of the **US Court of Military Appeals** (the "Servicemen's Supreme Court"), recently retiring Chief Judge Robert M. Duncan lamented. ■

Senior Staff Changes

PROMOTIONS: To be **Lieutenant General:** Charles W. **Carson,** Jr.

RETIREMENTS: M/G Joseph J. **Cody,** Jr.; L/G Duward L. **Crow;** B/G James M. **Fogle;** B/G Russell G. **Ogan;** M/G Donald H. **Ross;** L/G Dale S. **Sweat;** L/G Carlos M. **Talbott.**

CHANGES: M/G Ranald T. Adams, Jr., from Cmdr., 26th NORAD/CONAD Region with add'l duty as Cmdr., 26th Air Div., Luke AFB, Ariz., to Cmdr., AF Insp. & Safety Ctr. and Dep. IG for Insp. & Safety, Norton AFB, Calif., replacing M/G Ernest T. Cragg . . . **B/G Kenneth E. Allery,** from DCS/Ops, Hq. ADC & Asst. DCS/Ops for Ops, NORAD/CONAD, to IG, Hq. ADC & IG, NORAD/CONAD, Ent AFB, Colo., replacing B/G Guy Hurst, Jr. . . . **B/G Charles C. Blanton,** from DCS/Comptroller, Hq. AFSC, Andrews AFB, Md., to Dir. of Budget, AF Compt., Hq. USAF . . . **M/G Arnold W. Braswell,** from Cmdr., TUSLOG, USAFE, Ankara, Turkey, to ACS/Ops, SHAPE, Belgium . . . **Col. (B/G selectee) Dan A. Brooksher,** from Cmdr., 4600th AB Wg., ADC, Ent AFB, Colo., to Cmdr., 26th NORAD/CONAD Region with add'l duty as Cmdr., 26th Air Div., Luke AFB, Ariz., replacing M/G Ranald T. Adams, Jr.

M/G Ernest T. Cragg, from Cmdr., AF Insp. & Safety Ctr. and Dep. IG for Insp. & Safety, Norton AFB, Calif., to C/S Allied AF Southern Europe, Naples, Italy . . . **Col. (B/G selectee) Sidney L. Davis,** from Asst. DCS/Ops for Ops & Tng., to Asst. DCS/Ops for Con. & Spt., Hq. TAC, Langley AFB, Va., replacing B/G Thomas M. Knoles III . . . **B/G Hans H. Driessnack,** from Comptroller, ASD, AFSC, Wright-Patterson AFB, Ohio, to DCS/Comptroller, Hq. AFSC, Andrews AFB, Md., replacing B/G Charles C. Blanton . . . **Col. (B/G selectee) Elwood A. Kees, Jr.,** from Asst. DCS/Ops, to DCS/Ops, Hq. ADC & Asst. DCS/Ops for Ops, NORAD/CONAD, Ent AFB, Colo., replacing B/G Kenneth E. Allery.

B/G (M/G selectee) James S. Murphy, from Cmdr., 17th Air Div. (Prov.), SAC, U-Tapao Airfield, Thailand, to Cmdr., 20th NORAD/CONAD Region with add'l duty as Cmdr., 20th Air Div., Ft. Lee AFS, Va., replacing retiring B/G James M. Fogle . . . **Col. (B/G selectee) Len C. Russell,** from Dir., Ftr. Ops, DCS/Ops, to Asst. DCS/Ops, for Ops & Tng., Hq. TAC, Langley AFB, Va., replacing Col. (B/G selectee) Sidney L. Davis . . . **M/G Henry Simon,** from Auditor Gen. & Cmdr., AF Audit Agency, Norton AFB, Calif., to Dep. Dir., Contract Administrative Services, Defense Supply Agency, Alexandria, Va., replacing retiring M/G Joseph J. Cody, Jr.

M/G Foster L. Smith, from Dir., J-5, US EUCOM, Vaihingen, Germany, to Asst. DCS/Plans & Ops, Hq. USAF . . . **B/G Robert F. Titus,** from DCS/Ops, Hq. AFSC, Andrews AFB, Md., to US DCS/Live Oak, Casteau, Belgium, replacing retiring B/G Russell G. Ogan.

—Compiled by Kathryn Foxhall

By Don Steele
AFA AFFAIRS EDITOR

THE AK-SAR-BEN CHAPTER, NEBRASKA . . .

cited for consistent and effective support of the Air Force and AFA's mission, most recently exemplified in its sponsorship of the Second Annual Arthur C. Storz, Sr., Awards Luncheon.

Entertainer Bob Hope, left, applauds as AFA President Joe Shosid presents AFA's Award of Appreciation to Gen. John C. Meyer.

AFA President Shosid, right, presents AFA's Award of Appreciation to Bob Hope. Seated at the head table are, from left, V. J. Skutt, General Meyer, and Chapter President Robert Runice.

Ak-Sar-Ben Chapter President Runice, left, presents Capt. Richard Paul the Chapter's Arthur C. Storz, Sr., Award as the Outstanding Junior Officer of the Year at Offutt AFB. Looking on is General Meyer.

Chapter President Runice, left, presents the Arthur C. Storz, Sr., Award to Offutt AFB's Outstanding Airman of the Year, SSgt. Jerome Schroeder, as General Meyer looks on.

More than 1,000 members and guests, including many leaders of the Air Force, AFA, and the community, attended the Ak-Sar-Ben Chapter's Second Annual Arthur C. Storz, Sr., Awards Luncheon, held recently in Omaha's Peony Park.

Retiring SAC Commander in Chief, Gen. John C. Meyer, and entertainer Bob Hope received AFA's coveted Award of Appreciation. In presenting the two awards, AFA President Joe L. Shosid cited both recipients for distinguished professional careers, devotion to the men and women in uniform, and dedication to the objectives of the Air Force Association.

The Chapter's Arthur C. Storz, Sr., Awards for the outstanding junior officer and airman at Offutt AFB were presented to Capt. Richard Paul and SSgt. Jerome Schroeder, respectively. Chapter President Robert Runice made the presentations.

Mr. V. J. Skutt, Mutual of Omaha's Board Chairman, was the master of ceremonies. Highlights of the program are shown in the accompanying photos.

In recognition of the Chapter's consistent and effective support of the Air Force and AFA's mission, most recently exemplified in its sponsorship of this luncheon, AFA President Shosid named the Ak-Sar-Ben Chapter as AFA's "Unit of the Month" for October. ■

AFA News

In recognition of outstanding assistance, the Civil Air Patrol recently awarded its Certificate of Appreciation to the Alabama AFA. In the photo, Alabama AFA President Cecil Brendle, left, is shown accepting the certificate from CAP Brig. Gen. William M. Patterson, Chairman of the CAP's National Board, during a Dining-In at the National Staff College.

At the Pennsylvania AFA's 1974 Convention Awards Dinner, the State AFA's Carl Long Science Award—a trophy and $200—was presented to Stephen Wiggins, III, of Newton Square. Particip In the program included, from left, AFA National Director John Brosky, the master of ceremon AFA President Joe L. Shosid, the guest speaker; Mr. Wiggins; AFA National Director Carl J. Lo who presented the trophy; and Pennsylvania AFA President Frank Nowicki.

A highlight of the Pennsylvania AFA's 1974 Convention in Valley Forge was the presentation of an AFA charter to the newly organized Valley Forge Bicentennial Chapter. Standing are, from left, Chapter President Hugh F. Gannon, III; Vice President James B. Neff; State AFA President Frank Nowicki; and Chapter Secretary/Treasurer Karen Price.

Participants in the New Hampshire AFA's 1974 Convention in Manchester included, from left, State President R. L. Devoucoux; Wilfred B. Corriveau, Jr., the State AFA's "Man of the Year"; Raymond C. Gagnon, Jr., the State AFA's "Outstanding Senior AFROTC Cadet" from the University of New Hampshire; and AFA President Joe L. Shosid, the guest speaker.

At the Pennsylvania AFA's 1974 Convention, the Beaver Valley Chapter was named its "Chapter of the Year." Shown admiring the award are, from left, AFA National Director John Brosky; Mrs. Sterrett; Chapter President Deane Sterrett; and State AFA President Frank Nowicki. During the convention, Mr. Sterrett was elected to serve as the State President during 1974–75, and Tom Fry, a Past President of the State AFA, was named "Man of the Year."

he Scott Memorial Chapter's June meeting, Chapter President Charles Harriss presented Chapter's check for $509 to Mrs. Carol Plassmeyer, an MIA wife, for the POW/MIA cation Fund. Shown during the ceremony are, from left, Gen. P. K. Carlton, Commander, ary Airlift Command; Mrs. Plassmeyer; Mr. Harriss; MSgt. Robbie Frank, Chairman of at Scott AFB; and Col. Charles C. Irions, new Commander of the 375th Aeromedical ft Wing at Scott.

e Connecticut AFA's 1974 Annual Meeting in East Hartford, the following were elected e 1974–75 year, from left, seated, Harold Wells, Executive Secretary; Joseph Falcone, ice President; Margaret McEnerney, President; and Bernard Stein, Treasurer. Standing, left, Donald Willard, Recording Secretary, and Alexander Eigner, 2d Vice President.

recent ceremonies at City Hall, Philadelphia, Pa., AFA's Metropolitan Philadelphia awarded the 270th Electronics Squadron of the Pennsylvania Air National Guard a in recognition of the Squadron's twenty-five years of service to the city, state, and . Shown during the presentation are, from left, Lt. Col. Albert Blomer, Communications of the 270th; Chapter Secretary Joseph Lawrence; Don Angel, representing Philadelphia Frank Rizzo; Lt. Col. Gilbert Petrina, Commander of the 270th and a Past President of nsylvania AFA; and Chapter President Owen Ferry.

During recent ceremonies in his office, Brig. Gen. Leon A. Moore, Jr., Chief of Staff, Florida Air National Guard, received the Jacksonville AFA Chapter's Certificate of Merit, designating him its "Man of the Year" in recognition of his more than thirty-six years of service to the nation and his outstanding support of AFA and its objectives. Shown are, from left, General Moore; Chapter President Robert W. Sowerby; and Chapter Treasurer Robert W. Hesse.

At the Robert H. Goddard Chapter's Annual Awards and Honors Banquet, Otto Ledford, left, incoming President of the California Chapter, presents a Chapter Certificate of Appreciation to outgoing President Robert Hull. During the program, newly elected officers of the Chapter were installed.

AFA State Contacts

Following each state name, in parentheses, are the names of the localities in which AFA Chapters are located. Information regarding these Chapters, or any place of AFA's activities within the state, may be obtained from the state contact.

ALABAMA (Auburn, Birmingham, Huntsville, Mobile, Montgomery, Selma, Tuscaloosa): **Cecil Brendle,** 3463 Cloverdale Rd., Montgomery, Ala. 36111 (phone 281-7770, ext. 28).

ALASKA (Anchorage, Fairbanks, Kenai): **Vernon R. Johnson,** c/o Peat, Marwick, Mitchell & Co., 736 G St., Anchorage, Alaska 99501 (phone 272-7401).

ARIZONA (Phoenix, Tuscon): **Robert E. Poston,** 4818 E. Scarlett, Tucson, Ariz. 85711.

ARKANSAS (Blytheville, Fort Smith, Little Rock): **Robert M. Tirman,** 1801 Hill Rd., Jacksonville, Ark. 72076 (phone 372-8361, ext. 383).

CALIFORNIA (Apple Valley, Burbank, Edwards, Fairfield, Fresno, Harbor City, Hawthorne, Long Beach, Los Angeles, Marysville, Merced, Monterey, Novato, Orange County, Palo Alto, Pasadena, Riverside, Sacramento, San Bernardino, San Diego, San Francisco, Santa Barbara, Santa Clara County, Santa Monica, Tahoe City, Vandenberg AFB, Van Nuys, Ventura): **John W. Lee,** Box 5305, Fullerton, Calif. 92635 (phone 879-3951).

COLORADO (Aurora, Boulder, Colorado Springs, Denver, Ft. Collins, Pueblo): **James C. Hall,** P. O. Box 30185, Lowry AFB Station, Denver, Colo. 80230 (phone 366-5363, ext. 459).

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NEBRASKA (Lincoln, Omaha): **Lyle O. Remde,** 4911 S. 25th St., Omaha, Neb. 68107 (phone 731-4747).

NEVADA (Las Vegas, Reno): **Cesar J. Martinez,** 4214 Grace St., Las Vegas, Nev. 89121 (phone 451-3037).

NEW HAMPSHIRE (Manchester, Pease AFB): **R. L. Devoucoux,** 270 McKinley Rd., Portsmouth, N. H. 03801 (phone 669-7500).

NEW JERSEY (Andover, Atlantic City, Belleville, Camden, Chatham, Cherry Hill, E. Rutherford, Fort Monmouth, Jersey City, McGuire AFB, Newark, Trenton, Wallington, West Orange): **Joseph J. Bendetto,** 2164 Kennedy Blvd., Jersey City, N. J. 07305 (phone 420-6154).

NEW MEXICO (Alamogordo, Albuquerque, Clovis): **Harry L. Gogan,** 2913 Charleston, N. E., Albuquerque, N. M. 87110 (phone 264-2315).

NEW YORK (Albany, Bethpage, Binghamton, Buffalo, Catskill, Chautauqua, Elmira, Griffiss AFB, Hartsdale, Ithaca, Long Island, New York City, Niagara Falls, Patchogue, Plattsburgh, Riverdale, Rochester, Staten Island, Syracuse): **Gerald V. Hasler,** P. O. Box 11, Johnson City, N. Y. 13760 (phone 754-3435).

NORTH CAROLINA (Charlotte, Fayetteville, Goldsboro, Greensboro, Raleigh): **Elton Edwards,** P. O. Box 37, Greensboro, N. C. 27402 (phone 275-7616).

NORTH DAKOTA (Grand Forks, Minot): **Kenneth A. Smith,** 511 34th Ave., So., Grand Forks, N. D. 58201 (phone 722-3969).

OHIO (Akron, Cincinnati, Cleveland, Columbus, Dayton, Newark, Toledo, Youngstown): **Robert L. Hunter,** 2811 Locust Dr., Springfield, Ohio 45504 (phone 255-5304).

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OREGON (Corvallis, Eugene, Portland): **John G. Nelson,** 901 S. E. Oak St., Portland, Ore. 97214 (phone 233-7101).

PENNSYLVANIA (Aliquippa, Allentown, Chester, Erie, Homestead, Horsham, King of Prussia, Lewistown, New Cumberland, Philadelphia, Pittsburgh, State College, Washington, Willow Grove, York): **J. Deane Sterrett,** 110 McMillen Ave., Beaver Falls, Pa. 15010 (phone 843-4589).

RHODE ISLAND (Warwick): **Matthew Puchalski,** 143 SOG RIANG, Warwick, R. I. 02886 (phone 737-2100, ext. 27).

SOUTH CAROLINA (Charleston, Columbia, Greenville, Myrtle Beach, Sumter): **A. M. Hendry, Jr.,** 837 Gordonia St., Sumter, S. C. 29150 (phone 469-2883).

SOUTH DAKOTA (Rapid City): **Kenneth Roberts,** P. O. Box 191, Rapid City, S. D. 57701 (phone 342-0191).

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UTAH (Brigham City, Clearfield, Ogden, Provo, Salt Lake City): **Gil F. Friederichs,** P. O. Box 486, Clearfield, Utah 84015 (phone 825-9511, ext. 2363).

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WASHINGTON (Bellevue, Port Angeles, Seattle, Spokane, Tacoma): **Theodore O. Wright,** 15 Diamond S Ranch, Bellevue, Wash. 98004 (phone 237-2887).

WEST VIRGINIA (Huntington): **Nelson Paden,** 1641 Wiltshire Blvd., Huntington, W. Va. 25701.

WISCONSIN (Madison, Milwaukee): **Kenneth Kuenn,** 3239 N. 81st St., Milwaukee, Wis. 53222 (phone 747-5300).

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Shreveport, Louisiana — November 13-14, 1974

during

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The Standard Plan ($66,000 Maximum)

Insured's Age	Coverage	Extra Accidental Death Benefit*	Monthly Cost	Optional Family Coverage Spouse	Each Child**	Month Cos Fam Cover
20-24	$ 66,000	$12,500	$10.00	$6,000	$2,000	$2.5
25-29	60,000	12,500	10.00	6,000	2,000	2.5
30-34	50,000	12,500	10.00	6,000	2,000	2.5
35-39	40,000	12,500	10.00	6,000	2,000	2.5
40-44	25,000	12,500	10.00	5,250	2,000	2.5
45-49	15,000	12,500	10.00	4,050	2,000	2.5
50-59	10,000	12,500	10.00	3,000	2,000	2.5
60-64	7,500	12,500	10.00	2,250	2,000	2.5
65-69	4,000	12,500	10.00	1,200	2,000	2.5
70-75	2,500	12,500	10.00	750	2,000	2.5

The High-Option Plan ($100,000 Maximum)

20-24	$100,000	$12,500	15.00	$6,000	$2,000	$2.5
25-29	90,000	12,500	15.00	6,000	2,000	2.5
30-34	75,000	12,500	15.00	6,000	2,000	2.5
35-39	60,000	12,500	15.00	6,000	2,000	2.5
40-44	37,500	12,500	15.00	5,250	2,000	2.5
45-49	22,500	12,500	15.00	4,050	2,000	2.5
50-59	15,000	12,500	15.00	3,000	2,000	2.5
60-64	11,250	12,500	15.00	2,250	2,000	2.5
65-69	6,000	12,500	15.00	1,200	2,000	2.5
70-75	3,750	12,500	15.00	750	2,000	2.5

* In the event of an accidental death occurring within 13 weeks of the accident, the AFA plan pays a lump sum benefit of $12,500 *in addition to* the benefit, except as noted under AVIATION DEATH BENEFIT, above.

** Each child is covered in this amount between the ages of six months and 21 years. Children under six months are provided with $250 protection once they are 15 days old and discharged from the hospital.

AVIATION DEATH BENEFIT: A total sum of $22,500 under the High-Option Plan or $15,000 under the Standard Plan 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.

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Wide eligibility! If you're on active duty with the U.S. Armed Forces [regardless of rank], a member of the Ready Reserve or National Guard [under age 60], a Service Academy or college or university ROTC Cadet, you're eligible to apply for this coverage [see exceptions].

Keep your coverage at the low, group rate to age 75, if you wish.

Full conversion privilege. At age 75 [or at any time, on termination of AFA membership] the amount of insurance shown for your age group at the time of conversion may be converted to a permanent plan of insurance, *regardless of your health at that time.*

Disability waiver of premium, if you become totally disabled for at least nine months, prior to age 60.

Convenient premium payment plans. Pay direct to AFA or by monthly government allotment.

Reduction of cost by dividends. Net cost of insurance to AFA insured persons has been reduced by payment of dividends in eight of the last eleven years. However, dividends cannot, of course, be guaranteed.

Administered by insurance professionals on your Association's staff, for excellent service and low operating cost.

EXCEPTIONS:

Group Life Insurance: Benefits for suicide or death from injuries intentionally self-inflicted while sane or insane shall not be effective until your coverage has been in force for 12 months.

The Accidental Death Benefit and Aviation Death Benefit shal 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, 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

The insurance will be provided under the group insurance policy issued by United of Omaha to the First National Bank of Minneapolis as trustee of the Air Force Association Group Insurance Trust. However, because of certain limitations on group insurance coverage in those states, nonactive-duty members who reside in Ohio, Texas, Florida, and New Jersey are not eligible for AFA group life insurance coverage.

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. Coverage runs concurrently with AFA membership. AFA Military Group Life Insurance is written in conformity with the Insurance Regulations of the State of Minnesota.

Yes, now the Air Force Association offers members of the United States Air Force their choice of two great new life insurance plans, both designed to meet the special requirements of Air Force personnel.

Planned for You

Both plans have been specifically designed to fill your particular needs. This is full-time, worldwide protection. There are no war clauses—no hazardous-duty restrictions, or geographical limitations on AFA life insurance protection. At AFA, our policy is to provide the broadest possible protection to our members, including those in combat zones.

Low Group Rates

And, as a member of AFA, you are able to secure this outstanding protection at low group rates. What's more, there's no increase in premiums for flying personnel. In fact, in most cases, flying personnel are entitled to full death benefits. Only when death is caused by an aircraft accident in which the insured was serving as pilot or crew member does the special Aviation Death Benefit take effect.

Higher Benefits for Young Families

The higher benefits for younger members make both plans particularly outstanding buys for the young family. The young family breadwinner can make a substantial addition to his life insurance estate at a time when his family is growing up—when his financial obligation to his family is at its greatest!

CHOOSE EITHER OF THESE GREAT PLANS! MAIL THIS APPLICATION TO AFA TODAY!

REAKS THE BENEFIT BARRIER!

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
- ☐ ROTC Cadet _____ Name of college or university
- ☐ Air Force
- ☐ Other _____ (Branch of service)
- ☐ _____ Academy

Name and relationship of primary beneficiary

Name and relationship of contingent beneficiary

This insurance is available only to AFA members

- ☐ I enclose $10 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			STANDARD PLAN	
Members Only	Members and Dependents	Mode of Payment	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 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 understand United reserves the right to request additional evidence of insurability in the form of a medical statement by any attending physician or an examination by a physician selected by United.

Date _____, 19 ____ _____
Member's Signature

0 / 74
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

AFA SALUTES SAMSO ON ITS 20th ANNIVERSARY

During the program, the charter for the Greater Los Angeles Airpower Chapter, AFA's newest chapter, was presented by AFA President Joe L. Shosid to Chapter President George Harter. Shown are, from left, Ed Stearn, chairman of the Chapter's organizing committee; Mr. Shosid; Mr. Harter; and Lt. Gen. Kenneth W. Schultz, who accepted the Theodore von Kármán Award—AFA's highest honor in the field of science and engineering—on behalf of SAMSO.

Some 1,000 leaders of the Air Force, aerospace industry, AFA, and the community attended an August 5 luncheon saluting AFSC's Space and Missile Systems Organization (SAMSO) on its twentieth anniversary. The function was cosponsored by nine AFA chapters in the Greater Los Angeles Area, namely, Air Harbor, General Jimmy Doolittle, General Leonard E. Thomas, Greater Los Angeles Airpower, Long Beach, Los Angeles, Pasadena, San Fernando Valley, and South Bay.

Program participants included Gen. Samuel C. Phillips, Commander, Air Force Systems Command, Andrews AFB, Md.; Gen. Bernard A. Schriever, USAF (Ret.), SAMSO's first commander; Lt. Gen. Kenneth W. Schultz, SAMSO's current commander; AFA President Joe L. Shosid; and Martin M. Ostrow, AFA's Board Chairman, who served as master of ceremonies and general chairman. Edward A. Stearn was the arrangements chairman. Highlights of the program are shown in the accompanying photos.

—BY DON STEELE

AFA President Joe Shosid, left, and General Schriever display AFA's new "General Bernard A. Schriever Award," which was introduced at the luncheon. General Schriever will be its custodian for the next year. The award will recognize outstanding achievements in support of the USAF's missile and space program, and its first recipient will be named in 1975.

AFA President Joe Shosid, left, presented an AFA Citation of Honor to Col. Alvin L. Reeser, SAMSO's Deputy for Launch Vehicles, for "his brilliant technical and management achievements which led to a year of successful space launches." AFA Board Chairman Martin M. Ostrow, the master of ceremonies and general chairman, is seated in the foreground.

An AFA Citation of Honor was presented to the Aerospace Corporation for "its distinguished service as an important technical arm of SAMSO." The award, which was presented by General Phillips, left, on AFA's behalf, was accepted by Dr. Allen F. Donovan, the firm's Vice President for Technical Operations.

WHERE YOU'RE GOING DEPENDS ON WHERE YOU'VE BEEN!

ARE YOU MISSING THE INTERESTING ARTICLES NOW APPEARING IN

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If you're a true aviation buff, if your career is in the aerospace business, if your heritage is important to you, then you'll like AEROSPACE HISTORIAN.

It is the official journal of the Air Force Historical Foundation, a nonprofit group dedicated to preserving the traditions and publishing the history of aerospace power, with special emphasis on those of the United States Air Force. AEROSPACE HISTORIAN is published quarterly for the Foundation by Kansas State University.

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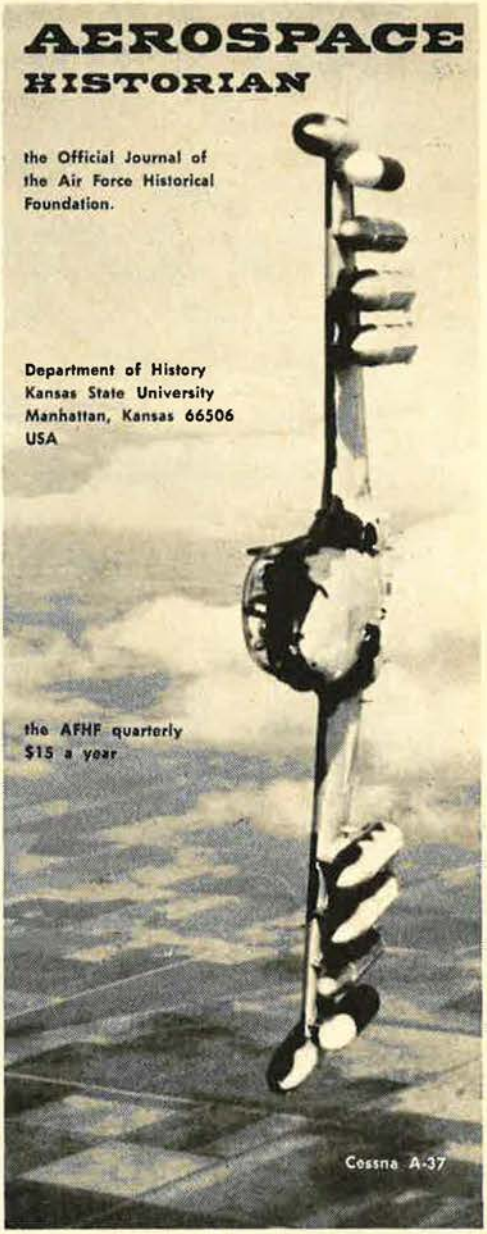

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Bob Stevens'

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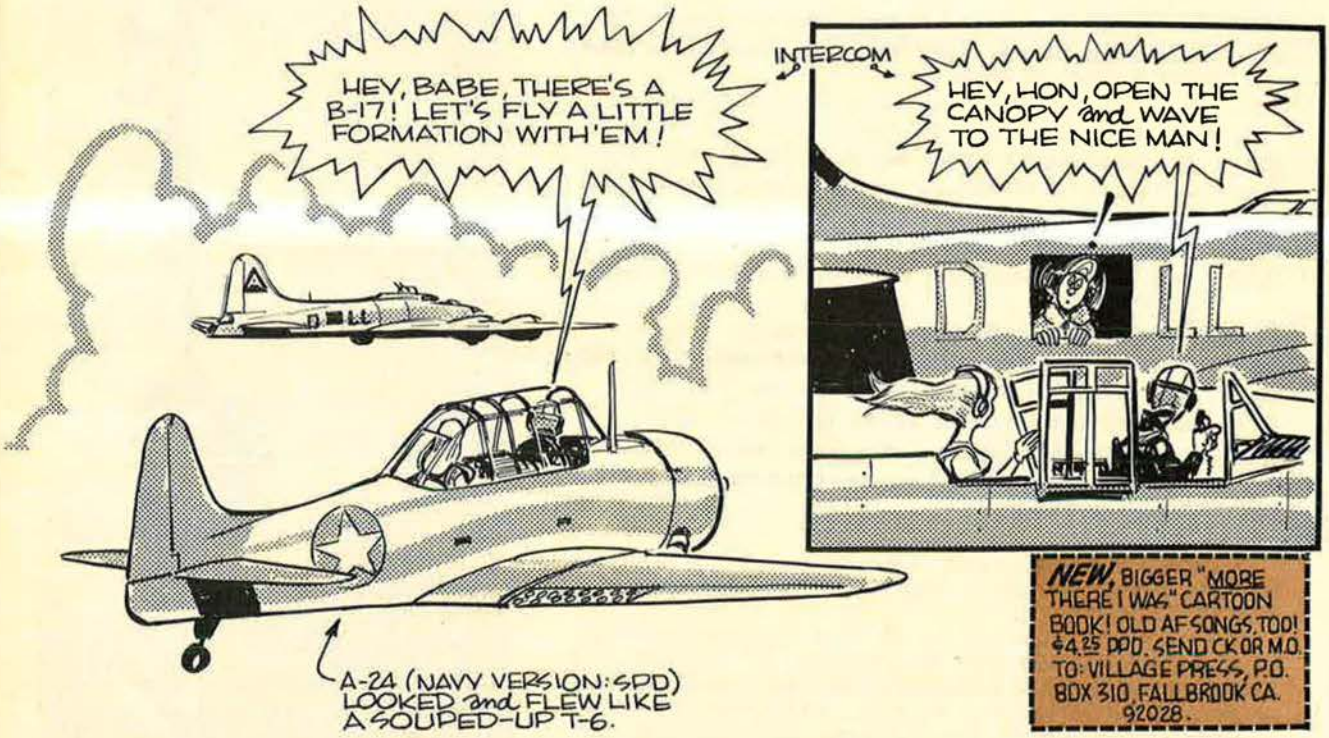

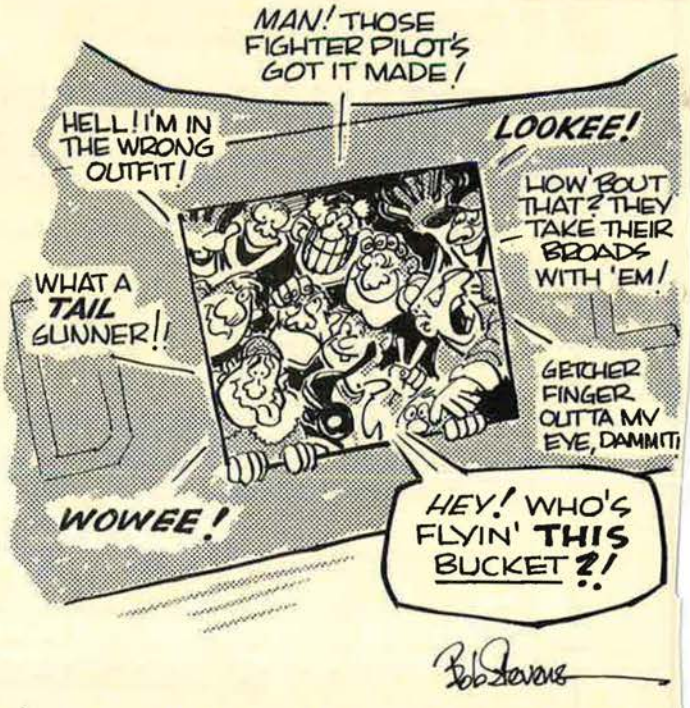

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For your flight test and ground equipment pressure measurement requirements, our super-accurate, solid-state digital pressure transducer is the perfect answer. Developed for the F-14 Tomcat digital air data computer and used also in the B-1, JA-37 and Space Shuttle air data systems, it's so precise that it can resolve changes in pressure altitude as small as an inch.

We make the basic sensor of fused quartz to maximize dimensional stability, minimize temperature effects and virtually eliminate hysteresis. Its rugged design automatically compensates for the effects of vibration and acceleration. The overall accuracy is so high that the U.S. Air Force Flight Test Center and NASA's Flight Research Center at Edwards AFB use it for inflight calibration of air data systems and the instrumentation of pacer aircraft.

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The DC-10 tanker/cargo jet:

Optimum way to upgrade U.S. military airlift capability.

Recent events have dramatically emphasized the importance of military airlift and at the same time have highlighted the need for increasing the non-stop range of the airlift fleet. Aerial refueling is a low-cost way of increasing the range of the airlift fleet.

The DC-10 aerial refueling capability will permit the airlift fleet, operating from U.S. bases, to reach all major areas in the world. In addition, the military DC-10 tanker and cargo capability can support an integrated deployment of tactical fighters and their associated unit support. The DC-10 tanker/cargo aircraft represents the most economical solution in terms of initial cost, total cost of ownership and fuel consumed.

The lower unit cost of the military DC-10 compared to contemporary four engine wide-bodied transports permits the purchase of more DC-10s for a given investment. The resulting larger DC-10 force offers increased flexibility, with capability to support simultaneous worldwide operations.

The DC-10 is proving day after day in commercial service that its fuel, operating and maintenance costs are low and its departure reliability record is high—important considerations for military operations.

MCDONNELL DOUGLAS

DC-10 tanker capability was demonstrated in company-funded flight test in October, 1971.