

AIR FORCE

and **SPACE DIGEST**

The Magazine of Aerospace Power / *Published by the Air Force Association*

A LOOK AT THE CZECH CRISIS

**What the Soviet Takeover
Means to Europeans**

**The New Challenge to NATO
and Western Security**

ALSO IN THIS ISSUE:

- ▶ How Our Air Guard Units Are Performing in the Far East
- ▶ GE's Gerhard Neumann Talks with AF/SD on Aircraft Engines
- ▶ Boeing's 747—The First Superjet Makes Its Debut
- ▶ PLUS . . . Special Report on AFA's Fall Meeting

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The computers in all these systems must not only handle all the functions we've described above, but must also be able to switch messages on a priority basis.

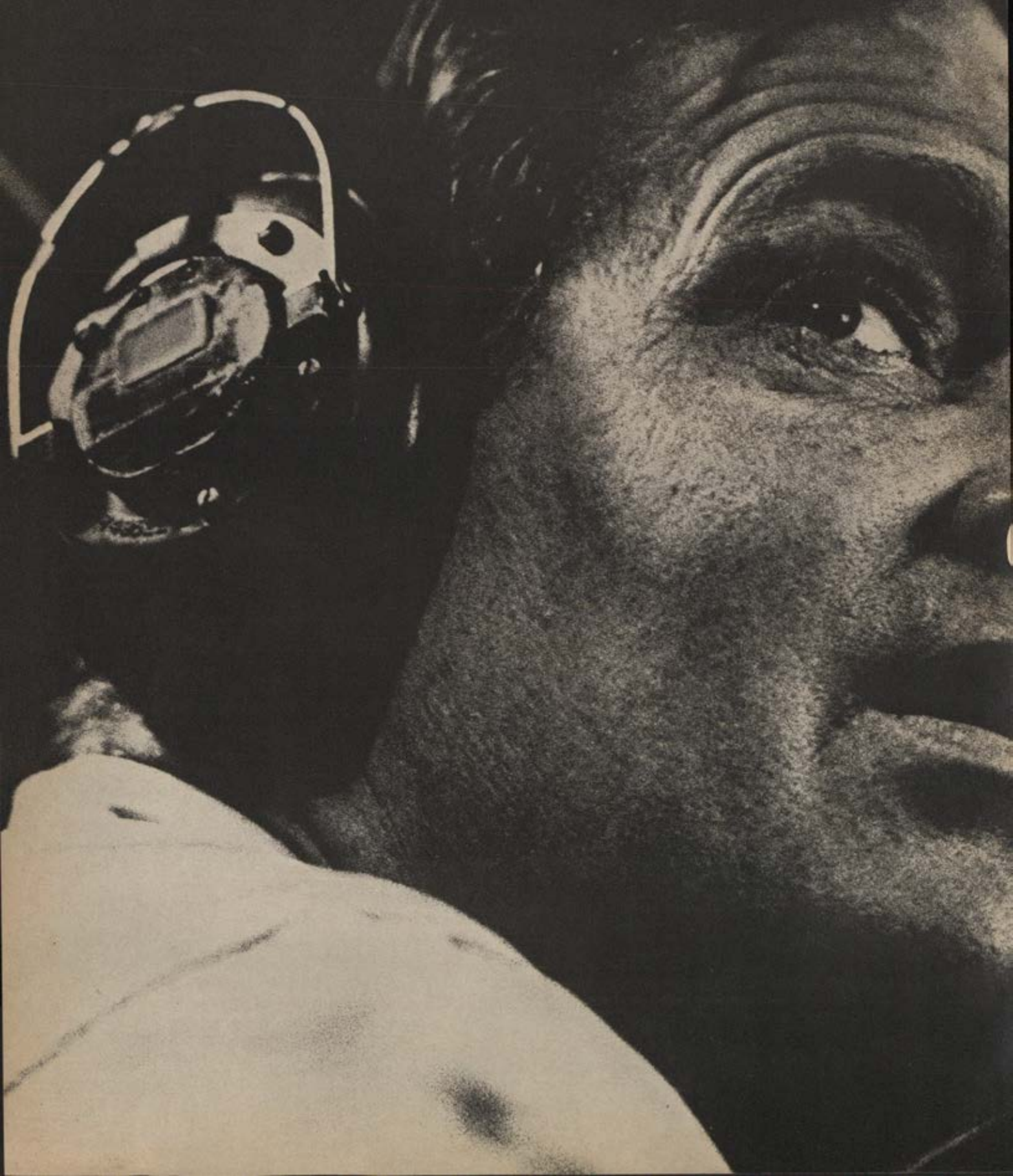
And, more importantly, many of them are specially coded to maintain the highest security regulations.

The computers know, automatically, which stations receive which kinds of information. And which don't.

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VOLUME 51, NUMBER 11

NOVEMBER 1968

Dividends from Defense / AN EDITORIAL BY JOHN F. LOOSBROCK

8

A Look at the Czech Crisis / BY STEFAN GEISENHEYNER

39

The Soviet military takeover of Czechoslovakia, a model of military efficiency that took NATO completely by surprise, causes the Western alliance to ask itself some hard questions.

Czechoslovakia and Western Security / BY SENATOR HENRY M. JACKSON

43

We cannot be sure Russia "will not use military force in pursuing its objectives in other situations, when it believes this can be done without incurring unacceptable risks."

Those Gung Ho Guardsmen in Vietnam / BY LT. COL. W. D. MCGLOSSON

47

The author, just back from Southeast Asia, reports on performance of ANG F-100 squadrons flying close-support missions there.

The Cluttered View from SEA / BY BARRY ZORTHIAN

52

The man who for 4½ years has been the top US public affairs officer in Saigon suggests that the mass of words and Vietnam War pictures published has done more to confuse than to inform.

Gerhard Neumann on US Engine Technology / BY EDGAR E. ULSAMER

58

An exclusive interview with one of the world's most eminent propulsion experts.

The Men Behind Soviet Aircraft Design / BY J. S. BUTZ, JR.

62

AF/SD's Technical Editor offers some insights into the personalities and techniques of men like Dementiev, Mikoyan, and Yakovlev.

First of the Superjets / BY EDGAR E. ULSAMER

68

The eyes of the world's aviation community focused on Everett, Wash., on September 30 as Boeing's sleek new 747 made its debut.

SPACE DIGEST

Speaking of Space / BY WILLIAM LEAVITT

73

The opening of the manned phase of the Apollo program, with the chance of a manned circumlunar flight soon, could rekindle public interest and congressional enthusiasm for the space program.

Defense's Responsibility to the Nation: More Than Just Arms

76

BY THE HON. CLARK M. CLIFFORD

The Secretary of Defense points out why DoD and the defense industry have the obligation to help solve pressing social problems.

Systems Technology for Social Problems: Problems and Prospects

79

BY CAPT. GERALD T. RUDOLPH, USAF

An examination of why there has, to date, been so little progress in putting systems technology to work on social problems.

The Soviet Space Program: Its Political Implications

82

BY DR. CHARLES S. SHELDON, II

Russia's exploitation of her space activities has helped create a new "balance of technological power, if not of terror."

The Bright Face of Aerospace Today / BY EDGAR E. ULSAMER

86

A special report on the many and varied events at AFA's 1968 Fall Meeting and Aerospace Development Briefings.

A New Platform for the Hoist / BY CLAUDE WITZE

95

The start of deliveries of Sikorsky's new HH-53C helicopter heralds renewed USAF interest in choppers for air rescue.

Casualty Reporting—A Hard Job That Gets Done

96

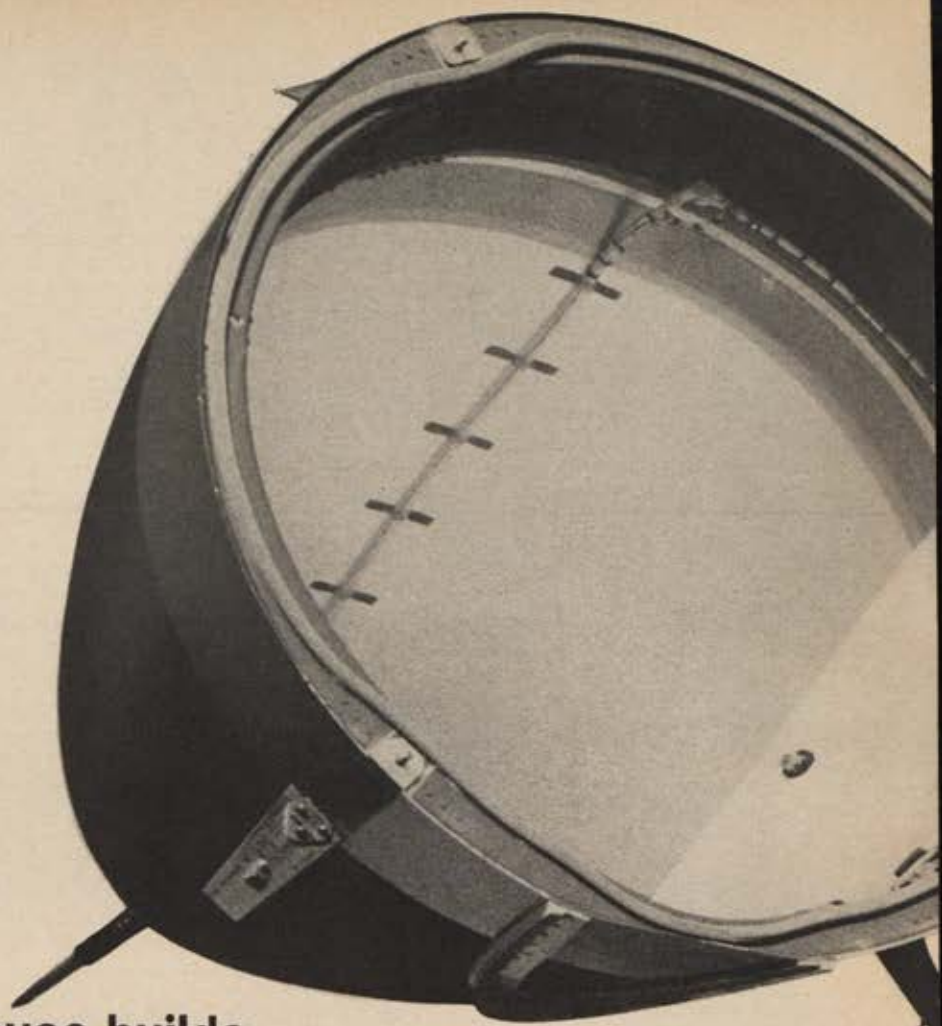
BY WILLIAM LEAVITT

How USAF handles what is perhaps the toughest job of them all.

DEPARTMENTS

Airmail	10
Airpower in the News	15
Aerospace World	24
New Books in Brief	32
Index to Advertisers	34

Senior Staff Changes	36
Letter from Los Angeles	102
AFA News	107
This Is AFA	110
There I Was	114



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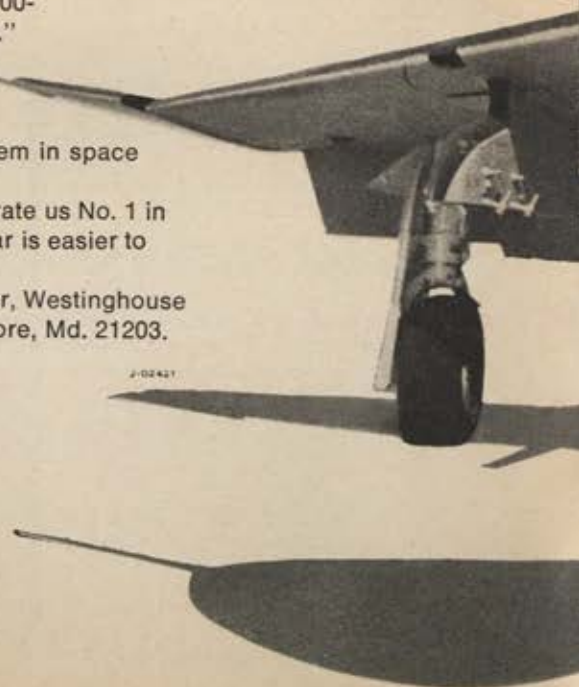
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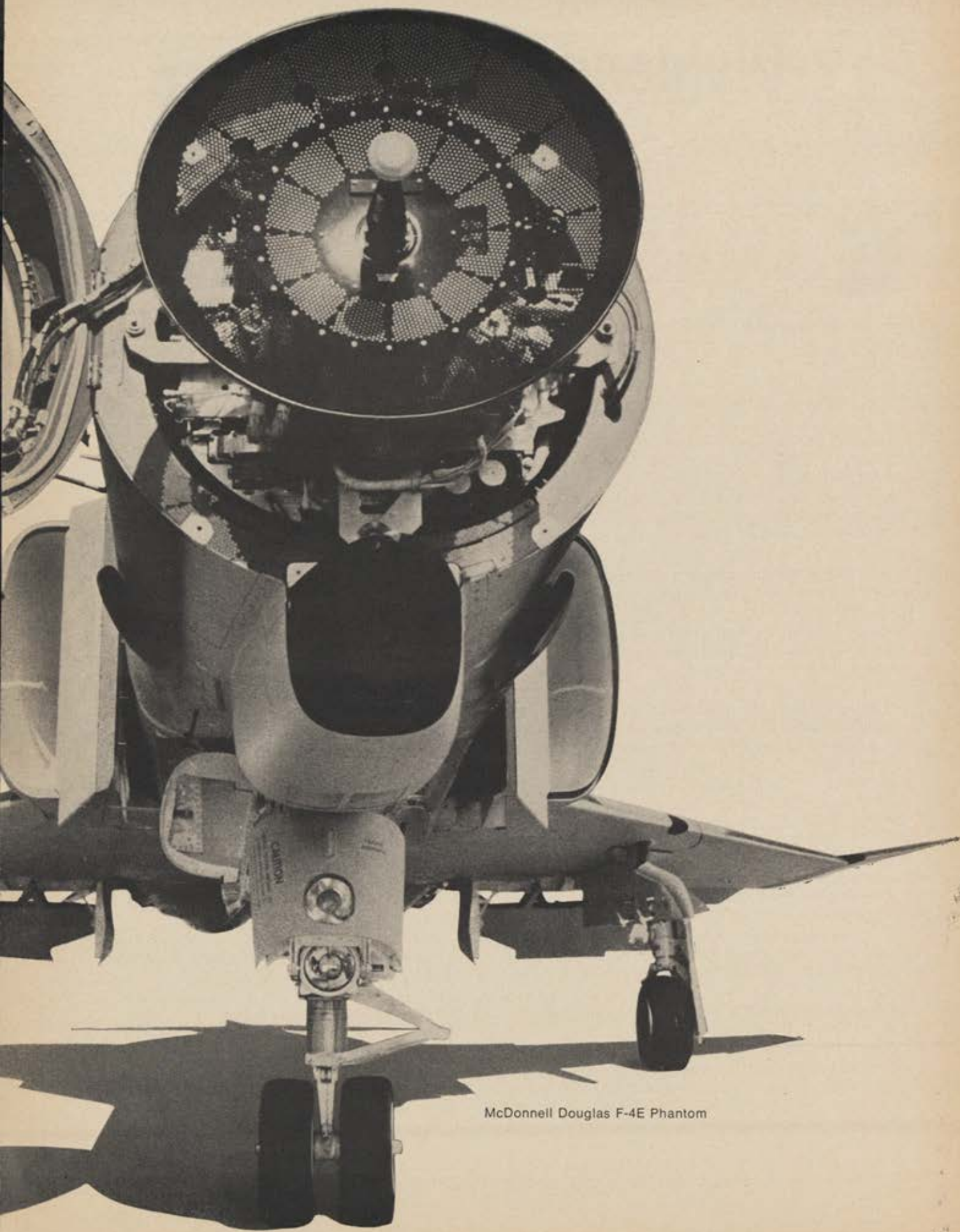
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McDonnell Douglas F-4E Phantom

Dividends from Defense

By John F. Loosbrock

EDITOR, AIR FORCE/SPACE DIGEST

THE notion that funds appropriated and spent for national defense often provide beneficial side effects and spinoffs to the civilian economy is nothing new. Examples are legion, from the printed circuits and transistors in your portable radio to the jetliner that flies you home for Christmas. By-products of federally financed research have put a lot of money into a lot of pockets.

You might think, therefore, that the proposals recently put forth by Secretary of Defense Clark Clifford—that “we in the Department of Defense have not only a moral obligation but an opportunity to contribute far more to the social needs of the country”—would have evoked a uniformly warm reception from all taxpayers. (*For more, see page 76.*)

What the Secretary is saying is that there are serious social and economic deficiencies in our society, which can be helped toward a solution by the application of knowledge and techniques that the Defense Department either has already acquired or needs to acquire to fulfill its own legitimate military mission. The taxpayer simply would be getting more for his money.

Mr. Clifford cited four major areas where he believes the Department of Defense can contribute both experience and expertise—housing, hospitals, schools, and employment facilities for the unskilled. It is difficult to argue that the military establishment has no legitimate interest in these fields. They relate directly to the kind of manpower the armed services need, the kind they want to keep, and the kind they are likely to get under present conditions. Not entirely by coincidence, housing, hospitals, schools, and jobs also represent major problems faced by the nation as a whole. To solve them we need all the help we can get.

Opposition to Mr. Clifford's proposal seems to fall into three major categories. There is the outraged liberal with knee-jerk reflexes. He views anyone or anything connected with the military as unclean per se, malevolently dedicated to taking over the country. It is not so much that he fears a military-industrial complex. He *has* one.

Then there is the equally outraged conservative, who sees the proposal as a mask for more money to be spent on “do-good” projects under the guise of defense appropriations. He has a good house in a good neighborhood, his hospital bills furnish an income tax deduction, his children are in private schools or blue-ribbon public ones, and he has a well-paying job, all often the results of an education he has received at

government expense through the GI Bill of Rights.

The third category consists of those who vent their longstanding dislike for former Secretary of Defense McNamara by taking it out on his successor.

In our view, the critics all are wrong.

If, through more provident planning, the military can get better hospitals, better housing, and better education and training for the man in uniform, why should not these lessons be passed along to the civilian sector as a fringe benefit? The stickiest part of the Secretary's proposal, of course, is the idea that defense contracts can be used to promote jobs in the ghetto areas of hard-core unemployment. But even now, the more farsighted and responsible defense industries are examining their social consciences and in many cases have ongoing projects directed toward just this goal. To us, it seems the Secretary makes a good case that what is good for the country is good for the Department of Defense, within the very reasonable limits he has set.

So far as education is concerned, we speak with a modicum of experience. The Aerospace Education Foundation of the Air Force Association for some time has been engaged in pioneering efforts in this field. It started when interest in space was high and eminent educators sought out the Foundation as an avenue through which Air Force knowledge and expertise in the space-oriented sciences could be injected into the mainstream of American education. Many symposiums and seminars have been held with state and local departments of education, using Air Force briefers. Distinguished educators dot the Board of Trustees of our Foundation, including several state superintendents of education, deans of colleges of education, leaders in educational research, and the like. And a close relationship with the US Office of Education has been maintained.

Several projects are under way or contemplated across the country, under Foundation sponsorship, including efforts to examine new ways our schools can profit from extensive Air Force experience with innovative education techniques.

This month the Foundation is sponsoring in Washington still another ambitious and pioneering effort—a National Laboratory for the Advancement of Education, with its main thrust directed at the problems of the inner city.

We know from experience that the military has much to offer toward the solution of our civilian ills. It will be a pity if the offer should be refused for specious parochial, emotional, or political reasons.—END

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"Nightingale" Memories

Gentlemen: Irving Stone's article on the McDonnell-Douglas C-9A "Nightingale" (August issue, p. 82) jogs a memory or two of an aerial ambulance of the same name, built twenty-five years ago for the Navy. And, like the C-9A, it was an adaptation of a successful civilian aircraft.

This earlier "Nightingale" was the GH-2, a single-engine, high-wing cabin ship. It was derived from Benny Howard's DGA series of racing and executive airplanes, and was a direct descendant of his DGA-6 "Mister Mulligan," which scooped both the Bendix and Thompson Trophy races in 1935.

The Howard Cabin Types were also "drafted" into Navy colors as the GH-1 and GH-3 light transports, and as the NH-1 instrument trainer. The AAF also used several DGA versions under the designation UC-70. Approximately 130 of the GH-2 version were manufactured during 1943-44, and at least a dozen are still active in civilian hands.

Although the C-9A is four times as fast as the GH-2, forty tons heavier, and carries seventy-plus evacuees instead of two, the "Nightingale" was the same breed of bird back then.

My competitive spirit tells me not to admit this, but some outfit from East Hartford, Conn., powered both the old and new "Nightingales." The GH-2 had Pratt & Whitney's R-985 recip, and the C-9A has a pair of JT-8D fanjets.

T. M. EMMERT
General Electric Co.
Flight Propulsion Division
West Lynn, Mass.

A Successor to the Title

Gentlemen: Whilst greatly appreciating the two articles on the Royal Air Force in the August 1968 issue of your magazine, I would just like to correct an error in the article on Lord Trenchard.

General Griffith quotes a letter from General Eaker "... Lord and Lady Trenchard had just been notified that the last of their five sons had been killed in action in Africa." In 1920 Lord Trenchard married Mrs. Katherine Boyle (widow of Captain Boyle, Royal Scots Fusiliers), who had a daughter and two sons by her previous

marriage. One of these sons, Eddie, was killed in a flying accident in 1938 and the other in action with the Royal Scots Fusiliers in 1943. Lord Trenchard's own two sons were Hugh, killed with the Guards Brigade in North Africa in 1943, and Tom, who was wounded but survived the war and is the present Lord Trenchard.

As the first air academy in the world we are justifiably proud of one of our founders, and I would be most grateful if you could put the record straight.

WING COMMANDER G. MCA.
BACON, RAF
Royal Air Force College
Cranwell, Sleaford
Lincolnshire, England

Canadair Correction

Gentlemen: In your September issue, page 212, under the heading "F-5A/B Freedom Fighter," you state the airplanes are being supplied under military assistance program to "South Vietnamese AF, Canada, and more than a dozen others."

This is entirely untrue insofar as Canada is concerned.

Canadair is producing, under license, a number of CF-5 and NF-5 airplanes for the governments of Canada and Holland. These are similar to the F-5, but incorporate improvements paid for by the Canadian and Netherlands governments as well.

Canada has joined with the US in providing some airplanes to other nations in the past, but Canada has never received airplanes under MAP.

JOHN W. HUGHES
Director of Public Relations
Canadair Limited
Montreal, Canada

• Mr. Hughes is entirely correct, and we regret our careless reference, which grouped Canada and the Netherlands with other countries receiving the F-5 through US military assistance programs.—THE EDITORS

Cold Water in Our Faces

Gentlemen: In your description of the Canadair CL-215A in the October issue of our fine magazine you state, "... it can take on 45,000 gallons of water..." That's quite a bit of water, and, if memory is not too bad, water weighs 8.35 pounds per gallon. This

would seem to give the CL-215A a payload of about 375,750 pounds. Now you have to admit that's a pretty big load for a pair of R-2800s.

Thanks for a fine issue anyway.

BILL MASTERS
Abilene, Tex.

• The figures shown in our caption were intended to describe a typical mission capability of the CL-215. We should have said that, as an example, it can deliver a total of 45,000 gallons on a fire 140 miles from its base between refuelings, which would require a number of sorties between the fire and a nearby lake.—THE EDITORS

Let's Hear It, Ex-Glider Pilots!

Gentlemen: I enjoyed immensely [Bob Stevens'] cartoon recap of the Bamboo Bombers in the August issue of AIR FORCE/SPACE DIGEST. I was a glider pilot in the European Theater of Operations, and his treatment was that of a guy who had to have been there. I was with the 98th Squadron, 440th Troop Carrier Group.

If by chance you would have the names and addresses of any former glider pilots—or if you hear from any former glider pilots—I'd appreciate it if you might find the time to send them along to me. Since that momentous day in October 1945 when I was discharged from the Air Force, I have completely lost touch with any of my former flying buddies.

Again, thanks for the memories. Incidentally, at one time I bunked with Jackie Coogan. He was quite a character then, and I doubt if he has changed a heck of a lot.

JOHN L. LOWDEN
Dir., Advertising and Sales
Promotion
International Telephone and
Telegraph Corp.
320 Park Ave.
New York, N. Y. 10022

Last of the B-57 Squadrons

Gentlemen: Well, you did it again. You erred a mite in your mention of the B-57s in your September issue. I'm referring to your article "A Gallery of USAF Weapons: The Bombers." It was a small mistake, however, to us graduates of the 8th TBS a very important one.

(Continued on page 13)

SCIENCE/SCOPE

The world's largest communications satellite -- a two-story-high, 1600-pound experimental giant designed to provide tactical communications among military units in the field, aircraft, and ships at sea -- is being built under direction of the U.S. Air Force for the Department of Defense by Hughes.

Satellite will carry a cluster of antennas whose powerful signals can be picked up by all types of terminals, including those with antennas as small as one foot in diameter. Satellite's communications capacity is comparable to 10,000 two-way telephone channels.

The Army's TOW missile is under consideration by the U.S. Marines as a result of combat-style tests they recently gave the wire-guided antitank weapon. A Marine unit at the Twentynine Palms Marine Base fired 20 TOW missiles, blasting concrete fortifications, sandbag bunkers, tank hulls, and moving targets.

All a TOW gunner has to do is hold the crosshair of the telescopic sight on a target; the missile is automatically steered to impact on that point. After a half-hour of instruction, Marines scored bullseyes on small, distant targets.

A new radar unit to aid ballistic missile defense has been installed on Kwajalein Atoll in the Marshall Islands. The experimental system, designed to help the Defense Department develop technology for protection against ballistic missile and satellite attack, will make high-resolution measurements of various targets, both in outer space and during reentry into the atmosphere. System's 40-foot-diameter parabolic antenna and microwave subsystem were built by Hughes.

Environmental testing is now available to component subcontractors at the six-story, 17,000-square-foot Hughes test center used for Surveyor spacecraft, Intelsat and ATS satellites, and Phoenix and TOW missiles. Eight thermal vacuum chambers, ranging in size from 18x20 inches to 15x36 feet, can duplicate the radiation of sunlight in deep space and the temperatures of lunar day and night. Vibration tests are performed on two 28,000-force-pound shakers, each equipped with a separate control console.

The 30-foot parabolic antenna atop the 12-story Hughes space systems division building adjacent to Los Angeles International Airport is converting signals from two Applications Technology Satellites into pictures of cloud formations and jet streams. Photos are received as part of a research program Hughes is conducting for the Environmental Science Services Administration.

The spin-scan cameras aboard the ATS satellites take a picture of Earth every 20 minutes when weather scientists want to track a storm. Of particular interest to them have been the ATS-3 photos of the Midwest during the 1968 tornado watch. The ATS satellites were built by Hughes, their cameras by Santa Barbara Research Center, a Hughes subsidiary.

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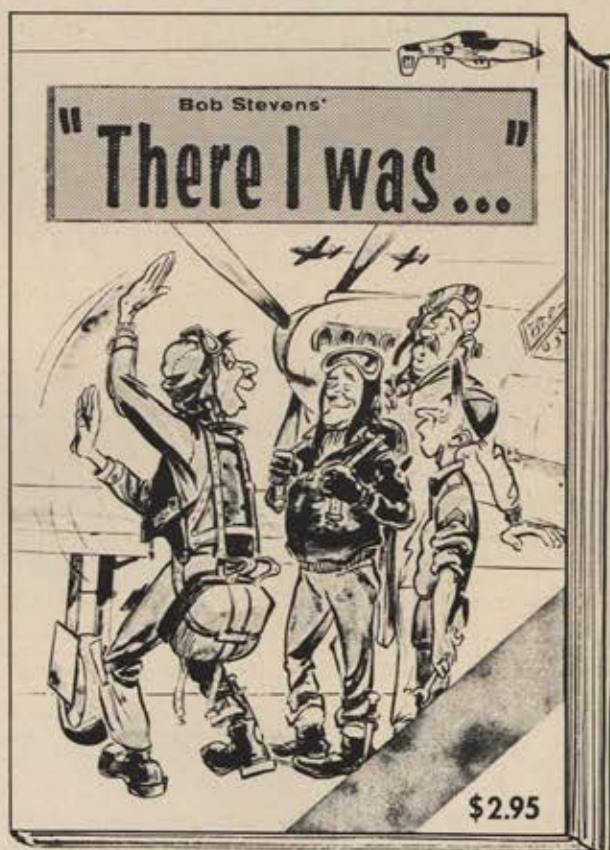
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To set the record straight, the one squadron left in SEA flying B-57s is the 8th Tactical Bombardment Squadron, not the 13th as you reported. The 13th, second only to the 8th in effectiveness in SEA (couldn't pass up a chance to bug my old buddies of the 13th), was deactivated in January of this year, with many of their members being transferred to the 8th. The 8th continues to carry on the fight today in SEA, even without my help. Incidentally, for your readers who worked with the 13th in SEA, their call sign was the "Redbirds."

As you have probably guessed, I am an avid reader of AIR FORCE/SPACE DIGEST and find it one of the best magazines I have ever read. Whereas, in the past I have read it for enjoyment and information, I now find it indispensable to my job as Professor of Aerospace Studies.

MAJ. ERNEST L. CARLTON
Davis and Elkins College
Elkins, W. Va.

Scale-Model Builder

Gentlemen: As an aviation enthusiast and scale-model airplane builder I need information about the aircraft of those aviators who were awarded the Medal of Honor for their deeds in the air. What is needed would be the aircraft type and model, serial number, color scheme, unit markings, and any other embellishments. I'm making a series of 1/72 scale models of these planes. Some, already finished, have been on display at March AFB, Calif.

I am especially interested in the bomber in which 2d Lt. Walter E. Truemper and SSgt. Archibald Mathies bought their farms and earned their awards attempting to save their pilot and aircraft. I've started on a P-38J for Maj. Thomas B. McGuire's plane but need the serial number of "Pudgy V." Information on these and any other planes would be appreciated.

TSGT. WILLIAM J. BENNETT
17017 S. Orchard Ave.
Gardena, Calif. 90247

Embry-Riddle Students

Gentlemen: The Embry-Riddle Alumni Association is endeavoring to contact all former students and graduates of the famed Embry-Riddle Aeronautical Institute, formerly known as Embry-Riddle School of Aviation.

Over the past forty-two years, since its beginning in Cincinnati, Ohio, Embry-Riddle has trained thousands of aviation personnel. During World War II, while located in southern Florida, ERAI was one of the largest civilian contractors training pilots and

mechanics for the Royal Air Force, the Free French Forces, and our own US Army Air Forces. Today, Embry-Riddle's home is in Daytona Beach, Fla., and offers Bachelor of Science degrees in Aeronautical Engineering, Aviation Management, and Aeronautical Science and professional pilot and mechanic training courses.

All former students and graduates are urged to contact us to receive the latest news of the school and Alumni Association.

HAROLD A. KOSOLA, President
Embry-Riddle Alumni Association
P. O. Box 2411
Daytona Beach, Fla. 32015

Where the Action Is

Gentlemen: I want to congratulate Colonel Henderson and your magazine's editors for the exciting article "Cleared In—Wet!" [August issue].

This is the kind of article people like to read, especially pilots like me, and you must try in every monthly issue to have one of them ready to print.

This one, and the other one like "Rescue in the Gulf of Tonkin," shows a good picture of the hot fighting in the Vietnam sky.

While I was reading I felt I was in the cockpit of the plane. Can you imagine so great a feeling—boy, it was real great!

I hope to have the chance to see more of this fine writing.

RAFAEL DIAZ B.
Santiago, Dominican Republic, W.I.

UNIT REUNIONS

69th Bomb Sqdn., 42d Bomb Group

A reunion of the 69th Bomb Squadron of the 42d Bomb Group will be held November 9-10, 1968, at the Hotel Webster Hall in Pittsburgh, Pa. All interested members of the Squadron should contact

Sid Leff
140 Atwood St.
Pittsburgh, Pa. 15213

98th Bomb Group

The reunion of the 98th Bomb Group, 1942-1945, a B-24 outfit, will be held during the first two weeks in July 1969. For further information please contact

Ernest M. Sharman
Box 381
Montgomery, Ala. 36101

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Eight new chapters have been added to the growing membership of the American Fighter Pilots Association. For information on a chapter in your area contact

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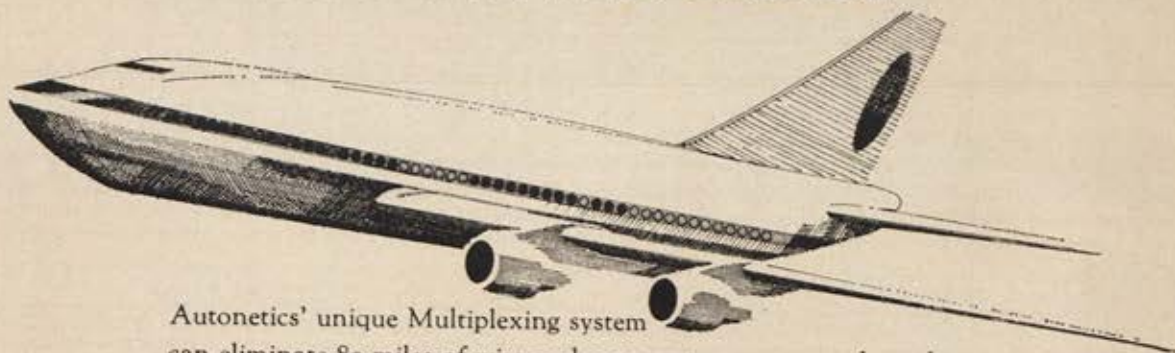
This powerful integer code has proved particularly effective for airline crew scheduling. A major domestic airline has used it extensively for over two years. The same integer programming has been used to solve other difficult problems in the areas of ship, project, production and job shop scheduling. Recently, C-E-I-R's integer code has shown great promise in truck and driver scheduling applications. What is your scheduling problem?

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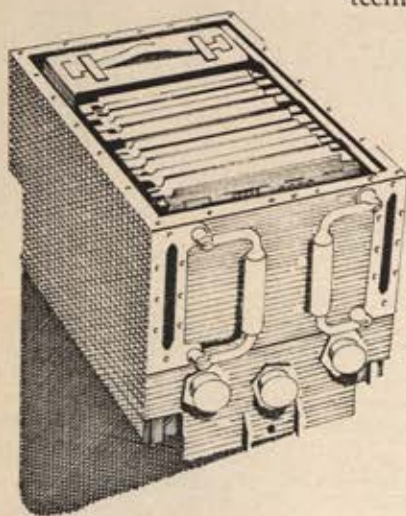
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By Claude Witze

SENIOR EDITOR, AIR FORCE/SPACE DIGEST

There Are No Defense Bargains

WASHINGTON, D. C., OCTOBER 15

The 90th Congress closed down yesterday and headed for the hustings. There are thirty-four Senate seats and 435 House seats to be filled, and most of our readers will know the winners by the time this magazine is delivered. The real problem is the same one faced by the entire nation in the presidential contest. There is a paucity of leadership, and no recent Congress has demonstrated this fact better than the 90th.

Much of the closing agony was suffered in debate about the Defense Department Appropriation Bill for Fiscal 1969. It is an argument that took up countless pages in the *Congressional Record* over the past couple of weeks and was inadequately reported to the public because so much news was being made by White House aspirants, Russians, and astronauts.

This is a sad fact because there is not another headline-making issue today that is not tied closely to the outcome of our approach to this bill for national security—about \$72 billion—and most other issues are not as important.

Senator Richard B. Russell of Georgia, Chairman of the Defense Appropriations Subcommittee, took care to put it on the record, at the outset, that the Defense Department spent \$77.9 billion in Fiscal 1968, of which an estimated \$27 billion was for our exercise in Southeast Asia. He took the words from the mouth of Paul Nitze, Deputy Secretary of Defense, who was the witness for an office that has consistently underestimated the real cost of the war in Vietnam. The President's original budget estimate for Fiscal 1969 was \$77.1 billion, and Mr. Nitze said \$25.8 billion of this was for Vietnam. But when Mr. Russell pointed out that the Fiscal 1968 Supplemental will increase Fiscal 1969 expenditures, the witness conceded that the Pentagon will spend \$79.5 in Fiscal 1969, of which \$27.2 billion is for Vietnam.

But now everything has been cut. The bill, in final form, is down \$5.2 billion from what the President requested.

"I want to make it very clear," Mr. Russell told the Senate, "that, for the most part, these reductions are deferrals and not savings. I would not be fair and honest with the Senate if I did not make that perfectly clear. They will reduce cash expenditures during Fiscal Year 1969, but expenditures and appropriations for Fiscal Years 1970 and 1971 will undoubtedly have to be increased accordingly."

As in the past years, Mr. Russell is confident the Fiscal 1969 bill will meet our needs, but now he has a reservation:

"There is no hesitation in my mind in stating that we cannot continue to support a war, be capable of honoring our commitments abroad, and maintain an adequate defense posture without substantially increasing the size of our defense budget in the near future. As reluctant as Congress will be to accept that statement, I make it unequivocally and without fear of contradiction."

The Senator then delivered a lecture on the nature of this war, on why it is so costly, and on the source of the enemy's support. The Georgia Democrat said the foe is dictating the terms on which the war is fought because we let him do it "apparently in fear of world opinion." He demonstrated how the cost of weaponry has gone up,

along with the price of maintaining and operating it. The case is summarized on page 21 of this magazine.

On top of this, the subcommittee chairman expressed the opinion that American hope for détente with the Russians was based "more on our heartfelt desires for a lessening of world tensions than on a sober analysis of Russian actions."

He cited the fast development of new Soviet airplanes and the enlarged Russian navy. And their ABM as well as enlarged ICBM systems. And FOBS. He said Russia has increased her defense expenditures more than thirty percent since 1965. Of particular importance to the United States, of course, is Moscow's role as a main source of war materiel for North Vietnam. As pointed out in the Air Force Association's Statement of Policy last March, it is Russian weaponry that is killing Americans in South Vietnam. Mr. Russell made this point, adding observations about Soviet adventurism in the Mediterranean, Berlin, and Czechoslovakia.

In response to a question by Senator Stuart Symington, Mr. Russell told why our performance in Vietnam has been disappointing. He said the United States "has been at least two years late" in every action taken. He continued:

"If we had had the courage to blockade the coast of North Vietnam and to have bombed incessantly the railroad that comes in from China, instead of quivering and quaking every time somebody mentioned Russia or China, this war could have been ended in three years."

For the opposition, the loudest spokesman was Senator Joseph S. Clark of Pennsylvania, who offered amendments that would have cut \$8 billion from the bill. Mr. Clark said he objected to "open, conspicuous, notorious, demonstrable waste." He accused the Joint Chiefs of Staff, the President, and key congressional committees of having an "obsession" with the "military offensive budget."

His major concern, Mr. Clark made clear, is the problem faced by US states and cities that cannot afford to fight poverty, crime, and other social ills without federal help. At one point he widened his charge to declare that the Defense budget is replete with "waste that causes Pennsylvania and the other forty-nine states of the Union to fall short in domestic programs. . . ." And, a moment later: "Our problem is not one of choosing guns or butter. It is one of choosing between guns and bread . . . bread for the poor, bread to furnish our education programs with the fiscal sinews needed to continue them, bread for the whole host of domestic programs. . . ."

To support this rhetoric, Mr. Clark took up three pages of the *Congressional Record* for a list of 324 Pennsylvania projects approved by the Department of Housing and Urban Development as meriting federal assistance. According to Mr. Clark, the money is lacking because the Joint Chiefs and the Armed Services Committees have no responsibility in these areas. These projects ranged, according to his list, from a new civic center project in Grove City to a sewer system for McKees Rocks and rent supplements for the Sycamore Realty Co., in Punxsutawney. Other Senators refrained from offering lists for their states.

Mr. Clark offered a number of amendments, designed to kill the ABM project, SAGE, other air defense missiles, and a good many personnel slots in the Defense Department. He wanted to cut back on helicopter purchases, a

(Continued on following page)

proposal that brought growls from helicopter builders in his own state, because, as Mr. Clark put it, "We have helicopters coming out of our ears in Vietnam, to such an extent that it is very difficult indeed to persuade a sergeant to ride in a truck," a statement that undoubtedly is true in that guerrilla-infested jungle. All of the Clark amendments were overwhelmingly defeated.

The next day there was an unusual closed-door session of the Senate, at which an effort was made to delay construction of the ABM. It, also, was defeated, in a vote that marked the fourth time in 1968 that the chamber had voted to go ahead with deployment of the Sentinel system. Senator John O. Pastore of Rhode Island, a man who since 1952 has done his homework on the subject of the atomic bomb in all its ramifications, took the floor when the secret meeting was over. He argued that the \$70 million in this budget for an ABM system may convince the Russians, "who are tough negotiators," that the time has come when something must be done about controlling nuclear weapons. Mr. Pastore demonstrated that he recognizes the role of defensive weapons in our over-all deterrent power.

Senator Thomas Dodd, professing his own inexperience, raised the reasonable question of how the existence of a Soviet ABM system will affect the conduct of our leaders in a crisis. With the possibility that the enemy's device will work, would a President "throw down the gauntlet" the way President Kennedy did at the time of the Cuban missile crisis? Mr. Dodd doubts it.

On top of this, Senator Henry M. Jackson added emphasis to the Dodd case. He is certain Russia will not negotiate seriously with an adversary who lacks muscle. He warned, "They impose their will wherever the risks for them are not prohibitive." And he added that the President's chief civilian, military, and scientific advisers support the ABM program.

The particular amendment under discussion had been introduced by Senators John Sherman Cooper and Philip A. Hart. It sought to block deployment of the ABM by deleting all of \$387.4 million for Sentinel procurement, personnel, and operating funds, but would have retained \$312.9 million for research and development.

It was rejected, 25-45, but not until Mr. Cooper argued that Red Chinese ICBM capability was overestimated and that Russia was possibly halting its ABM deployment. He and Senator Hart contended, also, that our own ABM is untested, can be overwhelmed or outflanked, and is a waste of funds that can lead to a new arms race.

Another major rub, and one that disturbed much of the aerospace industry, was the acceptance by the Senate of a proposal by Senator Mike Mansfield to limit the indirect (overhead) costs which could be added to the base cost of a defense research grant or contract to twenty-five percent of direct costs. After the bill went to conference with the House, Mr. Russell reported this amendment "was a matter of some considerable controversy," an evaluation that some observers said was too mild.

The conference committee deleted the Mansfield amendment and called for new studies of the subject by the General Accounting Office and the proper congressional committees. The report cited the requirement for uniform practices in the entire government, practices that will ensure proper allocation of direct and indirect costs. It did add that if this allocation is proper, then the proportion of indirect costs to direct should not exceed twenty-five percent.

Text of the Mansfield amendment shows that it was worded to restrict funds spent under "grant or contract."

Offering it, Senator Mansfield made it clear that he was not directing the basic restriction at the aerospace industry, but at universities, a distinction not made in his draft of the regulation. On the floor, the Senator made the point that research and development money, spent as overhead, has been used to clean college football fields and pay for janitorial service. At the same time, it became clear that he was talking about *all* federal research grants and contracts, not just those placed by the Defense Department.

It is this kind of mixup, which could have resulted in the crippling of many essential industry research efforts, that typifies the perils of our congressional budget system. Several years ago, we suggested editorially in this magazine that perhaps Congress needs a RAND-type corporation of its own to separate fact from fiction and simple bad judgment on Capitol Hill. The idea will retain its appeal so long as things like this are possible and members continue to confuse the mission of national defense with the mission of Housing and Urban Development. The contest between weapon systems and rent supplements in Punsutawney must not be settled in amendments to the Defense Appropriation Bill.

For the Record: A Reversal

There is no congressional group with a more unmanageable name than the Combined Subcommittee of Foreign Relations and Armed Services Committees on the Subject of US Troops in Europe. The Chairman is Senator Mike Mansfield of Montana.

For purposes of further discussion, it will be referred to here merely as the subcommittee, if only as our token revolt against the national mania for acronyms.

The subcommittee today released a report it has had under consideration since March 1, 1967, when the subcommittee was created to consider two resolutions. One of these declared it is the sense of the Senate that "a substantial reduction of US forces permanently stationed in Europe can be made without adversely affecting either our resolve or ability to meet our commitment under the North Atlantic Treaty." The other called on our NATO allies to make a greater contribution to NATO.

Well, the subject has been under scrutiny ever since, and now it appears that the report has been pried loose by a new urgency that grows out of the Soviet invasion of Czechoslovakia. The subcommittee finds this occupation disturbing to the world's political atmosphere, and particularly in Europe. So, it has concluded, the "time is obviously not propitious for substantial reduction of US forces in Europe."

There were no dissenters to this conclusion in the ranks of the subcommittee. Among those giving their approval were Chairman Mansfield, who introduced the initial resolution in the Senate and has long argued for a cut in US troop strength in Europe. And Senator Stuart Symington, who was a cosponsor and frequent speaker on the Senate floor, where he vowed not to support funding for more than one US division in Europe. And Senator J. W. Fulbright, another cosponsor and firm believer in the potentiality of détente. Also, Senator George D. Aiken, a cosponsor, who once characterized our forces as "an army of occupation in Western Europe." Another man who signed the report is Senator James B. Pearson, who did not appear in the original list of sponsors but who supported the resolution for a cutback in Senate debate.

Moscow papers, please copy.

(More "Airpower" on page 21)

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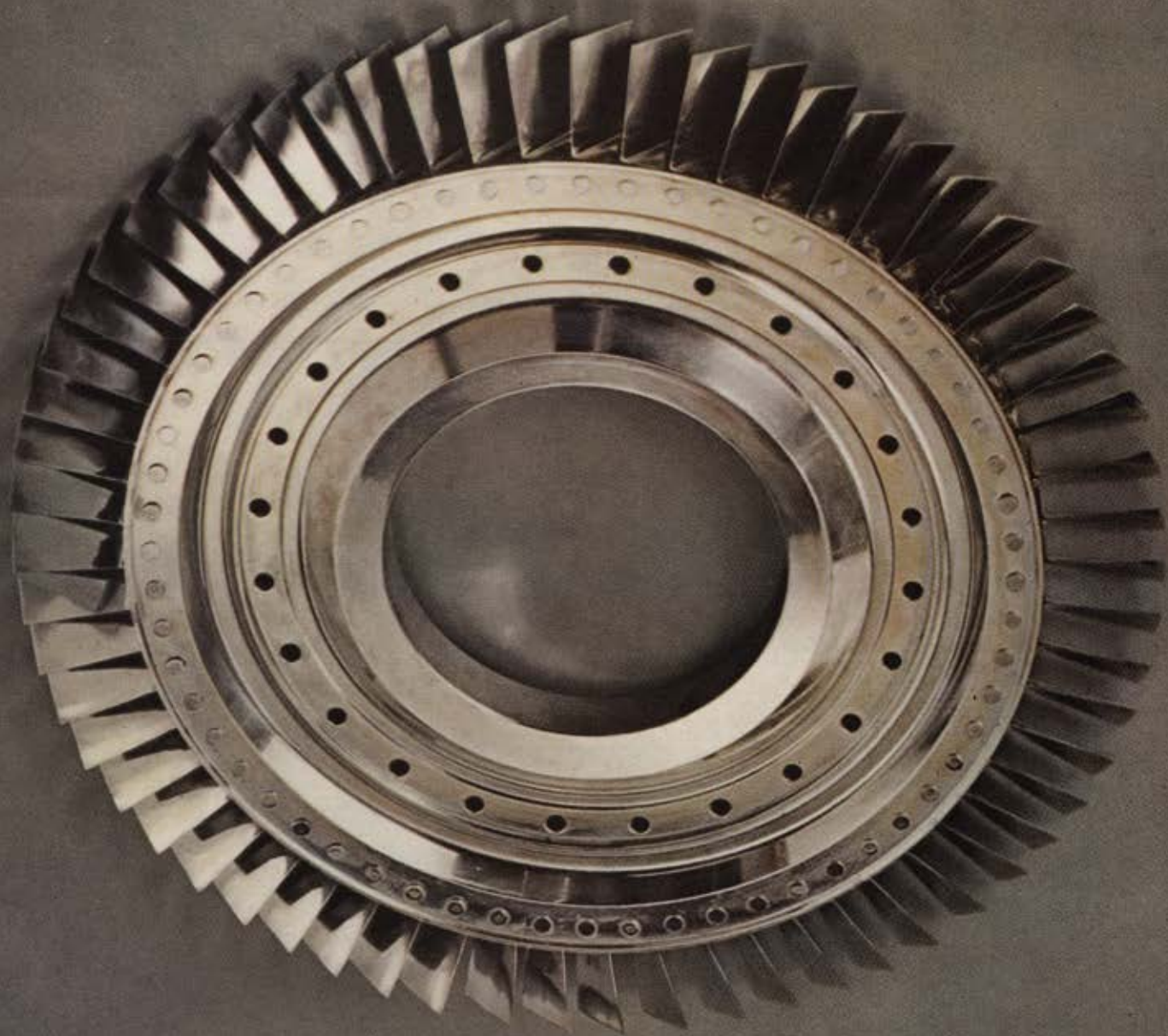
* The GE CF6 will power the McDonnell Douglas DC-10 Trijet chosen by major airlines. The GE TF39 is in flight test with the U.S. Air Force/Lockheed C-5, the largest and heaviest winged vehicle ever built. The GE TF34 has been chosen for VSX, the Navy's next generation of ASW aircraft.

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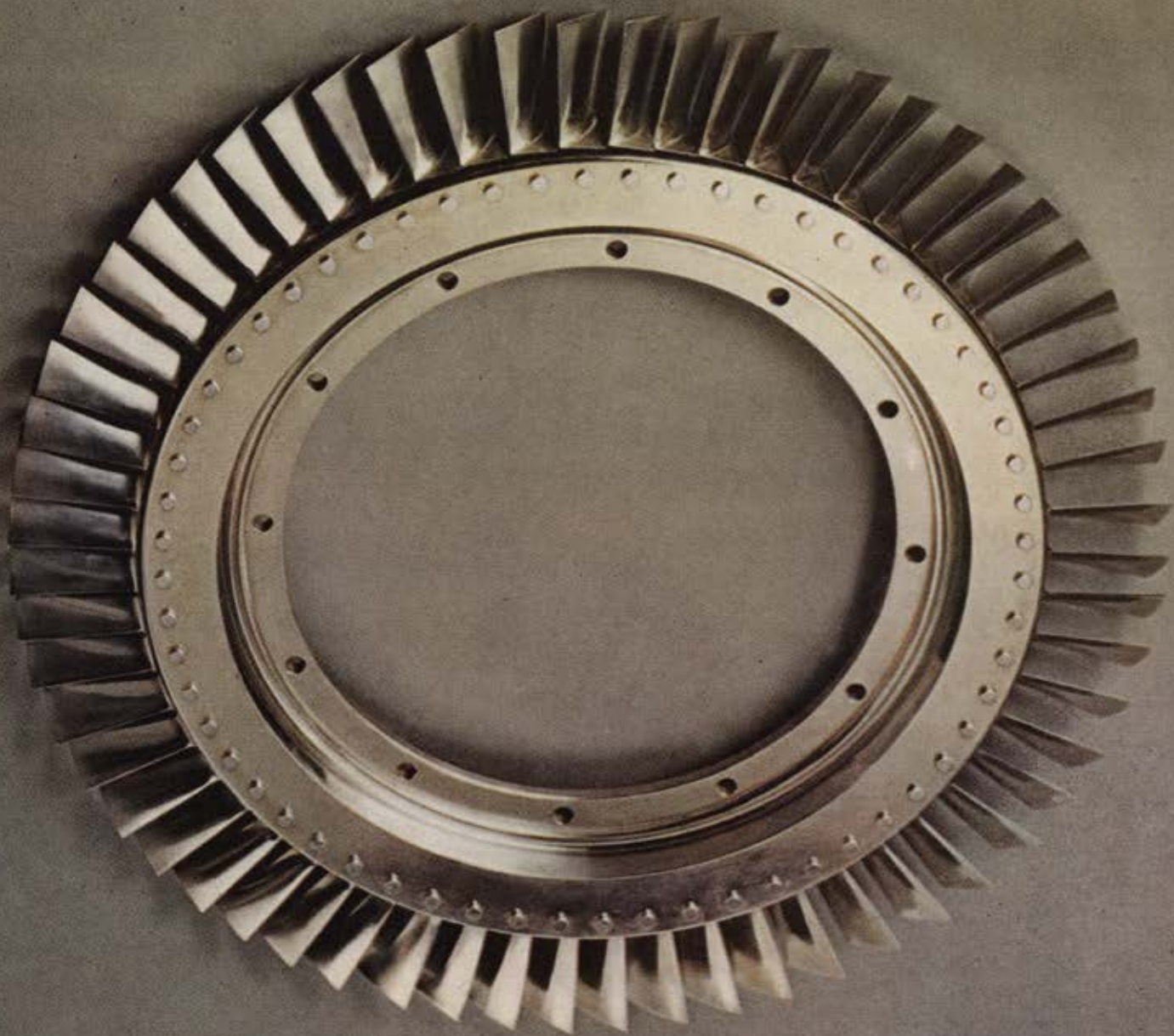
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The warehouse location, quantity on hand and cost of 65,000 parts is in the memory of a UNIVAC real-time computer system.

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According to the altimeter this plane is at 31,500 feet.

Air Force mechanics can ask a computer system for a new altimeter. They can get it delivered in about twelve minutes.



HCL at the Pentagon

Nobody likes the High Cost of Living, and the prices being paid by the American people for both bread and bombers are on the escalator. Senator Richard B. Russell of the Defense Subcommittee of the Committee on Appropriations is fully aware of this, but has found some of his confreres seem to know a lot more about how inflation has affected groceries than how it has affected armaments.

During debate on the \$72 billion Fiscal 1969 Defense Appropriations bill, the Senator made an effort to show why there can't be any substantial reduction in the cost of maintaining the Defense Department.

"The truth about the matter," he said, "is that today we do not get half as much defense for the same dollar [as] we did at the end of the Korean War."

At his request, both the Secretary of Defense and the Secretary of the Air Force prepared some statistics to prove this. For USAF, these show that in the past eight years,



Senator Richard B. Russell has been working on defense matters for 35 years. His colleagues say he is the top authority in Congress.

since 1960, the average cost of civilian employment in the Air Force has risen more than fifty-four percent, officer pay forty percent, and airmen's pay some thirty-seven percent. The cost of running the Air War College has risen nearly thirty-four percent. The price of an M117 (empty) bomb has increased more than 250 percent.

In the purchase of weapon systems, inflation does not get all the blame. In addition to the rise in prices and wages, there are great increases in capability, technical complexity, and sheer size. There also is a big variation in the number acquired—our fleet of C-5 transports is going to be much smaller than the most popular World War II transport—which has the effect of boosting the cost per unit.

The aircraft data in the following table are average unit flyaway costs:

Air Force strategic aircraft:

Medium bombers:	Unit cost
B-17 (World War II)	\$218,000
B-29 (World War II)	680,000
B-47 (Korean War)	2,000,000
B-58 (Fiscal Years 1955-61)	20,700,000
FB-111 (Fiscal Years 1967-69)	7,000,000
Heavy bombers:	
B-36 (Korean War)	3,700,000

B-52 (Fiscal Years 1952-61)	7,900,000
RS-71 (Fiscal Years 1964-66)	24,600,000

Air Force fighters:

F-51 (World War II)	54,000
F-47 (World War II)	89,000
F-86 (Korean War)	298,800
F-84 (Korean War)	465,990
F-100 (Fiscal Years 1952-58)	740,540
F-101 (Fiscal Years 1953-59)	1,800,000
F-105 (Fiscal Years 1954-63)	2,500,000
F-4 (Fiscal Years 1962-69)	2,100,000
F-111A (Fiscal Years 1965-69)	6,800,000

Air Force transports:

Medium:	
C-47/53 (World War II)	94,000
C-46 (World War II)	262,000
C-119 (Korean War)	662,730
C-130 (Fiscal Years 1963-68)	2,400,000
C-141 (Fiscal Years 1962-67)	6,300,000
Heavy:	
C-124 (Korean War)	1,700,000
C-133 (Fiscal Years 1953-68)	8,900,000
C-5 (Fiscal Years 1967-69)	22,000,000

Navy fighters:

F-4U (World War II)	102,000
F-2B (Korean War)	328,400
F-9F (Korean War)	280,290
F-8 (Fiscal Years 1954-63)	1,100,000
F-4 (Fiscal Years 1955-69)	2,600,000

Navy attack aircraft:

Light:	
TBM (World War II)	101,000
AD-4 (Fiscal Years 1948-52)	253,860
A-1E (Fiscal Years 1951-54)	417,870
A-4B (Fiscal Years 1955-62)	522,460
A-4E (Fiscal Years 1960-64)	816,290
A-7 (Fiscal Years 1966-69)	1,800,000

Attack submarines:

SS (World War II)	4,700,000
SS (Korean War)	22,000,000
SSN (Fiscal Year 1951 program)	58,000,000
SSN (Fiscal Year 1962 program)	72,000,000
SSN (Fiscal Year 1968 program)	77,000,000

Attack carriers:

Conventionally powered:	
CVA (World War II, Essex class)	55,000,000
CVA (Fiscal Year 1942 program, Midway)	90,000,000
CVA (Fiscal Year 1951 program, Forrestal)	189,400,000
CVA (Fiscal Year 1961 program, America)	249,000,000
CVA (Fiscal Year 1963 program, John F. Kennedy)	277,000,000
Nuclear powered:	
CVAN (Fiscal Year 1960 program, Enterprise)	451,300,000
CVAN (Fiscal Year 1968 program, Nimitz)	545,000,000

Destroyer types:

DD (World War II)	8,700,000
DD (Korean War)	17,900,000
DDG (Fiscal Year 1961 program)	33,300,000
DLGN-35 (Fiscal Year 1962 program)	130,300,000
DLGN-36 (Fiscal Year 1967 program)	200,000,000
DLGN-37 (Fiscal Year 1968 program)	180,000,000

Battleship:

New Jersey (1940-43)	100,000,000
New Jersey (activation costs, Fiscal Year 1968)	20,000,000

To these facts Mr. Russell added that the war in Vietnam is using up our stockpile of materiel. He said, "We are scraping the bottom" of our surpluses, and, "We cannot afford to continue in our present direction and have any sort of effective fighting organization. We have drawn down too long from the pantry shelf of military hardware for us not to realize that the day of reckoning must come, and it will come very soon."—END



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By Allan R. Scholin

ASSOCIATE EDITOR, AIR FORCE/SPACE DIGEST

WASHINGTON, D. C., OCT. 18

As this is written, there are indications that some kind of deescalation may be taking place in the Vietnam War, possibly to include the cessation of all bombing in North Vietnam. If this is accompanied by some real indication of Hanoi's willingness to discuss a cease-fire throughout Vietnam, it could signal the beginning of the end of what has long since become the longest war involving US combat forces.

If, indeed, Hanoi is now willing to negotiate, certainly one of the principal persuaders has been the B-52 Stratofortress which, since June 1965, has been employed with truly devastating effect to frustrate North Vietnam's military offensive.

From its earliest days in combat against the North Vietnamese and Viet Cong, it has proved to be the weapon the enemy fears most. As Ed Neilan of the Copley News Service reported recently, "Testimony from captured Viet Cong and North Vietnamese troops is almost unanimous in stating that the unseen terror of a B-52 bombing is the most fearful part

of a Communist soldier's assignment in Vietnam."

Most dramatic performance by B-52s came during the seventy-seven-day siege of the US Marine base at Khe Sanh early this year, when Stratofort crews dropped 60,000 tons—120 million pounds—of bombs on enemy positions surrounding the base.

Gen. William C. Westmoreland, top US commander in Vietnam at that time and now Army Chief of Staff, told B-52 crews after the North Vietnamese had abandoned the Khe Sanh siege:

"I chose the code name Operation Niagara [for the air phase of the Khe Sanh defense] because I visualized your bombs falling like water over the famous falls in New York State, and that's exactly what happened. . . . Without question, the amount of firepower put on that piece of real estate exceeded anything that had been seen before in history, by manyfold. And the enemy was hurt; his back was broken by airpower."

As this magazine pointed out in June, in describing the fearful Khe Sanh defense, it marked the begin-

ning of the end of North Vietnamese aspirations in South Vietnam.

Unquestionably, too, the B-52s have proved more effective in recent months than in their first long-range attacks on the Viet Cong.

"When I was here before, one of my soldiers used to say that B-52 strikes were the world's most expensive way of turning trees into matchsticks," said Maj. Gen. Ellis B. Williamson, now Commanding General of the Army's 25th Division, who had commanded the first American brigade to arrive in South Vietnam in 1965. "We'd go into the jungles behind a B-52 strike and we'd find a dead snake or a dead monkey, but not much else."

"Now we are finding evidence of successful strikes. The reason they are more effective is that we're getting better at telling the bombers where the enemy is. I don't want to oversell this . . . but we are so much better than we used to be, it's hard not to be pleased."

Much credit for the B-52's more effective performance belongs to Gen. Creighton W. Abrams, Jr., top US
(Continued on page 30)

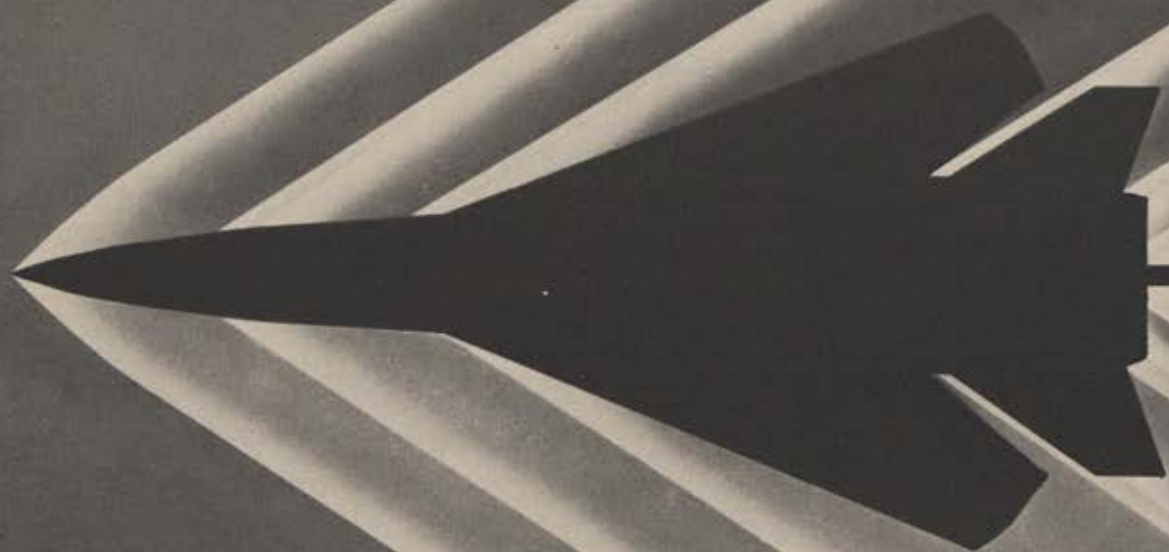


Those who take the trouble may count ninety bombs in this photo, still eighteen shy of the maximum 108 bombs carried by a single B-52 in bombing enemy targets in Vietnam. Stratoforts, which began hitting Viet Cong positions in June 1965, have proved to be the weapon the enemy most dreads.



Continued effectiveness of B-52s in years to come is in some measure dependent on these short-range attack missiles (SRAM), being produced by Boeing with nuclear warheads, which will arm variable-sweep-wing FB-111 bombers, as well as late model Stratofortresses well into the 1970s.

INVOLVEMENT



F-105 Thunderchief



F-84F Thunderstreak



P-47 Thunderbolt

At Republic it means developing the next air superiority aircraft

The next Air Force air-to-air fighter must outfly and outfight anything that may fly against it.

Republic has devoted four years of intensive effort, including comprehensive engineering studies, wind tunnel tests, and buffet, high lift, and engine/airframe compatibility studies, to the next fighter-fighter.

And we have the combat experience to make it pay off. From Republic, new thunder for the Air Force.



FAIRCHILD HILLER
REPUBLIC AVIATION DIVISION



"Lead the Force" C-141 logs a month of 21-hour flight days.

Hour upon hour, flight after flight, the huge C-141 StarLifter spent nearly all its time aloft. Piling up over 650 flying hours in March, 1968,



it set a new aviation mark by averaging 21.25 flight hours per day for 31 days.

The Military Airlift Command's "Lead the Force" program was inaugurated in 1965. That year, six sleek StarLifters were singled out to "Lead the Force." Four are building up accelerated flying hours. The other two are achieving impressive numbers of takeoffs and landings for MAC's training wing. The program's purpose: put the LTF C-141s two years ahead of the rest of the force...push them to the limits of their capabilities...so any indications of problems can be spotted and corrected long before they might occur on other MAC StarLifters.

As the program progresses, the world's first operational fanjet airlifter continues to exceed Air Force

requirements. Through more than 27,000 takeoffs and landings and 36,300 flying hours within the first



two years, average LTF C-141 utilization has been gradually increased beyond the goal of 10.7 hours a day



per plane. This is the highest consistent airframe flight time ever accomplished by a military airlifter. In setting this standard, some StarLifters have flown utilization rates of 16.3 hours a day for two consecutive months.

Built by Lockheed-Georgia Company in Marietta, 284 C-141s have been delivered to MAC on schedule

high-speed strategic airlifters. Of these, the six LTF StarLifters are the standard-bearers of the force that is revolutionizing this country's strategic airlift capabilities—substantially reducing the time needed to move men and materiel to Southeast Asia. Recently, for example, Military Airlift Command C-141s airlifted a major portion of the 101st Airborne Division to Vietnam in only 17 days.

The ability to understand present mission requirements and anticipate future ones, coupled with technological competence, enables Lockheed to respond to the needs of the Air Force in a changing world.



...Lockheed's response to U.S. Air Force demands for large-volume,



LOCKHEED
LOCKHEED AIRCRAFT CORPORATION

Revisiting Khe Sanh, whose successful defense early this year may have proved the turning point in North Vietnam's attempt to take over South Vietnam by military aggression, US Marines line up to board Boeing Vertol CH-46 Sea Knight choppers on operation to stem flow of North Vietnamese troops through demilitarized zone.



—Wide World Photos

commander in Vietnam, whose basic strategy has been to order out small ground patrols to make contact with enemy units. When they did, they called in reinforcements to ring the enemy force. Then they dug in to call for air strikes. The enemy had the choice of staying put and taking heavy losses, or trying to break out of the trap against well-entrenched American and South Vietnamese forces.

"Abrams has been using B-52s like maneuver battalions, like a strategic reserve, jabbing all the time," said one of his top aides. The enemy, in his attempt to attack Saigon and other cities, played into General Abrams' hands by moving out of jungle sanctuaries toward populated areas. This, the aide explained, imposed on the enemy a "more complicated logistics system, which gives us better area targets."

The bombers must have done well, for employment of B-52s has steadily increased. In 1965, after Stratoforts

went into action in June, SAC's 3d Air Division on Guam flew about fifty B-52 sorties a week. The weekly average climbed to 100 in 1966, to 186 in 1967, and well above 300 in 1968. By the end of this year, total tonnage dropped by B-52s in Vietnam may reach three-quarters of a million tons—about half of the total dropped by all allied aircraft in Europe during World War II, and double the total delivered by USAF, Navy, and South Korean aircraft in the Korean War.



Some 16,000 Air Reserve Forces personnel, most of them called up in January shortly after the North Koreans captured the USS *Pueblo*, and the remainder in May, will be released from active duty on or before June 30. The repercussions of that call-up are likely to affect the Air Reserve Forces for years to come.

The one bright spot, from a morale standpoint at least, is centered on

three air bases in South Vietnam, where four squadrons of former Air National Guardsmen, and most of a fifth, are flying combat missions, and, from all reports, doing a great job. (See "Those Gung Ho Guardsmen in Vietnam," page 47.) The 750 or so men in those units have been assigned duties for which they were trained and equipped. The same applies to a degree to the Air Force Reserve airlift groups and to the flying elements of various other units, some of which are serving overseas. But for most of the remainder, and particularly those in support elements, the recall has represented a series of frustrations.

The beginning, in late January, was full of high purpose. President Johnson ordered them out on thirty-six hours' notice, presumably to avenge the nation's embarrassment over the *Pueblo* capture. But almost nine months later the *Pueblo* crew is still imprisoned, and the men who were summoned overnight have not been



New gunship to replace AC-47 Spooky in Vietnam combat is Fairchild Hiller AC-119K. Black-camouflaged plane features four 7.62-mm Miniguns and two 20-mm cannon, plus sensors to locate enemy targets at night. To improve flight characteristics, it is fitted with pair of General Electric J85 turbojets of 2,800-pound thrust, augmenting reciprocating engines.



Radio-controlled six-foot-long model of Lockheed C-130 Hercules, built by Lanier Industries of Gainesville, Ga., takes off from north Georgia lake during tests for US Navy Air Systems Command, studying feasibility of employing 175,000-pound propjet Hercules in amphibious operations.



Air cushion landing gear (ACLG) developed by Bell Aero-systems Company, Buffalo, N. Y., is tested on LA-4 Lake amphibian testbed. Unique gear, dotted with tiny nozzles, forces out layer of air enabling plane to "float" to landing on water, swampland, gravel, or other unimproved surfaces.

called on to lift a finger toward their recovery, though some of them are serving relatively nearby, with Air Force units in South Korea.

Many had literally nothing to do, left missionless when their aircrews and planes were transferred elsewhere. For months they sat idle while the Air Force vacillated between releasing them or shipping them out as individual replacements. It was mid-summer before USAF chose the latter course, with most of the men going overseas.

True, this was not the kind of mobilization for which most of the recalled units had been programmed. In a major national emergency, they were prepared for deployment to a "bare base" in the US or overseas, where support units would have been required along with the combat elements.

Instead, it seems obvious now, if not at first, that the real purpose of the recall was to provide the Air Force with aircrews and aircraft—both, despite Secretary McNamara's protestations, urgently needed by the Air Force.

The F-100 pilots who will have served their year in Vietnam by June 30, and the aircraft they brought on duty with them, have helped see the Air Force through a critical stage. Unquestionably, to that extent, the recall served a useful purpose. But in terms of personal sacrifices on the part of most Reservists, as well as in dollars, it would have proved far less expensive had DoD granted the Air Force's urgent pleas, as far back as 1963, for an increase in pilot training and aircraft procurement.

Other costs of the recall, and the shortsighted policies that made it necessary, are still to be paid. It is

going to be extremely difficult to persuade experienced officers and airmen to rejoin these units, thus exposing themselves and their families once again to the hardships and frustrations of another mishandled recall.

If these substantial problems are to be overcome, it's up to the Defense Department and the Air Force, between now and June 30, to guarantee a more realistic mission structure and recall philosophy for the nation's Reserve Forces.



Col. Robert M. White, former X-15 pilot who holds almost every top medal, including the Air Force Cross, has been named Director of the FX



Col. Robert M. White, former X-15 test pilot who won US Astronaut wings when he reached 314,750-foot altitude in North American research plane, has been named chief of AFSC Systems Project Office in charge of the development and acquisition of the proposed FX air-superiority fighter plane.

System Program Office in AFSC's Aeronautical Systems Division, Wright-Patterson AFB, Ohio.

As Director of the SPO, Colonel White is responsible for development and acquisition of the FX advanced tactical fighter aircraft.

Colonel White came to ASD from Thailand, where he flew seventy combat missions in the F-105 Thunderchief and was decorated with his eighth through sixteenth Oak Leaf Clusters to the Distinguished Flying Cross, the Silver Star with three Oak Leaf Clusters, and the Air Force Cross given to him at Cam Ranh Bay by President Johnson in December 1967.

Selected as an X-15 test pilot in 1958, Colonel White flew the X-15 sixteen times, setting new speed and altitude records, both since superseded. He won his Astronaut wings for flying the aircraft to an altitude of 314,750 feet, or 59.6 miles. For these accomplishments he received the Harmon International Aviators Trophy from President Kennedy in 1961, the Collier Trophy in 1962, also from President Kennedy, the Distinguished Flying Cross, the Distinguished Service Medal, and the NASA Distinguished Service Medal.

Meanwhile, eight companies have been invited to submit proposal requests on the FX, with a deadline of early December. The eight are Boeing, Fairchild Hiller, General Dynamics of Ft. Worth, Grumman, the team of Lockheed-California and LTV Aerospace, McDonnell Douglas, North American Rockwell, and Northrop.



Air Force pilot training capacity will be boosted to a total of 4,400 per year beginning next summer when a
(Continued on following page)

Air Chief Marshal Boon Choo Chandrueksa, Royal Thai AF chief, and USAF Brig. Gen. John W. Baer, Deputy Chief, US Military Assistance Command, Thailand, review AF paintings at Bangkok dinner observing USAF's 21st birthday.



tenth undergraduate pilot training school is reopened at Columbus AFB, Miss.

A SAC installation housing B-52s and KC-135 tankers for the past thirteen years, Columbus AFB had been a pilot training base in Air Training Command from 1950 to 1955. When SAC relinquishes the base after shifting its planes to other locations, ATC will take it over with a goal of ap-

proximately 450 pilot outputs per year.

The 4,400-per-year production rate does not all go to active Air Force squadrons. USAF schools are turning out 130 pilots per year for the Marine Corps and about 150 for the Air National Guard.



Men who design US military aircraft these days face an almost im-

possible job in satisfying all their customers.

In a recent symposium on the West Coast, three top military aces—Maj. Gen. Marion Carl of the Marine Corps; Adm. James Thach, Navy; and Brig. Gen. Robin Olds of the Air Force—insisted today's fighters are too complicated. They want guns instead of missiles for air combat, they don't need—or can't use—Mach 2 speeds, and sophisticated avionics are a nuisance.

Yet in the same week, the Senate Preparedness Subcommittee warned that the US is lagging behind the Soviet Union in fighter development, voicing its "grave concern over the ability of the US to establish and maintain control of the air during the 1970s." The Senators were concerned mainly about the Soviet Mach 3 MIG-23 Foxbat and other new designs the Russians displayed more than a year ago at the Moscow air show.

Planes like the Douglas A-4 Skyhawk, Grumman A-6 Intruder, LTV A-7 Corsair II, Cessna A-37, Republic F-105 Thunderchief, and General Dynamics F-111A—all employed in Vietnam—would all lose to existing Soviet (Continued on page 34)

NEW BOOKS IN BRIEF

Air Mail Emergency, 1934, by Norman E. Borden, Jr. The assignment for the Army Air Corps, under the direction of the late Maj. Gen. Benjamin Foulois, to fly the mail cost the lives of many pilots and pointed up the Corps's lack of training and equipment. Photographs and an appendix are included. Bond Wheelwright Co., Freeport, Me. 177 pages. \$7.95.

Communist China & Arms Control: A Contingency Study, 1967-1976. This scholarly report, prepared for the US Arms Control and Disarmament Agency, provides a thorough background and summary of Chinese military and diplomatic policy and examines the prospects for arms agreements involving Red China. The Hoover Institution, Stanford, Calif. 94305. 181 pages. \$5.

The Guaranteed Society, by Leonard Baker. Government subsidies and contracting agreements, welfare programs, unemployment, and taxes are among the targets of the author's criticisms. However, he professes optimism that the American people may find working solutions to these problems once they are clearly outlined. Macmillan Co., N. Y. 276 pages. \$6.95.

A History of the Luftwaffe, by John Killen. Although this book contains a good deal of weighty detail on German air operations through 1945, it is made readable and even suspenseful by anecdotes and vivid descriptions. Doubleday, N. Y. 324 pages. \$5.95.

Interim Report on the American Search for a Substitute for Isolation, by Thomas K. Finletter. A former Secretary of the Air Force and US Ambassador to NATO examines the international political developments since World War II that have pressured the US into controversial involvement in world affairs. Norton, N. Y. 185 pages. \$4.95.

Intervention and Revolution: The United States in the

Third World, by Richard J. Barnet. "... the C.I.A. has conducted operations against legitimate governments on three continents," says the author, who attempts to answer the "how" rather than the "why" of the interventions. A worthwhile critique of this aspect of American foreign policy during the last twenty years. World Publishing Co., Cleveland, Ohio. 302 pages. \$6.95.

L'Aviation Française, 1914-1940—Ses Escadrilles—Ses Insignes, by E. Moreau-Berillon. A short history of French air units, with lists of honors, orders of battle, and descriptions of unit insignia. The book, which is in French, also includes 180 color plates of these insignia and a review of France's military aviation history. 380 pages. May be ordered from M. Moreau-Berillon, 43, rue Boissy-d'Anglas—75-Paris 8°.

The New Universe. In this handsome book, eight well-known astronomers and astrophysicists comment on some of the recent breakthroughs in man's knowledge of the universe. Some of the references are highly specialized. Rand McNally, Chicago, Ill. 128 pages. \$8.95.

The Origins and Legacies of World War I, by D. F. Fleming. Covering this topic is a rather ambitious undertaking for a single volume, but it is done here with clarity and thoroughness. The sacrifice of detail may irk scholars but improves readability. Doubleday, N. Y. 352 pages. \$6.95.

Soviet Naval Strategy, by Robert W. Herrick. Despite its increasingly publicized capabilities, the Soviet navy is intended for defensive purposes, this author, a retired US Navy commander, contends. He traces the offensive-defensive cycles in Soviet military policy over the last fifty years and estimates the Soviet navy's present strength. U.S. Naval Institute, Annapolis, Md. 250 pages. \$9.

—MARIA T. ESTEVEZ



HF-SSB 10 lbs

The new Delco 3200 transceiver.

Pick it up, run with it. It measures 5¼" x 4¼" x 10". And weighs a mere ten pounds, including battery.

The 3200 is a truly portable, long-range 2-way radio station. It operates over distances well beyond 500 miles, with crisp, clear transmission and reception. Voice or CW. Eight thousand channel selections from 2 to 10 MHz with the turn of a knob. A full 10 watts P.E.P. output.

DELCO RADIO

Division General Motors, Kokomo, Indiana

The secret? Single sideband design, with full frequency synthesis.

In short, everything that's needed to keep contact as long as necessary.

That's the Delco 3200. A lightweight, two-way radio station. Designed to withstand combat environment from the arctic to the tropics.

For information, write: Delco Radio, Military Requirements Department, Kokomo, Indiana.



MARK OF EXCELLENCE



One of the world's largest movable dish antennas, located at Etam, W. Va., some eleven stories tall, was built by Philco-Ford for Comsat Corporation to provide an international communications link with satellites in orbit.



During halftime ceremonies at Air Force Academy-Wyoming football game, Lt. Gen. Thomas S. Moorman, Academy Superintendent, presents special plaques to MSgt. William A. Stokes, left, Drum Major of Academy Band, and SSgt. Charles W. Young, named Academy's outstanding noncommissioned officer and airman of the year, respectively. Among spectators at game and presentation were all major air commanders, attending conference at Academy with USAF Chief of Staff.

aircraft in air-to-air combat, the Senate panel declared. The only reason the US is successful in air-to-ground operations in Vietnam, they added, is the lack of enemy air opposition.

While the McDonnell Douglas F-4 has consistently outfought the MIG-21 over North Vietnam, the Senators indicated the reason is better-trained US pilots rather than a superior aircraft. It quoted Air Force and Navy pilots who have had an opportunity to test-fly a MIG-21 in Israel against first-line Navy and USAF fighters as

asking, "Where can we buy MIG-21s?"

The Senators warned that plans for the Air Force's projected FX and Navy's VFX should be reviewed periodically to make sure that air superiority remains their primary mission.

Meanwhile, to get back to the comments of the three aces, General Carl, who commands the Marines' 2d Air Wing at Cherry Point, N. C., said, "We gave up guns too soon. Visual identification is required before beginning an attack. It takes five seconds to get a missile off. Five seconds is

too damn much when you're in a hassle!"

Admiral Thach, originator of the "Thach weave" in World War II air combat, who rose to four-star rank before his recent retirement, was equally outspoken. "The pilot never gets what he wants," he charged. "He needs guns whether he has missiles or not. Missiles are a fine weapon against bomber formations. Against enemy fighters, traditional fighter tactics must be employed, and the pilot needs guns."

INDEX TO ADVERTISERS

Autonetics Div., North American Rockwell	14
Beech Aircraft Corp.	99
Breeze Corporations, Inc.	64
CEIR, Inc.	13
Chicago Aerial Div., Bourns, Inc.	94
Crucible Steel Corp.	Cover 3
Delco Radio Div., General Motors Corp.	33
Electronic Communications, Inc.	22 and 23
Fairchild Hiller Corp., Republic Aviation Div.	25
General Electric Co., Aircraft Engine Group.	17
Honeywell, Inc., Aerospace & Defense Group.	2 and 3
Hughes Aircraft Co.	11
Hydro-Aire Div., Crane Co.	35
Lockheed Aircraft Corp.	26 and 27
Lockheed Missiles & Space Co.	Cover 2
LTV Aerospace Corp.	28 and 29
LTV Electrosystems, Inc.	4

McDonnell Douglas Corp.	Cover 4
Motorola, Inc., Government Electronics Div.	36
Pan American World Airways/Clipper Cargo.	9
Pratt & Whitney Aircraft Div., United Aircraft Corp.	18 and 19
Ryan Aeronautical Co.	37
Sperry Rand Corp., Univac Div.	20
Sylvania Electric Products, Inc., Electronic Systems Div.	56
TRW Systems	55
United States Air Force	38
Vega Precision Laboratories.	105
Vertol Div., The Boeing Co.	109
Vitro Corp. of America.	72
Western Union	1
Westinghouse Electric Corp., Defense & Space Center, Aerospace Div.	6 and 7

General Olds centered his comments on speed and avionics. Though the F-4s he flew as commander of the famed 8th Fighter Wing in Thailand were capable of Mach 2.5, he said he never had occasion to fly faster than Mach 1.2. Bombs, missiles, gun pods, or fuel tanks carried externally restrict the Phantom's speed. It's only when all "garbage" has been jettisoned that the F-4 can reach its top design speed.

In some fifty missions against targets in the Hanoi area, General Olds—now Commandant of Cadets at the Air Force Academy—said his complex radar and navigational systems were almost useless because he had to go in at fifty-foot altitude and pull up to 200 feet to bomb. These tactics, he said, were necessary to avoid enemy SAM missiles, whose effectiveness begins against planes flying at 100 feet or higher. General Olds also indicated his electronic countermeasures pods weren't as effective against SAMs as other pilots have reported.

The three veteran aces agreed there are "too many echelons" between the pilot and the aircraft designer, that what starts out to be a good clean design for a specific mission tends to get all cluttered up by the time it comes off the production line. They blamed civilian "experts" who have never faced an enemy pilot in the air with making decisions that end up imposing needlessly high odds on US pilots in combat.



Maj. Gen. Walter B. Putnam, who retired in August at Gunter Air Force Base, Ala., is returning to active duty at Maxwell AFB, Ala., on November 1 as National Commander of Civil Air Patrol (CAP), upon retirement of CAP's present commander, Brig. Gen. William W. Wilcox.

In his new post, General Putnam will serve in a dual role. As national commander of CAP, he will be chief executive officer of a nonprofit civilian corporation dedicated to air search and rescue, to assistance during times of local or national emergencies, and to aerospace education and training.

In addition, he will serve as commander of Civil Air Patrol-US Air Force, a military unit composed of Air Force officers, enlisted men, and civilians, which assists in the operation and direction of CAP activities.

Prior to his retirement, General Putnam commanded the Southern NORAD Region and Fourteenth Air Force, both headquartered at Gunter and both now deactivated.

(Continued on following page)

ARNIE THE AD MAN GOES INTERNATIONAL

For those loyal readers who have been wondering whatever happened to Arnie the Ad Man, it is high time we brought you up to date. (If you haven't followed this column regularly, Arnie is the tight lipped, tense, somewhat ulcerous young man who calls on Hydro-Aire from its advertising agency.)

Seems Arnie took a sabbatical from Gladhand, Doubledry & Markup. He left mumbling something about getting back to the grass roots—and flew to Europe.

Last week we got a letter. From Lisbon. It arrived in a plain brown envelope and was marked "Secret" in red crayon. The contents were in code. Fortunately, our secretary still has her Jack Armstrong decoder ring—an engagement gift. We quote parts of her translation:

"...have uncovered an international plot to steal our Hytrol anti-skid braking system. While sipping a Pernod on-the-rocks (the martinis are lousy here), I overheard parts of a conversation at the bar between two suspicious looking characters. One was an Oriental gentleman. The other one wore a monocle and spoke in a heavy German accent. Both were dressed in belted trenchcoats. My ears perked up when I heard the word 'Hytrol' several times, followed by such phrases as 'improved stopping distance,' 'smooth landing roll' and 'proved performance.' Then the guy with the monocle said, 'Ve vill be gettink the drawinks next veek' and the other guy just smiled in that enigmatic way.

"Obviously, I have stumbled onto something vital to the future of Hydro-Aire. Am willing to interrupt my sabbatical to pursue this matter, providing you approve additional budget for a leased Beretta and a buxom assistant. Please advise immediately. Love, Arnie."

Well, before getting the CIA into the act, we checked some of our sales reports. Seems we are working on Hytrol anti-skid proposals for the German fighter—the VFW 614—and two Japanese aircraft—the XT-2 jet fighter and the XC-1 cargo plane.

Further, we're not really surprised that old Arnie ran into conversations about Hytrol in far-off places. After all, virtually every major foreign airline now uses Hytrol equipped jet transports and our engineers and customer service people are all over the globe. Our switchboard operator is taking a crash course at Berlitz so she can handle the phone calls. And the guy who owns our local travel agency just ordered a new Cadillac.

As for Arnie, we've dropped a memo to his boss, Irv Image, suggesting that the agency extend his stay in Europe. And we've mailed him our old Ian Fleming paperbacks and a stained trenchcoat. He'll have to find his own buxom assistant.



HYDRO-AIRE

3000 Winona Avenue, Burbank, California
DIVISION OF CRANE

Fuel Pumps & Valves, Hydraulic Motors & Pumps, Electro-Hydraulic Controls, Temperature Control & Coolant Systems

collage 54

Down to Earth with Motorola

It's no secret that we at Motorola are humble, self-effacing sorts. You know what we mean. Every time there's a big achievement in space (of which we've been intimately involved in just about every one), do you see us taking full-page ads in Time or the Wall Street Journal proclaiming that Motorola command system, transponder, or telemetry system made it all possible? No! We quietly go about our business and hope against hope that somehow the world will eventually know that we are lovable, clever people who, besides making TV sets and car radios, build a lot of advanced things to support our nation's conquest of space.

With this in mind, then, it shouldn't surprise you to learn of our interest in a proposed system of synchronous satellites that will provide TV and other forms of communications for the entire U.S.A....nay, perhaps the world. It is a network that may well be of both commercial and tactical military value. The signals will go from the satellites to a network of ground terminals, and then get piped by cable to TV stations, telephone switching centers and the like. Now, what we want to do, in our typical down-to-earth manner, is build all the ground terminals



for the system. That may not sound very glamorous, but it represents a pretty good-sized piece of business. And, more important, it is the kind of business that is right up our technological alley. We've built relatively comparable ground terminals for SGLS, DSIF, and MSFN, and we have some good ideas on how to build an optimum RF system applicable to the 25' or 30' antennas that will be at each ground terminal. Other closely

related experience we have in the field was gained on our ASGLS and in-house development projects. There we developed advanced techniques in wideband, low distortion receivers and economical receiver synthesizers.

In any case, the new satellite system, when completed (don't ask us when), will provide more and better TV for more people (this is progress?), better telephone circuits. You'll be hearing, hopefully, more about this Space Communications System later and if you become involved with it, please put in a good word for our Ground System people. Better yet, write to them at 8201 E. McDowell Rd., Scottsdale, Arizona 85252, or Phone (602) 947-8111, and let them put in a few good words for themselves.



MOTOROLA
Government Electronics Division

WORLD ————— CONTINUED



Maj. Gen. Walter B. Putnam has been called from retirement to become National Commander of Civil Air Patrol at Maxwell AFB, Ala., on November 1, succeeding Brig. Gen. W. W. Wilcox.

SENIOR STAFF CHANGES

B/G Albert J. Bowley, from Cmdr., 45th Air Div., SAC, Loring AFB, Me., to Chief, Strategic Plans & Policy Div., J-5, Joint Staff, JCS, Washington, D. C. . . . B/G Thomas H. Crouch, from Cmdr., Wilford Hall USAF Hospital, ATC, Lackland AFB, Tex., to Dir. of Professional Services, Office of Surgeon General, Hq. USAF, replacing M/G Archie A. Hoffman . . . B/G Kyle L. Riddle, from Chief, MAAG, Tokyo, Japan, to Special Ass't to Cmdr., 12th AF, Bergstrom AFB, Tex. . . . Dr. Stephen W. Tsai, from Washington University to Chief Scientist, AF Materials Laboratory, AFSC, Wright-Patterson AFB, Ohio.

RETIREMENTS: B/G William H. B. Erwin, M/G Archie A. Hoffman, B/G William W. Wilcox.—END

(This "Aerospace World" column is the last to be compiled by Allan R. Scholin. During his stewardship since May 1962, "Aerospace World" has consistently won top ranking in our readership surveys. His occasional feature articles, too, have scored well with our readers—from his first on the then-new US Strike Command in May 1962 to his recent on-the-scene reports of USAF operations in Southeast Asia. Now Al, who put in more than twenty years with the Air Force, in and out of uniform, before coming to us, is returning to government service with the Strike Command at MacDill AFB, Fla. But wherever Al may go, his typewriter will be with him, and we hope to be able to offer more of his commentaries on the aerospace world in the months to come.—THE EDITORS)

What will this fighter pilot's chances be when that bird out there is the real thing, a MIG 21? They'll be good, very good. Because this bird, a supersonic Firebee II, will be the nearest thing to a fighting mad MIG he can shoot at. More than just a clay pigeon, this bird is a real jet aircraft. It flies like one. It maneuvers like one. Returning combat pilots tell us they must train against a maneuvering jet to be really prepared. Over 20 years of Ryan jet target experience is built into this supersonic Firebee. And those who train against it will know just what to expect - when the chips are down. Firebee II is another Ryan first. That follows. Because being first is a Ryan tradition.

RYAN

When the chips are down...

We'd like you to know more about Firebee II. For complete information, write Frank Gard Jameson, Ryan Aeronautical Company, San Diego, California 92112.

Proven systems of recovery make the Firebee II a multi-mission bird.



Anything but.

A young man can climb into this incredible piece of hardware and break the sound barrier.

And the awe-inspiring probes into space are not figments of his wild imagination.

He read the fantasy of Buck Rogers as a boy.

Now in a Buck Rogers' space suit he explores the outer reaches of the beyond.

It all started with imagination and dreams.

If anything, a young man's fancy is exactly what we need.

Without it we'd all still be on the ground.

U.S. Air Force—great career, great life.

This is not just a young man's fancy.



In the early morning hours of August 21 the Soviet Union began its military takeover of Czechoslovakia. The invasion—a model of military efficiency—took the NATO nations completely by surprise, and the Red Army, had it chosen to do so, could have marched all the way to the Rhine. The lessons for the Western alliance are clear, and the European NATO nations face a most difficult choice: Either they prepare for possible wars more energetically than ever before, thereby sealing the Iron Curtain for a long time to come, or they continue to try and deal with the Russians, putting the defense of Europe in the hands of US nuclear might, which cannot, of itself, stop or prevent local conventional conflicts . . .

AIR FORCE
NOVEMBER, 1968

A Look at the Czech Crisis

By Stefan Geisenheyner

AIR FORCE/SPACE DIGEST EDITOR FOR EUROPE



—United Press International Photo

Czech patriots jeer a Soviet tank in Prague as forces from the USSR and four Warsaw Pact nations occupy their land.

IT BEGAN like a James Bond thriller. In the early morning hours of August 21, an unscheduled Soviet Aeroflot flight from Moscow requested and was granted permission to land in Prague. The all-male tourist group disembarked, retired to the men's rooms, and emerged shortly after as heavily armed, uniformed Soviet commando troops who immediately took over the vital installations of Air Traffic Control and Communications. Overlooked, however, was an airline teletype room whose operator called Frankfurt with the story of the takeover and frantically requested help. This was the first word concerning the invasion of Czechoslovakia to reach the West.

At about the same time, 1:15 a.m., the NATO radars facing East were jammed. Such jamming had happened before, and was believed to be part of Russian maneuvers then under way. Nobody in the Western military command posts discovered until one to two hours later that the Soviet Union had set its military machine in motion to assist the Czech Communist state against alleged counterrevolutionary moves supposedly instigated by the US and West Germany.

Thus began a Soviet military adventure which, though apparently based on misinterpreted intelligence, served to damage the unity and credibility of world communism.

More important, it tended to reawaken a complacent West to the dangers of Russia's expansionist policy and irrational actions stemming therefrom.

The impact was felt around the world, but primarily it was the NATO nations that were shocked back into harsh reality after pursuing for years a well-meant and honest policy of coexistence and détente. Nobody in Europe had expected this Russian move. The groundwork had been so well laid, covered by verbal and military smoke screens, that the surprise could be called complete. On the political level, the invasion may have been a gross mistake for the USSR, but the military expertise exhibited was first class. In particular, the deceptive moves preceding the crossing of the Czechoslovakian borders were so well planned that they serve as a classic example of a thoroughly planned and successfully executed surprise. NATO was caught completely off guard.

The bitter lessons are manifold. For years, NATO's contingency planning had been based on the assumption that there would be a warning period of at least fourteen days to four weeks prior to any major crisis. In fact, two whole months were available for NATO to prepare for a possible invasion of Czechoslovakia and any foreseeable follow-up action. But nothing was done because the threat was not taken seriously. Western intelligence was well aware of the troop concentrations in the southern part of Eastern Germany, Poland, and the Ukraine. But intelligence had cried "wolf" so many times that no one in the governments or in the military commands believed that the actual point of danger was near again when the call for an alert went out once more on August 20.

The actual invasion had been camouflaged by a series of interlocking exercises. The first took place in Czechoslovakia between June 20 and 30; the second after a partial mobilization of reservists in the Ukraine

starting July 23. These widely publicized war games—covered on all Western TV stations—were combined with air defense exercises over Western Russia.

The NATO forces that had been placed on low-level alert during the first exercise were, after it ended, returned to normal readiness status. They began to prepare for their own summer exercises in Greece, which were to involve a large part of NATO's mobile strength. While this exercise, called "Deep Furrow," was under way in the Mediterranean area, Russia invaded Czechoslovakia. NATO had been caught off balance in a militarily dangerous situation, and if the Soviets had so planned it, the Red Army could have marched through Germany and on to the Rhine, meeting only sporadic and unorganized resistance.

The first news of the invasion reached the governments in Europe via press and commercial radio. Some German and American troop commanders who had heard the night broadcasts put their troops on alert without waiting for orders. The German government was on vacation, and it took almost a day to locate the Minister of Foreign Affairs, who was fishing in Norway.

It is not possible to prevent with 100 percent certainty the same sequence of events from happening all over again. The Russian deception plan was based on the age-old ruse of feint, feint again, then thrust on a large scale, involving political as well as military moves. Since the initiative always lies with the aggressor, who can leisurely lay plans to strike with the greatest economy at a place and time of his own choosing, the only feasible countermove by the West is a perpetual readiness on all fronts of the Iron Cur-



—Wide World Photos

Bewildered, angry Czech citizens fill Prague's streets and crowd around the Soviet forces after the military takeover.



—Wide World Photos

Photo made from a private apartment shows Soviet tanks lining up in a side street near Prague's Old Town Square.

tain. A primary need is better reconnaissance, including an improved spy network, and substantially strengthened conventional NATO forces kept at high readiness.

It is not easy to reorganize and beef up NATO strength to the level needed to fulfill this requirement. Several years of planning and training are involved. Some help has to come from the US, but the main effort must be made by the European members of the Alliance.

The reasons for this need for increased combat readiness of NATO are not only found in the possibility of an open attack by the East. They are found mainly in the political instability of Russia's satellites. It has been widely stated that the invasion of Czechoslovakia was an in-house affair of the Warsaw Pact. This is doubtless true. Moscow felt it had to intervene militarily since there was, in Soviet eyes, a chance that the Czechs were about to change sides in the East/West power play. A Western-oriented Czechoslovakia would represent a grave strategic danger to the Russian heartland and could lead to the collapse of the Warsaw Pact organization.

Russia's satellites are dubious allies, and events such as occurred in Eastern Germany in 1953, and in Hungary in 1956, and in Czechoslovakia in 1968, may occur again. Therein lies a great military danger for the West, one which outweighs the political advantages of such unrest. This is an important lesson. The nations of Central Europe should be grateful for the restraint and discipline shown by the Czech government and its population and by the Soviet troops as well. If Czechoslovakia had succumbed to the temptation of fighting the invaders militarily, Western Europe might well have been involved in a major war. The fighting undoubtedly would have spilled across into Bavaria, the only sanctuary for hard-pressed Czech divisions. And if the Russians had followed them across the border in hot pursuit, the situation could become irretrievable.

It is not too farfetched to conceive of a sequence of events similar to the Czech crisis developing in East Germany. There the old Soviet-trained Stalinists are dying out and younger, nationalistic-minded executives are taking over. In fact, the younger generation in East Germany sympathized with the Czech form of democratic socialism—as it became known in August—to such a degree that pro-Czech demonstrations had to be suppressed by force. If hard-line communism begins to decay seriously and openly in East Germany, the Soviets will have to move in again. Here again, only a strong *allied* military readiness along the border would prevent the shaping up of a possible disaster that could lead to a general nuclear exchange.

So the West has to be on the ready everywhere, from the Middle East to the North Cape, against a variety of possible Eastern military moves ranging from a general nuclear exchange to small local wars. After the Soviet miscalculation of the effects of Czech liberalization on Czech loyalty to the Warsaw Pact, similar misjudgments of another nature can be imagined regarding Finland, Austria, Romania, Yugoslavia, or Albania, not to mention Western Germany, which has been the target of a vicious Soviet propaganda campaign since August. The East claims that West Germany is the cause for all unrest in Central Europe. It is even possible that the Russians may come to believe their own propaganda and act accordingly.

The West's military position is not strong these days. Four main elements are involved:

- The commitment of the US in Vietnam has weakened its military effectiveness in Europe.
- The Russian divisions now in Czechoslovakia, which are most likely to remain there, demand a strengthening of NATO's defenses in Bavaria. With the present troop strength available to NATO, the gap cannot be closed.
- The military withdrawal of France from NATO has weakened the structure considerably.
- Finally, the lukewarm attitude of Germany toward its own defense should be mentioned here. Germany

(Continued on following page)



—United Press International Photo

Angry Czechs watch as Soviet tankers ride by in Prague. Emotions ran high, but there was little real resistance.

spends only 4.2 percent of its gross national product (GNP) on its armed forces. Britain supports its defense with 6.8 percent of its GNP and the US with a staggering 10 percent. Thus, Germany is "freeloading" on the US and the other allies for its own security.

It should be hoped that the message about the dangers of possible unrests in the East bloc nations has reached the decision-makers in Bonn. If it has not, they may go down in history as one of the governments that, to their own misfortune, did not heed the Latin proverb *Si vis pacem para bellum* ("If you want peace, prepare for war"). In the framework of NATO, and assisted by its allies with weapons and know-how, Germany has to reinforce and modernize its conven-

tional forces. It is important, however, that allied troops remain stationed in West Germany for the general interest of NATO. Germany alone cannot possibly defend the borders of the West unassisted. It has neither the manpower nor the financial resources. Furthermore, Russia and the East bloc nations are honestly afraid of a resurgence of fascism in Germany, and only the presence of allied troops is, for the East (as well as the West), an acceptable assurance that this will not take place.

At the moment it does not seem likely that the German government will embark on a guns-instead-of-butter policy. But Chancellor Kiesinger's remarks, made in September during a major policy statement in the Lower House, mentioned such a possibility. He said that if the USSR keeps its troops in Czechoslovakia, then Germany will have to take certain protective measures. This implies a strengthening of the German armed forces. Such a move would, on the other hand, indefinitely postpone the chance of coming to a peaceful agreement with the USSR and would throw Europe back to the cold war period. Therefore, Germany and the other European NATO nations face a most difficult choice. Either they prepare for possible wars more energetically than ever before, thereby sealing the Iron Curtain for a long time to come, or they continue to try and deal with the Russians, putting the defense of Europe in the hands of US nuclear might, which cannot, of itself, stop or prevent local conventional conflicts.

The new phase of East-West confrontation as introduced by the Czech crisis represents a breakaway from the static political and military picture of the past twenty years in Europe. From now on, a variety of events may occur that will upset the local balance of power. It is primarily the task of the Europeans to meet such danger. Europe may not be so lucky again to have levelheaded Czech citizens facing restrained Russian military power with neither side resorting to arms. The next time, in another country, it may be different.—END



—United Press International Photo

On the Soviet occupation's fifth day, Russian soldiers move into positions in the streets of downtown Prague.



—Wide World Photos

This student, bolder than most, waves a Czech flag after clambering aboard this Soviet tank in Prague street.



—United Press International Photo

This scene, of young Czechs carrying a wounded countryman, was made into a handbill, widely distributed in Prague.

"The Soviet Union is a dangerous and unpredictable adversary. We cannot be confident that a Soviet Union that spearheads a five-nation intervention in Czechoslovakia will not use military force in pursuing its objectives in other situations, when it believes this can be done without incurring unacceptable risks" . . .

Czechoslovakia and Western Security

By Senator Henry M. Jackson

THERE have been those in recent years who argued that the Soviet Union was on an irreversible course toward more moderate policies, and that détente was here to stay. We were told that "the cold war is history," that "the threat of military aggression by the Communists in Europe has all but vanished."

As my colleagues in the Senate know, I have not shared this optimistic view.

But whether we have been optimistic or pessimistic about Russian policy, the brutal invasion of Czechoslovakia has been a sobering experience for all of us. It evokes memories of comparable acts in other years—the Nazi military occupation of Czechoslovakia in 1938-39, and the Kremlin takeover of Czechoslovakia in 1948.

Our task now, as I see it, is to keep our eye on what is going on in the real world, on what our Soviet ad-

versary is up to, and then be sure we undertake appropriate actions.

How the Military Balance Has Shifted

Let us look at the military situation in Central Europe as it actually is today, not as we might wish it were. The cold fact is that the military balance in Central Europe has been very significantly altered, to the disadvantage of the West.

Within the past two months, the Soviets have mobilized several hundred thousand additional men. They have added at least ten combat-ready divisions to the forces they previously had deployed in the Central European area.

The USSR has brought into being extensive support and logistic services to sustain the forward deployed forces. It has established, and is exercising on a continuing basis, improved and expanded lines of communication for the support of military operations in Central Europe.

Moscow has undertaken this massive expansion of its military capability in Europe while continuing to increase the forces deployed along the Soviet frontier with China.

The Soviets now have in Central Europe the largest and most readily usable combat force they have put
(Continued on following page)

Senator Jackson (D.-Wash.) was elected to the 77th Congress in November 1940, and has served in each succeeding Congress. He has been a Senator since the election of 1952, and in 1960-61 served as chairman of the Democratic National Committee.



The accompanying article is the text of a statement on the floor of the US Senate by Senator Jackson, Democrat from Washington, on October 3, 1968, delivered in the wake of the Soviet invasion of Czechoslovakia. Senator Jackson is a member of the Senate Armed Services Committee and the Joint Committee on Atomic Energy.

into the field since World War II. It is a force that has the capability for further moves. And there is no indication that this expanded force is soon going to return home. Even now, Soviet troops in Czechoslovakia are preparing winter quarters.

With this grim picture in mind, what can we say about Soviet intentions toward Romania and Yugoslavia and Austria? At this stage, I don't think any of us can be sanguine.

Certainly we cannot discount the dangers that the course of suppression and counteraction in East Europe will produce new crises spilling over the borders of East European states. There is always the possibility that Moscow may try to restore some unity to the Warsaw Pact nations by manufacturing a major crisis centered on Berlin and West Germany.

I expect to see some repercussions of recent events in the policy councils of the Soviet Union. I would not be too surprised at some shifts in the Politburo that could portend still more difficulties for the Western nations. There are already some indications of a move to the right within the Kremlin.

Nor is the prospect reassuring in the Middle East and North Africa. Will the Soviet leaders seek to step up Arab-Israeli tensions? Will they promote greater Algerian pressure on its neighbor states?

Nor does the bitter rivalry between Moscow and Peking necessarily presage less troubles for the free world. In fact, China's brand of communism is generating pressure on Moscow to demonstrate its own forms of militancy. And we cannot assume that Moscow and Peking are headed for a final separation. Some reconciliation is conceivable in the post-Mao period.

I think we can all agree that the future is filled with grave uncertainties and continuing perils for free nations and the cause of individual liberty. It was difficult enough to do business with the USSR, to identify areas of shared interests, and to make progress in those areas before Czechoslovakia. This most recent demonstration of Soviet suppression surely does not make our problems easier.

New Capabilities for the Soviets

In all this the growing productive power of the Soviet Union is a factor of great significance. With its large command economy the USSR can now produce across-the-board capabilities that enable the Kremlin to move simultaneously on many fronts: increased consumer goods and services for Soviet citizens; a massive space program; aid to other Communist nations—including substantial support for North Vietnam; and a steady rise in its defense budget, permitting it to build a large and diversified arsenal of sophisticated weapons.

Of special significance is Moscow's formidable drive to reach a level of nuclear parity with the United States. This is a very serious worry.

The Soviets are increasing their ICBM force at a very fast rate. The number of operational ICBMs targeted against the US has nearly tripled in the last two years. The evidence I have indicates the Soviets will have rough parity with the US in operational land-based missiles within a year or so, and that they in-



—United Press International Photo

A Soviet tank rumbles past the heroic statue in Prague's Wenceslaus Square. In background is the National Museum.

tend to surpass us in numbers of ICBMs shortly. By the mid-1970s, about eighty percent of Soviet ICBMs will be in dispersed single silos; two years ago the bulk of the force was in vulnerable soft sites or in clustered silos. Also, the larger missile payload the Soviets can mount on their bigger ICBMs gives them the capability to deploy higher yield nuclear warheads per missile than we can.

In addition, Moscow has in full swing the production of the new sixteen-tube Polaris-type submarine, and the number of submarine-launched ballistic missiles available to the USSR in mid-1970 will be two and a half times the level of 1966. It is likely that their goal is a seaborne nuclear force comparable to our own Polaris capability.

At the same time, the Soviet leaders are deploying the Galosh defensive missile system in the Moscow area, and our best intelligence is that they are continuing to build and improve their ballistic missile defense.

The USSR is also making heavy investments in mobile long-range forces capable of conventional operations at extended distances from its own borders. Soviet ships are no longer confined to the Russian coastal areas of the Baltic and Arctic Oceans and the Black Sea; Moscow has boldly extended its naval strength into the Mediterranean Sea, the Indian Ocean, and also into the Persian Gulf.

Even when the Russians have been in a condition, vis-à-vis the West, of admitted inferiority in strategic power and in mobile long-range capabilities, Moscow has periodically pressed forward policies designed to extend its influence and to push history along the path of Soviet expectations. One recalls the repeated threats to the freedom of Berlin, the Cuban missile venture, and now the ruthless subjugation of Czechoslovakia.

In past Soviet adventures, the strategic inferiority of Soviet power has set limits on the extent of the risks that Moscow was willing to run. It is disquieting to contemplate the still more dangerous range of risks that the Kremlin might accept in the future if it were confident of being closer to an equality or a superiority of over-all deterrent strength—however that is



—United Press International Photo

A young Czech girl runs for her life as Soviet tank crews open fire on demonstrators in Bratislava on August 22.

measured in terms of the ratio between offensive and defensive nuclear systems—and also possessed a local superiority of force in the area of intervention. The stage would be set for the most perilous kind of confrontations—showdowns between nuclear powers in which Moscow did not feel fully deterred by our nuclear forces.

The Soviet Union is a dangerous and unpredictable adversary. We cannot be confident that a Soviet Union that spearheads a five-nation intervention in Czechoslovakia will not use military force in pursuing its objectives in other situations, when it believes this can be done without incurring unacceptable risks.

In the wake of Czechoslovakia, there is no excuse for any American to ignore the first priority of American policy. And the first priority in this uncertain and dangerous world is to maintain a greater nuclear power and strength than the Soviet Union. Strategic parity with the Soviet adversary is not good enough. The survival of our nation and our allies in freedom depends not on a parity of nuclear power but on a margin of advantage in nuclear power for the peace-keepers over the peace-upsetters.

Our aim is not, of course, an unlimited accumulation of nuclear weapons. Our policy should be to create and maintain a relationship of nuclear forces favorable to the deterrence of adventurism and aggression.

In this connection, I commend [Defense] Secretary [Clark] Clifford for going forward with the tests of the MIRV principle and for proceeding, without delay, in the deployment of the Sentinel ABM. Also, given the rapid buildup of Soviet offensive nuclear strength, this country must promptly provide for a new generation of ICBMs with a larger payload and for more advanced Poseidon-type nuclear submarines.

The Prospects for Arms Limitations

We have been told that if we concede nuclear parity to the Soviets, we will be in a better position to persuade the Soviet Union to limit or reduce their nuclear arms. I do not accept this notion. On the contrary, I believe the Soviets are less likely to engage in pro-

ductive arms-limitation talks if we let our margin of strategic advantage go by default. All of us should understand by now that the way to encourage a reasonable response from Moscow is to maintain strong positions, which make negotiated agreements more attractive to them than continued disagreements.

Quite obviously, the assault on Czechoslovakia has set back the prospects for top-level East-West discussions on the control and limitation of nuclear offensive and defensive forces. We will continue to hope for such discussions—at a proper time under appropriate circumstances.

If and when such arms talks materialize, however, we and our allies should be prepared to bargain toughly. The productive power of the Soviet economy is not nearly as great as that of the American economy. Any big expenditures on a new generation of nuclear weapons puts greater pressures on the Soviet economy than on ours and means greater sacrifices for the Russians than for us. In possible negotiations with the Soviets, we should not give up the idea of a margin of safety for the free world in nuclear power.

And in the aftermath of the Czech invasion, I hope that we will be more vigilant than ever in insisting upon adequate safeguards in any armaments agreements we may negotiate with Moscow. What we and our allies are after in any arms talks with the USSR is a system of limitation and control of armaments that will reduce existing risks in the world without introducing new ones. Obviously, we should avoid entrusting our security to any agreements with the Soviet Union that are not self-enforcing, or that cannot be effectively enforced at every stage.

Giving New Attention to Europe

The struggle in Vietnam is very important and clearly requires much of our national thought and effort. We want to end not just the bombing of the North; we want to end the war. We are trying to achieve a political settlement on honorable terms that would not increase the danger of a later, larger conflict in Asia. But it is high time that we in this country again gave the problems of Europe the close and sustained attention they deserve.

The North Atlantic area is still the most decisive region for the future of this nation. The strength and mutual confidence of the Atlantic allies are the . . . most important safeguards of peace with freedom in the Western world. It is of fundamental importance that this country meet its responsibilities in the Atlantic Alliance with the mature judgment that marks a great nation.

Given the lightning-like Czech invasion, it is now necessary to reexamine the assumption of Western defense planners that there would be early "political warning" of a Soviet conventional military move against NATO. The assumption of early warning—warning that would give us time to get our forces back to Germany—was behind the decision announced last year to redeploy 35,000 US NATO-assigned troops from Germany to the United States. Also, NATO's heavy reliance on mobilization arrangements has been justifi-

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—United Press International Photo

In Bratislava, a young Czech with his nation's flag on his shoulder stands defiantly before this Russian tank.



—United Press International Photo

In Prague, flag-bearing demonstrators, one with a crucifix, march to the funeral of a companion slain by the Russians.

fied on the ground that there would be ample political warning of attack.

Yet, in the Czech crisis, until the moment of assault, the political signals from Moscow were at best ambiguous. The Soviet leaders used Warsaw Pact maneuvers to conceal plans for the invasion. The discussions inside the Kremlin were secret and thoroughly guarded. The five-nation move on the morning of August 21 took almost everybody by surprise.

With the military balance in Central Europe now significantly changed to the disadvantage of the West, it makes no sense to talk about an early reduction in the ready combat capability of NATO forces in Europe. All NATO members should stop discussing cut-backs and redeployments and start preparing to carry, for as far ahead as one can see, their full share in the forward defense of Europe.

As a starter, the proposed reductions in force contributions by certain European governments and by Canada should be suspended and concrete steps should be taken by our NATO partners to strengthen and improve the readiness of their NATO-assigned forces.



—United Press International Photo

A Soviet soldier tries to repair his tank, which ran into trouble somewhere in Czechoslovakia during the takeover.

For our part, we should move promptly to bring American combat units in Europe up to full strength, return needed specialists and longer-experienced officers, and increase the scale and quality of US troop training and maneuvers in Europe.

Looking ahead, we can reasonably expect our European allies to share more of the common load in the defense of Europe. What is needed is a NATO program for the orderly and fair adjustment over a period of years of burden-sharing among all the Atlantic allies. This task is at the heart of effective force planning under the North Atlantic Council and its Defense Planning Committee. I believe it is time for a European initiative to get such a NATO program under way.

Using Our Resources Wisely

The occupation of Czechoslovakia may clear the air in another respect. We are often told to cut back key defense programs because they divert funds from urgent home-front tasks. Certainly, the attack on poverty and the drive to overcome the remaining barriers to full and equal participation in American life of all our citizens are urgent. I, for one, am no recent convert to this point of view. Over the years I have sponsored and fought for liberal legislation to improve the plight of the poor, to protect the health of all our people, and to open up educational opportunities to every American child. We should do many more things for justice and fairness at home. We will. But make no mistake about it: We won't be able to keep building a better America at home unless we also attend to our fundamental security requirements abroad.

A sound national policy, of course, rests on an understanding that the nation's resources are limited. Our capabilities must be committed with discrimination and prudence.

But unless Americans are prepared to accept the responsibilities of a great nation in the fateful and difficult years ahead, the problems can become worse and worse and the international crises finally unmanageable.

Winston Churchill said the right words to us: "The price of greatness is responsibility."—END

Of fourteen F-100 Supersabre squadrons flying close-support missions in South Vietnam, five are made up of Air National Guard personnel called to active duty in January. Any doubts the Seventh Air Force leaders might have harbored about their capability were soon dispelled when the units quickly matched or surpassed other F-100 squadrons in sortie rates, and earned more than their share of "top gun" honors. Now they're known as . . .

Those Gung Ho Guardsmen in Vietnam

By Lt. Col. W. D. McGlasson

HQ., D. C. NATIONAL GUARD



Like their Regular Air Force counterparts, former Air Guardsmen have plunged wholeheartedly into civic action programs in Vietnam. Here A1C Arthur D. Krull of Iowa's 174th Tactical Fighter Squadron, at left, a chiropractor in civilian life, helps treat a Vietnamese girl badly burned when her mother spilled a pot of boiling water. The scene is a dispensary operated by USAF medics near Phu Cat AB.

THE air war in Vietnam may lay to rest another of those myths that persist long after they have lost their validity.

It's the myth that part-time fighting men, like those in the Air National Guard, can't hope to acquire the skill and teamwork demanded by modern warfare.

Air Guardsmen taking part in tactical fighter operations in South Vietnam have thoroughly discredited that ancient myth, with a performance rivaling that of any of the Regulars.

In May and June of this year, four Air Guard squadrons deployed to South Vietnam, making the 12,000-mile flight in three days with eleven to thirteen air-to-air refuelings, and overnight stops in Hawaii and Guam. All but four of their eighty F-100s arrived on precise schedule; those four were delayed by mechanical problems but arrived a few days later.

Once on the scene, all four squadrons put their first combat flights into the air within three to five days, and revved up to full operational status within a week. They've been driving ahead full-bore ever since, matching and sometimes moving out ahead of USAF squadrons in their wings by such yardsticks as sortie rate, aircraft-in-commission rate, bomb-damage assessments, and abort rate.

In the 37th Tactical Fighter Wing at Phu Cat, "top gun" honors go each day to the pilot who flies the best mission. During one memorable nine-day period, pilots of Iowa's 174th Tactical Fighter Squadron won the honor seven times!

At the end of four months, the Iowans had amassed a record on a par with any squadron in the wing. They had flown 2,600 sorties and accounted for 1,050 bunkers or fortifications, twenty-one enemy bridges, twelve gun sites, more than 1,000 meters of trenches, a flock of sampans, and 320 enemy soldiers. Their bombs had set off 139 sustained fires and 100 secondary explosions.

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1st Lt. Michael J. Laskowski, of New York's 136th Tactical Fighter Squadron at Tuy Hoa, was the first former Air Guardsman to be rescued after ejecting when his Supersabre was hit by ground fire during an attack on VC positions in the A Shau valley. He was picked up within thirty minutes by a Jolly Green Giant crew. Three Air Guard pilots, including one from Lieutenant Laskowski's squadron, have been killed in combat.



Colorado's 120th Tactical Fighter Squadron had compiled an equally impressive record in the 35th Tactical Fighter Wing at Phan Rang. In three months of combat flying, they had logged exactly 2,000 sorties and had destroyed or damaged 2,011 enemy bunkers, 1,306 military structures, 2,745 meters of trenches, 279 fighting positions, 150 sampans, and a host of less-easily defined targets—like four-fifths of a VC pack train.

Comparable performances have been credited to the other two Air Force Squadrons: the 188th from New Mexico and the 136th from New York, both assigned to the 31st Tactical Fighter Wing at Tuy Hoa.

Air Force combat leaders have not been hesitant to give the Guardsmen full credit for their performance.

"They're a damned fine outfit, as good as any in the Air Force and better than many," said Col. Herndon F. Williams, commander of the Phan Rang wing, when asked for his appraisal of the Colorado flyers.

His deputy, Col. Leo A. Higgins, was more specific: "They're gung ho, they put their ordnance exactly where it's wanted, they don't whine or complain, they keep their aircraft in top-notch flying condition, and they maintain tight operational discipline, which is highly critical in a war like this one."

A former reporter and editor with the Copley Newspapers in his native California, Lt. Col. W. D. McGlasson is Executive Assistant for Public Relations in the National Guard Association of the US, after six years as Associate Editor of The National Guardsman magazine. In military status he is a training officer in the G-3 section at Hq., D. C. National Guard, and acting information officer for the DCNG.

Colonel Higgins concluded with a remark that is made repeatedly by senior Air Force officers in South Vietnam:

"They operate like professionals!"

Hardest of all to impress are forward air controllers, the FACs, who spend hours daily in lazy sweeps across VC country, vectoring in pilots from every squadron on Vietnam ground targets. And they, too, have kept a flow of commendations going to the Guard.

One letter, praising two of the New Mexico pilots for their aggressiveness and flying skill, is typical of many. The two "Taco" pilots—Taco is the radio call sign for the 188th—put all their ordnance precisely on a hard-to-reach cable support at a Viet Cong river crossing, wrote the FAC, even though their target was "exceptionally small and difficult to identify." Then, when Viet Cong machine-gunners opened up on the FAC's tiny, low-flying plane, the Taco pilots rolled in to strafe the enemy positions "with outstanding accuracy."

The FAC's closing words were as welcome to the Guard pilots as another Air Medal.

"It is most gratifying to work with pilots of the Taco caliber," he said. "Through their aggressiveness and professionalism, they dealt the enemy a solid blow."

This kind of praise from combat-experienced Regulars is welcome fare to the Guardsmen, and they're doing their best to earn it.

Maj. James W. Van Scyoc, one of the Tuy Hoa-based New Mexicans, explained the attitude of the Guardsmen better than most when he said:

"We want the Seventh Air Force to remember us as a bunch of pretty competent guys, who kept their airplanes flying, put their ordnance where the FAC wanted it, and got the job done like professionals."

In everything but their part-time status, it was



Two pilots of New Mexico's 188th Squadron at Tuy Hoa get weather briefing prior to combat mission. MSgt. Elbert R. Williams, left, briefs Maj. Vernon R. King, center, and 1st Lt. Allan W. Ness. Experience level of Guard pilots is well above USAF average. New Mexico squadron boasts fifteen pilots with more than a thousand hours in the F-100, and total time of some is in the 8,000- to 9,000-hour range.

pointed out by Guardsmen and Regulars alike, they are professionals. The commanders of all three wings containing Air Guard squadrons cited the experience levels of the Guardsmen—pilots and ground personnel alike—as a major reason for the skill they have demonstrated in actual combat.

A heavy proportion of the Guard pilots fly commercial airliners as civilians. Almost all of them have previous experience flying jets for the USAF. Both in total flying hours and in hours flying the F-100 they equal or exceed most Air Force Supersabre units.

In one of the squadrons, the 174th at Phu Cat, fourteen of the twenty-four pilots claimed more than 1,000 hours in the F-100 alone, and others were crowding the 1,000-hour mark. In New Mexico's 188th, fifteen pilots could claim that distinction, and all but six of the pilots had logged more than 1,000 total flying hours, some going as high as eight to nine thousand. The twenty-four New Mexico pilots averaged 2,475 total flying hours, 1,158 in F-100s and 1,439 in fighters, as of mid-August, and that's a record few units can match—USAF or Guard.

The 35th Wing, to which the Colorado squadron is assigned, has set up categories for its pilots. In Category I are those who have logged at least 1,000 total flying hours, 250 hours in the F-100, and fifty combat missions. Every pilot in the 120th far exceeded the standards for the first two items before he reached Vietnam. In a scant two months, they'd all met the third criterion and every pilot moved into the top rating. No other squadron in the wing could claim such a record.

New York's 136th was close behind the others, with nine pilots in the Supersabre Thousand-Hour Club.

Nor was long experience the exclusive attribute of the pilots.

"Where else but in these Guard outfits could you

find an *average* experience level among maintenance people of ten to twelve years, most of it on F-100s?" asked Capt. David N. Welch, a Regular who took over the maintenance officer's job in the 188th after it reached Vietnam.

Few active AF units can come anywhere near such a record, he said, because of their high turnover rate.

"In active units, you're lucky if your crew chiefs have a couple of years' experience on the F-100," he

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Maj. Thurman C. Dabbs, 188th Squadron flight surgeon, uses "Pied Piper" approach to attract Vietnamese children to clinic at village of La Hai, near Tuy Hoa, by amusing them with animal imitations. As laughter dispels their fears, he finds them more receptive to medical treatment.



Sgt. Lewis A. Wieder of Colorado's 120th Tactical Fighter Squadron, shown here loading shells for Supersabre's 20-mm cannon, was IBM technician in Denver before his recall.



A1C Nicholas DeFelice, left, and SSgt. Clayton C. Comlish, here unloading a 750-pound bomb, were called to active duty with 107th Tactical Fighter Group, Niagara Falls, N. Y., but were shifted with about 150 New York Guardsmen to Kwangju Air Base, Korea, to form nucleus of the 107th Combat Support Squadron. They are among some 800 former Air Guard officers and airmen who were detached from their home units to fill assignments elsewhere in PACAF.

said. "Here, I find almost every key man has eight to twelve years of working experience."

A fifth tactical fighter squadron in South Vietnam is virtually all-Guard in character, even though it shows on official records as USAF.

It's the 355th TFS at Phu Cat, which was deployed to Southeast Asia last January with an all-Regular membership. A few weeks after it reached the war zone, a transformation commenced. Air Force personnel on TDY were gradually replaced by Air Guardsmen from two other mobilized Air Guard organizations—the District of Columbia's 113th Tactical Fighter Wing and New Jersey's 108th Tactical Fighter Group, both stationed at Myrtle Beach.

By late August, seventeen of the twenty-four pilots and 145 of the 150 airmen in Phu Cat's 355th squadron were Guardsmen.

The Air Guard's contribution to Seventh Air Force is not limited to the four—or five—squadrons, however. Each of the original four took 350 to 385 officers and airmen to SEA, about 200 more than required for the squadrons themselves. Each individual in the 200-man overage had been selected by his Air Force specialty to fill Pacific Air Forces (PACAF) needs. As soon as they reached their Vietnam bases, men in the "surplus" category were pulled out of the squadrons and filtered into vacant slots in the support structures of the three wings.

Today, you'll find Air Guardsmen holding down responsible posts in virtually every section, every shop, at Phan Rang, Tuy Hoa, and Phu Cat. Seven-level master sergeants took over as NCOICs in electrical shops, parachute shops, phase maintenance, hydraulics shops, and elsewhere. Lesser-ranking Guardsmen filled jobs appropriate to their experience. Two Air Guard flight surgeons assumed command of base hospitals. A Guard officer became chief of maintenance control at Phu Cat.

The most notable feature of this process of transference, say both the Regulars and the ex-Guardsmen, is the ease with which it was accomplished and the complete lack of friction.

Cooperation, in fact, seems to have been a major feature of the entire shift of Air Guardsmen into Seventh Air Force.

"Everyone with whom we have dealt has been absolutely outstanding in welcoming us, and helping us get our feet on the ground," said Lt. Col. Fred Fink, Commander of the New Mexico squadron.

That the process of absorbing the Guardsmen into their parent wings went smoothly is attested to by those responsible.

"The 174th was integrated into the wing, the base, and the mission as quickly and effectively as any unit we've ever taken on," declared Lt. Col. Herschel D. Peel, Director of Personnel for the Phu Cat wing. Officers at the other bases expressed similar views.

Two Colorado sergeants earned a distinction they would just as soon have missed. They became the first Air Guardsmen to be wounded by enemy action. Viet Cong hurled a few mortar rounds into Phan Rang a few nights after the Guardsmen arrived, damaging four F-100s but injuring none of the men. Then, on June 23, they hit again.



Capt. Dudley L. "Beetle" Bailey of 120th Squadron, a United Air Lines pilot before his recall, logs his unit's 2,000th combat sortie, only ninety days after Colorado Guardsmen flew first mission in Vietnam. (All photos with this article, except that from Korea on page 50, are by the author.)

MSgt. Dale F. Price and TSgt. Frank E. Mullins were working on the flight line, with their respective maintenance and weapons crews, when the first round landed, shortly after midnight. Sergeant Price at first thought a truck had backfired. Then other rounds hit, and he dashed for his truck to drive it into one of the protective revetments. A shell burst only a few yards away, sending a shard of steel through his arm.

He drove the truck into the revetment, then made sure his fellow Guardsmen were under cover, before consenting to go to the dispensary for treatment. Twenty-one stitches were needed to close his wound. Early next morning, he was back on the job as usual.

Sergeant Mullins suffered a less serious injury. A piece of shrapnel tore through his jacket, leaving an ugly scratch along his ribs. After things had settled down, he took time to get the wound dressed, then he too went back to his post.

Other squadrons soon added other names to the list. Capt. Warren K. Brown, one of the Iowans, became the first Guardsman to die in action when his plane was downed by Viet Cong ground fire on July 14. Three days later, Lt. Col. Sherman Flanagan, a D. C. Air Guard volunteer flying with the hybrid 355th TFS, lost his life in a similar manner. Third to die was Capt. Joseph A. "Jake" L'Huillier, from the Niagara Falls unit, who ejected unsuccessfully after his F-100 was hit by ground fire near Chu Lai.

First Lt. Michael J. Laskowski, of the New York squadron, was one of the lucky ones. He was the first Guard pilot to eject successfully from his disabled plane after ground fire damaged his flight controls. He parachuted down through the multitiered canopy of jungle in territory controlled by the Viet Cong, and hid in the roots of a huge tree until a rescue helicopter reached the scene. He was yanked out of the jungle and on his way home within thirty minutes, courtesy of the Jolly Green Giants.

One cannot make a precise evaluation of the Air Guard's performance in Vietnam. Too many vital yardsticks are classified. Statements by Air Force leaders, such as those already quoted, make it plain, however, that the Guardsmen are carrying their full share of the close-support burden, and with commendable effectiveness. All three of the wing commanders under whom they serve use such terms as mature, experi-

enced, competent, and disciplined in referring to the Air Guardsmen in their organization. All three likewise emphasize the "professional" manner in which Guard personnel have approached their combat role.

The tactical fighter fleet in Seventh Air Force contains some fourteen squadrons of F-100s. With five of those squadrons manned by Guard pilots, backed up by Guard airmen, the Air Guard provides what one Seventh Air Force officer termed "a significant proportion" of the fighter cover for ground forces in South Vietnam. Flight records showed that pilots in the five squadrons were flying ninety to 100 sorties per day, seven days a week, and that, too, equals or surpasses any comparable array of units in SEA.

Col. Rufus Woody, Director of Current Operations at Seventh Air Force Headquarters, said Guard pilots were particularly effective in efforts to interdict the troublesome, VC-dominated A Shau valley, and in bitter fighting that swirled around several isolated posts along the Cambodian border several weeks ago.

"I wasn't at all surprised by the Air Guard's first-rate performance over here," he declared. "I flew with pilots from three of the squadrons when I was Director of Tactical Evaluation for the Twelfth Air Force, and no one had to tell me how professional they were."

Out of the 10,511 Air Guardsmen mobilized in January and May, more than 5,000 are serving overseas—2,000 in South Vietnam, more than 3,000 in Korea, and several hundred others were sent individually to some thirty other foreign bases in Thailand, Taiwan, Okinawa, Greenland, Libya, and the Philippines. The 354th Tactical Fighter Wing at Kunsan, Korea, is predominantly Air Guard, including its two F-100 tactical fighter squadrons—the 166th from Ohio and the 127th from Kansas. Still another unit, the 154th Tactical Reconnaissance Squadron from Arkansas, flying RF-101s, is stationed at Itazuke Air Base in Japan on a temporary tour.

The Air Guard mobilization early in 1968, in the wake of the USS *Pueblo* crisis, gave the Air Force 315 additional combat-ready aircraft and a still larger number of combat-qualified crews. Just as important, it put thousands of highly qualified specialists into key jobs at air bases throughout the world, to ease the burden on overextended Regulars.

Four significant points emerge from the Air Guard's outstanding performance in Vietnam, believe Air National Guard spokesmen in Washington. These are:

(1) Air Guard units, under their "COMBAT BEEF" readiness program, are combat-ready now and capable of carrying their share of the war load.

(2) They are demonstrably capable of rapid and effective integration into the Air Force team, and have won nothing but praise from Air Force senior officers for their morale, attitude, and professional ability in the war zone.

(3) The several thousand Air Guardsmen who have been assigned individually to jobs in Air Force support activities have proved that individual Guardsmen possess the competence, technical skill, and leadership ability to hold their own anywhere in the Air Force.

(4) Guard aircraft are maintained with such proficiency that the transition to active duty, and combat, poses no problems.—END

No previous war in history has been as thoroughly covered as the one in Vietnam. Since 1964, the US and South Vietnamese governments have formally accredited more than 2,000 journalists. But, as the man who has been the top US public affairs officer in Saigon suggests, the mass of words and pictures published by the news media has done more to confuse than to inform the American public. Here he presents the factors that he believes are contributing to . . .

The Cluttered View from SEA

By Barry Zorthian

US INFORMATION AGENCY

Barry Zorthian was born in Turkey of Armenian parents, has spent most of his life in the United States or working for its government in such places as India and Southeast Asia. He is a graduate of Yale, has a law degree from New York University, and is a member of the New York bar. Most recently, he has completed four and a half years as the chief US Embassy spokesman for our war effort in Saigon, where he has been both lauded and lamented by the couple of thousand journalists and professed journalists who have visited that war-torn capital. Last month, Mr. Zorthian made a speech to the National Press Club in which he reflected on his long and frequently frustrating experience in Vietnam. Because so many of our readers have a deep interest in the subject, AF/SD is printing the text of the speech as a necessary adjunct to our running coverage of the war. Despite some of the things he said, Mr. Zorthian received a standing ovation from his audience, which has a reputation as the toughest in Washington.

PERHAPS the most difficult task of communication we have faced as a society in the post-World War II era is that of communicating the complex, frustrating, and perplexing part of our national experience known as the war in Vietnam. I would like to examine the question of how well we, the press and the government, performed that task.

In many ways Vietnam was the supreme test of our abilities. That public opinion was a critical factor in the course of the war is stating the obvious. An analysis of the formation of that opinion would involve many ingredients, and we may have to wait for historians to measure the interplay of various factors from the perspective of time. But, at the least, the information reaching the public from Vietnam was a significant factor. And it is not too early for us to look at the record, to note the problems, and to seek solutions in order to apply any lessons that we may learn to the tasks of communication in the future.

Certainly in Vietnam we had the opportunity and the means to demonstrate our competence. The communications revolution of the past two decades has

given us the technical capability. In Vietnam, our government had unprecedented access to the media and the press had unprecedented freedom of movement and coverage. There remains the question of how well we met our responsibilities on the substance of the message.

I use the word "communication"—a somewhat inadequate term—to include the task of both the government and the press. For I am convinced that on issues of national affairs we have a joint and parallel responsibility for communication with the public: the government out of its obligation to inform the electorate; the press in its capacity as the watchdog of the government in behalf of the people. Almost by definition, the government and the press are natural adversaries; but if our relations must have conflict, they need not be hostile and at best should be founded on mutual respect. Our relationship would also be healthy and beneficial if we could engage in constructive dialogue on our problems—without self-righteousness, without recrimination, without undue sensitivity, all admirable qualities which too often have been absent in our exchange in the past.



Mr. Zorthian, in light suit, escorts Gen. Maxwell D. Taylor, former JCS Chairman and US Ambassador to Vietnam, on tour through the US Information Service library in Saigon.

These are lofty sentiments—perhaps they smack too much of theory and cannot exist in the world of reality. Nevertheless, I like to think that at least a start was made along this road in Vietnam. That the government and the press had differences is hardly news. And that there were periods of hostility between the two is not a startling revelation. But I would submit that eventually we eliminated most of the hostility—and while we still had very real differences in outlook, in evaluation, and in judgment, we also had dialogue: hours and hours of dialogue at many levels and in many settings. The substance of that dialogue was most often the war itself—its conduct and status.

Those discussions inevitably also turned to shop talk—to the question I posed earlier, to the performance of the government and the performance of the press. And out of the heat of those discussions came an awareness of the problems that faced us both.

Insofar as the government's performance is concerned, I hope you will forgive me the understatement of simply recording that the government was not usually treated gently in those exchanges. I suppose I am one of the few men alive who can claim the equivalent of a four-year college course in the infinite variations of the use of the word "deception." However, my purpose today is not to defend the government's performance or even to rehash it with you. Your evaluation of that has been thorough and blunt, as it should be—and, I might add, not without effect. For while I am not prepared to accept all your criticisms as having been justified, I would also concede that the government profited from the exchange and sought to make adjustments in response to your criticisms. The results were not always completely to your satisfaction although some correspondents on occasion would confide that we were doing all right—after checking to make sure that they were out of earshot of their colleagues.

Let us agree today that the performance of the government must be improved and that we need to develop more effective means of communicating with the

electorate as well as with the people of other nations.

Let us turn to the other half of the problem. The Vietnamese say, "The tongue has no bones. It can be twisted in any direction." What was the direction of the press? In seeking to respond, I make no claims to definitive judgment or that my particular presentation represents the views of your colleagues in the field—though I would note that the more thoughtful ones were as relentless in probing the problems of the press as those of the government.

The difficulty in giving an unequivocal answer to the question I have posed is the same consideration that applied to almost everything else in Vietnam. There were very few blacks or whites. There were instead shadings of gray, and a judgment as to the particular degree of gray depended on the outlook of the individual—and that in turn on his vantage point, his experience, his preconceptions. Judgments by me may be affected by the nature of my work in Vietnam and, recognizing this, let me resort to my claim of friend and associate and attempt only to identify areas that at least deserve analysis for any comprehensive evaluation of the performance of the press in Vietnam.

The first major point to make in this attempt is that generalization about the press in Vietnam was as treacherous as generalization about virtually every other aspect of the situation. There was always an exception, a "yes, but." During most of the past few years, there were anywhere from one hundred to three hundred working journalists on hand [in Vietnam] at any given time, together with supporting cameramen, technicians, and assistants. [This was in contrast to] my first daily briefing in my office in September of 1964, the start of that institution that eventually came to be known widely as the "Five O'clock Follies," [which] catered to fewer than fifteen correspondents.

Over the years, about two thousand different individuals were accredited and, including second and third and fourth visits by many of these, about four thousand accreditations were registered. These correspondents covered the full spectrum of competence—from many of the best journalists available, to those for whom the label was only a thin camouflage for partisan evaluation, to the inevitable adventurers who had somehow obtained the necessary letter of endorsement. To lump all these into a single group labeled the "press" is obviously unwarranted and misleading, and my observations today refer only to legitimate correspondents—not those whom I would describe as "nonjournalists."

The second major point is that any evaluation of the press in Vietnam must recognize and pay tribute to that part of the record that was in keeping with the best traditions of a free press. The score of journalists who gave their lives in Vietnam attests to the degree of raw personal courage displayed by many of your colleagues. The professional recognition you have given the work of many reflects the high degree of their competence and integrity.

Let there be no doubt that, whatever the discomfort on occasion for officials, the press in Vietnam played its historic and proper role: the zealous judge of the government's performance, the independent interpreter

(Continued on following page)

of events. It did so under trying circumstances in which every facet of professional skill was necessary. The general assignment reporter in Vietnam had to be a journalist for all seasons—a combat reporter, a political analyst, a sociologist, an economist, an investigator. He faced the most complicated of assignments—the reporting of a so-called people's war that was alien to all previous American experience. And the response by many of your colleagues to this challenge was distinguished.

The third major point is that the record revealed problems and raised questions that grew out of the situation itself and the nature of our system of journalism as it is practiced today.

Perhaps the most complex of these problems was the question of qualification of correspondents for this new form of war—an insurgency war with its compound of military, political, social, and psychological elements. There [was] a significant number of highly qualified journalists in Vietnam—men who have been covering Asia for years; men who had sufficient professional experience to perform competently in any situation; men who prepared conscientiously for the task. But there were also many whose qualifications at best were doubtful.

Qualification is not a matter of age or even of desire. It is a question of outlook, experience, knowledge, perspective. And the war in Vietnam required, more than most, a knowledge of the history, culture, politics, and circumstances of the people. There is a cultural adjustment involved in going overseas for the first time, particularly to Asia. There is a personal shock effect in coming face to face with war for the first time. These can affect the nature and tone of reporting—and the only way to reduce their impact at all is to prepare in advance.

Perhaps few reporters would have responded as one did to my question as to whether he had read a single book about Vietnam before his assignment with the answer: "No, I didn't want to clutter up my mind." Or one who interrupted a military briefing to ask "What is a battalion?" If these cases are not representative, are they essentially different from asking, as editors did so often, for a definitive interpretation on the first or second day after arrival in Vietnam from a correspondent who has been plucked out of a domestic assignment with little warning and plunked down in Vietnam twenty-six hours later?

The problem was not unique to the press. The government faced the same question but, though we did not solve it completely, literally thousands of officers, both civilian and military, received training in Vietnamese history, culture, and language for periods ranging from a few weeks to a full year before taking up their assignments.

Corollary to this problem of qualification was the problem of turnover. Again, there were notable exceptions and the problem existed for the government as well, but it seemed to be particularly severe in the case of the press. Correspondents are not born with experience, and a period of training and acclimation is to be expected—and was unavoidable in the case of Vietnam in view of the shortage of Vietnam specialists when the war began. Furthermore, war coverage is a

young man's game, though I might note that a number of veterans of World War II covered Vietnam with considerable distinction. But granting all this, does it make sense to transfer a correspondent quite so often after he finally gets that experience? I have admiration and respect for those correspondents who have stayed with it through these many long years, but they are a relatively small group. Six-month tours for "resident" correspondents and one- and two-week tours for transients were hardly exceptional. Just the number of accreditations alone indicates some measure of the extent of the problem.

You would find it hard to believe the number of times we received cables that I finally concluded were a standard form provided by Western Union. The text would read: ARRIVING SAIGON THURSDAY MORNING PAN AM FLIGHT ONE. PLEASE MEET AND ARRANGE APPOINTMENTS WITH BUNKER, WESTMORELAND, KOMER, THIEU, AND KY. ALSO REPRESENTATIVE VIETNAMESE. REQUEST TRAVEL DA NANG FOR INTERVIEW WALT, PLEIKU FOR QUICK REVIEW MONTAGNARD SITUATION AND DELTA WHERE HOPE TO SEE VANN. ALSO INTERESTED MEETING WITH GEN. THANG AND MAJOR BE IF TIME PERMITS. KEEP SUNDAY CLEAR SINCE I MUST FILE BEFORE DEPARTURE EARLY AFTERNOON THAT DAY. And you know, sometimes they did it all. Vietnam must seem like something viewed through the window of a fast-moving train to these instant experts.

I am not troubled by the question of whether qualification or length of service in Vietnam resulted in criticism or support of the war; I am troubled by the question of the validity of the reporting when these are not present.

Another related problem was the one of sources. Few American correspondents knew Vietnamese; not too many knew French; and yet many of the most worthwhile sources in Vietnam were comfortable only in those languages. What limitations did this lack of language place on a correspondent in obtaining and evaluating sources? How much did he depend on other correspondents rather than undertake independent inquiry? How much was he a captive of his Vietnamese assistant or interpreter—and what were *his* sources, qualifications, and prejudices? What motivated the Vietnamese who sought out the journalist with information and interpretation? How much did the established Vietnamese source now respond out of habit with outdated comment on the general situation because he had come to believe the correspondents wanted to hear it that way? Certainly, the official American position should be questioned carefully, and providing public exposure for the dissenter is an honorable tradition in journalism, but what were the motives and qualifications of the critic in the official structure? These are questions that must be faced and answered by a competent journalist in any involved story, particularly overseas. In Vietnam, the problems were more complex and the judgments harder to make.

Standards and definitions were also a source of difficulty. What yardsticks were used to measure Vietnamese society? Western concepts and standards? Or measurements that were relevant and realistic in an Asian country in the midst of war and transition from

(Continued on page 57)



To know where the needle is...

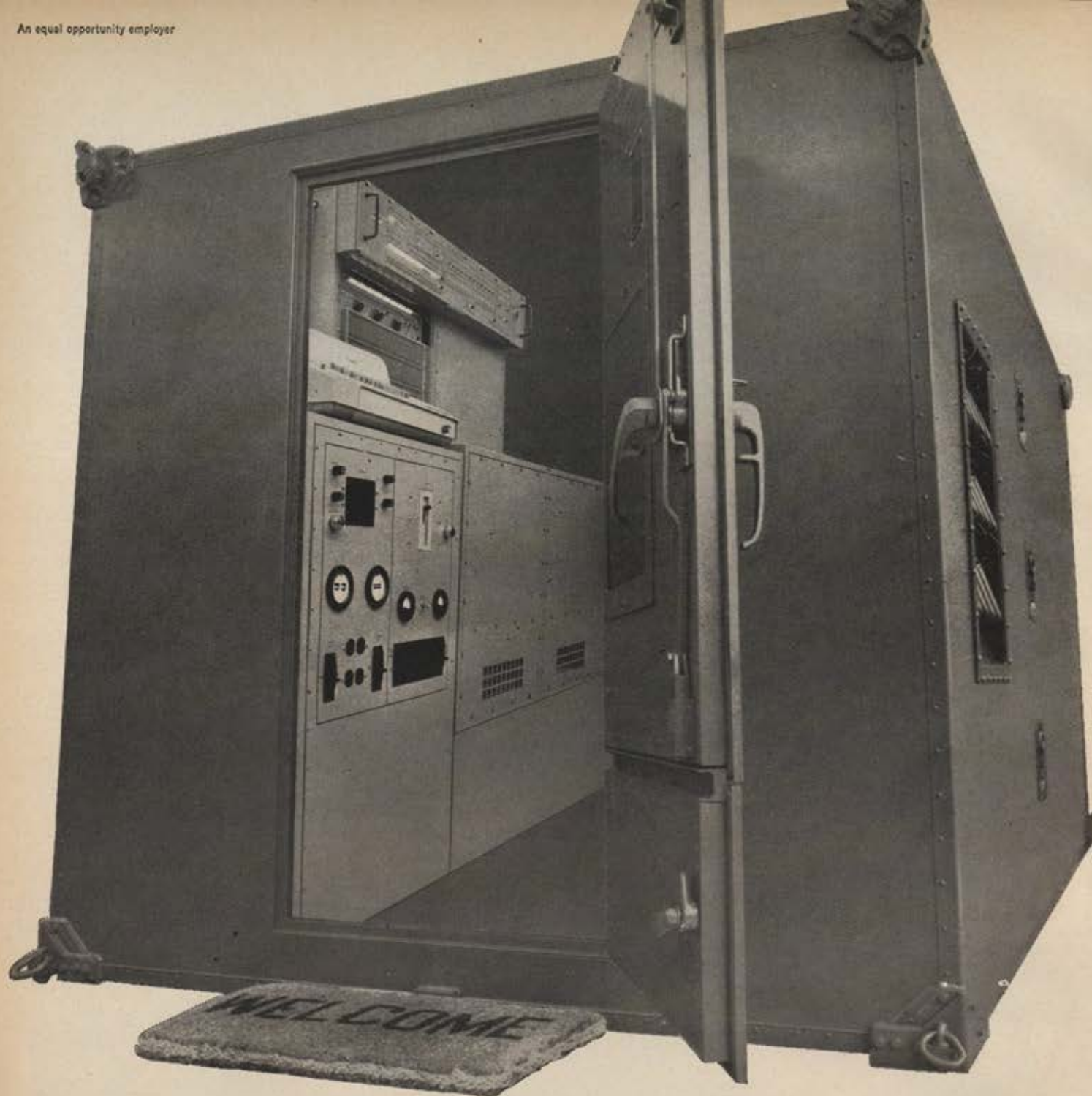
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a traditional society to a modern state? Even if we needed reference to our own standards to make coverage meaningful to an American audience, were we applying these standards as they exist in fact or as they are stated in textbooks? Why should we measure the Vietnamese elections of a year ago against standards more demanding than [those of] "any election held in the United States"? We've been at it almost two hundred years; they, just a handful.

How were we to measure the war itself—this most complicated of all wars, where the people rather than territory was the objective? The use of statistics had severe shortcomings, but was there a better yardstick, or were we to depend on the divining rod of each individual? How valid in Vietnam was the normal practice of generalization based on the particular, of measuring the thousand by examining the few? And how did you evaluate the attitude of people in a country where sophisticated research techniques were limited at best and most interviews were suspect because the person being questioned assumed the inquiry was sponsored by the government and responded accordingly? I suppose the extreme example in this context was one correspondent who loudly proclaimed within twenty-four hours after his arrival in Saigon: "Hell, I know what the Vietnamese think! As a matter of fact, I talked to two of them today." Not quite. Not even when interviewed by both Gallup and Harris.

I don't think we ever agreed on definitions of relative words in Vietnam. Perhaps it was not possible to do so—and expect the audience to have the same definition as well. But certainly the meaning of relative words represented a problem area. What was the meaning of progress in this unconventional war? What did the government mean and what did the press mean when it used the term? What was victory and corruption and democracy and stability and military capability—in Asia and in a war of this nature? Were we talking about the same benchmarks or were we talking across each other?

Consider the problem of fairness—not objectivity, because that word is in journalistic disfavor today. Accepting the new standard, there was still a question of definition. Fairness as determined by whom and in terms of what attitude? What was the fine line between reporting and advocacy—and had the line shifted? Was it "fair" to send a confirmed pacifist to cover a war—and not inform the reader of his viewpoint? And how often in a situation where apparent proof of almost any interpretation was available, did the correspondent—or his editor—simply seek confirmation of preconceptions or protection of prior judgments? What was the price paid in terms of fairness by the Vietnamese government for its lack of experience and its shortage of facilities and qualified personnel in dealing with several hundred correspondents, representing twenty or thirty nations, while not a single correspondent from any country—including the Communist states—had unrestricted access to the other side during the entire war?

And finally, the institutional characteristics of modern journalism. What were the results of competitive pressure on correspondents? Did the rocket from the home office lead to more emphasis on the eye-catching,

dramatic version that would outdo the competition than on the niceties of complete accuracy? I am aware of the essential nature of journalism, but I am also mindful of Heywood Broun's admonition that "there is no deadline for truth." Did the presence of so many lead the individual to try to justify his presence to his editor and audience by overreaching for the story that would distinguish him from his colleagues? How often was a story kept alive beyond its intrinsic value in order to satisfy the demand for more copy?

What was the effect of the volume of coverage of the war? That it was enormous is unchallenged. But did this volume contribute to clarity and comprehension for the reader, or to confusion? How much of it was he able to absorb, or did he ultimately just become dazed? The test is not the weight of the product but its value.

Have we learned to handle television—or better phrased, has television learned to handle war and particularly this type of war? There is no question about the impact of the medium. But what was the cost in comprehension for the audience when the medium brought combat in vivid color into the family living room every day, but because of its nature was unable to provide the same drama for the intangible or the humdrum that may have been more meaningful in the long run?

These are troublesome problems. Many are common to complex stories anywhere, but some are unique to Vietnam and all were intensified there. I present them in some detail because I think that for you, as for the government, the problems demand more attention than the successes.

They do not constitute an indictment of the press nor does the posing of them necessarily imply conclusions that are critical. They do, however, represent areas that deserve frank recognition and searching examination for the lessons they contain and the guideposts they can provide for the future.

Certainly, I present no sweeping conclusions or easy solutions, though I suggest that some of the established practices of the press may be dated. In the world of today a story as complex as Vietnam may require the development of new techniques and new self-discipline, if only to reduce the scope of the problems. I also recognize that there are no magic formulas to some of these problems and that in the final analysis the answer will have to be what it has been historically—reliance on the judgment of a competent professional journalist. The real challenge then becomes the training of sufficient journalists—and editors—to satisfy the requirements of the press in this age of instant communication.

Whatever the answers, one thing is clear. Friends and associates can only pose problems. The solutions can come only from you, your editors, and your publishers. I have not forgotten the advice I accepted earlier; it is not the business of government to tell the press how to run itself, but I suggest that it is the urgent business of the press to turn its well-developed powers of analysis on itself.

For what is involved is not only the standards of your profession but, in the long run, the confidence of your readers and listeners.—END

The six-year-old moratorium on major air-breathing engine research and development has created a situation in which the US has a great deal of catching up to do. Some of the contractual techniques currently used by the Department of Defense can be seen as inhibiting the aerospace industry from taking even reasonable risk in cases of weapon systems designs covered by rigid performance guarantees. These and other problems are taken up in this exclusive interview with one of the world's most eminent propulsion experts, the head of General Electric's Aircraft Engine Group . . .

Gerhard Neumann on US Engine Technology—

WHERE WE STAND

WHAT THE FUTURE HOLDS

By Edgar E. Ulsamer

ASSOCIATE EDITOR, AIR FORCE/SPACE DIGEST

THE postponement of essential research and development during the past several years has "mortgaged" the nation's technological future. This is the view of one of the nation's top propulsion experts, and the man who directed the design and construction of many of the world's most advanced aircraft engines, including the powerplants of the XB-70, the C-5 Galaxy, and the American SST.

Gerhard Neumann, General Electric Co. Vice President and head of its Aircraft Engine Group, also sees hazards in current Department of Defense contracting policies. These, he believes, keep industry from taking "reasonable risks" because they impose implacable performance guarantees.

Mr. Neumann notes that the Soviets seemingly don't operate under such constraints. "They are pushing as hard as they can, they don't have our budget worries, and they have the brains to do the job," Mr. Neumann says. He adds that the United States, on the other hand, "spends only very, very small amounts of money" on engine research.

Mr. Neumann blames the parsimonious funding on the overriding immediate requirements of the Vietnam War, and he urges that the lost ground be regained just as soon as the nation's priorities permit it.

The GE executive is emphatic in his contention that as a nation "we are not moving nearly as fast as we should." He urges that immediate and greater emphasis be placed on developing more energetically the state of the art, especially for military aircraft. "A great deal more should be done, including more parallel

designs of advanced-technology engines," he points out.

Mr. Neumann cites as an example of present R&D shortcomings the present plans for the Air Force's next-generation fighter, the FX. He believes the FX's speed requirements are being stated too conservatively. Quoting Lockheed's Vice President for Advanced Development Projects, C. L. "Kelly" Johnson, that it would be ridiculous if the United States didn't develop any military aircraft able to chase a commercial SST to identify it, Mr. Neumann wonders "if the Russians wouldn't be delighted to hear that our latest fighter is going to be slower than the SST."

On the matter of current government contracting policies, which he believes handcuff industry to the safest, low-risk approach with minimal advances in the state of the art, Mr. Neumann does not recommend a total return to CPFF (Cost Plus Fixed Fee) contracting. But he does warn that these days any company that pumps reasonable—but as yet not completely verified—state-of-the-art advances into weapon systems for the Department of Defense "stands to lose its shirt and wind up in ruin" if the performance guarantee is not met. This is all the more true, he says, for the "package" concept approach now coming into vogue. Mr. Neumann points out, though, that his criticism of these contracting practices is confined to weapon systems that have a high technological content and are designed for missions that call for state-of-the-art advances.

To overcome what he calls the "penalty of the systems responsibility trend," the GE planner urges specific demonstration and prototype programs. But, while

POWERPLANTS—THE PACING FACTOR

The powerplant has, since the days of Orville and Wilbur Wright, been the pacing factor in aircraft design. In today's era of superjets, SSTs, FXs, and AMSAs, the dependence on engine advances preceding any over-all system advance is nearly total.

On an individual basis, the man most identified with advances in the state of the art so far as air-breathing engines are concerned is Gerhard Neumann, the head of the General Electric Company's Aircraft Engine Group. His revolutionary design approach to variable stators in GE's J79, power source of the B-58, F-104, and F-4, earned him a Collier Trophy in 1958.

His "run—don't walk" drive has resulted in his company's winning and successfully developing some of the most ambitious and prized engine contracts—the powerplants for the C-5, the XB-70, the SST, and the DC-10 superjet.

The brilliant, German-born engineering manager, whose colorful career reaches from aircraft mechanic in Claire Chennault's Flying Tigers and air intelligence officer of the World War II Office of Strategic Services to chief executive of one of the world's two largest propulsion companies, only rarely grants interviews. Consequently, AF/SD is especially proud to present this exclusive interview



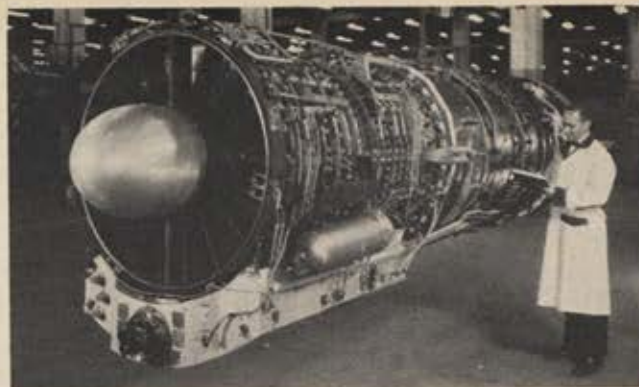
he stresses the virtues of demonstration programs for advanced-technology systems such as aircraft engines, he warns that "in an emergency this [approach] can set you back timewise quite a bit."

Two- to Three-Year Cycle

From demonstration to component design and test and final assembly of the complete engine takes two to three years. While the demonstration concept gives the builder greater assurance and, therefore, can shorten the design and production cycle, it has often floundered in the past because there was no application waiting for the system, Mr. Neumann says.

In an era of R&D austerity, Mr. Neumann strongly advocates a "lot more" work and involvement in advanced-engine research by NASA. NASA's Acting Administrator, Dr. Thomas O. Paine, is currently exploring specific propulsion areas that warrant more intensive NASA efforts, Mr. Neumann says.

While lamenting the presently insufficient engine research effort by the United States, the GE executive is optimistic about long-term prospects. "The ideas are there; the capable people in government are there; the only thing that's missing is money," he says.



General Electric's J93, powerplant of the six-engine Mach 3 XB-70, was one of the world's first advanced-technology engines, employing new materials and high inlet turbine temperatures for a thrust output of some 30,000 pounds.

He bases his optimism also on the fact that current studies show a vast potential for further progress across the board in propulsion design.

Although an advocate of applying technology gradually, Mr. Neumann recommends that the next generation of advanced-technology engines incorporate substantial increases in operating temperature as well as employing advanced concepts in cooling. Further, he believes, they should use techniques that permit fuel to be introduced in a "mist or vapor form" in place of the present droplet technique. "Droplets burn only slowly on the outside and therefore require more and longer engine stages. An efficient vapor fuel system would constitute a quantum jump, and so would hydrogen cooling," he says.

"Big progress is being made to improve the [present] combustion system, which shoots fuel in under pressure to break up the droplets by substituting combined air/fuel nozzles in place of solid fuel nozzles," Mr. Neumann says. This fuel mist would permit shorter combustors, and thus shorten engine length. While test engines using this approach and other advanced techniques have demonstrated the feasibility of sharply cutting down the length of the combustion section, their reliability, operating characteristics, and life expectancy are generally as yet not adequately demonstrated, according to the GE planner.

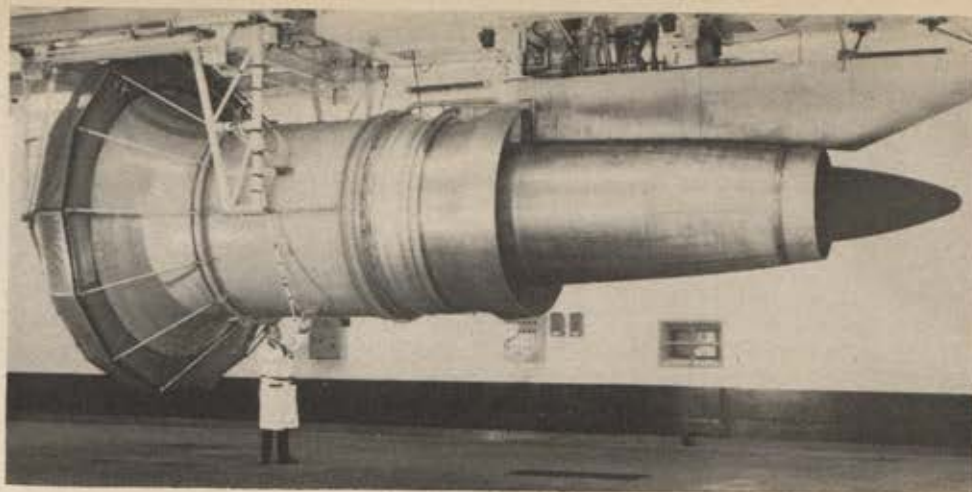
Mr. Neumann says it is relatively simple to design and operate a "clean new compressor of an advanced type with fewer stages [than at present], with a workable stall or surge margin." But the challenge is to build in enough of a stall margin to operate the engines over several years of service, "after the edges [of the blades and stators] are corroded and frizzed and foreign object damage has set in."

Another major challenge to engine designers, Mr. Neumann points out, is development of reliable supersonic compressors. "The compressor's function is to impart energy into the air, and, obviously, if the compressor blades rotate at supersonic speed, one can do a better job. We at General Electric, and I believe other companies, are running supersonic compressor stages and have established their enormous energy potential. Unfortunately, the efficiency of this design over a wide operating range is not yet what it should be. I, therefore, don't think that we are ready to in-

(Continued on following page)

First of the subsonic, high-bypass-ratio engines is GE's TF39, which powers the C-5

Galaxy and which, as a production engine, was accepted by the Air Force on October 6, 1968. It produces 41,000 pounds of thrust. Two dozen YTF39 prototype engines were used for the C-5 test program and performed flawlessly.



corporate the supersonic compressor into the next generation of engines."

One area of engine technology that lags behind its inherently vast potential, according to Mr. Neumann, is the so-called "flexcycle." This is an engine that can be optimized at will for either subsonic or supersonic operation. "This is the ideal engine for supersonic aircraft that also require subsonic missions, and I am a complete believer" in the concept, Mr. Neumann says. He would like to see much greater effort to develop this design than is under way now.

New fuels need more effort, too, in Mr. Neumann's opinion. He would like to see more work on exotic fuels like methane (thirteen percent greater energy content and 700 percent better heat-sink characteristics than JP4 and JP5) and liquid hydrogen, as well as a thrust toward truly cheap fuels of the Bunker C type that could sharply cut operating costs for military transports and commercial aircraft.

New Ground Rules Ahead

Future aircraft and propulsion system designers, in Mr. Neumann's view, are going to have to operate under ground rules substantially different from today's. Integration of engine and airframe, for subsonic and especially for supersonic aircraft, has emerged as a technological requisite. This applies not only to ducts and exhausts but to the engine shape itself. It means that almost from the outset of a given design the airframe and engine manufacturers must submit design models that can be tested out by both the airframe and engine people.

Two related areas that hold additional promise are the increase of bypass ratio for subsonic aircraft coupled to requisite, matched increases in operating temperatures. Here, Mr. Neumann feels that the eight-to-one ratio of the TF39 is far from being the end of the line. Ratios of twelve to one, and possibly up to twenty to one under certain conditions, might prove practical, he thinks. He is less optimistic about the wisdom of designing ultralarge engines, with triple or more the power output of the C-5's and 747's powerplants. Such gigantism involves exorbitantly high development costs and multiplies maintenance problems.

Rather than tie up a fortune in the development of gargantuan powerplants, Mr. Neumann suggests that

it might be more economical to think about using more than four engines, thereby increasing the reliability of the next generation of superjets.

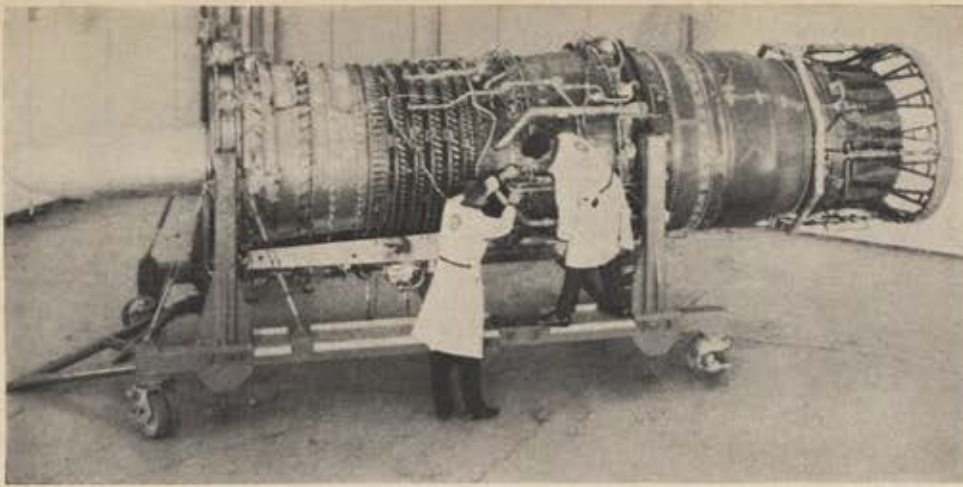
GE's Present Generation of Engines

Reverting back to technology in hand and under application, Mr. Neumann says that the widely reported "failure" of the TF39 test engine in August 1968 turned out to be no more than an external skin failure. The cause was diagnosed quickly and corrected so that the engine was back in test operation a few days later. "We have accumulated more than 9,000 test hours and things have been going better than we ever expected," he reports. (Lockheed-Georgia Co. Vice President and C-5 Program Director Lee Poore has said that during the preliminary flight-test phase of the C-5, involving almost twenty-five hours of air time, the engines, which were cycled completely and restarted in flight, "performed flawlessly.")

Equally satisfactory, Mr. Neumann says, is the performance of the GE4, powerplant of the US SST. He says this "is truly the ideal engine in this time frame" for the currently favored fixed-wing design that Boeing plans to propose to the FAA. But he adds that it appears possible and beneficial to produce lighter and more powerful SST engines for later application. GE has been successful, he reports, in the development of the company's third major engine project—the CF6—power source of the DC-10 superjet, where an extensive integration effort involving airframe, nacelle, and engine is currently in progress and has "achieved an unprecedented degree of coordination that can't help but benefit the program."

As for the use of advanced composite materials in the rotating parts of commercial engines, Mr. Neumann urges a go-slow policy because of a number of as-yet-unresolved problems. (A similar stance is being taken by GE's principal competitor, Pratt & Whitney, whose spokesman termed advanced composites "brilliantly promising but not quite ready for operational service from our point of view." Rolls-Royce, by way of contrast, is using so-called "hyfil" plastic blades in its RB.211 engine, the propulsion plant of the Lockheed L-1011, but will maintain the capability to furnish titanium blades if necessary.)

Mr. Neumann stresses that advanced composites



The GE4 turbojet engine, which will power the US SST, is by far the most powerful aircraft engine in existence. During recent prototype testing the engine exceeded its design thrust of 63,200 pounds by a substantial margin. GE believes that engine growth to about 75,000 pounds of thrust can be attained.

have been under test "ever since we used such blades in the [General Electric] J47 engine in 1947. We keep pursuing this area aggressively because the composites have many excellent characteristics and they are cheaper. I believe that GE uses more composites for the nonrotating parts of our advanced-technology engines than any other manufacturer. But [as rotating parts] they also have many characteristics that have yet to be demonstrated to be reliable in service."

Among the negatives, he lists rain erosion, dust erosion, and hail and other foreign-object damage over the thousands of hours that an operational engine requires. Mr. Neumann further believes that at this time the "repairability of composite blades is questionable." He says that "we have serious doubts whether it will be possible to refile and rework a composite in the same way and to the same degree that is being done with titanium and other metallic blades." The cost advantage of a composite blade might be dissipated if it should prove necessary to replace it more frequently than "a hollow diffusion-bonded titanium blade of roughly equal weight but with greater lifespan," he suggests.

Commercial Aviation Challenges

Noise is hurting both aviation's image and its economics. While he is optimistic about moderate gains in sound suppression in future generations of engines, he believes that the solution will have to be a combination of factors, including relocation of airports and "deflection of noise away from the people." He says the noise restriction rules currently proposed by the Federal Aviation Administration "are too stringent for the time period" they are meant for, and that these proposed rules could well "handicap the safety and economy" of the coming generation of commercial aircraft. Nevertheless, he says, "we believe that the CF6 engine will be unmatched in terms of sound suppression, a quality which the engine will retain throughout its lifespan."

Mr. Neumann points out that aircraft noise is a factor "for just a few minutes of each flight. There must be some ingenious way of not compromising the aircraft too much throughout its flight envelope for the sake of this short, critical period."

On the matter of easing the air system saturation

by means of aircraft with STOL or VTOL capabilities (GE is building the engines of the McDonnell Douglas 210E STOL aircraft, which Eastern Airlines is considering for its East Coast shuttle between New York and Boston; of the de Havilland Buffalo; of the Lockheed AH-56A; and of the Ryan XV-5A fan-in-wing aircraft), Mr. Neumann foresees an orderly evolution beginning with STOL aircraft, eventually adding vertical capability.

For the moment, he indicates, the engine technology to produce efficient and economically viable STOL aircraft with a capacity of about 150 passengers as the airlines want "is well in hand." Once the STOL technology is proved out in actual service "we can step up to VTOL in the generation following, but going V/STOL in the first round would be too much of a jump," he says.

Sophisticated monitoring approaches is another area in commercial aviation efficiency where engine technology can make further contributions to the economics of engine maintenance and help prevent failure, Mr. Neumann believes. (According to airline statistics, every dollar invested in advancing engine-monitoring techniques has paid off \$5 in maintenance cost cuts.) Work on "diagnostic instrumentation," Mr. Neumann notes, is helping to forestall failure by establishing the remaining life of engine components. The principal means used in new monitoring systems, he says, are sound monitoring, tape comparison, life samples, and radiation probes.

This area is being pursued "aggressively and with much progress" by GE, according to Mr. Neumann.

Progress and the aggressive exploitation of the technological potential emerge as the recurring themes in a conversation with Mr. Neumann. They reflect the restless dynamics that guide him and his GE team. And on them revolve the qualifications for doing the best job for the taxpayer, "beyond mere price," which, in his view, are the contractor's dedication to do the job for the military, the contractor's present performance in the field, the contractor's capacity to do a given job, and his record of living up to all the contractual obligations.

On all counts, Mr. Neumann and GE's Aircraft Engine Group stand ready to back up the future technological requirements of his adopted country "aggressively and with much progress."—END

Those Jolly Red Giants

Among foreigners, at least, the top Soviet aircraft designers have exhibited a broad sense of humor and a penchant for needling one another, as well as their foreign colleagues. But how good are men like Dementiev, Mikoyan, Yakovlev? Have they initiated new concepts, or are they simply copying from the West? Are they old-fashioned in preferring to choose from promising designs by building and testing prototypes, rather than by sophisticated paper analyses? Here are some insights into the personalities and operating techniques of . . .

The Men Behind Soviet Aircraft Design

By J. S. Butz, Jr.

TECHNICAL EDITOR, AIR FORCE/SPACE DIGEST

TO THE Westerner, few Russian mysteries are deeper than that surrounding the technical leaders of Soviet aviation, those key designers who create the civil and military airplanes of the USSR.

Nothing in the literature gives a clue to the personalities of these men. Nothing describes their day-to-day routine, the atmosphere in their offices, their management methods, their degree of entanglement in bureaucratic red tape, or the amount of personal and professional freedom they enjoy. Even though most of the key designers have been active for more than a quarter century, the full extent of their technical achievements is not understood in the United States. There simply isn't enough accurate information available to judge if these Russians are truly outstanding technical innovators, or whether they are simply skillful copiers of Western techniques.

Sadly, most of the literature that is available is unpalatable to Westerners. Soviet leaders persistently cling to their own version of history, and do not accept basic facts as they are recorded by the rest of the world.

Even today, booklets commemorating 1968 as the fiftieth anniversary of civil aviation in Russia claim that A. Mozhaisky built the first heavier-than-air flying machine and that I. Golubev flew it in 1882, some twenty-one years before the Wright brothers' first flight. The scientists N. Zuhkovsky and S. Chaplygin are credited by the Russians with most of the gas-dynamics originality for which the rest of the world honors Prandtl and von Kármán. And on it goes, through a complete history of the creative and inspi-

rational geniuses who have transformed human existence through sixty years of aviation development. But, according to their version of history, Russians did it all, guided by the "history-making decisions of the Communist Party."

A somewhat more realistic picture comes out of Soviet technical journals and from internal publications of the military services and Aeroflot (the organization responsible for all civil aviation in the USSR). These publications usually report on technology and do not make a sustained pitch for the Communist version of history, but neither do they illuminate the working life of key Russian designers, the atmosphere at the top in the Soviet aircraft industry, or the efficiency of its leadership.

In view of this paucity of sensible printed information, it is somewhat surprising to learn that a number of responsible persons in the Western aviation community believe they have an intimate understanding of the forces at work in the creative center of Soviet aviation. These persons have come by their ideas through personal contact, and a substantial number of formal and informal meetings have taken place during the last fifteen years between members of the US aviation community and the top echelons of the Soviet aircraft industry. It is a sad commentary on our times, however, that many of these contacts have gone unreported in the press, and many Westerners who took part have been reluctant to acknowledge their roles, much less to pass along their impressions.

The following estimate of the actual situation in Soviet aviation design bureaus was made primarily by men who took part in 1958 talks in Canada between



Petra V. Dementiev, Aviation Minister of the USSR, chief of all aircraft development and production in the Soviet Union since the mid-1940s, is shown above (third from right) with four of his "Chief Designers" during a tour of Canada in 1958. The group (from left to right) is: G. P. Svishekev (electromechanical systems); Lloyd Young of Ontario Hydro; A. I. Mikoyan (fighters); Gail Snyder, Ontario Hydro guide; Dementiev; N. D. Kuznetsov (engines); and A. A. Kolosov (electromechanical systems). During their visit to Canada the Russian group was entertained at luncheon by top engineers and executives from Avro and Orenda, who were developing the Arrow fighter and Iroquois turbojet engines, both of which were highly advanced. The luncheon meeting developed into a congenial and frank discussion about management and technical problems. The Canadians came away with the impression the Soviets were abreast of Western technology in most areas.

engineers and executives of Avro and Orenda, and a delegation of top Russian designers and their boss, Petra V. Dementiev, Aviation Minister of the USSR. This estimate was reinforced by men who accompanied a Russian group led by A. N. Tupolev on its 1959 US tour, which included the Douglas facilities at Long Beach, Calif., and it was corroborated by men who hosted another Russian group headed by Mr. Dementiev during his 1964 visit to Hawker Siddeley Aviation in Great Britain.

Further reinforcement was obtained by the writer last summer during an interview with Alexander Yakovlev. Mr. Yakovlev received a group of US aviation writers at his design bureau in Moscow, apparently the first such visit by foreign writers to his facility.

Men who have met with the Russians generally report that two realities make the actual situation inside the design bureaus far different from either the propagandists' preposterous picture or the image held by many Westerners of a melancholy, rigid, and suspicious bureaucracy. These two realities are said to be: (1) Top Russian designers are exuberant realists; and (2) they operate under a "prototype" system of development that is probably the most competitive and technically stimulating in the world. This system is similar to the one employed in the United States until the mid-1950s, and the odds appear strong that the

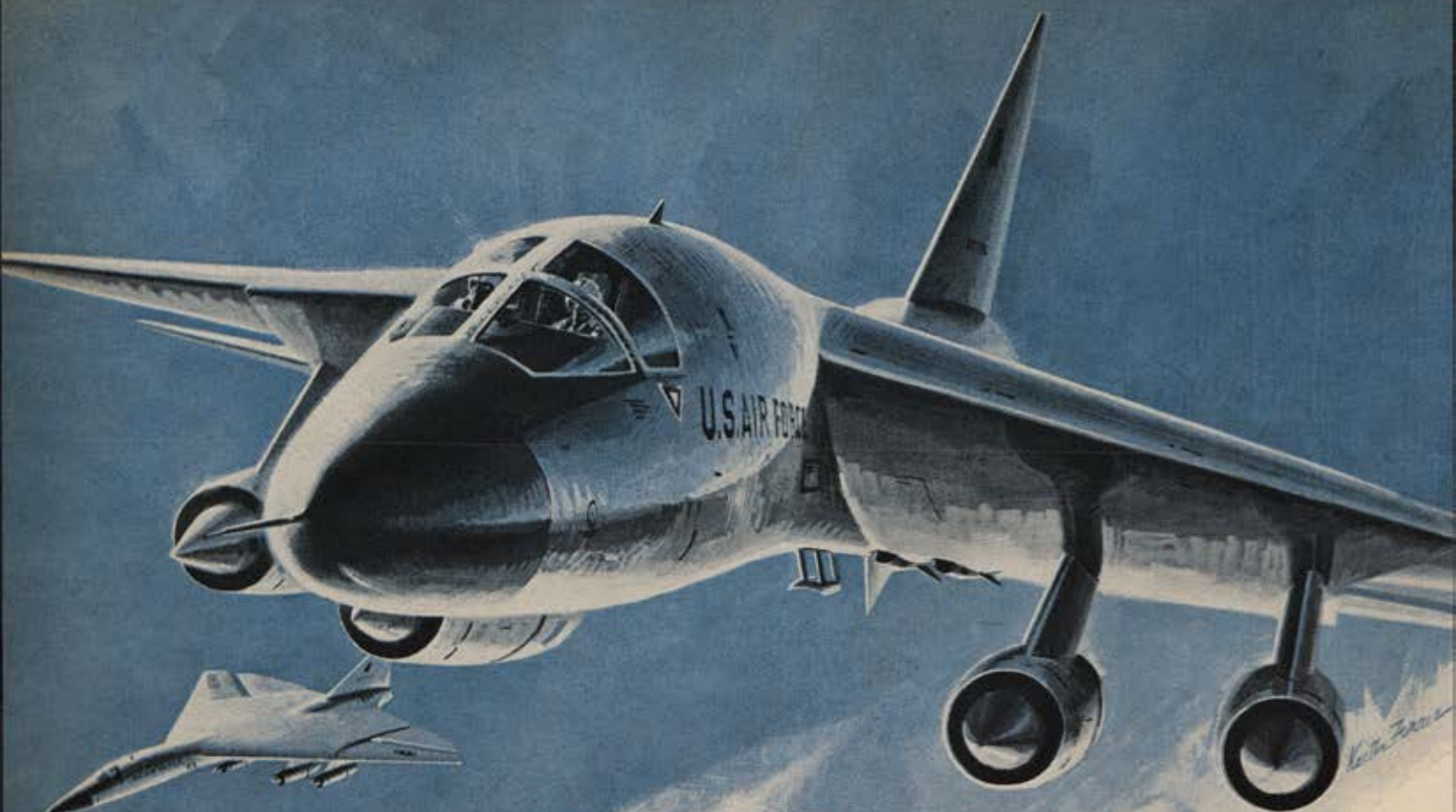
US will return to such an approach in the 1970s, rejecting the strong dependence on "systems analysis" and "cost-effectiveness" studies that characterized the 1960s.

Russian Designers Are Realists

In 1958, the Canadians were unprepared for the relaxed, frank atmosphere that prevailed during their talks with the Russian aeronautical experts who gave the impression of being "vigorous, knowledgeable people with a boyish type of exuberance." Some of the Canadians described them later as "intelligent Texans," proud of their accomplishments and content of themselves and the future.

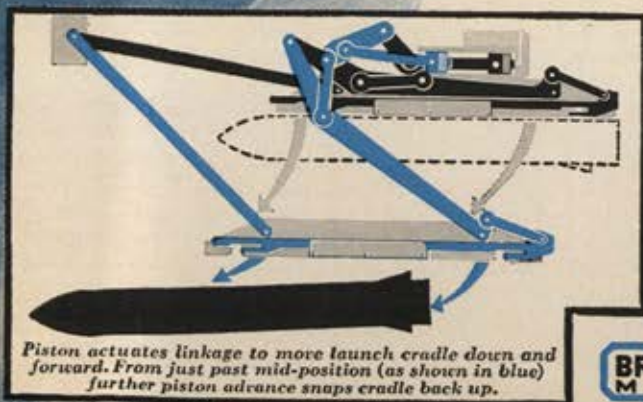
The Canadians also were caught by surprise by the Russians' well-developed sense of humor. They not only saw humor in nearly every situation, but they constantly needled their hosts and each other, including Mr. Dementiev. Dementiev and A. I. Mikoyan (MIG fighter design chief), who were classmates at the Zuhkovsky Aeronautical Engineering Academy in the 1920s, provided almost continuous examples of this needling.

At one point Mr. Dementiev was explaining to a small group the advantages of one-man management
(Continued on page 65)



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A Soviet delegation headed by P. V. Dementiev (sixth from left on front row) visited England in 1964. They are shown at left with their hosts during a tour of aircraft facilities. Sir Arnold Hall, now managing director of the Hawker Siddeley group, stands to Dementiev's left after a flight aboard the Trident airliner. To the left of Sir Arnold are A. I. Mikoyan and Col. General A. V. Ponomarev, Deputy Commander in Chief of the Red Air Force.

and pointed out that all segments of the aircraft industry, including equipment and engine designers, reported directly to him. Mikoyan interrupted to assure the listeners that this was true and then made a throttling gesture with his hands around his neck.

Again, when Dementiev tried to get serious over a question regarding series production of aircraft, he said that it was inefficient to allow many design modifications once this stage was reached and that his office was very strict in holding down the number of changes. At that point Mikoyan broke up with laughter.

In spite of the easy give-and-take between the Russians, it was abundantly clear to the Canadians, and all groups meeting subsequently with the Soviet designers, that Mr. Dementiev is the boss of all aviation development and production in the Soviet Union. At the Avro meeting one of the Russians said that Dementiev had been responsible for all major decisions since 1945. He also is highly placed in the two main branches of the government, for he is a member of both the Council of Ministers of the USSR and the Central Committee of the Communist Party.

Another major conclusion of the Canadians after the 1958 meeting was that the Russian designers wasted little time on fantasy, false claims, or pretensions of technical omnipotence. An irrepressible group humor, in which no one was immune from the needle, again was the medium through which the Russians exhibited their basic realism. Many of the laughs at the Avro meeting came from stories about misuses of the Russian visitors, although the Canadians were never filled in on the exact details of the goofs. Such details couldn't be as important, however, as the fact that all of the Russians, including Mr. Dementiev, could take a joke about their work, retaliate in kind, and were obviously not strangers to such a relaxed atmosphere.

Technical Topics at Canadian Meeting

Titanium—An important technical topic at the 1958 Avro meeting was the metal titanium. The Russians reported that they were operating experimental engines that contained a large percentage of titanium parts, but they did not then have such engines in production.

Mr. Dementiev also said that a great deal of experimental work was under way with airframe parts

made of titanium but that none of these projects had reached the production stage. Mr. Mikoyan was emphatic in his view that this development was being carried out too slowly and that titanium was ready for use in fighters, but Mr. Dementiev would not allow it.

Following these detailed discussions, the Canadian engineers felt that they were ahead in some phases of engine and airframe design, with the Russians ahead in others, but that the over-all state of titanium technology and high-speed aircraft development in the two countries was about equal. The Canadians were in an excellent position to make such a judgment ten years ago, for they were nearly ready to fly the Avro Arrow fighter and the Orenda Iroquois engine, which stood an excellent chance of breaking the world speed records and setting the standard for long-range interceptors in the Western world.

Supersonic Transport—In 1958 the Russians had been investigating supersonic transport designs seriously for three or four years, according to Mr. Dementiev. He also stressed that no one design appeared particularly outstanding at that time, and that much more work remained to be done. The Russians held the view that when taking such a large step forward it is necessary to do what is technically sound and the "economics will follow later."

Manned Fighter vs. Missile—On September 23, 1958, during the visit of the Russian delegation, Prime Minister Diefenbaker indicated for the first time that the Canadian government might cancel the Arrow fighter and buy Bomarc missiles from the United States. This news item came in for some general discussion by engineers at the Canadian/Russian meeting. The Russians generally agreed that such a move would be a bad one for the 1960s and that such high-performance interceptors as the Arrow definitely had a place for the next ten to fifteen years. After that, however, Mr. Dementiev thought that missiles would replace the manned fighter. Mr. Mikoyan again disagreed strongly and said that the "flexibility" of manned fighters would make them attractive for all current roles into the indefinite future. At that point, Mr. Dementiev pretended to be exhausted and said that he always had trouble with Mikoyan.

Engine Development—From the description by Mr. Dementiev, it appears that Soviet engine development

(Continued on following page)

programs are run in a manner that is considered "ideal" in the United States. He said that under most circumstances thirty to forty developmental engines are constructed and that approximately 10,000 running hours are accumulated on them before the design is approved and the first production model delivered. In most cases, this number of test hours is required before production models of US engines are delivered, but in the past decade it has been increasingly difficult to get approval for a large number of developmental engines. Consequently, the programs became extended and delayed.

Prototype Development

The Soviets apparently are convinced that competition on paper is not a satisfactory method of pushing technology and obtaining advanced aircraft. They continue to rely on the prototype method, which is nearly as old as aviation, to meet nearly all of their requirements for new aircraft. Under this system two or more engineering teams build similar aircraft and the best one is selected through a flight competition.

Mr. Dementiev described the Soviet development cycle in 1958 as follows. First, the military or civil aviation ministry comes in with a requirement. As minister in charge of aircraft development and production, he has the right to dispute the requirement. In such technical disagreements, Zuhkovsky Central Aerohydrodynamic Institute, Tsagi, which has been described as the Russian version of the now-defunct National Advisory Committee for Aeronautics in the US, acts as a third party.

Two to four design collectives usually are put to work on the requirements with a preliminary design on paper. These collectives usually have 1,000 to 1,500 engineers and technicians, and each of the chief designers has several collectives under his direction. All of the men whose names are identified with Russian aircraft, such as Tupolev, Yakovlev, and Mikoyan, hold the rank of "chief designer."

An evaluation group with representatives from

Dementiev's ministry, the "contracting" ministry (*i.e.*, the military or Aeroflot), and Tsagi select the best of the preliminary designs, and these are produced in prototype. In some cases, where all the preliminary designs have significant merit, apparently all go into flight test. Normally, four or five prototype models of each design are built. These are tested by the design collective first and then subjected to a series of rigidly controlled ground and flight tests by a state committee, along with the other designs. The winner, or winners, of this competition usually are produced in quantity.

No changes in this basic Soviet management policy appear to have occurred in the last decade. For example, seven new high-performance fighter aircraft have been shown at Red air shows during the past two years, including the Mach 3.5 Mikoyan "Foxbat," which took the 1,000-km. closed-circuit world speed record away from the Lockheed YF-12A. Gen. J. P. McConnell, USAF Chief of Staff, and other ranking Air Force officers, explained in recent congressional testimony that the majority of these new Russian fighters would be weeded out and that probably only two or three would be placed in operational service.

US May Return to Prototype System

The selection of military aircraft through flight-test competition came to an end in the United States in the late 1950s. The McDonnell F-4 Phantom was the last major aircraft chosen in this manner, and it received first-class competition from the Chance Vought F8U-3. In fact, the McDonnell Aircraft Corporation thrived on such competitions and possibly would not have become a power in the aviation industry if it had not had the opportunities afforded by flight competitions. Around 1950, the company was a relatively small Navy contractor and began a rapid expansion after receiving its first Air Force contract, for development of the F-101. This award was made after the F-101's predecessor, the XF-88 fighter, came through in flight tests and outperformed the Lockheed XF-90, which already had been judged the winner in a paper evaluation.

Most experts in the aircraft industry and military fought hard to retain the prototype system. But they were overruled by the top civil echelons in the DoD, where it was believed that prototype building was a waste of money and that analytical techniques had become so sophisticated that advanced systems could be evaluated on paper.

The high cost argument has been pretty well knocked down in France with the recent development of the Mach 2.5 Mirage IIIG variable-sweep fighter on a budget of about \$20 million. This "bare-bones" prototype does not have an advanced electronic system or an advanced engine, both of which would be needed for a truly outstanding operational fighter. However, it has allowed verification and refinement of a high-speed variable-sweep-wing design for a lower cost than many analytical studies that could not guarantee such verification.

In the Pentagon it is widely believed that the next Administration will take a hard look at a basic policy decision to use the prototype system more, and sys-



Dean of Soviet designers A. N. Tupolev visited the United States in 1959 and was invited to Long Beach by Donald Douglas to renew an acquaintanceship of more than thirty years. He showed unusual interest in manufacturing methods.

tems analysis less, in the development of advanced vehicles of all types. The advantages now claimed for the prototype system, even in some sections of the Office of the Secretary of Defense, include: keeping the proficiency of engineering teams at a high level through more realistic competition and more frequent periods of hardware development; improvement of the engineering data available for systems analysis; and giving the military services a better chance of purchasing an outstanding design. The main task now is to prove that the prototype system will save money over the long run, and this is being worked on.

Yakovlev's Design Bureau

Alexander Yakovlev's interview with US aviation writers this summer in his design bureau did nothing to dispel the idea that Soviet designers are highly intelligent men who are proud of their accomplishments and have confidence in themselves and the future. Mr. Yakovlev's courtesy, quiet good humor, and broad knowledge of the aircraft of all nations marked him as a man whom any aviation enthusiast would enjoy.

Our visit began with a ride up a Moscow alley, into the tiny courtyard of an unmarked building that faces on Leninprospekt. From the outside, there was nothing to distinguish Yakovlev's offices from the drab, semi-rundown buildings that line most streets in Moscow. But, once inside, the mood was transformed completely; the design bureau's reception room was furnished in the best US aerospace tradition. Dramatic pictures of Yakovlev airplanes, deep carpets, and a winding staircase were the main appointments, with the Russian touch of highly polished panels of exquisitely grained wood on the walls.

The interview took place in a large room that could have been the board room of any large US corporation. Again there were beautiful wall panels, deep carpets, and top-drawer furnishings, including an oval table seating about twenty-five.

Mr. Yakovlev talked at length about the YAK-40



A. N. Tupolev and his group pass the Thor production line during their 1959 tour of Douglas facilities at Long Beach. The Russians in this party of seven barely looked at the missiles, but went over every detail of DC-8 production.

(see *AF/SD*, Oct. '68 issue, p. 46), his attempt at a DC-3 replacement. He talked of the extreme difficulty of matching Donald Douglas' achievements, but he has high hopes that his little transport will be the first to fill the bill.

Mr. Yakovlev went on to say that he and most Soviet designers have been working on VTOL for many years. At the moment, he favors the VTOL design of the Hawker P.1127, but he added that this might change.

Concerning the design of Soviet civil aircraft, Mr. Yakovlev stressed that most people outside Russia do not appreciate that most of these airplanes must be operated from small grass and dirt fields in severe winter conditions. Such bush flying materially affects the design, he said.

When asked about the future of aviation, Mr. Yakovlev held that the greatest technical achievements still lie ahead, and he sees virtually unlimited growth. In response to a question about the possibility of rockets replacing aircraft, he said that he had heard such predictions in Russia and around the world, but he added that "this is the talk of hotheads."

On our way out of the meeting, Mr. Yakovlev showed us his model room, containing a scale model of every aircraft he has designed, and there are dozens. An oversize model of his pride, the YAK-3, sat in the middle of the room, and in his discussion of this fighter, Mr. Yakovlev dropped the startling bit of information that 35,000 of them were made in WW II.

According to most Western sources, YAK-3 production totaled around 10,000. The higher figure is in startling contrast to the output of all models of the P-51 Mustang, which came to fewer than 22,000.

This information concerning the YAK-3 drove home as much as anything else the pitiful state of US knowledge about Soviet aviation. We don't know their designers, we don't know how they operate, and we don't even know what they did in World War II. Such ignorance about an advanced-technology enterprise as large as Russian aviation is imprudent at best, and might even be characterized as foolhardy.—END

Alexander Yakovlev is welcoming a group of US aviation writers to his design bureau in Moscow this past summer. The furnishings in the reception room, board room, and front portion of these offices were a match for those of any US aerospace firm.



The eyes of the world's aviation community focused on Everett, Wash., on September 30 as the world's first superjet—Boeing's sleek new 747—made its debut amid proper pomp. Scoring "mosts" in everything from advance sales to passenger capacity and profit potential, the 747 is an aircraft that promises to revolutionize air transportation . . .

First of the SUPERJETS

By Edgar E. Ulsamer

ASSOCIATE EDITOR, AIR FORCE/SPACE DIGEST

ON September 30, the Boeing Co. rolled out its huge 747 jetliner—the world's largest, fastest, and most productive commercial aircraft. The occasion was as momentous as the 710,000-pound, 231-foot-long, \$20 million giant itself, which emerged with provocative slowness from its special assembly building. The sunshine outside was almost as bright as the \$20 billion market (900 aircraft, plus spares) that the company forecasts for the superjet.

A crowd of some 10,000, including keynote speaker Secretary of Commerce C. R. Smith and aviation leaders from around the world, was on hand to witness the champagne christening by twenty-six photogenic stewardesses representing a like number of airlines from the sixteen countries that have ordered the first 158 747 jetliners—more than \$3 billion worth of airplanes.

Boeing officials pointed out that at rollout time a total of 241 firm and pending orders, plus options, were on record to place the program—the most expensive in commercial aviation history—on a sound financial footing. Both in number of aircraft and dollar value at the time of rollout, the 747 set new sales records.

Boeing predicts that between 600 and 850 aircraft will be sold by 1978 and that these will be followed by sales of even larger, more productive superjets already under study by Boeing's advanced planning groups. The 747 program's impact on the nation's export drive and balance of payments (the foreign and US airlines' buys of the 747 are nearly evenly split, with a similar ratio presumably prevailing in future sales) could be enormous. Commerce Secretary Smith said that "already model 747 airplanes valued at \$1.5 billion have been contracted to foreign airlines," which would "contribute to our international balance of trade and strengthen our balance of payments."

In its peak years the 747 program will employ about 50,000 workers at Boeing and among the participating 1,500 subcontractors. But the significance of the 747 to the national interest far transcends both the balance

of payments issue and what Secretary Smith called the "contribution to the prestige of United States aviation." The 747, according to Boeing executives, will enable the US carriers to "substantially advance" their ability to augment the US military airlift capability (through MAC contracts and CRAF participation). In addition to its capability of transporting up to 490 passengers, the planned freighter version will have a payload of 250,000 pounds transcontinentally or 200,000 pounds intercontinentally at speeds about fifty miles per hour faster than any currently-flying military or commercial transport. Thus, the 747 can sharply increase US strategic mobility.

First Flight on December 17

First flight of airplane No. 1 is scheduled for December 17. FAA certification and delivery of the first aircraft to Pan American World Airways are slated for



This picture sequence shows the birth of a 747 superjet in Boeing's Everett, Wash., final assembly building, which, in terms of volume, is the largest structure in the world.

Visual highlight of the superjet's rollout ceremony came as the red-and-white giant emerged with measured dignity from the semidarkness of the hangar for its debut before aviation executives from all over the world. Bright sunshine and an enthusiastic crowd greeted the first 747.



late in 1969. Pan Am is the airline that launched the 747 program by placing an order in the spring of 1966 for twenty-five aircraft.

The test program for the 747 will be the most extensive ever undertaken in commercial aviation. In addition to laboratory tests of parts and components already under way, the program includes assignment of five of the giant airplanes to a \$28 million, year-long, Boeing and Federal Aviation Administration flight-test program. These aircraft will have logged approximately 1,400 flight hours by the program's end.

Two structurally complete airframes are reserved for static and fatigue testing to prove strength and airframe life.

The first 747s will be 231 feet, four inches long, with a wingspan of 195 feet, eight inches, and a tail that rises more than sixty-three feet above the ground. Gross weight will be 710,000 pounds.

The 747 is powered by four Pratt & Whitney JT9D-3 turbofan engines. Each engine initially will have 43,500 pounds of thrust on takeoff and about 10,000 pounds of thrust in cruise—approximately twice the power of the largest commercial jet engines in use today. Engine growth will reach 47,000 pounds of

thrust in the water injection JT9D-7 model by 1972. By comparison, the thrust output of the C-5's TF39 engines are 41,100 pounds on takeoff and about 8,000 pounds in cruise. Cruise thrust, according to Boeing officials, is of critical importance to 747 growth plans because future weight increases, combined with the aircraft's inherent high speed and altitude requirement, can only be realized with increased cruise thrust.

The JT9D engines enable the 747 to operate from any airfield that can accommodate the current 707 or DC-8, and give it a speed of 625 miles an hour. The superjet can operate at ranges up to 6,000 miles.

Passengers will occupy a single-level cabin section nearly twenty feet wide—seven feet wider than current large jetliners. A variety of seating arrangements is possible, with two aisles running the length of the aircraft. The extra-wide cabin and double aisles will afford a new level of comfort and spaciousness—as well as provide room for such innovations as lounges, theaters, and private passenger areas.

Passengers will board through five double-width doors on each side of the fuselage. The flight deck, with arrangements for a crew of either three or four,

(Continued on following page)



With forward fuselage in position and wings and center section now in place, the aft-fuselage section of the airplane is positioned, loosely aligned with the remaining sections.



After the same procedure is followed with the aft-fuselage section, the 231-foot-long aircraft structure, filling the assembly bay area, finally emerges as a gigantic entity.



Champagne christening of the first 747 was handled by stewardesses from 26 airlines in the 16 countries that, by rollout time, had placed orders for the \$20 million plane.

will be above the main passenger cabin. On the same level, behind the cockpit, will be space for additional private or special passenger accommodations. Possibilities for this upper deck compartment include a business office, a private stateroom with bed, or even a spacious lounge. A circular stairway will join the upper level areas with the main passenger cabin below.

All-Cargo Version in Prospect

In an all-cargo model, the 747 will carry twenty-eight cargo pallets, each ten feet long, eight feet wide, and eight feet high. Additional stowage will be available in lower-deck cargo compartments in front of and behind the wing. The 747's 100-ton cargo capacity will be more than twice that of today's jet freighters.

The 747C (convertible) will be available as either an all-cargo or all-passenger airplane, or as a combination cargo/passenger airliner.

On the all-cargo and convertible airplanes, the nose will open upward, so that freight may be moved straight onto the main deck and through the length of the airplane by a roller system in the floor. The 747 is designed for fully automatic loading of passenger baggage and freight.

The plane will have a sixteen-wheel main landing gear (four units of four wheels each) and a two-wheel nose gear for even distribution of loads on airport ramps and runways.

The direct operating cost per seat-mile (the cost of flying the airplane one mile divided by the number of seats available) will be about thirty to thirty-five percent lower than for the 707. In a cargo configuration the ton-mile cost will be similarly lowered for the 747 compared with 707-320C cargo jet.

The Boeing Co. plans a production capacity of up to 200 Model 747s by December 1972, and 400 by December 1975.

The 747 already is being offered at an increased

takeoff weight of 775,000 pounds to accommodate both more fuel and payload for transpacific operations. This growth is spurred by competition from the so-called airbus, the Lockheed L-1011 and the McDonnell Douglas DC-10 trijets. A 490,000-pound DC-10, for instance, is already being offered with growth engines, by either GE or Pratt & Whitney, which permit a 4,300- to 4,700-nautical mile range and an 85,000- to 89,000-pound payload. Boeing is also considering extending the upper deck of the 747 the whole length of the aircraft to achieve a passenger capacity of about 600 in high-density and 500 in low-density seating.

Assembly of the 747 is in a new plant in Everett, Wash., north of Seattle. On the 780-acre site is the world's largest building in volume (160 million cubic feet) for 747 primary manufacturing, subassembly, major assembly, and final assembly operations. This facility includes an automatic wing-panel riveting machine larger than a football field.

In one of the largest subcontract programs in commercial aircraft manufacturing, approximately sixty-five percent of the airframe weight is built by firms other than Boeing.

At the time of rollout the 747 program had absorbed investments in excess of \$750 million, or about fifteen times the net earnings of the entire Boeing Co. during the first half of 1968. To capitalize this enormous venture Boeing authored novel forms of investment sharing, involving the airlines as well as the major subcontractors. The so-called progress payments—the various installments paid by an airline before it receives the first plane of a given order—has been upped to fifty percent in the case of the 747. The exact nature of the financial involvement of the subcontractors has not been revealed for competitive reasons, but is believed to be substantial and proportionate to each major subcontractor's share in the program.

Similar formulas are being applied in the case of the L-1011 and DC-10 trijets except for the fact that progress payments were lowered to thirty-five percent, according to airline sources. While Boeing officials are "very bullish" about the over-all prospects of the 747 program, especially the passenger model, they are guarded about the outlook for the freighter version. "We plan to have a freighter, provided we have the capability to carry an adequate payload over the distances required by the airlines," is how one senior official put it. Boeing is very aware of the severe competition furnished by the slightly larger L-500-114MF, commercial derivative of the C-5 Galaxy, which is being offered to the airlines by the Lockheed-Georgia Co., with a takeoff weight of 831,000 pounds and a payload of 300,000 pounds.

With an order backlog in excess of \$3 billion in existence at a time when the aircraft had not even been flown, the success of the 747 program would not, however, seem to depend on the freighter version. By virtue of its lower seat-mile costs, its greater profit potential, and its more effective use of the nearly saturated airways in the high-traffic areas of the world, the superjet quite clearly is an aircraft whose time has come. At least, Boeing Co. and twenty-six major airlines of the world seem to be convinced that this is the case.—END

THE SPACE AGE IN PERSPECTIVE

- Technology •Education
- Science and Public Policy



SPACE

DIGEST

VOLUME 11, NUMBER 11 • NOVEMBER 1968

Speaking of Space

By William Leavitt73

The flight of Apollo-7 could be followed soon by a manned circum-lunar mission, which in turn might rekindle national enthusiasm for the space program. But for the space program of the 1970s, enthusiasm will not be enough. Space must be meaningful to the man in the street.

Defense's Responsibility to the Nation: More Than Just Arms

By Clark M. Clifford76

The Department of Defense and the defense industry, which together consume a large portion of the nation's wealth, have the obligation to help solve many of the country's pressing social problems.

Systems Technology for Social Problems: Problems and Prospects

By Capt. Gerald T. Rudolph, USAF79

To date, there has been too little progress on putting systems technology to work on social problems—for two reasons. Not enough people know what systems technology is, and there is a strong reluctance to accept the kind of centralized authority needed for such techniques.

The Soviet Space Program: Its Political Implications

By Dr. Charles S. Sheldon, II82

It's hard to deny that Russia's exploitation on the political and propaganda fronts of her space activities has helped create a new "balance of technological power, if not of terror."

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The opening of the manned phase of the Apollo program, with the chance of a manned circumlunar flight in the near future, could rekindle public interest and congressional enthusiasm for the space program. But in the 1970s, enthusiasm and showmanship will not be enough. Space will have to be made clearly relevant to the needs of the man in the street . . .

On the President-Elect's Agenda—A Balanced Space Program for the 1970s

BY WILLIAM LEAVITT

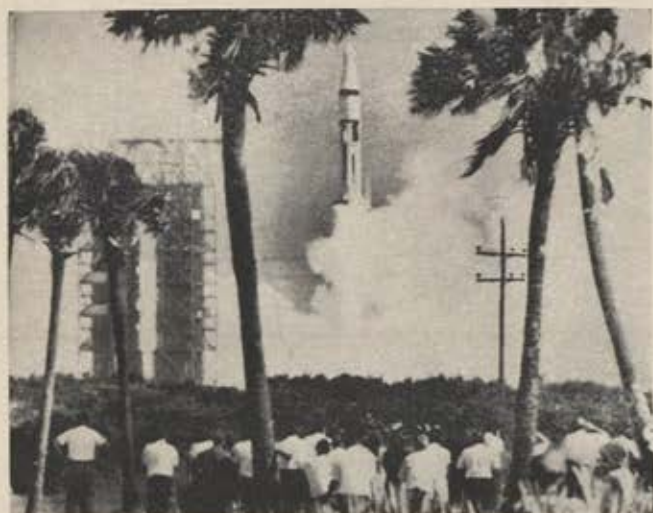
Senior Editor / Science and Education

AS THIS is written, Astronauts Walter Schirra, at forty-five the grand old man of American spaceflight, Walter Cunningham, and Donn Eisele are circuiting the earth in their Apollo-7 capsule. All three have colds, and there are a few problems with the spaceship's electrical power system, among other items. But as several million Americans have seen on live television, the flight is going well. It may even go well enough to encourage

the National Aeronautics and Space Administration's planners to proceed with their tentative idea of following Apollo-7 with a manned loop around the moon before the end of the year.

There would be good political reasons for such a manned circumlunar mission, without landing, in the near future. This month the nation goes to the polls to choose a new President. And unless the worst fears of political observers are realized and the election goes to the House of Representatives, we will have a President-elect on November 5. On his agenda—perhaps not at the top of the list but still important to him and the country—will be the question of how best to proceed with the space program beyond Apollo and the moon landing, which now has at least a reasonable chance of meeting its target of achievement before the end of the decade. An early circumlunar flight might serve to restore flagging public interest and congressional support of the space program sufficiently to encourage the new President to infuse new confidence and enthusiasm into the program, to give NASA and its people—and the military space program, too—the kind of shot in the arm that only a President can give.

Whether or not any of this happens is sheer speculation at this point. As to an early manned circumlunar flight, there are many valid *nonpolitical* reasons for not going ahead too soon with such a mission. They have to do with the technical complexities of the Apollo hardware, including the problems NASA has experienced in the development of the Lunar Excursion Module (LEM), the crucial component of the Apollo combination which must work perfectly during the landing



—Wide World Photos

Friday, October 11, 1968: The Apollo-7 mission opens with launch of Astronauts Walter Schirra, Walter Cunningham, and Donn Eisele from Cape Kennedy, Fla., just after 11:00 a.m. EDT, opening manned phase of moon program.



—Wide World Photos

Taking a leaf from Dean Martin's TV show, Apollo-7 space trio gets into spirit of things with lettered appeal for cards and letters during first live telecast from orbiting spaceship.

and ascent portions of the moon-landing mission when it finally occurs. Beyond the LEM's problems, which NASA is confident can soon be fixed, there is the overriding need for maximum confidence in the entire Saturn-Apollo system, the kind of confidence that was built up over many missions of the Mercury and Gemini man-carrying systems in earth orbit. Thus the decision whether to proceed soon to an around-the-moon flight will be a hard one for NASA's technical people and the agency's present caretaker leadership, headed by Dr. Thomas Paine, the Deputy Administrator who has taken over as Acting NASA Administrator in the wake of James E. Webb's resignation as NASA chief last month.

In any case, what to do about the space program after Apollo is a question that must get serious attention from the new Administration. There is a strong need for a new focus for the program which would earn renewed public and congressional support—solid and

continuing support that would not have to hang on the kind of showmanship that necessarily characterized the first decade of the space age.

To many observers, such focus should be on earth-connected benefits, benefits that can be clearly seen and understood by the public. This is not to say that manned spaceflight beyond Apollo should be abandoned or that the planets should be left to the Russians, who after all don't have to worry very much about public opinion. It is rather to point up the fact that, except for the most spectacular space events, the American public has understandably become accustomed to the routine of spaceflight and will not buy the arguments of prestige or international competition with the Russians as once they did—no matter how valid such arguments may be in the long run.

Thus it is reasonable to argue that the "new" space program should represent a balanced assortment of programs that at the same time are able to serve earth-bound purposes, including military requirements, advance the art of manned spaceflight in an orderly way, and serve scientific purposes in terms of obtaining more data about the close-in space environment and information on the true nature of the moon and nearer planets. To ask for such a "balanced" program is one thing; to get it is another. Yet there is no logical reason why such a program cannot be charted. Space technology has already proved itself useful to earthly purposes such as communications, observation, and weather tracking, among others.

What is needed is the imagination to expand those programs that have already demonstrated their worth and to take at least a few risks in such areas as direct-broadcast television for, say, educational purposes in a few demonstration areas, not necessarily abroad but here in our own country, when the technology is ready, as it should be within a few years. Or to commit the country to a manned earth-orbiting multipurpose space station program, which could serve earth-survey, weather-watching, and even communications purposes in the relatively near future. These are just some of the possibilities for the near-term. Other programs that

Whether or not to proceed soon with manned circumlunar flight will be a tough decision for Apollo technical planners and for Acting NASA Administrator Dr. Thomas O. Paine, right, who succeeded James E. Webb in October.



One of the world's leading authorities on aviation and space medicine, Dr. Hubertus Strughold, Chief Scientist of USAF Systems Command's Aerospace Medical Division, located at Brooks AFB, Tex., retired September 30.



should be considered would include early development of a spaceborne international air-traffic control and navigational satellite system to help handle the coming revolution in global air transportation.

The main point is that we have invested to date an enormous amount of money and talent and national energy in the space effort, and it would be tragic to let it go down the drain just when it was beginning to pay off. While this is true, much has also happened on earth, in our own country, since that day back in 1957 when the Russians jolted us all by blasting their Sputnik into the void. We have become embroiled abroad in a frustrating war, and at home we face a frightening collection of threats to our domestic tranquillity. In our own country we are facing a revolution of rising expectations among that portion of the population that has hitherto been denied, for whatever reason, participation in the general affluence of which we're so proud. In such a context, it's no longer enough to claim, correctly, that space has created better jobs for people who already had jobs. In the 1970s, space will have to create jobs for many people who have perhaps never worked at all, or been underutilized when they did have jobs.

This makes a new ball game in which space, which still seems so remote to so many people, has to become even more relevant to the everyday problems of everyday people.

Man on the Milky Way

To anyone who has closely followed the progress of the US space program, the recent retirement of Dr. Hubertus Strughold, Chief Scientist of the Air Force Systems Command's Aerospace Medical Division at the USAF Aerospace Medical Center, Brooks AFB, Tex., will mark the end of an era.

Dr. Strughold, one of the German scientists who fell into the hands of the Allies after the end of World War II, is perhaps less known to the public than such figures as Dr. Wernher von Braun. But in the world of space medicine, the human side of spaceflight, the seventy-year-old physician is uniquely recognized as one of the leading theoreticians in his art and as the father, if any one individual can be accorded the honor, of space medicine. He is the world's only holder of the academic title Professor of Space Medicine, conferred by the Air University at Maxwell AFB, Ala.

We've had the privilege and fun of knowing the soft-

spoken and utterly charming Dr. Strughold since the days immediately after Sputnik. We first met him during a lengthy visit to the old USAF School of Aviation Medicine in 1958 when the facility was located at Randolph AFB near San Antonio. By then he was already being recognized within aeromedical circles as one of the pioneers in space medicine, one of that small band of believers in the inevitability of man's leap into space. He had already been instrumental in founding, back in 1949, the USAF Department of Space Medicine at the School of Aviation Medicine, where some of the earliest groundwork for the US man-in-space program was done, on low budgets and with small staffs.

For years he had been writing, in what has always been a delightfully lucid literary style, on the medical aspects of manned spaceflight with particular reference to the problems of life support and the conditions men might encounter on alien planets. Mars seemed always to be his favorite planet, and when you talked with Dr. Strughold about landing on Mars there was a sense of reality about what he said that belied the then-fantastic nature of the discussion.

Dr. Strughold came to the United States by Air Force invitation after the war in 1947 and has spent virtually all his working time at the USAF School of Aerospace Medicine and much of his spare time being as Texan a Texan as you can get with a heavy German accent. His aeromedical research career in Germany started in the 1920s when as a young physiologist he became interested in aviation. An academic who likes to laugh at himself, he enjoys recalling such youthfully zany adventures as trying to get a billet as ship's doctor on one of Dr. Hugo Eckener's dirigibles and being told that airship flight was so smooth that no one would need a doctor aboard.

Dr. Strughold's first love has always been astronomy, and he remembers waiting excitedly as a young boy in Westphalia, Germany, where he was born, for the chance to see Halley's Comet. The fascination with astronomy, the professional training as physiologist, and his interest in aviation eventually converged quite naturally into his specialization in space medicine, long before very many people took the idea seriously. In fact, Dr. Strughold recalls that years ago, when he was new to this country, he was asked to be a guest speaker at a hospital in the east. He chose spaceflight as his topic and gave his speech to an appreciative and attentive audience of hospital patients. When he was leaving he



Grumman has developed for possible lunar use a Lunar Roving Vehicle that could increase by 100 times the area an exploring astronaut could cover if he just went on foot. The manned version would have a 7-mile radius at 10 mph, and the unmanned version, operated from earth by remote control, using extra power, would have a 750-mile range.

asked what sort of patients they were—and was told he had been speaking to the psychiatric ward.

Not long after Sputnik, he recounted the story and asked brightly, "Now who's crazy?"

Dr. Strughold, who can easily remember the lean days when people who believed in the idea of space-flight were viewed as hopeless visionaries, has lived to see his own dreams realized in the Mercury, Gemini, and Apollo programs. He is philosophical about the present lull in enthusiasm for space:

"Everything goes in waves," he says. "This is a natural process. . . . Before the first Sputnik, we had a kind of tidal wave, a theoretical wave; when Sputnik appeared and caused everywhere a kind of 'sputnikosis,' as I like to call it, this started the second wave, and during the wave, fantastic progress has been made in the space business. . . . At the present time, there is some kind of lull, but there will be another wave, and it will be concentrated around the moon or on the moon. After this, say in the early 1970s, there will again be a kind of lull, and this will be followed by a new wave, and this wave will concentrate on the planet

Mars. This is a general rule of the universe and also of the human mind.

"Sometimes people say: Yes, but the man on the street is against this. This is a complete mistake. If you talk with the man on the street about the cosmos, he knows more about it than, let's say, a scientist 100 years ago, and he's very much interested. . . . I like to express it this way: The man on the street is no longer a man on the street in the old sense; he is more or less a man on the Milky Way."

Mr. Webb Exits

A few years back we attended a meeting at the Air Force Academy in Colorado Springs at which NASA Administrator James E. Webb was the featured speaker. Having dawdled over coffee, we arrived late for Mr. Webb's speech, noted that Mr. Webb had apparently been speaking for a while, and began to try to find our place in the advance text that had been handed out to the press.

We couldn't find our place and finally asked a col-

Defense's Responsibility to the

BY THE HON. CLARK M. CLIFFORD

Defense Secretary Clark M. Clifford, right, has called (see text) for a conscious effort by the Department of Defense and the defense industry to use their skills and resources in the solution of pressing social problems.



In a widely noted speech to the National Security Industrial Association in Washington on September 26, Defense Secretary Clark M. Clifford urged that, in view of the large percentage of the gross national product it consumes, the Department of Defense should consciously contribute its research-and-development know-how, in fields ranging from housing to systems analysis, to solutions of many of the nation's nonmilitary problems. He called for the defense industry's cooperation in the effort. He dwelt, too, on the contributions DoD could make to the civilian world in the fields of training and education and employment. The Air Force Association, through its affiliated Aerospace Education Foundation, has for some years been working vigorously at finding ways to help adapt militarily developed training and education to civilian education, in cooperation with the US Office of Education and many state and local education departments. Following are important excerpts from the Secretary's speech. (See also the Editorial, on page 8.)

—THE EDITORS

WE ARE far from the optimum development of our educational resources. The blunt fact is that we have focused much of the new technology in education on the exceptional student. For the average or below average youngster, education has been scarcely affected by the scientific revolution since World War II. Educators now say that traditional classroom procedures are not only inefficient but in some cases actually impede the average child's will to learn. If this is true of the student from middle-class America, we must acknowledge how badly we serve the child from the rural slum or the city ghetto, whatever his intellectual endowment may be. Much needs to be done.

The Department of Defense can be, and to a degree has already begun to be, a trailblazer in the improvement of education. My predecessor, Bob McNamara, began the imaginative Project 100,000. He directed that the armed services admit to basic training a limited number of men who, under strict earlier regulations, would have been below military entrance requirements. He was convinced that these men, with the benefit of new teaching methods, would learn to do their military jobs satisfactorily. His confidence was justified. Project 100,000 has been a spectacular success. Of the men who entered during the first year of the program, over ninety percent are now performing effectively on active duty.

The Department of Defense is one of the world's largest educators, and should be one of the world's best. We train military people in 1,500 separate skills, and our schools for service children are in twenty-eight countries around the globe.

The training obtained during military service has been for many Americans the open sesame to a fuller life. Now and for the indefinite future, millions more must serve to guard our country against external threats to its security. We can serve them and add immeasurably to that security by seeing to it that they leave military service equipped to

league in the next seat if he could help us out. He replied that Mr. Webb had already been talking for twenty-two minutes and still hadn't started on his prepared text.

The memory of Mr. Webb's loquaciousness, which in that instance lasted about an hour and forty-five minutes, is still fresh. Mr. Webb, there's no doubt about it, is a good talker, and somehow that quality seemed to go with the era of NASA over which he presided from 1961 until last month, when he stepped down, on October 7, his sixty-second birthday.

Those who have followed the career of the ebullient Jim Webb as NASA chief will not soon forget him. For he seemed, more than the leaders of most other federal "action agencies," like a real person who showed warts and all.

But Mr. Webb, in his tenure as head of the space agency, has been more than just a talker. He has been an enthusiastic manager of billions of dollars and thousands of men, an unquenchable salesman across the country of the benefits of the space program, and a hard infighter for his agency. He entered the NASA pic-



A vigorous manager of men and money, a tough infighter for his agency, James E. Webb stepped down October 7 after a long stint as Administrator of the National Aeronautics and Space Administration.

Nation: More Than Just Arms

accept a larger share of the problems and the rewards of American society.

I know that many of the [industrial] companies . . . have already entered the education field and have been working with us. I am already aware of some promising work, but we have just begun to explore the many useful ways for cooperation between industry and the military services. I am convinced, as I hope [industry is], that continued collaboration will not only help us do our job better, but that it can be the catalyst for improving school systems throughout the country.

Finally, I come to the problem of employment.

The National Alliance of Businessmen, launched last January as the result of President Johnson's vigorous efforts, has proved that there can be a workable relationship between the federal government and private industry in putting to work so-called unemployables from the heart of fifty of the nation's ghettos.

There is a real potential for defense industry to bring enterprise to the ghetto. There are already encouraging examples of what can be done—such as in the Watts area of Los Angeles and the Roxbury area of Boston. More than fifty of our major defense contractors have launched specific projects.

I want to see this sort of effort expanded.

As a further step, I have directed today certain changes in the Armed Services Procurement Regulations. The effect of these changes will be to encourage our major contractors to give greater attention to the possibility of locating new facilities in or near labor surplus areas and to give more consideration to placing subcontracts in these areas. Through these changes in our Regulations, I want to spotlight a responsibility, shared by the Defense Department and its major contractors, to contribute, wherever practical, to solving the problems of hard-core unemployment.

By law, we cannot award contracts on a sole-source basis nor pay a price premium to relieve economic dislocation.

This means we are forbidden from setting aside complete procurements for award exclusively to firms in labor-surplus areas. We cannot award a contract without competition regardless of the significant contribution such a contract might make to the hard-core unemployment program and the total national interest. I believe the time has come to reexamine this legislative policy.

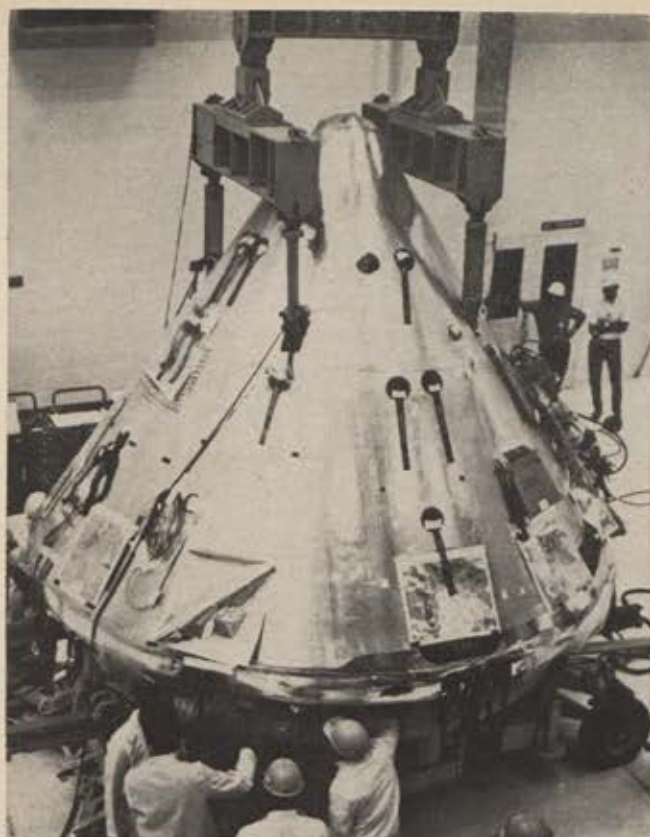
With the approval of President Johnson, . . . I intend to join with the Secretaries of Labor and Commerce to determine whether there are still other ways in which the Defense Department and industry can join together in attacking the problems of hard-core unemployment. . . .

Let there be no doubt as to my strong feeling that the Department of Defense has the opportunity and the responsibility to make a greater contribution to the social needs of the country, for it is my certain conviction that such action will contribute to our total national strength.

Not too many years ago, the War and Navy Departments were concerned almost exclusively with men and simple machines. Defense industries were regarded as mere munition-makers. How remote that era seems!

We now have a military-industrial team with unique resources of experience, engineering talent, management and problem-solving capacities, a team that must be used to help find the answers to complex domestic problems as it has found the answers to complex weapon systems. Those answers can be put to good use by our cities and our states, by our schools, by large and small businesses alike. The nation will be the better and the stronger.

I have no illusions that the tasks we have been discussing are simple, or that they can be accomplished overnight. The problems are many, and they will be with us for too long a time. But I am confident that the defense industries and the Defense Department can, while providing "for the common defense," also "promote the general welfare" and make even more meaningful "the blessings of liberty to ourselves and our posterity."—END



The Apollo manned spacecraft is "insulated" with a shiny coat of thermal-control material to protect crew from heat and cold. Coating was developed by G. T. Schjeldahl Co.

ture as a member of the new wave of leadership brought in by John F. Kennedy, and somehow his personality seemed most appropriate to the excitement and the newness of the space program in the early 1960s—an excitement that is now gone in the face of congressional and public apathy and in view of the collection of domestic and foreign crises the country faces.

There is a note of sadness in the fact that Mr. Webb chose as the moment for his exit the very time when three Apollo astronauts were making their preparations for the first manned earth-orbital flight of the US moon-landing program. But sentiment, despite appearances to the contrary, is not the central feature of Jim Webb's personality. Having served more than seven years in the Administrator's chair at NASA, having led his agency not perfectly, but with earnestness, political shrewdness, frequent toughness, and hardly ever at a loss for words, he now leaves for what we're sure will be new ventures. He's scarcely the sort for retirement.

Orbiting Space Farms?

We're indebted to Eloise Engle, Virginia-based aerospace writer who attended the recent International Congress of Aviation and Space Medicine in Oslo, Norway, for the following report on what astronauts of the future might be eating on the job:

"What will astronauts be dining on in the future? In the past, there have been the toothpaste-tube fares, a corned-beef sandwich (smuggled aboard one of the Gemini flights) and, for the Apollo flights, there are the instant freeze-dried packets that become edible when

liquid is added. But for extended voyages over a long period of time, Soviet scientists suggest another idea.

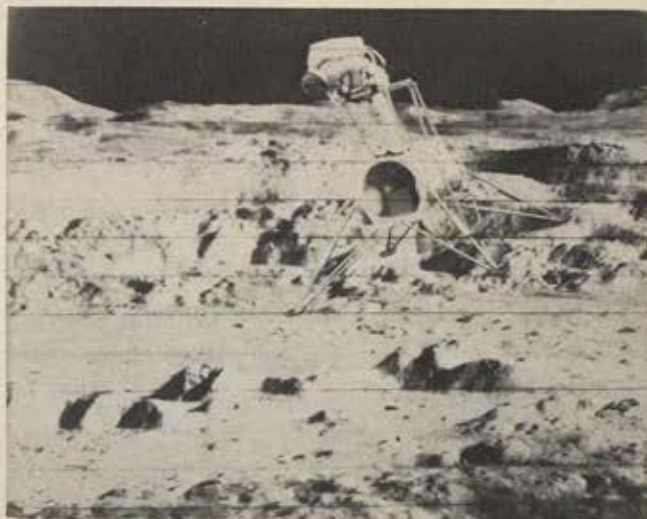
"J. Nefyodov, A. Ustiakov, and V. Vysotsky reported their views on food regeneration in life-support systems at the Oslo meeting and agreed that storage of necessary foods on board the spaceships seemed to be advantageous in some cases. They also said that reduced diets based on pure nutrients could be helpful in solving the food problems. But they are convinced, too, they said, that additional components can be gradually phased into a life-support system based primarily on stored food.

"One of the most promising components to be incorporated into the life-support system is higher plant life," the Russian trio said. "From the viewpoint of supplying space pilots with traditional vegetables, it is advisable to establish large hothouses with various crops to be grown. . . . Further theoretical and experimental research should be conducted with the purposes of evaluating the possibility and effectiveness of integrating higher animals into life-support systems."

"There was considerable Russian skepticism about the value of the once-heralded algae as astronaut food. Physiologist Dr. Vasili V. Parin of the Soviet Academy of Science and Director of the Institute for Biomedical Problems in Moscow said that there are many physiological problems connected with the use of unicellular algae and that preliminary investigations have shown that the chemico-technical treatment of the algal and bacterial biomass prior to its use in the food is of high complexity and low efficiency. In other words, it appears not to be worth the effort.

"In general, the Soviet delegation to the Congress felt that the most probable pathways to food regeneration would be the incorporation of synthetic food into space diets. The effects of synthetic food on human life and performance will be known only after extensive testing.

"But the vision of an orbiting space farm, complete with fresh vegetables, chickens, rabbits, and eventually maybe a cow, is intriguing. Will astronauts become farmers or vice versa?"—END



TRW, Inc., has proposed Lunar Flyer vehicle, two of which could be carried on Apollo missions to allow additional exploration. Rocket-powered, it would carry man several miles.

Although there is much talk of putting defense-style systems technology to work on nonmilitary problems, there has really been little progress in that direction—for two main reasons. First, there has been little real understanding of what systems technology is. And second, there is a strong reluctance in American society to accept the kind of centralized authority needed to use such techniques . . .

Systems Technology for Social Problems— Problems and Prospects

BY CAPT. GERALD T. RUDOLPH, USAF

THERE have been many articles on the pages of this journal and others urging the adoption of the aerospace industry's "systems technology" by the nondefense sector of society to solve the nation's mounting social problems. It has been suggested that health, education, welfare, urban renewal, agriculture, pollution control, and other common problem areas are fertile ground for the use of systems technology. But along with this growing interest and enthusiasm, most observers acknowledge that little real progress is being made in getting responsible agencies to adopt these advanced methods.

Defining Systems Technology

In this writer's opinion, there are two major reasons for this lack of progress. For one thing, the public does not entirely understand so-called systems technology, largely because the aerospace industry has been unable to define it adequately and explain how it is used. And even more fundamentally, American society has always been reluctant to accept the kind of centralized authority required to implement systems solutions, especially at the community and regional levels. Thus, every effort should be made to surmount these two obstacles because it is the judgment of many experts that systems technology will prove to be the most valuable parcel of knowledge to come out of present-day space technology. This article offers one definition of systems technology

and suggests what could lie ahead in social terms for this new capability.

Defining systems technology is not easy. Although many articles and books written by professional aerospace engineers, managers, and scientists describe unique aspects of systems technology, there is very little literature covering the entire subject. The concepts usually discussed are systems analysis, systems engineering, operations research, systems management, and the so-called systems approach. And most writers give only a parochial viewpoint of systems technology as applied in their own disciplines. When one takes a broader perspective of the aerospace industry, including the scientific, engineering, and management disciplines, a different viewpoint emerges, which reveals all of these new ideas to be mere applications of the same basic philosophy. To illustrate this systems philosophy, it is necessary to dwell on the concept of the system as a framework of perception.

A system is any group of interacting elements, which, together, act as a single entity for some specific purpose. This group of elements is normally thought of as isolated from its environment, although "input" and "output" interactions across the system's conceptual boundaries do occur. Almost anything can be thought of as a system because almost everything in the universe is related in one or more dimensions to something else. All things are related in time, space, function, or some other dimension. System thinking is nothing more than

training the mind to perceive situations as a system of interrelated factors. For example, the popular term "weapon system" refers not just to an aircraft or missile, but to all the elements that contribute to the performance of the mission. In practice, these other elements are the weapons, personnel, base facilities, ground equipment, spares, training, command and control, and documentation. Theoretically, the system concept could encompass even more: the supply system, transportation system, or even the economy that supports the entire complex of related systems. System thinking, then, is the basis for all concepts and practices known collectively as systems technology.

Since about 1948 and publication that year of Norbert Wiener's book, *Cybernetics*, the concept of the system as a scientific tool has grown increasingly useful. Traditionally, each scientific discipline has had its own mathematical system representation dealing with the kinds of systems peculiar to that field. Electrical engineers have always used the so-called "black-box" system concept from which a body of mathematics evolved for control-system theory, servomechanism theory, and related electromechanical control systems. Wiener's mathematical concepts, however, led to the evolution of a more generalized abstraction that could describe a wide variety of systems to include organic systems such as the human nervous system.

These trends in scientific thought have led to an enlarged body of mathematical system theory which, today, allows the system thinker to place almost any system perception into precise mathematical form, *provided* the interrelationships between elements are tangible and can be "quantified." System performance can thus be synthesized, measured, analyzed, or altered; key decision or intervention points can be found and tested; and system sensitivities can be analyzed. Scientists of many disciplines are now engaged in researching different kinds of systems for the purpose of obtaining a better understanding of the system concept itself. In other words, a science of systems is now evolving as a separate field recognized by both professional scientific societies and universities throughout the world.

A Unique Advantage

To return to the idea of systems technology, the point to be made here is that system thinking now offers a unique advantage over other ways of conceptualizing problems. A system perspective can be immediately translated into a precise analytic model from the vast new knowledge of systems science.

In management decision-making problems, system thinking is reflected today in what has become known as systems analysis. Those familiar with the Department of Defense high-level decision-making processes are well aware that most problems of national significance are subjected to rigorous system modeling for analysis of alternative choices. The growth of importance of systems analysis is merely a reflection of the fact that scientific techniques are beginning to show up in the management domain. Another widely known field allied with systems analysis is operations research or operations analysis. The distinction between these two fields is simply one of intent. Whereas *systems analysis* nor-

mally deals with decision problems of future or long-range alternatives, *operations analysis* deals with analyzing and improving existing systems. Both fields are simply scientific approaches to management problems using a systems perspective.

In addition to its impact on the analytical problems of management, system thinking has introduced many new management concepts that have proved highly successful in the aerospace industry in handling complex projects. The system program management or management-by-system concept, developed by the Air Force Systems Command, is perhaps the most widely known of these new ideas. Under this management scheme, a project is defined in its total system context, in which all program aspects are brought under the direction of a System Program Office (SPO).

This management team directs the project from its inception through development, installation, and turnover to the using agency. The SPO has full responsibility for all project elements that make up the system, including finance, schedules, hardware, personnel, computer software, research and development, production, training, maintenance and reliability standards, engineering, trade-off analysis, system design, and all aspects of the project that directly affect the program mission.

To accomplish this management task, the program office uses a management system consisting of standardized procedures, forms, techniques, and organizations to ensure detailed coordination between individual system element managers at every level of authority. In effect, the management system ensures that the program office itself functions as a system with highly refined procedural interfaces included in the "management package." The system program concept and the management system package have been widely accepted by private industry and are now considered routine by most of the aerospace industry.

Decentralizing Responsibility

System thinking has also altered the traditional line and staff concept of organization theory. The systems organization is a concept which *decentralizes* responsibility and authority by building an organization as a system of autonomous subsystems (departments), which coordinate with other management elements only on specific issues. Each manager is totally responsible for his own subsystem function while top management controls the total system by monitoring system inputs, outputs, and subsystem interfaces.

The interdisciplinary systems staff is also gaining popularity in the aerospace industry. This involves placing a highly technical staff of specialists in various fields at the disposal of top management to design a model of the business operating as a system in the total business environment. A system model facilitates management decisions such as capital investment and organizational changes, and it eases the control of the organization by enabling manual or automatic control systems to assume operational control of routine functions of the business system. Soviet industry is particularly advanced in the field of semiautomated command and control centers for managing business operations.

Still another aspect of systems technology is the rap-

idly advancing field of systems engineering. Here again, systems thinking is used in the design and development of complex projects. The basic idea is to design a total system rather than to fit together separately designed system elements. Throughout the design process, all system elements are continuously refined so that the total system performance is optimized, often at the expense of degraded subsystem performance. For example, an individual missile design might be intentionally compromised to be less than optimum if the launch facilities or logistic system to support the optimum design would be unnecessarily complex, thereby degrading the overall system performance. Systems engineering entails design tradeoffs encompassing as many aspects of the problem as possible. These include system reliability, performance, ease of maintenance, supply, human engineering, development risk, production ease, and so forth. Systems engineering is thus that part of the total systems technology base that translates system models into hardware systems.

To summarize this brief overview of the major elements of systems technology, what we're really saying is that systems technology is a collection of concepts, practices, and techniques that have emerged in the aerospace industry in response to the difficulties inherent in executing complex and expensive aerospace projects. At the heart of this technology is a way of perceiving problems as a system of interacting elements. Many new theories, methods, and occupations have arisen in the engineering, management, and scientific domains, which collectively enable the industry to attack problems of a magnitude heretofore unapproachable.

Systems and Society

But what of the social applications of this special technology? How can such techniques better serve the public than conventional methods? Only a few examples are necessary to stimulate the imagination on the multitude of possibilities this new capability affords. In the area of pollution control and waste disposal, an industry study for the state of California has shown that a profit-making regional waste-disposal system could be built that would handle all the liquid and solid waste matter of the entire San Francisco Bay area. A system of plants would convert waste to usable, salable products, which would completely eliminate the tax burden normally required to support this function.

Proposals for a national monetary system eliminating the need for cash have been advanced in which a computer network would automatically debit and credit bank accounts, check identity, perform accounting, and tabulate national economic statistics. Democracy itself could be revolutionized by a voting system enabling individual polling from existing home telephones, with built-in provisions against fraud, and instantaneous vote tabulation on national or regional issues.

Library information systems have been proposed that could increase the number of local-access libraries while reducing the over-all tax burden by connecting remote stations to central and/or national library centers. The list of proposals and possibilities goes on and on: transportation system ideas, communication, education, housing, land development, financing, and taxation.

Truly, systems technology offers society the management potential, engineering capability, and theoretical tools necessary to solve a vast number of social problems, to conserve national resources, and to improve the over-all efficiency and well-being of society. It is understandable why many people in the aerospace industry are excited over the potentials of systems technology for social applications.

Recognizing the New Capability

Why, then, have government and private sources been so slow in recognizing this new capability? What are the problems involved in implementing systems solutions? In this writer's opinion, the fundamental and most difficult problem is the structure of authority and responsibility of our social institutions themselves and the national psychology that backs up this structure.

Total systems solutions require some degree of centralized authority, at least as large as the system being considered. A regional waste disposal system needs a regional authority capable of making decisions for the region as a whole on all matters that affect the system. Because a true systems perspective is so broad, encompassing finance, organization, control, and regional and local system elements, the central authority must hold corresponding powers. In practice, systems plans and designs have not worked out well because, at best, the central authority has been a temporary committee of local representatives without true legal decision-making authority. If they are to be effective, true systems solutions cannot be diluted by city, county, or state boundaries.

It is not the purpose here to suggest that these traditional trappings of democracy be done away with merely to facilitate the advance of systems technology. But it is clear that in order to exploit the full potential of this new capability for social progress, some new form of broad system-wide authority is necessary. The New York Port Authority, while limited in its power, is perhaps a good example of the type of intergovernmental organization needed to execute systems solutions on a regional basis. This kind of decision-making body is not easily formed in a nation that jealously guards its freedom from centralized control at any level.

There can be no doubt that systems technology will play an increasingly important role in employing the resources of the nation for the solutions to some of our more complex social problems. What is needed to expedite this process is a better understanding of the capabilities and limitations of this new technology and the requirement for matching social institutions able to use the total systems approach with desired effect.—END



The author, Captain Rudolph, is currently assigned to Advanced Development Projects at the Air Force Systems Command's Space and Missile Systems Organization in Los Angeles, Calif. He is a 1958 West Point graduate and holds advanced degrees in Astronautics and Business Administration from the Air Force Institute of Technology and the George Washington University. The above article is adapted from a portion of his Air Command and Staff College thesis available from Air University Library, Maxwell AFB, Ala.

It is hard to deny that Russia's exploitation of her space activities on the political and propaganda fronts has helped create a new "balance of technological power, if not of terror," even in the face of the many technical failures and annoying secrecy of the Soviet program . . .

The Soviet Space Program: Its Political Implications

BY DR. CHARLES S. SHELDON, II

WE MAY discount the realities of Soviet leadership in space even when they have been first in many fields by pointing to the thoroughness of the US follow-up. But it is hard to deny there has been a restructuring of world power . . . as a result of Russian space activity. At first there were many who were convinced that whatever the Russians claimed about space was more likely done with mirrors and exaggeration than with real science. We heard about throwing up cast iron and "The Big Red Lie," and constant stories of dead cosmonauts condemned to perpetual orbit titillated the readers of Sunday supplements.

The claim has been made that the early Sputnik successes were more than paid for by increased export sales of Soviet machinery, instruments, and military goods. In a very short time, the Russians moved from the ranks of the supposedly technically incompetent to a more accurate reflection of their very real progress. It may be, of course, that the pendulum has swung so far as to overstate their capabilities. We have had forecasts even by technical people that by certain dates the Russians would land men on the moon, establish permanent stations in orbit, capture our satellites in orbit, and do many other startling things, and the dates for such accomplishments have long since passed.

Nonetheless, in ten or twelve years we have seen the shift from a view that the power balance was between Russian manpower holding Western Europe hostage and the threat of American nuclear weapons to a new balance of technological power, if not of terror, across a wide spectrum of modern capabilities.

Secrecy, Success, and Failure

Although the Soviet Union has been freer to forecast in official circles what its long-range technological plans for space are than would be true in the United

States, this is in stark contrast to the short run. The United States issues countless bulletins, articles, and brochures on most of its coming space operations that are new to our program, and then accepts the praise for our openness, or scorn for our failures. By contrast, the Soviet Union says it believes in letting results speak for themselves, and usually the first official announcement about an operation in space comes after some assurance of success.

A careful search of the record after the event usually will reveal the event did not come without warning, but the general effect and certainly the exact timing are matters of surprise (except as astronomical "windows" dictate the very moment of launch). Of course, this seeming Soviet modesty and self-control also provides the mechanism for hiding those space failures that fall short of reaching orbit. Because they strictly limit access to launch sites, such repressive information policies are enforceable in a way impossible at Cape Kennedy or even at Vandenberg, where Southern Pacific passenger trains wind their way through the base.

The Soviets' image of success may strengthen their claim to being the wave of the future, but the lack of advance detail also gives an impersonality to their program, a certain remoteness to it. They have said they cannot reveal the details of their space organization, their budget for space, or even the men who are its leaders. The excuse is that identifying these men in life will make them targets of Western assassins. This sounds unlikely as a serious concern, but the late Sergei Korolev, though correctly guessed by Western scholars to be Chief Designer, was not officially identified until his untimely death and burial with high honors in the wall of the Kremlin. Our policy of relative openness has helped not only the American people, but also our friends in many countries to share at least vicariously some of the struggle to succeed in space.

It must be noted parenthetically that the contrasting



In philosophy, the US program is no more military than the Soviet, and, in the presence of the Soviet fractional orbital bombardment system (FOBS), one can argue it definitely lacks a military dimension the Russians possess; yet we do carry an onus and a suspicion of illegality in many other countries, which somehow the Russians escape. Since we could not retroactively achieve the bland Soviet line that the program is wholly scientific, the alternative might be still without flamboyance to promptly announce as much information as the Russians do. Our present policy does not hide information from determined collectors, but it both inconveniences domestic interested parties and provides fuel to foreign propagandists.

Support for Space

From a high of about one percent of gross national product, the United States now puts in about three-quarters of one percent into its space program. Inasmuch as the Soviet gross national product is about forty percent that of the United States, and their space program, about as varied as our own, consistently puts up more tonnage of payload, it seems a reasonable guess that they are devoting closer to two percent of their GNP. The question is, can they afford it and have they had any major perturbations in support?

Khrushchev was obviously interested in space, and undoubtedly gave it good support. Brezhnev and Kosygin by contrast seem colorless and it is harder to judge their attitudes. It may be recalled that the political change occurred while Voskhod-1 with three men was in orbit. The absence of manned launches from Voskhod-2 in March 1965 to the Soyuz-1 flight of April 1967 naturally raised the question why there was such a period of quiescence, especially since the full potentialities of the Voskhod system had not been exploited.

My own interpretation would be that we witnessed the pause between two stages of technology, and the two years were really not too different from the pause between Gemini in 1966 and Apollo in 1968. It was Kosygin in late 1965 who was interviewed by James Reston of the *New York Times* on the question of financial burden. Kosygin stated that spaceflight was important, and not an undue burden; and he further volunteered that he did not think the then-existing level of effort was too great a burden for the United States either.¹

The United States budgets for space have declined each year after 1966, and now the number of flights is falling off, too, as programs are completed or curtailed. By contrast, the Soviet program has grown fairly consistently, with an unusually large increase from 1966 to 1967, and a sustained high level in 1968.

Whatever the reasons, there is a tendency for programs in the United States to go in and out of fashion, and each year new funds must be authorized and appropriated and apportioned so that our programs are under constant review in both the executive and legislative branches of government. This keeps the programs in touch with the realities of public opinion but may be hard on those programs whose total development cycle is spread over many years.

¹ *New York Times*, December 8, 1965, p. 1.

policies on information are not as cleanly delineated as the foregoing discussion implies. Through the use of a cover name, Kosmos, and the further claim that every flight is scientific, the Russians have been prompt to announce within hours the orbital elements of all launch successes. In the United States we run an open NASA program, although Congress occasionally has grumbled even then about a credibility gap on NASA information releases. The agency does tend to try to put its best foot forward, and the efforts are sometimes so obvious there is a backlash.

However, about two-thirds of all US space launches are for the Department of Defense, and considerable obstacles are thrown in the way of gathering information about most of them. They are nameless, and, although the fact of launch is given out locally, whether or not orbit was attained is not then disclosed. This appears weeks later in the Goddard Satellite Situation Report, but by that time the name of launch vehicle used has disappeared from the record. The consolidated story, but still without mission identification or name, appears some time after the end of the year in the President's report to Congress, and even here, thought has been given to dropping this record as too bulky.

Dr. Sheldon, Acting Chief of the Science Policy Research Division of the Legislative Reference Service of the Library of Congress in Washington, D. C., is one of the country's leading authorities on the Soviet space program and a former staff member of both the House space committee and the National Aeronautics and Space Council in the White House. The accompanying article, excerpted from a longer presentation given at a conference of the American Institute of Aeronautics and Astronautics in Washington in August 1968, is published here with permission of the Institute and the author.

Some people argue the Soviet Union's space program is spared all the tribulations faced in this country in getting funding. Obviously they do not have congressional hearings, and the controlled press does not afford an independent review of national goals. But even the Russians face the same shortages of resources that we do, and have to make choices. We have seen them in past years delay completion of canals and nuclear power stations. So space is not automatically exempt. All one can point to is that many space tasks have not been undertaken as soon as they were technologically feasible, but on the other hand, the launch rate is rising, and doing so very substantially.

We know from our own experience that very heavy expenditures can be made for space before flights occur, as has been true in the Apollo program. By the same token, failure to undertake heavy expenditures for advanced programs would not be provable, either, until with the passage of time no results in hardware became evident. So the real test of the level today of Soviet expenditures for space will not be made until we see whether [outgoing NASA Administrator James] Webb is right—that new, more ambitious parts of the Soviet program are now in the making at factories and test sites beyond the range of Western visitors.

International Cooperation

A useful dividend of the NASA space program has been that the United States could conduct cooperative programs with more than seventy-five other nations. This has given these countries a share in space research in keeping with their capabilities and willingness to invest resources. We are constantly seeking to build bridges to the rest of the world, and [our] space effort is one way. A secondary advantage follows when in some cases countries do not dissipate limited resources by reinventing what has already been paid for. Relying on the United States may tend to limit the spread of launch vehicle technology with its arms implications. Space competition, it has been argued, may be a substitute for war, and hence this is socially useful, too, although rather a backhanded compliment.

Because the Russians do not seem to have expended the price to run two major segments of the space program, one civil and one military, they have also lost the advantage of an easy way to separate classified programs from unclassified, and hence have had no good way they could run international programs of cooperation involving combined teams and hardware. On some occasions the Russians have made disparaging comments about our cooperative programs as designed to limit the growth of space programs in third countries, but they have not really been very convincing since no one is forced to cooperate with the United States or is excluded from running purely national efforts as well.

One can probably credit the NASA program of international cooperation as having had some effect on the recent shift in Soviet policies. For years "cooperation" consisted of having people in Soviet bloc countries send sighting reports on satellites to Moscow, but receiving little in return. Just within the last year or so, the Russians have held their first formal meetings with scientists of [Eastern] bloc countries to discuss cooperation

in the American manner, and we are told this will lead eventually to the launch by the Russians of experiments and possibly even complete satellites consisting of hardware developed by bloc countries.

A further area of cooperation has been between the Soviet Union and France. Already experimental programs of color TV have been sent through Molniya-1 satellites between the two countries. This has been linked with the Soviet adoption of the SECAM-3 French system of color TV. There are to be Soviet-launched French payloads in elliptical orbit around the earth, and possibly in lunar orbit. A rumored bone of contention is whether French scientists will be allowed to go to the Soviet launch site to manage the intricacies of final check-out and launch, but this may be possible.

Limited US-Soviet Exchange

Talk of cooperation between the United States and the Soviet Union is not new. Progress has been slow because, through so many of the years, the two countries were not evenly enough matched for both sides to be equally ready to trade data and to work together closely. Broader political differences have also figured in the delays. Undoubtedly in both countries there are strong forces that would oppose a truly close relationship. If some of the ambitious space projects of each country have had as a basic purpose the building of a broad capability to operate in space, then one would hardly expect a willingness to give up any vital element of an independent national program. For example, neither side would want to be dependent upon the other for launch services or for tracking.

The hope that a combined US-Soviet program would save money is probably not realistic. [By] coordinating work done to different standards and with mutual suspicions and language barriers, programs might very well end up taking longer and costing more. Even the fairly favorable conditions of the ELDO (European Launcher Development Organization) experience have not been overly encouraging. Of course, a more limited cooperation in terms of data exchange or the division of some missions might be of at least limited help financially. But the almost rhetorical calls made at various times on both sides, "Let us go to the moon together," seem more calculated to create political effects than specific plans for hardware and flight operations.

There are, of course, cooperative arrangements between the two countries, arrived at with great caution on both sides to make sure more was not being given away than was gained in return. The most active is the exchange of weather satellite pictures over the "cold line" between Moscow and Suitland, Md. There has also been much planning of a joint textbook on space medicine, but after some years there is still no book. There has also been talk of exchanging geomagnetic information. The Soviet Union has recently suggested informally the exchange of geodetic information, but this has been received with some suspicion that it would give a better tie of the Eurasian datum to the North American one for Soviet missile targeting purposes than would be supplied in return. One other agreement called for cooperation in communications experiments with Echo II. This was so limited . . . that it only involved

transmission of signals from Jodrell Bank and Soviet receipt of those signals, with the United States not directly involved.

In all fairness, it must be recognized that cooperation has existed in other ways beyond these formal agreements. The Russians have consistently sent delegates to meetings of the International Astronautical Federation, and to meetings of COSPAR, the Committee on Space Research of the International Council of Scientific Unions. They have been increasingly free in putting replicas of payloads on display at international meetings, such as the Brussels World Fair, the Paris Air Show, and Expo 67 in Montreal. They have gradually released more pictures and movies of their space operations, which one could classify as a form of cooperation, since these have satisfied some of the long-standing curiosity about previously secret space operations.

Military Support

As indicated earlier, the Soviet Union was late in recognizing the usefulness of military support operations in space, but now military observation photographic missions make up the largest single element in their spaceflight program. This change of direction in activity has had its consequences politically, which are quite noticeable. We went through a period when all our military operations in space were labeled as aggressive, and Soviet threats were made about countermeasures. After 1962, when Soviet flights of this type started, the complaints became more muted, or at least were heard less often. Then we had the phase where in private an occasional Soviet official, perhaps in a jocular vein, would suggest trading pictures of military bases taken by satellites. Almost consistently through the entire period the public line has continued that the Soviet program is purely scientific, but that it must remain under wraps because of the close link between superior Soviet strategic rockets and the launch vehicles used for space.

The closest to a public break in the "all peaceful" line has been the claim for several years of first a "global rocket" that could approach its target from any direction and then of orbital bomb carriers, including the parading of two different rockets in Moscow that were described as having an orbital capability. But the Russians have also labeled as viciously untrue US reports that certain flights involving reentry tests are in fact related to the FOBS. One other indirect but possibly significant shift of attitude is reflected in a Yugoslav interview of a Soviet space official late in 1967, which emphasized the extreme importance of military support activities.²

It is also wryly amusing that, while the United States has no plan for bombs in orbit, and while the Russians already have made many such flights (presumably without actual nuclear material on board), they have tried to raise this issue in their propaganda to our disadvantage. Partly because of shortcomings in our public in-

formation policies, the wholly passive Manned Orbiting Laboratory of the United States has several times been described by the Russians as an orbital bomb carrier, which it most definitely is not.

Arms Control and Stalemate

Major international agreements in the arms-control area have been limited to the nuclear test ban in the atmosphere and space, and to the ban on weapons of mass destruction in orbit. Some would argue that even without arms limitations or controls beyond the present ones, the risks of a major direct military confrontation between the United States and the Soviet Union have been lessened by the growing power of both countries to destroy the other, and the likelihood that both could accomplish this, even if one of them should be the victim of a first strike.

President Johnson made a speech in Nashville, Tenn., last year, which was indicated to be off the record, yet was well reported at the time in national news media.³ He said the military advantages of space operations to the United States had brought savings in our military budget equal to ten times everything spent for the space program so far. With the space program having cost about \$40 billion, if one takes him literally, the saving in the defense budget attributable to space work in the last dozen years is \$400 billion. Because the Soviet Union is exploiting military space applications on a broad front, that nation has probably found the investment extremely profitable, too.

The case can be made that we live in such a dangerous age of mass-destruction weapons that certain knowledge of what other powerful nations are up to is extremely important to avoid miscalculation and destruction. If this is so, even though major powers continue to practice security measures to hide some aspects of their capabilities and their intentions, they may actually share some benefits from a disclosure of traditionally secret information to other powerful states. If they are strong, knowledge of this fact may deter the other strong powers from any delusion that they could win an easy victory by starting military operations. If they are not adding to their strength, such knowledge might make unnecessary the escalation of weapons manufacture and deployment in the fear of an existing escalation by the other side which, in fact, did not exist.

Of course, these arguments have the weakness of assuming that the reaction that follows from greater knowledge of the other side would always bring a better result. In general, though, if there are two scorpions in the bottle, perhaps it is better that they not be blindfolded. If the United States and the Soviet Union each knows how strong the other power is in weapons and logistics facilities, this may increase their caution in dealing with each other in situations that risk escalation to higher levels of response.

One cannot judge this matter with complete confidence on either side because of the secrecy maintained. However, it seems inescapable that the world strategic outlook has been affected by the appearance of military support roles in space by both the major space powers. —END

³ New York Times, March 17, 1967, p. 13.

² Zagreb Vjesnik, January 21, 1968, p. 8. Interview of B. P. Konstantinov, vice president of USSR Academy of Sciences—"Space research is not so expensive as it is useful . . . and its importance for defense is enormous. It is known now how much trouble the United States had when it sent spy planes to take pictures of USSR territory from a great height. Such spy planes have become useless."

With some 5,000 military, government, and other guests on hand to view the broad spectrum of industry advances, with panels of topflight experts reviewing progress on the US supersonic transport and the outlook for international cooperation in aviation and space technology, with a gala dinner dance saluting USAF's twenty-first anniversary, and with a salient keynote address by an AFA founder, now Secretary of Commerce, the Association's Fall Meeting effectively illuminated . . .

The Bright Face of Aerospace Today

By Edgar E. Ulsamer

ASSOCIATE EDITOR, AIR FORCE/SPACE DIGEST

THE watchwords of the Air Force Association's 1968 Fall Meeting, held in Washington, D. C., September 16 through 18, were "more and better," applying to the range of diverse programs that make up this annual event.

The central element of the Fall Meeting—the Aerospace Development Briefings—exceeded previous years both in the quantity of the exhibits and attendees, and in the quality of the briefings and displays.

Secretary of the Air Force Harold Brown and USAF Chief of Staff Gen. J. P. McConnell, who were among the first of some 5,000 leaders from all segments of government, industry, and the scientific community to view the exhibits, agreed that this year's briefings were "the best you have ever held."



Air Force Secretary Harold Brown and Chief of Staff Gen. J. P. McConnell, shown here with AFA President Robert W. Smart, opened the Aerospace Development Briefings and described them in scope as "the best you have ever held."

"They are invaluable to the Air Force," General McConnell said, and indicated that he is "very interested in this program." He added that he hoped next year's Aerospace Development Briefings might be even better, except he didn't "know how 1968 could be improved upon."

A total of forty-five formal, escorted briefings were given on a nearly continuous basis by the forty-nine exhibitors (*see box, page 93, for listing*). The briefings were attended by about 2,300 officials, including more than 1,000 field-grade and general officers of the Air Force, and a similar number of officials from the Department of Defense, the Army and Navy, and such government agencies as FAA, NASA, AEC, and the Department of Transportation.

International Marketing Seminar

Two special aerospace management seminars were featured during the Fall Meeting. One covered the subject of "International Aerospace Marketing: Promises and Problems." The other was called "Commercial Supersonic Flight: High Risk vs. High Return."

Both seminar panels were made up of government and industry experts who dealt with the topics authoritatively and in depth. The five experts participating in the International Aerospace Marketing Seminar on September 17 analyzed and evaluated the changing pattern in the export of aerospace products, which Leonard A. Alne, Deputy for International Logistics Negotiations in the Department of Defense, characterized as the "piece-of-the-action syndrome." Explaining that this tendency toward collaborative arrangements in the international aerospace market was increasing

[illegible]

Brief, formal program of the Fall Meeting's Air Force Anniversary dinner dance led off with the introduction of the Air Force's most recent Medal of Honor winner, Capt. Gerald O. Young, a helicopter commander, shown here at United Aircraft's Sikorsky Aircraft Division exhibit dedicated to his heroism.

"Defense ministries abroad," he said, "are increasingly preoccupied with making greater [indigenous] technological contributions to the defense equipment. They are striving for larger development programs at home in order to keep up with the state of the art. When development is clearly beyond their economic or technical capabilities, they wish at least to produce some portion of their equipment at home." He added that as a result coproduction and licensing are rapidly becoming the most promising areas of international aerospace marketing.

Mr. Alne predicted that in case of complete military aircraft sales, which make up about forty-eight percent of all US military aerospace exports at present, "perhaps only half of our future aircraft sales will be in the form of complete aircraft produced in the US, and half, if we are successful, might comprise aircraft components sold directly to foreign development and production programs."

Consequently, the US aerospace industry will have to stop depending on supplying a limited number of major US prime producers and start "piggy-backing" on foreign aircraft and other prime systems manufacturers, he suggested.

Mr. Alne explained further: "US suppliers of components and equipment, in avionics, in mechanical and hydraulic systems, in computers, in ground accessories, in environmental control systems—in all the seventy-five percent nonairframe portions of an aircraft—will have to establish and maintain the same relationship with foreign primes that they now do with US primes."

This meant, he said, "learning about foreign development and production plans; projecting their budget availabilities; scouting the competition; discerning foreign design problems; contributing engineering so-

(Continued on following page)

Engrossed audience attending briefing at United Technology Center exhibit was typical of the some 2,300 attendees of the Aerospace Development Briefings, which set new records in terms of the number and scope of the briefings and exhibits as well as the enthusiastic audience reaction they generated.





Among the dignitaries visiting the Aerospace Development Briefings were Acting FAA Administrator D. D. Thomas, left, and his predecessor, Gen. W. F. McKee, USAF (Ret.).

lutions to, instead of simply searching for, buyers of US equipment; finding opportunities for US equipment that foreign ministries of defense cannot afford not to have—in brief, treating the foreign market as if it were domestic.”

The Assistant Secretary of the US Department of Transportation for International Affairs, Donald G. Agger, postulated the need for international collaboration in aviation as well as all transportation means on two principal grounds: First, he pointed to the wastefulness of developing “transportation technology and transportation techniques that have already been developed by some other nation.” Second, Mr. Agger argued that “for a variety of reasons the European nations are not going to quietly leave the manufacture and sale of aircraft to the normal forces of the marketplace if doing so would strangle their own aircraft industries.”

“The Europeans are alarmed,” he said, “at the loss of their markets to the United States and at the subsequent decline of their own industries. And I fear

there is good reason to believe that to save their industries they will look more and more toward ‘Buy European’ agreements and ‘Buy Domestic’ agreements.”

Explaining that decisions to “Buy European” or “Buy Domestic” are not difficult to enforce, he said the US alternative “for keeping our traditional export markets open may be cooperative international agreements for the development and the production of new transportation techniques and products, including aircraft.”

“When we talk about competing with friendly nations in the export market,” he said, “we are talking about nations in whose future we have a continuing stake. For a long time now, our future has been tied up in their future. Their fate is our fate. For the indefinite future, we’re going to have to manage our affairs and conduct our business with this in mind.”

Representing the European point of view at the seminar, the Director of Engineering Projects of Rolls-Royce Limited, D. O. Davies, pointed to the “over-all benefit and strength of the non-Communist world” gained by increasing international collaboration on aerospace programs.

“These programs,” he said, “ensure a greater degree of standardization of the equipment within the military forces of the allied nations.”

Speaking for the US aerospace industry, General Electric’s Mr. Small recognized that the US, as do all nations with an indigenous aerospace industry, needs to control its military exports. This control has resulted in the government’s approving only about one out of three requests for export of military equipment, he said. The criteria for the US government’s approval or disapproval of military exports range from technological security considerations of the system involved to maintenance of regional arms balances and whether or not a given sale is compatible with existing “offset” agreements.

In consequence, Mr. Small said, the question “Is it all worthwhile?” must be asked. He said that US aerospace industry, in spite of a multitude of restraints and drawbacks, does consider it worthwhile to pursue the military export market for these reasons:

1. Aerospace exports serve the US national interests and, therefore, will continue to receive favorable government attention.

Seminar on “International Marketing: Promises and Problems” on September 17 featured government leaders and aerospace industry executives from the US and England as panelists and speakers. New trends in the vital export market were analyzed by such experts as DOT’s Assistant Secretary Donald G. Agger, at the rostrum,



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BACKGROUND DATA

U. S. Government
☐ USAF Active Duty
☐ USAF Civilian
☐ Other Active Duty
☐ Other Civilian

Aerospace Industry
☐ Manufacturing
☐ Engineering
☐ Commercial
☐ Aviation
☐ General Aviation

**Other Industry
or Business** ☐

Professional
☐ Educator
☐ Lawyer
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Highlight of awards program, a key feature of the Air Force-Industry Luncheon, was the presentation of the new Thomas Gerrity Trophy, being awarded here by AFA President Robert W. Smart to Maj. Gen. Charles G. Chandler, Deputy Chief of Staff/Materiel, PACAF, for outstanding systems logistics management.

2. American industry has an impressively broad and deep technology base from which products and services required by the international market can readily be supplied.

3. Our government has become more sophisticated in technology-export policy in spite of controls that tend to inhibit aerospace exports.

4. Through sales and licensing, industry of several nations has demonstrated an ability to develop successful, mutually beneficial programs that will tend to further increase industry-to-industry cooperation.

5. The US balance of payments problem has focused on the necessity of increased foreign trade, and the aerospace industry has traditionally been one of the nation's principal manufacturing export industries.

6. And lastly—the 1970s will produce an impressive replacement market for US aerospace products that were supplied to other nations during the 1950s and 1960s.

James P. Mitchell, Vice President of the Aerospace Division of the Chase Manhattan Bank, moderated the seminar.

Status Report on the US SST

Preceded by extensive press and television ruminations about what announcements the Federal Aviation

Administration and Boeing would make at this AFA meeting about the redesign of the American SST, the Management Seminar on Supersonic Commercial Flight on September 18 served as a forum for the first complete status report in 1968 on the US SST program.

The President of the Boeing Co., T. A. Wilson, announced that in the current redesign effort of the American SST "the front runner . . . is a fixed-sweep design with a conventional aft tail, which in planform is similar to the F-4 supersonic fighter." In February of this year, Boeing, builder of the American SST under government sponsorship, announced that its initial variable-sweep-wing design, the so-called Dash 200 model, would not meet essential prototype requirements and that, therefore, a complete redesign program, scheduled to be submitted to the FAA by January 15, 1969, has become necessary.

At the AFA seminar Mr. Wilson stated: "Our studies continue to indicate that the variable-sweep concept [on the basis of which Boeing won the SST competition in 1966] has the potential for providing efficient supersonic cruise and landing and takeoff equal to our subsonic transports. However, the multiengine and landing gear arrangements required in a commercial SST tend to move the wing pivot point well outboard

(Continued on following page)



Speaker at Air Force-Industry Luncheon was the Secretary of Commerce, C. R. Smith, a former President of the Air Force Association and former head of American Airlines.

Among military leaders manifesting great interest in the briefings and exhibits of the Aerospace Development Briefings was Chief of Naval Operations Adm. Thomas H. Moorer. More than 1,000 field-grade and general officers attended the forty-five formal, escorted briefings.



of the fuselage, reducing the inherent low speed advantage of the variable-sweep approach."

Mr. Wilson stressed that, press reports to the contrary, Boeing has not committed itself to any one of the four configurations it is currently evaluating—nor does it plan to do so before the January deadline.

The Boeing executive stated that he was "very optimistic about ultimate success" and that he fully expected that his company will "present an airplane that satisfies the objectives of the [SST] program."

Maj. Gen. J. C. Maxwell, Director of the FAA's SST program office, told the seminar that there is evidence the Soviet Union's SST, the TU-144, has been rolled out and is likely to fly later this year, ahead of the British-French Concorde.

The other speakers at the SST seminar were United Airlines Senior Vice President William C. Mentzer, chairman of the US Airline SST Technical Committee, who discussed operational and economic aspects of the SST program; and the Assistant Managing Director of the British Aircraft Corporation, A. H. C. Greenwood. The British aerospace executive predicted that the Concorde would fly "this year" and that the Anglo-French SST would give great impetus to further growth of air travel and aeronautical technology. Stressing the need for intensified international collaboration in aerospace programs, he suggested that the development of follow-on versions of the SST may lend itself to joint US-European programs.

The seminar was moderated by Stuart G. Tipton, the President of the Air Transport Association of America.

Air Force Anniversary Dinner Dance

The social highlight of the Fall Meeting was the Air Force Anniversary dinner dance on the evening of September 17. Leading off the brief formal part of the gala event was the introduction of the Air Force's most recent Medal of Honor winner, Capt. Gerald O. Young, who received the nation's highest military award for heroic helicopter rescue operations last November in South Vietnam (see *AF/SD*, July, '68, p. 43).

The Anniversary program featured introduction of a number of outstanding young members of the United States Air Force, in keeping with the evening's theme, the twenty-first birthday of the Air Force as a separate service. Among them were: 1st Lt. Maxine J. King, first WAF to represent the United States in the Olym-

pics, participating at Mexico City in the three-meter springboard diving event; an outstanding representative from the AFROTC (Cadet Col. Donald F. Johann), one from the Officer Training School (Officer Trainee Col. Frederick R. Collins), and one from the Air Force Academy (Cadet Col. Thomas R. Case). Others representing the "Young Air Force" were 1st Lt. Pamela S. Weaver, a Military Airlift Command flight nurse on her way back to Vietnam duty; and A1C Will F. Pittman, a twenty-one-year-old supply management specialist whose birthday coincides with that of the USAF.

In their brief remarks to the festive gathering, both Air Force Secretary Brown and Chief of Staff General McConnell put "the accent on youth."

"Without young attitudes and young ideas we could not hope to cope with the pace of world events," Secretary Brown said, adding that this had to be coupled with "maturity if our country is to retain its position of leadership in the world."

The Secretary concluded by saying:

"The people of the United States have developed a system that retains ultimate control in their own hands, but allows a wide sphere of freedom and initiative to the government officer, the industrial executive, and the private citizen. The result—as we have seen in the multitude of displays at this meeting—is a diversity and creativeness that cannot be equaled by any regimented effort. It is up to all of us to see that we maintain the capability for self-analysis that our system requires if it is to survive in this changing world."

General McConnell urged that the country stop "feeling sorry about the small but vocal element among our youth who are opposed to everything we respect and cherish [and] instead pay more attention to the far greater number who are committed to constructive goals—young men and women like the outstanding representatives of youth who are with us tonight."

Some 2,500 attended the event. Music was provided by the Airmen of Note under the baton of Chief Warrant Officer Bob Bunton.

Air Force-Industry Luncheon

The concluding event of the 1968 Fall Meeting was the Air Force-Industry Luncheon on September 18 where four USAF officers and two Air Force civilian employees were honored for exceptional achievement in the management of US aerospace resources.



Throng of Aerospace Development Briefings attendees awaits beginning of escorted briefing tour, feature event of AFA's Fall Meeting. Drawing a record 5,000 viewers this year and consisting of forty-nine exhibitors who furnished forty-five regular briefings on major areas in state-of-the-art advances, the event was a "sellout."

The six winners, three each selected by the Air Force Systems Command and the Air Force Logistics Command, and their awards were:

- **BRIG. GEN. GUY M. TOWNSEND**, Deputy for Systems Management, Aeronautical Systems Division, Wright-Patterson AFB, Ohio—the AFA Distinguished Award for Management.

- **COL. CHARLES D. WALDECKER**, USAF (Ret.), for his service as Director of Programs/Budget, Hq. AFSC, Andrews AFB, Md.—the AFA Meritorious Award for Support Management.

- **PAUL B. MCKEE, JR.**, Chief, C-141/C-130 Systems Engineering Office, Aeronautical Systems Division, Wright-Patterson AFB, Ohio—the AFA Meritorious Award for Program Management.

Air Force Logistics Command recipients were:

- **COL. FLOYD E. DIXON, JR.**, Chief, Airborne Radar and Electronics Warfare Item Management Division, Warner Robins Air Materiel Area, Robins AFB, Ga.—the AFA Logistics Executive Management Award.

- **LARRY C. JOHNSTON**, Directorate of Maintenance, Hq. Oklahoma City Air Materiel Area, Tinker AFB, Okla.—the AFA Logistics Middle Management Award.

- **1ST. LT. MICHAEL A. CIOLLI**, Directorate of Procurement and Production, Hq. Ogden Air Materiel Area, Hill AFB, Utah—the AFA Logistics Junior Management Award.

A new annual award of the Air Force Association, memorializing Thomas P. Gerrity, who died early in 1968 while serving as Commander of the Air Force Logistics Command, was awarded to Maj. Gen. Charles G. Chandler, Jr., Deputy Chief of Staff for Materiel, PACAF. The General Gerrity Trophy for "outstanding dedication to service, devotion to duty,

and contributions to systems logistics management" was awarded for General Chandler's outstanding management of the largest and most demanding tactical logistics system in the Air Force in support of the Vietnam War effort.

The awards were presented by AFA President Robert W. Smart.

The luncheon's master of ceremonies, AFA Chairman of the Board Jess Larson, introduced the key speaker—Secretary of Commerce C. R. Smith, a former National President of the Air Force Association. Addressing himself to national defense in a broad sense, and including the imperative "defense of the dollar," Secretary Smith emphasized the total interdependence between a free and vibrant economy and "our ability to defend against most, if not all, threats to our security."

"Disruptions in the country's ability to produce," he said, "can threaten our security from within. The billions of dollars we spend on education, health, manpower training, and other social purposes will disappear unless the private sector produces the revenue base for these programs. And, without funds for worthy purposes, domestic disquiet can reduce our capacity to defend our borders."

The Secretary concluded by stressing that "a climate of growth and increasing strength for United States business and industry will provide the cornerstone of our national defense. Without that cornerstone, we will not have an adequate defense."

His remarks represented a fitting finale for AFA's Fall Meeting, dedicated to the proposition that the aerospace strength of the United States rests on the twin pillars of military and technological preparedness.—END

COMPANIES THAT TOOK PART IN AFA'S 1968 AEROSPACE DEVELOPMENT BRIEFINGS AND DISPLAYS

The following companies conducted briefings at the 1968 Aerospace Development Briefings and Displays:

AC Electronics Div.,
General Motors Corp.

Aerojet-General Corp.

Allis-Chalmers

Allison Div., General Motors Corp.

Atlantic Research Corp.

AT&T and associated companies

Avco Corp.

The Boeing Co.

Continental Motors Corp.

Control Data Corp.

Electronic Communications, Inc.

Fairchild Hiller Corp., Republic Aviation Div.

The Garrett Corp.

General Dynamics Corp.

General Electric Co.

Aircraft Engine Group
Aircraft Equipment Div.

Grumman Aircraft Engineering Corp.

International Business Machines Corp.

International Telephone & Telegraph Corp.,
U.S. Defense & Space Group

Litton Industries, Inc., Guidance & Control
Systems Div.

Lockheed Aircraft Corp.

LTV Aerospace Corp., Vought Aeronautics
Div.

Martin Marietta Corp.

McDonnell Douglas Corp.

Douglas Aircraft Co.
McDonnell Co.

North American Rockwell Corp.

Autonetics Div.
Columbus Div.
Los Angeles Div.

Raytheon Co.

Ryan Aeronautical Co.

Sikorsky Aircraft Div., United Aircraft Corp.

Sperry Rand Corp.

Sperry Flight Systems Div.
Sperry Gyroscope Div.
Sperry Systems Management Div.

Standard Manufacturing Co.

TRW Systems Group

United Aircraft of Canada, Ltd.

United Technology Center

Westinghouse Electric Corp., Aerospace Div.
Wyman-Gordon Co.

The following companies, and military agency, displayed products and equipment at AFA's 1968 Fall Meeting, but did not conduct briefings:

Aero Spacelines, Inc.

Aircraft Radio Corp., Subsidiary Cessna
Aircraft Co.

Beech Aircraft Corp.

The Coca-Cola Co.

The Conference Book Service
Hycon

North American Rockwell Corp.
Atomics International
Rocketdyne Div.
Space Div.

Olivetti Underwood Corp.

Pan American World Airways

Pepsi-Cola Co.

The Seven-Up Co.

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U.S. Air Force



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Start of deliveries of the new Sikorsky HH-53C heralds renewed USAF interest in choppers for the Aerospace Rescue and Recovery Service. Long-range, twin-turbine aircraft, heavily armed and armored, will be a welcome sight to pilots shot down in remote jungles . . .



Airborne shot of the HH-53C provides good view of the auxiliary fuel tanks. These come in two sizes, can carry 450 or 650 gallons and withstand incendiary shell hits.

A New Platform for the Hoist

A USAF F-105 pilot, shot down over North Vietnam, safely ejected from his aircraft and landed in a heavy growth of elephant grass. Enemy troops who saw him come down surrounded the area and raked it with gunfire, while the pilot appealed for help over his emergency kit radio. Unable to find him, the Communists set the elephant grass afire, and the pilot was almost driven into the clear when an HH-43 Huskie helicopter appeared and dropped a hoist. On the way up, the pilot was fired upon by his pursuers and shot back with his pistol, supported by two automatic weapons overhead. When the experience was all over, another officer asked the pilot at which point in his trial was he most frightened? The answer: "When that damned helicopter had to land to refuel!"

The helicopter pictured on this page, posing outside the Pentagon, may be the answer to that pilot's prayer.

It is the new USAF/Sikorsky HH-53C, soon to be the mainstay of the Aerospace Rescue and Recovery Service. The Huskie had limited range and no aerial refueling capability. The HH-53C will be able to fly missions limited only by crew fatigue and oil capacity, using the air-to-air refueling probe mounted below the pilot's seat on the right side. The vehicle has a defensive firepower equal to that of the AC-47 or "Puff, the Magic Dragon." It carries the same three GE 7.62-mm Miniguns, mounted at door, a window, and rear ramp.

Most significant is the fact that USAF has plans to buy about fifty HH-53Cs, a program that marks a substantial revival of Air Force interest in and requirement for rotary-wing aircraft. They were used in Korea for rescue missions, and the Huskie later proved efficient in fighting airplane crash fires, but it has been several years since USAF has shown such serious intent to build up its helicopter inventory. —C. W.

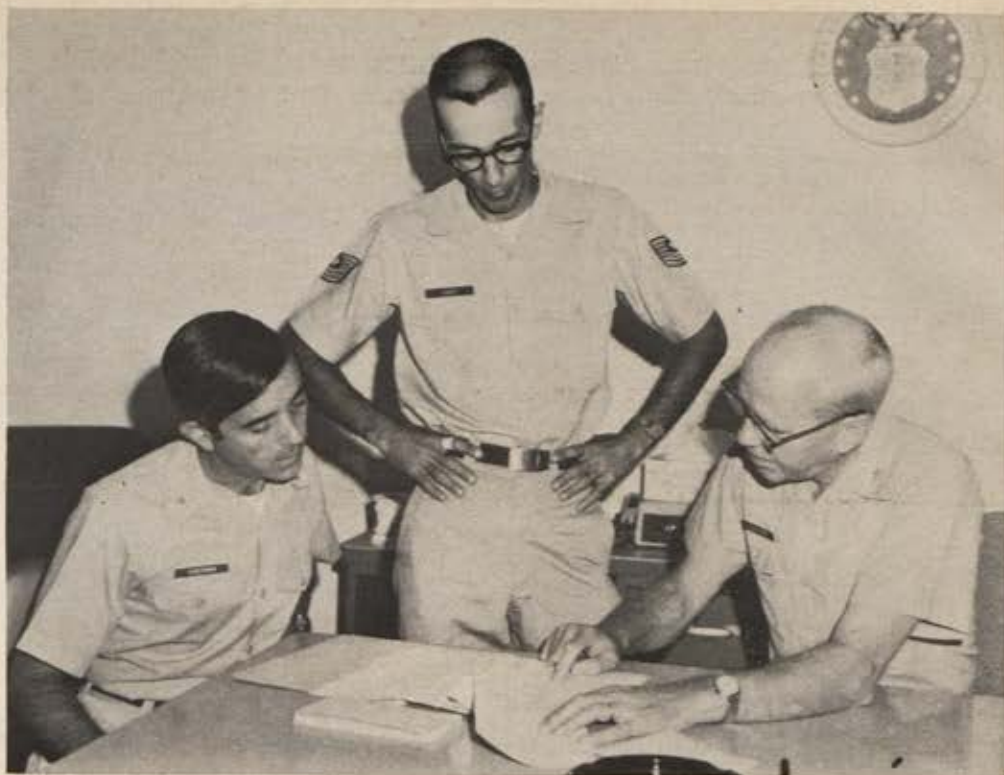


Ground view shows how big the new aircraft is. It can carry twenty-two litters or, in high-density setup of seats, a crew of three plus as many as sixty-four fighting troops.



Hovering, the HH-53C points its refueling probe almost directly at camera. The 20,000-pound external hook for raising cargo could accommodate an entire Apollo spacecraft.

More than 60 people work together in the Casualty Division to provide vital services to Air Force people and their families. Lt. Col. Joseph G. Luther, right, veteran Chief of the Division, has frequent working sessions—this one on manning—with colleagues. SMSgt. James B. Hart (center) is Division Non-commissioned Officer in Charge. Lt. Col. Robert Gaberman (left) is with USAF Military Personnel Center.



Casualty Reporting—A Hard Job



One of the most complex operations of the Division is Missing Persons, where cases of USAF captives in Vietnam are handled. Mrs. Janie Beckner, left, is Chief of Missing Persons Branch. Here she consults with personnel relations specialists, Mrs. Jerry Hill and Eugene Schultz.

One of the toughest military jobs—and one that has to be done in the most humanitarian way possible—is the reporting of casualty information. A dedicated group of uniformed and civilian specialists at the Casualty Division of the Directorate of Personnel Services, USAF Military Personnel Center, Randolph AFB, Tex., are the ones who do the job . . .

An Air Force / Space Digest

Photo Feature

That Gets Done

IN TIME of peace or war, military people die, are hurt, or fall ill, sometimes seriously, every day of the week. To the outside world, they are but statistics. But to the services, they are much more. They are the subject of a carefully designed system that must handle the awful responsibilities of notifying next-of-kin, of being available to help families with benefits, and of keeping hope alive if there is any realistic chance that someone missing may turn up.

In the Air Force, this painful and delicate set of tasks is centered in a little-known operation called the Casualty Division of the Directorate of Personnel Services at the USAF Military Personnel Center, Randolph AFB, Tex. Into the Casualty Division's Operation Center flows—twenty-four hours a day, by teletype, telegram, and telephone—information from around the world on Air Force deaths, wounded-in-action reports, and reports of injuries and serious illnesses. And from the Center are dispatched the circumstance reports that must accompany the notification of next-of-kin who have been designated by Air Force people on the emergency-information cards they are required to fill in for their records. Also, next-of-kin are invited to phone the Center collect at any time for information.

A death notification of next-to-kin is, of course, the
(Continued on following page)



In the 24-hour Casualty Division Operations Center, CW04 Leo F. Scott, Reporting and Notification Duty Officer, left, examines casualty messages while MSgt. James R. Mahany, NCOIC of the section, answers one of many phone queries.



An unpleasant duty, but one that has to be performed: TSgt. James H. Horton, Reporting and Notification Duty NCO, dispatches a telegram via the section's Western Union Intrafax machines. Section is Division nerve center.



Assistance to Air Force families in the wake of emergencies is the responsibility of Casualty Assistance Branch, which is headed by Lt. Col. Eugene W. Dombroski, left, shown at work on a case with NCOIC, SMgt. Bernard T. Pickar, Jr.



Prime casualty-assistance responsibility is assigned by region, as shown on United States map. Here TSgt. Arthur E. Bath, Casualty Assistance specialist, and Margaret Helms, of casualty assistance staff, check a new case assignment.

toughest job of all. In past days, such terrible news went out by wire. Under today's Air Force system, *all* deaths, active-duty or retired, must be reported in person to next-of-kin by an Air Force officer, along with initial information of circumstances. Overseas missing-in-action status is also reported personally, while injury or illness is reported by wire. Stateside, where required and feasible, serious illness or injury is reported personally, but normally notification is by wire.

As any Air Force officer who has ever had to perform this painful duty will attest, there is no "right way" to tell people they have lost a loved one. But the job is done, every day, in accordance with the system by which every Air Force installation in the country is required to assign responsibility for personal notification of next-of-kin to particular officers. In many cases, it may be the base commander himself, in the US, who will perform the duty, if the death has occurred on or near his base. But whoever does it, it must be done as soon as possible. Usually a chaplain assists.

Beyond the collation of all Air Force casualty data, the Casualty Division and its allied offices at Randolph have other important duties.

The Casualty Assistance Branch's job is to make sure that Air Force families are rapidly informed of all benefits. And toward that end, the country is divided into regions, each of which has an Air Force installation with prime responsibility for providing benefit services to eligible Air Force families.

These days, the Casualty Division is busy with a special problem that stems from the Vietnam War—prisoners held in North Vietnam or by the Viet Cong. It is hard to keep track of the welfare of USAF flyers known to be prisoners, since the North Vietnamese and VC file no reports with the International Red Cross. The problem is further compounded by the fact that the Missing Persons Branch must periodically review, with unavoidable pain to concerned families,



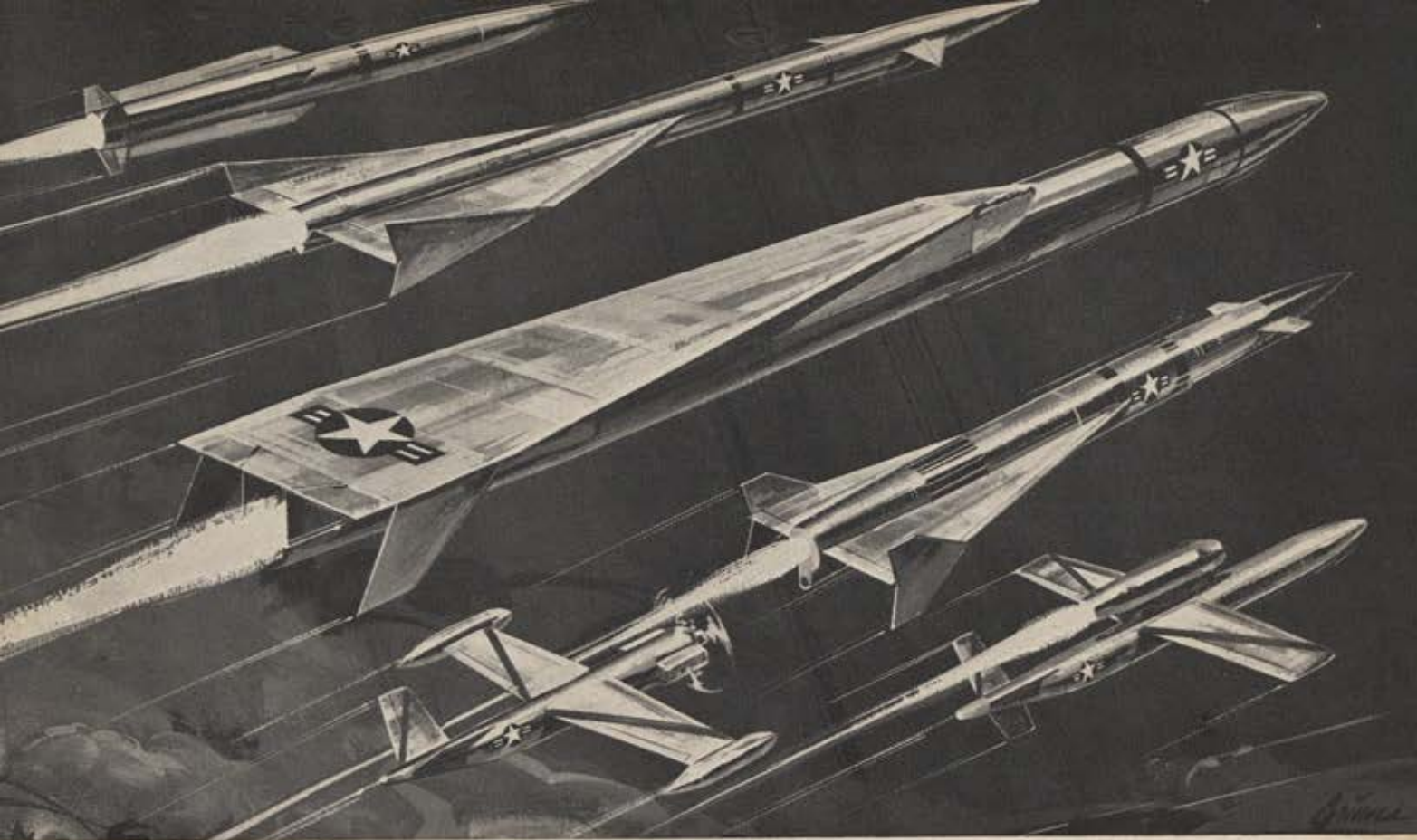
Maj. Henry S. Faircloth (left), Chief of the Reporting and Notification Branch, and Charles R. Gierth, certification clerk, examine one of some 5,000 Reports of Casualty (DD Form 1300) published yearly by Casualty Division.

the question of whether missing personnel who might have been captured should be presumed dead or not.

The Missing Persons Branch deals daily with queries from families on often intensely personal matters. Recently the Branch started a special newspaper for families of missing-in-action Air Force people to keep them informed of benefits, new information, and prerogatives such as space-available flights on Air Force aircraft.

The Casualty Division is not the sort of place where, when you visit its offices, you ask the people if they like their work. Rather it's a place where a hard job—"USAF taking care of its own"—gets done seven days a week.—END

—W. L.



Stand-in for an enemy

What are the enemy capabilities we must be prepared to face—and foil—in the years ahead? Both manned aircraft and missiles will operate at supersonic speeds. Both will be capable of extreme high altitude or tree-top level attack. The speed of detection and response required of defensive weapons and the men who control them will be critical.

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By Irving Stone

WEST COAST EDITOR, AIR FORCE/SPACE DIGEST

General Eaker on Vietnam

LOS ANGELES, OCTOBER 9

With a gloves-off analysis of the "Mistakes We Have Made in Vietnam and the Present State of Our National Security," Lt. Gen. Ira C. Eaker, USAF (Ret.), threw a provocative and unusual note into proceedings of the 12th Annual Symposium of the Society of Experimental Test Pilots (SETP) here last month.

The three-day meeting, held at the Beverly Hilton Hotel in Beverly Hills, traditionally is centered on the mission and accomplishments of military and industry test pilots from all over the world, who give their "Report to the Aerospace Profession" in a series of technical papers. The presentations focus on what the pilots themselves have to say about their research test programs and combat experiences with new aircraft, an exercise that has been expanded in recent years to include detailed expositions on sorties into space.

General Eaker, who commanded both the Eighth Air Force in England and the Mediterranean Allied Air Forces in World War II, also qualifies as a veteran test pilot. He was on board the *Question Mark* when that plane set a world endurance record in 1929. He also made the first transcontinental flight with air-to-air refueling in 1930 and the first blind transcontinental flight in 1936.

The General's observations on the war in Vietnam constituted a long list of errors in tactics and policy, for which he placed the blame on nonmilitary decision-makers in Washington. These errors ranged from basic misjudgment of the nature and extent of the conflict to the fact that expert military advice had been ignored from the beginning. The early military advisers, General Eaker said, requested funds and weapons to train and equip the South Vietnamese, but the "Whiz Kid" view was that the war would not last long.

On top of this, naval and air forces have been used only in a supporting role while the United States became committed to a land war. This approach, General Eaker be-



Though designed to land only on paved runways, Lockheed C-141 StarLifter is shown here in limited test of operating from bare soil at Harpers Dry Lake near Edwards AFB, Calif. After feasibility studies on aluminum mat surfaces at Dyess AFB, Tex., extensive bare soil tests are being proposed.

lieves, "flowed from President Kennedy's buying General [Maxwell D.] Taylor's *Uncertain Trumpet*, and General Taylor along with it" to produce "the theory of graduated response, [which is] a sophisticated title for too little, too late."

The General, further, lamented our failure to set up a unified command for Southeast Asia, which has resulted in waste of money and materiel as well as delays in decision-making that have helped the enemy. He drew applause from the test pilots when he said that political leaders, against the advice of military leaders, created sanctuaries and told the enemy where they were. General Eaker said this "was like giving criminals a license to steal." It left Haiphong free for the importation of munitions, the streets safe for the storage of supplies, and increased our aircraft and pilot losses by telling the foe where to expect our attacks.

The bombing truces and pauses, the General said, have amounted to "a death sentence for about 1,000 US and allied troops and civilians every week." On the home front, he was critical of our determination to carry on business as usual, without letting the war disturb the economy.

The General described as a "prime blunder" our failure to take advice from our Asian allies. He said that "our Asian partners are unanimous in the view that our strategy and tactics in Vietnam are wholly unsuited to the accomplishment of our objectives there."

He added: "Thai and South Korean leaders point out the Asian peoples look upon restraint in the use of force as weaknesses. They know that Oriental Red leaders respect only superior force."

"Our Asian partners would have responded to the seizure of the *Pueblo* by capturing North Korean ships until we held more tonnage and more crews than the *Pueblo*. If the North Koreans then refused an exchange, they would have seized every North Korean vessel on the high seas."

"In Vietnam, our Asian partners would have had us destroy Ho Chi Minh's Hanoi palace within a few hours after the attack on our embassy in Saigon. They would also have advised that we lay General Giap's headquarters flat after shells fell on General Westmoreland's headquar-

Lt. Gen. Laurence C. Craigie, USAF (Ret.), has been awarded an honorary fellowship in the Society of Experimental Test Pilots for being the first US military pilot to fly a jet aircraft. He flew Bell XP-59 in October 1942.



ters. Our Asian allied leaders reiterate that the Reds understand and respect only an eye for an eye.

"At the time of the Tet atrocities, when the Viet Cong and North Vietnamese attacked the principal South Vietnamese cities, murdering 25,000 civilians and rendering 250,000 homeless, our Asian allies would have had us respond by breaking the Red River dikes, driving a million North Vietnamese from their lowland homes, eliminating rice production, and inundating long stretches of both rail lines from the North."

General Eaker predicted the war will not end until it is no longer profitable for the Reds. It now costs us \$30 billion a year, while the Russians and Red Chinese together spend only about \$1.8 billion.

"If we had run World War II as we have this war," he declared, "Hitler would be in control of Europe today and Japan would control Asia and the Pacific west of Honolulu."

Turning to the present state of US defenses, General Eaker accused our leaders of having pursued a policy of unilateral disarmament since 1961 "on the theory that our strategic superiority was provocative and our good example in disarming might be followed by the Reds."

He said this policy must be reversed and the big decisions on weapons selections and defense planning returned to the Joint Chiefs of Staff. He warned that Russian progress in space can bring them dominance over the earth.

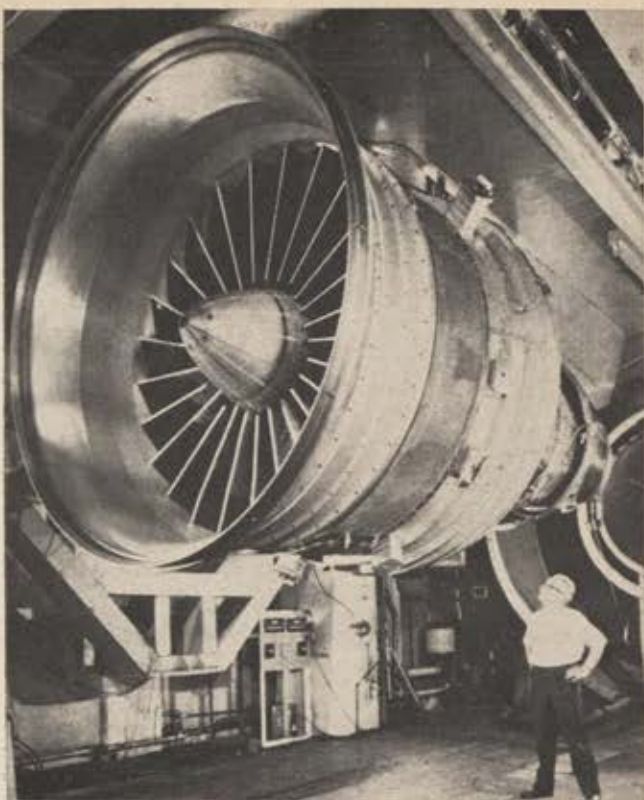
In this defense contest, General Eaker said, "The US has the resources to win. The question now is: Do we have the leadership?"

C-5 Test Program Rolls Along

The tight test program for the C-5 Galaxy—the Air Force's huge new cargo configuration—will involve fast, successive introduction of aircraft to cope with the varied and exacting evaluation phases.



Landing gear door made of aluminum honeycomb core covered with bonded layers of boron composite skins has been tested at supersonic speeds on this F-5 fighter. Northrop, which developed structure, says the strong yet lightweight material could be used to build complete airframes.



RB.211 engine, powerplant for Lockheed's new L-1011 Airbus, dwarfs employee at Rolls-Royce factory in England. Designed to produce 40,600 pounds of thrust, more than double that of current transport engines, power of big turbofan could "grow" to 50,000 pounds in future models.

Lockheed-Georgia Co.'s chief engineering test pilot, Leo J. Sullivan, revealed at the SETP meeting that the C-5 test aircraft would be utilized as follows:

- Aircraft No. 1 is targeted to complete its flight flutter program in December, which will clear the aircraft for operation through the entire airspeed-altitude envelope. Concurrently with the flutter program, preliminary stall development tests and the preliminary stability and control trials are being conducted. Following these, the aircraft is scheduled to enter the official automatic flight control system tests, which will involve the all-weather landing system tests. Except for the correction of deficiencies, this will complete the test program for Aircraft No. 1, which is expected to end in the late fall of 1970.

- Aircraft No. 2 was scheduled to fly in October following taxi tests. It then is programmed for a preliminary evaluation, including icing trials. The engine update for Aircraft No. 2 is scheduled for December. This means that the prototype engine, the General Electric YTF39, will be replaced by the production engine, the TF39. After the engine substitution, the Air Force preliminary evaluations program will be conducted and will be followed by engine and fuel system tests, prior to the start of Category I (contractor testing) and Category II (Air Force testing) performance programs at Edwards AFB, Calif., early in the summer of 1969.

- Aircraft No. 3 is the structural test unit and is scheduled to make its first flight in November 1968. After this it will go into the airload survey, and will be followed with off-runway landings and dynamic response programs. This will complete the Aircraft No. 3 test program—targeted for the summer of 1970.

- Aircraft No. 4, scheduled to fly in February 1969, will be devoted mainly to avionics testing. The Lockheed

(Continued on following page)

Lt. Gen. Leighton I. Davis, USAF (Ret.), former Commandant of the Industrial College of Armed Forces, Ft. McNair, D. C., has been appointed executive secretary of Lockheed Aircraft Corporation's safety board.



C-141 avionics test bed is expected to contribute to the avionics evaluation before the No. 4 aircraft test program begins.

- Aircraft No. 5, scheduled to fly in March 1969, will perform system tests for such installations as the environmental, mechanical, and hydraulic installations. These will be followed by the aerial delivery test program, under which contractor and Air Force tests are scheduled to begin in August 1969 at Fort Bragg, N. C.

- Aircraft No. 6, 7, and 8 will be the Category II (Air Force test) units. Aircraft No. 6 will be the accelerated service unit, targeted for 2,700 hours of flying time in its first year of service.

- Aircraft No. 7 will be used for service suitability, maintenance, and personnel subsystems checkout.

- Aircraft No. 8 will undergo adverse weather testing. After its general wring out in the Eglin AFB, Fla., climatic hangar, it will be flown to Panama for tropic tests, then to Alaska for extreme cold tests, to Wright-Patterson AFB, Ohio, for adverse weather trials, finally finishing its weather phase in the hot environment of Yuma, Ariz.

Lifting Body Flight Testing

Current lifting-body research promises to contribute a valuable store of knowledge for generation of feasible designs for controlled, relatively pinpoint landings of reentry vehicles returning to earth from space missions.

First flight of the Martin X-24, a USAF prototype lifting-body configuration now at Edwards AFB, Calif., will take place later this year or in the early part of 1969. Air Force Maj. Jerauld R. Gentry, Aerospace Research Flight Test Officer at Edwards, discussing aspects of the lifting-body flight test program at the SETP meeting, revealed that the X-24A has a more complex flight control system than the Northrop-built M-2 and HL-10, the National Aeronautics and Space Administration's initial lifting-body flight configurations. All three of the vehicles are involved in a joint NASA-Air Force evaluation program.

The specific test objectives are to demonstrate the feasibility of unpowered horizontal landings, explore the transonic and low-supersonic speed regimes, and demonstrate an unpowered approach from a representative terminal entry flight condition, such as Mach 1.8 (approximately 1,190 mph) at 90,000 feet altitude. The lifting-body test vehicles are designed for launch from a B-52 at 45,000 feet altitude.

The X-24A incorporates provisions for automatic positioning of the control surfaces as a function of Mach num-

ber—intended to provide the required stability while minimizing drag. The vehicle also incorporates an aileron/rudder interconnect, which can be programmed automatically as a function of Mach number as well as angle of attack. The primary flight controls include four flaps—two upper, two lower. There are provisions in the cockpit of the X-24A for the manual control of the flap position and interconnect ratio.

The current plan is to perform the first flights of the X-24A in a strictly manual mode, according to Major Gentry.

There were many reasons why the M-2, as it was configured, would not have been a satisfactory operational vehicle, Major Gentry declared. The HL-10 so far has proved to be a somewhat less demanding vehicle to fly, he says. The X-24 is intended to be a further improvement, but, "I'm sure that it, too, will have some deficiencies," he adds. Major Gentry feels that, before any horizontal-landing lifting body becomes operational, the vehicle will have to incorporate:

- Acceptable handling qualities throughout the operational envelope.

- Approach and landing techniques at least equal to that of the HL-10. Improvement may be accomplished by higher basic lift-to-drag ratio, variable geometry, or landing engines. He also feels that it would be desirable to have a capability for executing a missed approach for go-around.

The first HL-10 flight was made on December 22, 1966, uncovering numerous problems. One of these was that lack of control response at the higher Mach numbers and angles of attack indicated serious flow separation. After additional wind-tunnel testing and some redesign, the HL-10 flew again in March 1968. The flight results indicated that the flow separation problem essentially had been eliminated, also that control harmony was greatly improved, that the stability augmentation system performed as designed, and that a significant improvement in lift-to-drag ratio was realized. Compared to the M-2, the lateral-



"Betcha two bits my bicycle isn't ready yet..."

directional stability and handling qualities of the HL-10 were much improved, the very steep approach flight path angles were reduced, and the pilot had increased float time, after completion of the landing flare, to extend the gear to accomplish the landing, Major Gentry declares. The HL-10 has been flown eight times this year, and another flight was scheduled for mid-October.

Viewpoint on General-Aviation Testing

A hard look at general-aviation flight testing was taken at the SETP meeting by Arvin O. Basnight, Director of the Federal Aviation Administration's Western Region. Mr. Basnight used "progress and conscience" as his theme.

He declared he had reviewed several of the latest programs with members of his test-pilot staff and had asked where the greatest challenge lay—was it in the supersonic transport, the jumbojets, V/STOL, helicopters, gliders, research aircraft? Mr. Basnight says: "To my surprise, several replied that, from the standpoint of constructive contribution on the part of the test pilot, the general-aviation airplane may well be the greatest challenge in aviation!"

Underscoring that it should be axiomatic to those in the aviation profession that progress is paced by conscience, one of Mr. Basnight's critical observations was:

"Progress in general aviation, however, should not be restricted to the consideration of state-of-the-art improvements. The products of advanced technology and of the efforts of military, research, and transport aviation inevitably find their way into the general aviation airplane. Thus, lightweight, efficient turbine engines, pressurization, air conditioning, advanced autopilots, and navigation displays, as well as advanced materials, will force breathtaking advances in general aviation. These new developments are fine, but is it *progress* to put them into an airplane in which the stall/spin characteristics have not been improved?"

"This is 1968 . . . almost two decades after industry petitioned CAA to delete spins from pilot certification requirements on the promise that they would improve stall characteristics and develop spin-resistant aircraft. I'm not sure that we have made *progress* in this regard, because one of the principal causes of fatal accidents is still the stall/spin-type accident, and one of the main work efforts still expended by FAA test pilots is in the improvement of stall characteristics of new and modified aircraft. It could be stated unequivocally that this indictment should rest on our professional conscience. If the developmental test pilot [were] able and permitted to do his job, the FAA certification pilot certainly would not have to be faced with the constant plea for better stall characteristics!"

And a critical question Mr. Basnight asked: "How many general-aviation test pilots can tell me that they have access to top management and have sufficient authority to require changes to new or existing models which will permit them to be flown by the pilot of 'average' ability? Or better still, by pilots of little experience or less than average ability—say the kind of people that their sales departments successfully sell airplanes to?"

Mr. Basnight revealed that FAA's Western Region has proposed a broad policy of acknowledging the timeliness of the need for significant improvement in the certification of new aircraft as well as modifications of older models. The proposal includes, among others, these major points:

- Review of accident-industry history by manufacturers.
- Improvement in the prediction and monitoring of suspected problem areas after certification.
- Dissemination of information pertaining to certification of general-aviation aircraft.—END

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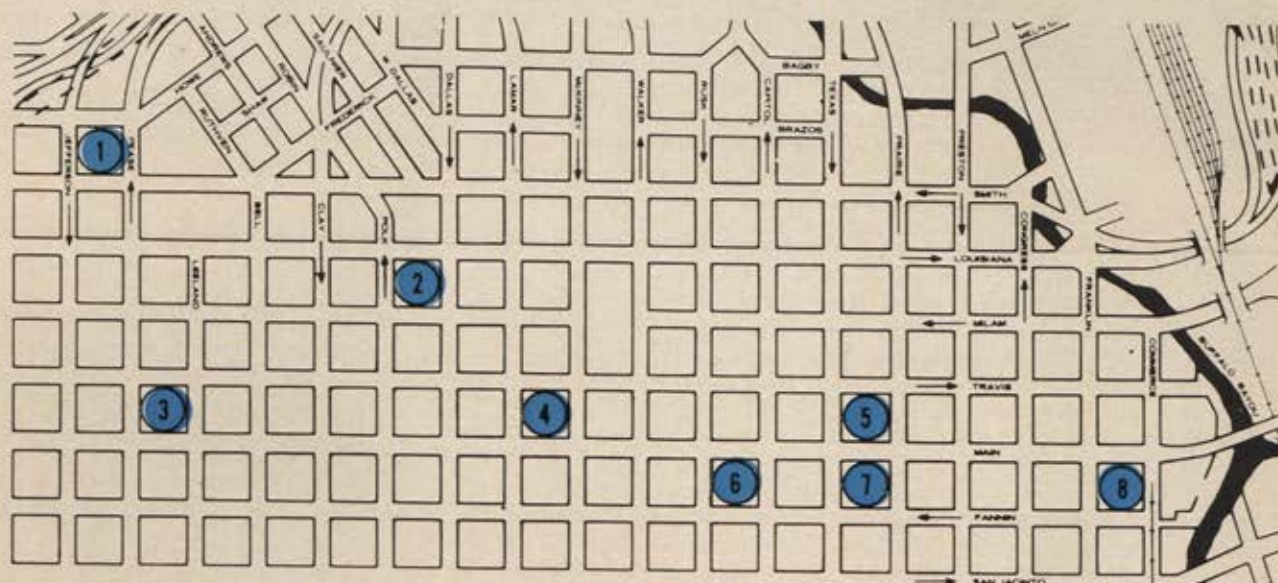
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3. Savoy Field	12.00 - 15.00	15.00 - 18.00	8. Continental Houston	11.00	16.50
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Air Force Association Convention
Houston, Texas March 18-21, 1969

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THE NATION'S CAPITAL CHAPTER, WASHINGTON, D. C.,

cited for extremely effective programming in support of the Air Force Association mission.

As a follow-on to its highly successful Charter Night Reception honoring Congressman **Porter Hardy, Jr.**, a member of the House Armed Services Committee for twenty years who is about to retire after twenty-two years of distinguished public service, the **Nation's Capital Chapter** recently sponsored a reception and luncheon—the reception to welcome the Air Force general officers newly assigned to the Washington, D. C., area, and the luncheon to honor AFA's Board of Directors.

More than 200 attended the affair, held in conjunction with AFA's Fall Meeting and the 21st Anniversary of the Air Force. Chapter President **Lou Davis** served as Master of Ceremonies. After the honored guests had been introduced, **Lt. Gen. John W. Carpenter, III**, Deputy Chief of Staff for Personnel, responded for the general officers, and AFA President **Robert W. Smart** expressed his appreciation for the AFA Board of Directors' support and cooperation.

During the program, **Jess Larson**, Chairman of AFA's Board of Directors, acting in behalf of **Col. Charles W. "Chuck" Kerwood, USAF (Ret.)**, President of the *Ligue Internationale des*

Aviateurs, presented AFA Executive Director **James H. Straubel** a citation "for contributing without stint his talents as editor, publisher, and manager to increased public understanding and support of aerospace power through the written and the spoken word." The citation had been signed by the late Maj. Gen. Benjamin Foulois, Charles A. Lindbergh, Captain Eddie Rickenbacker, and many other aviation greats and pioneers.

Honored guests included **Lt. Gen. Jack Lavalley**, Director, Defense Communications Planning Group, Defense Communications Agency; **Maj. Gen. Clyde Box**, Deputy Inspector General; **Maj. Gen. George S. Boylan, Jr.**, Director, Aerospace Programs, DCS/PR; **Maj. Gen. Joseph A. Cunningham**, Deputy Director/Civil Disturbance Planning and Operations; **Maj. Gen. Glenn A. Kent**, Assistant Chief of Staff, Studies and Analysis; **Maj. Gen. Henry B. Kucheman, Jr.**, Director of Development, DCS/R&D; **Maj. Gen. Lester F. Miller**, Director, Personnel Training and Education, DCS/Personnel; **Maj. Gen. John S. Samuel**, Senior AF member, Military Studies and Liaison Division, WSEG, OSD; **Brig. Gen. John C. Giraudo**, Deputy

Director, Legislative Liaison, SAFOS; and **Brig. Gen. Maurice R. Reilly**, Deputy Director of Civil Engineering, DCS/Programs and Resources.

Others included AFA National Secretary **Glenn D. Mishler**; National Treasurer **Jack B. Gross**; and Regional Vice Presidents **Walter E. Barrick, Jr.**, **Martin H. Harris**, **Dick Palen**, **W. M. Whitney, Jr.**, and **James W. Wright**.

These National Directors were on hand: **Joseph E. Assaf**, **William R. Berkeley**, **George M. Douglas**, **A. Paul Fonda**, **George D. Hardy**, **Laurence S. Kuter**, **Joseph J. Lingle**, **Carl J. Long**, **Howard T. Markey**, **Earle N. Parker**, **Peter J. Schenk**, **William W. Spruance**, and **Jack Withers**.

More than 35,000 spectators lined the ramps of the Ogden Municipal Airport while an estimated 20,000 more jammed surrounding roads for the annual **Weber County Air Fair** sponsored by AFA's Ogden Chapter, Utah.

Highlight of the show was a demonstration of precision flying by the **Thunderbirds**, official USAF precision formation aerobatic team.

(Continued on following page)



At the Nation's Capital Chapter reception and luncheon for the General Officers new to the Washington area, and to honor AFA's Board of Directors, are, from left, **Lt. Gen. John W. Carpenter, III**, DCS/Personnel; AFA President **Robert W. Smart**; **Lt. Gen. Jack Lavalley**, Director, Defense Communications Planning Group, DCA; and Chapter President **Lou Davis**. More than 200 attended the affair.



AFA Executive Director **James H. Straubel**, right, proudly displays the citation presented him at the Nation's Capital Chapter luncheon held during AFA's recent Fall Meeting. Admiring the citation are **Jess Larson**, AFA's Chairman of the Board, standing, and **Col. Charles W. Kerwood, USAF (Ret.)**, President of the *Ligue Internationale des Aviateurs*, on whose behalf the citation was given to Mr. Straubel.



Congressman Joe D. Waggoner, Jr., second from right, presents Lt. Col. Fay G. Adams, USAF (Ret.), aviation professor at Louisiana Polytechnic Institute, with a Citation designating him Louisiana AFA's Outstanding Educator. At the Congressman's Washington offices are, from left, State Vice President John McGaffigan, Regional Vice President Jack Gilstrap, Shreveport Chapter President Toulmin Brown, and Mrs. Melanie Gust, who is Colonel Adams' daughter.



At a reception recently sponsored by AFA's San Francisco, Calif., Chapter to welcome the new Commander, Sixth Air Force Reserve Region, Col. Charles Howe, left, Chapter President Cal Ferris, second from right, a Forest Service pilot, gives a lesson in forest-fire diving methods. Others are, from left, Thomas W. Barbour; Edward Dooley, Editor of the San Francisco Examiner; and Col. Donald S. Glover, Director of Information, Fourth Air Force (ADC).

The program included a demonstration of crop dusting by Bill Hunter; sky diving by members of the Ogden Sky Knights sports parachuting club; an experimental aircraft and an antique aircraft fly-by; a low-altitude jump by members of the Utah National Guard. Also, static displays furnished by the Federal Aviation Administration, Forest Service, aerospace industries, radio-controlled model aircraft club, Red Cross and jeep patrol, and USAF.

The Chapter, its President, Raymond W. Cassell, and members of the committees are to be congratulated on an outstanding show and on

their consistently effective programming in support of AFA's mission.

In conjunction with a Virginia State AFA Executive Committee meeting recently held in Arlington, Va., the Arlington Chapter sponsored a dinner meeting at the Bolling Officers' Club in observance of the 21st Anniversary of the Air Force.

Jim Evans, noted Washington radio commentator, aviation enthusiast, and a supporter of AFA and aerospace power, was the guest speaker. Chapter President Cliff Dougherty served as Master of Ceremonies.

More than 100 attended the affair,

including National Director George Hardy, Central East Regional Vice President Walter E. Barrick, Jr., and State President A. A. West.

At its observance of the 21st Anniversary of the Air Force, the Middle Georgia Chapter sponsored an "Air Force Birthday Ball" at Robins AFB.

Test pilot Leo Sullivan of Lockheed and Lt. Col. Joe Schiele, pilots of the gigantic Lockheed C-5 Galaxy on its recent maiden flight, were among the honored guests at the Ball and shared the podium for remarks about the flight.

(Continued on page 111)



William Randolph Hearst, Jr., center, displays his newly acquired AFA Life Member card to Dr. John S. Foster, Jr., Director of Defense Research & Engineering, Department of Defense, left, and Iron Gate Chapter President J. Ray Bell. Dr. Foster was the guest speaker at a recent meeting of the Chapter during which the well-known newspaperman, Mr. Hearst, was presented his AFA Life Member card.



At a dinner of Sacramento, Calif., Chapter are, from left, Frank O'Brien, Sacramento County Supervisor; Regional VP Will Bergstrom; Col. Daniel James, Jr., Vice Commander, 33d Tactical Fighter Wing, Eglin AFB; Chapter President Glenn H. Hall; State VP L. E. DeVisscher; and Commanders Walter J. Wilson and R. D. Butler, 3535th Air Base Group and 320th Bomb Wing at Mather AFB.



New Chinook lifts 12 tons.

**Boeing's latest helicopter—
the new CH-47C—
carries two tons more than
the "B" model Chinook.**

**Payloads can be carried
internally, externally or both.**

**Size, power, maneuverability
and reliability make the new
Chinook the most versatile
helicopter available for
heavy-lift missions.**

**Boeing's Vertol Division
backs its products with the
V/STOL industry's largest and
most advanced R&D facilities.**

At Boeing, something new is always up.

BOEING HELICOPTERS

THIS IS AFA



The Air Force Association is an independent, nonprofit airpower organization with no personal, political, or commercial axes to grind; established January 26, 1946; incorporated February 4, 1946.

Objectives

• The Association provides an organization through which free men may unite to fulfill the responsibilities imposed by the impact of aerospace technology on modern society; to support armed strength adequate to maintain the security and peace of the United States and the free world; to educate themselves and the public at large in the development of adequate aerospace power for the betterment of all mankind; and to help develop friendly relations among free nations, based on respect for the principles of freedom and equal rights to all mankind.

Membership

Active Members: US citizens who support the aims and objectives of the Air Force Association, and who are not on active duty with any branch of the United States armed forces—\$7 per year.

Service Members (non-voting, non-officeholding): US citizens on extended active duty with any branch of the United States armed forces—\$7 per year.

Cadet Members (non-voting, non-officeholding): US citizens enrolled as Air Force ROTC Cadets, Civil Air Patrol Cadets, or Cadets of the United States Air Force Academy—\$3.50 per year.

Associate Members (non-voting, non-officeholding): Non-US citizens who support the aims and objectives of the Air Force Association whose application for membership meets AFA constitutional requirements—\$7 per year.

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State Contacts

Following each state contact's name and address 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: A. T. Ousley, 715 Cleermont Drive, S. E., Huntsville, phone 539-3222. **BIRMINGHAM, HUNTSVILLE, MOBILE, MONTGOMERY, SELMA.**

ALASKA: Robert Reeve, P. O. Box 3535 ECB, Anchorage, phone 272-9426. **ANCHORAGE, FAIRBANKS, KENAI, NOME, PALMER.**

ARIZONA: Hugh P. Stewart, 709 Valley Bldg., Tucson, phone 622-3357. **PHOENIX, TUCSON.**

ARKANSAS: William L. Terry, 1100 Boyle Bldg., Little Rock, phone FR. 6-2011. **LITTLE ROCK.**

CALIFORNIA: C. A. DeLaney, 1808-A Newport Blvd., Costa Mesa, phone 548-2231. **BURBANK, CHICO, EDWARDS, EL SEGUNDO, FAIRFIELD, FRESNO, HARBOR CITY, LONG BEACH, LOS ANGELES, MONTEREY, NEWPORT BEACH, NORWALK, NOVATO, PASADENA, RIVERSIDE, SACRAMENTO, SAN BERNARDINO, SAN DIEGO, SAN FRANCISCO, SANTA BARBARA, SANTA CLARA COUNTY, SANTA MONICA, TAHOE CITY, VANDENBERG AFB, VAN NUYS, VENTURA.**

COLORADO: Robert M. Lee, 318 Pine Avenue, Colorado Springs, phone 473-7546. **COLORADO SPRINGS, DENVER, PUEBLO.**

CONNECTICUT: Joseph C. Horne, 28 William Avenue, Torrington, phone HU. 2-6312. **TORRINGTON.**

DELAWARE: Vito A. Panzarino, Greater Wilmington Airport, Bldg. 1504, Wilmington, phone 328-1208. **WILMINGTON.**

DISTRICT OF COLUMBIA: Louis W. Davis, 1629 K Street, N. W., Suite 500, Washington, D. C., phone 659-3250. **WASHINGTON, D. C.**

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IDAHO: Charles F. Barnes, 1116 South Cole Road, Boise, phone 343-7731, Ext. 63. **BOISE, BURLEY, POCATELLO, RUPERT, TWIN FALLS.**

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IOWA: Donald Koontz, Simpson College, Indianola, phone 261-2835. **CEDAR RAPIDS, DES MOINES.**

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OHIO: George A. Gardner, 620 Rockhill Avenue, Dayton, phone AX. 9-3956. **AKRON, CANTON, CINCINNATI, CLEVELAND, COLUMBUS, DAYTON.**

OKLAHOMA: Lawrence E. Leffler, 2208 N. Key Blvd., Midwest City, phone 732-9843. **ALTUS, ENID, OKLAHOMA CITY, TULSA.**

OREGON: Clayton Gross, 804 Portland Medical Center, Portland, phone 233-0675. **CORVALLIS, PORTLAND.**

PENNSYLVANIA: George W. Crosby, 1905 West 34th Street, Erie, phone 866-3955. **ALLENTOWN, AMBRIDGE, ERIE, HARRISBURG, LEWISTOWN, PHILADELPHIA, PITTSBURGH, WAYNE.**

RHODE ISLAND: William V. Dube, T. F. Green Airport, Warwick, phone 781-8254. **WARWICK.**

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SOUTH DAKOTA: John S. Davies, 392 S. Lake Drive, Watertown. **SIOUX FALLS.**

TENNESSEE: Howard F. Butler, 6224 Hillsboro Road, Nashville, phone 292-7381. **MEMPHIS, NASHVILLE.**

TEXAS: Sam E. Keith, Jr., P. O. Box 5068, Fort Worth, phone PErshing 8-0321. **ABILENE, AMARILLO, AUSTIN, BIG SPRING, CORPUS CHRISTI, DALLAS, DEL RIO, EL PASO, FORT WORTH, HOUSTON, LUBBOCK, SAN ANGELO, SAN ANTONIO, SHERMAN, WACO, WICHITA FALLS.**

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WISCONSIN: Kenneth E. Kuenn, 3239 North 81st Street, Wauwatosa, phone 871-3766. **MADISON, MILWAUKEE.**

WYOMING: Merle W. Allen, Veterans Administration Center, Cheyenne, phone 634-1581, Ext. 232. **CHEYENNE.**



At a recent Sewart AFB, Tenn., open house are, standing from left, Thunderbirds Eddins, Angel, Musser, Dickey, Shelton, Mille, Ruff, and, kneeling, Forbes, plus AFA members S. R. Altman, Middle Tennessee Chapter President; CMSgt. R. G. McGowan, Regional VP Jack Gilstrap; Maj. T. O. Owen; and J. L. Delaney.

Others honored at the Ball included Maj. Herbert V. Kalen, Vietnam returnee who received the Silver Star, Distinguished Flying Cross with two oak leaf clusters, and the Bronze Star for his helicopter rescue work in Southeast Asia; Col. Floyd E. Dixon, Chief, Airborne Radar and Electronics Warfare Item Management Division, Warner Robins Air Materiel Area, recipient of the AFA Logistics Executive Management Award at AFA's Fall Meeting in Washington, D. C.; Lois McEachern, "Miss Robins AFB"; and Burma Ann Davis, the reigning "Miss Georgia."

Recent recipients of college scholarships from the Officers' Wives Club, Miss Martin Reheis and Scott Pendergraft, both of Warner Robins, were introduced. When asked to comment on the "generation gap," Miss Reheis said, "There is no generation gap . . . just a communications gap."

Past State AFA President George O. Cornish was Master of Ceremonies and Chapter President Paul Fain was the host.

CROSS COUNTRY . . . Congratulations to AFA National Director A. Paul Fonda, who recently retired from the USAF Reserve and was presented the Legion of Merit by Gen. J. P. McConnell, USAF Chief of Staff.

COMING EVENTS (State Conventions) . . . Utah, Ogden, November 8-9 . . . Oregon, Portland, November 15 . . . Florida, St. Petersburg, November 21-23 . . . Virginia, Langley AFB, November 23 . . . Idaho, Boise, December 7 . . . Wisconsin, Milwaukee, December 7.

The National Laboratory for the Advancement of Education, sponsored by the Aerospace Education Foundation, Washington, D. C., November 18-20 . . . Organizational Advisory Council Meeting, Washington, D. C., November 19 . . . State Presidents' Orientation Meeting, Washington, D. C., January 9-10, 1969 . . . Board of Directors and Nominating Committee Meetings, Washington, D. C., January 11, 1969.

—DON STEELE

Colorado Governor John A. Love signs a proclamation designating September 16-22 as Air Force Week in Colorado. Looking on at the ceremony are, from left, 1st Lt. Deborah Johnson, ADC, Ent AFB, Colo.; Gen. Robert M. Lee, USAF (Ret.), Colorado AFA President; and 2d Lt. Yolán Laporte, ADC.



One gift works many wonders



Photo contributed by Harold Halma

GIVE THE UNITED WAY

Help work wonders for the poor, the sick, the aged, the young. Give them the hope, the health and the happiness they might never have without you.



Your fair share gift works many wonders

THE UNITED WAY



27.5 million families benefit from child care, family service, youth guidance, health programs, disaster relief and services for the Armed Forces through 31,300 United Way agencies.

Space contributed as a public service by this magazine

EXTRA INCOME

THREE PLANS TO CHOOSE FROM

☐ MEMBER

☐ MEMBER & SPOUSE

☐ ENTIRE FAMILY

WHAT IS AFA EXTRA INCOME HOSPITAL INSURANCE?

For every day you (or members of your family, if you have elected family coverage) are hospitalized AFA sends you money for up to 365 days . . . money you can use as you wish, without restrictions of any kind.

WHO IS ELIGIBLE?

Any United States citizen under the age of 60 who is or becomes a member of the Air Force Association is eligible to apply for AFA Extra Income Hospital Insurance for himself, his spouse, and unmarried children more than 14 days and less than 21 years of age.

HOW ARE BENEFITS PAID?

Once AFA receives verification that hospitalization has taken place, you will receive a benefit check within seven days with additional checks thereafter on a weekly basis upon AFA receiving certification of your continued hospitalization.

**FIRST TIME OFFERED
TO ACTIVE DUTY
MILITARY PERSONNEL**

HOW MUCH EXTRA INCOME DO YOU NEED? CHOOSE THE BENEFIT AMOUNT YOU REQUIRE FROM THIS FLEXIBLE GROUP PLAN!

1. You are the key to family finances. How much extra money would your family need if you were hospitalized? Check Plans A-1 and AA-1.

2. Does part of the family income depend on a working spouse? Would a cook, or maid or housekeeper be needed during a wife's hospitalization? How much would this, and other expenses cost? Check Plans A-2 and AA-2.

3. If you have a family, you should consider providing extra income for children's hospitalization. Accidents involving whole families do happen, especially with military families living around the world. Check Plans A-3 and AA-3.

And remember: Benefits are paid up to 365 days of hospital confinement for each accident or sickness for each insured person while the patient is under the care of a legally qualified Doctor of Medicine.

WHY DO YOU NEED EXTRA INCOME HOSPITAL INSURANCE?

Hospital costs for Non Military Families are climbing out of sight!

In 1966, according to the American Hospital Association, average total cost per hospital admission was \$380.39 — up 412% in just 20 years.

Average 1966 cost per hospital day, over an average hospitalization of 7.9 days, was \$48.15 — a figure which includes only basic costs.

And costs are going higher. Other authorities estimate that average cost per hospital day may reach \$100 by 1980.

Would your present hospital benefits begin to cover this cost? Do they even cover today's costs?

Military Families Can Have Severe Money Losses Caused By Hospitalization

Military families as well as civilian families can be financially hurt by the indirect expenses of hospitalization and serious illness.

Even if every cent of direct hospital cost is covered by government benefits (or hospital insurance) there may be hundreds or thousands of dollars in indirect losses. For example:

Loss of income, especially when more than one member of the family works

Extra travel expense (sometimes for long distances) for other family members

Cost of housekeeper or "sitters"

Special diets, sometimes for long periods

Expense of special home care.

BENEFIT SCHEDULE

PLAN	INDIVIDUAL PLAN MEMBER	LIMITED FAMILY PLAN AND SPOUSE	FULL FAMILY PLAN AND CHILDREN
A	\$20/DAY	\$15/DAY	\$10/DAY
AA	\$40/DAY	\$30/DAY	\$20/DAY

COST SCHEDULE

INDIVIDUAL PLAN PLAN A-1			LIMITED FAMILY PLAN PLAN A-2			FULL FAMILY PLAN PLAN A-3		
Member: \$20 per day			Member: \$20 per day Spouse: \$15 per day			Member: \$20 per day Spouse: \$15 per day Children: \$10 per day		
Member's Age	Annual	Semi-Annual	Annual	Semi-Annual	Annual	Semi-Annual	Annual	Semi-Annual
Under 40	\$ 29.00	\$15.50	\$ 58.00	\$ 30.50	\$ 74.00	\$ 38.00	\$ 134.00	\$ 68.00
40-49	\$ 37.00	\$19.50	\$ 72.00	\$ 37.00	\$ 86.00	\$ 44.00	\$159.00	\$ 80.50
50-59	\$ 53.00	\$27.50	\$103.00	\$ 52.50	\$118.00	\$ 60.00	\$222.00	\$112.00
60-64	\$ 76.00	\$39.00	\$147.00	\$ 74.50	\$162.00	\$ 82.00	\$312.00	\$157.00

PLAN AA-1			PLAN AA-2			PLAN AA-3		
Member: \$40 per day			Member: \$40 per day Spouse: \$30 per day			Member: \$40 per day Spouse: \$30 per day Children: \$20 per day		
Member's Age	Annual	Semi-Annual	Annual	Semi-Annual	Annual	Semi-Annual	Annual	Semi-Annual
Under 40	\$ 58.00	\$31.00	\$117.00	\$ 61.00	\$148.00	\$ 76.00	\$268.00	\$136.00
40-49	\$ 74.00	\$40.00	\$144.00	\$ 74.00	\$172.00	\$ 88.00	\$318.00	\$161.00
50-59	\$106.00	\$55.00	\$206.00	\$103.00	\$236.00	\$120.00	\$444.00	\$224.00
60-64	\$152.00	\$78.00	\$294.00	\$147.00	\$324.00	\$164.00	\$624.00	\$314.00

AFA EXTRA INCOME HOSPITAL INSURANCE PROVIDES THIS MONEY. BENEFITS ARE PAID DIRECTLY TO YOU — AND YOU USE THIS MONEY TO BEST SUIT YOUR NEEDS.

INSURANCE PROGRAM

HOSPITAL INSURANCE

Pays CASH benefits up to \$40 per hospital day for each insured person!

All AFA members — military and civilian — and their families are eligible.

OTHER BENEFITS

Protected AFA members may continue their coverage at the low, group rate to Age 65, or until they become eligible for Medicare, whichever is earlier. Hospitalization for all sicknesses and accidents is covered, except for a few standard exceptions listed under "Exclusions."

LIMITATIONS

Hospital confinements separated by less than three months for the same or related conditions will be considered continuations of the same confinement.

Coverage will continue through the life of the master policy unless terminated for whichever of the following reasons occurs first for the protected person: (a) attains age 65; or (b) becomes eligible for Medicare; or (c) AFA membership dues are due and unpaid; or (d) a premium payment is due and unpaid. For dependents, coverage will continue through the life of the master policy unless terminated for whichever of the following reasons occurs first: (a) such dependent ceases to be an eligible dependent; or (b) the protected person's insurance terminates hereunder; or (c) the dependent spouse either attains age 65 or becomes eligible for Medicare; or (d) any required dependent premium payment is due and unpaid.

EXCLUSIONS

The plan does not cover losses resulting from (1) declared or undeclared war or act of war; (2) service in the armed forces of a country other than the United States; (3) acts of intentional self destruction or attempted suicide while sane or insane; (4) pregnancy (including childbirth or resulting complications); (5) confinement in any institution primarily operated as a home for the aged or engaged in the care of drug addicts or alcoholics; (6) illnesses for which the insured has received medical treatment or advice or has taken prescribed drugs or medicines within 12 months prior to the effective date of his insurance. Coverage for such pre-existing illnesses will begin after 12 consecutive months during which he is covered under the policy and receives no such medical treatment or advice and takes no such prescribed drugs or medicine; (7) hospital confinement commencing prior to the date the protected person or eligible dependent becomes insured under this policy.

HOW TO APPLY

Fill out the attached application and mail it to AFA with your first premium payment. You may elect to pay premiums either annually or semi-annually.

APPLICATION

AFA EXTRA INCOME HOSPITAL INSURANCE

Underwritten by Mutual of Omaha Insurance Co. Omaha, Nebraska

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

DATE OF BIRTH _____ CURRENT AGE _____ HEIGHT _____ WEIGHT _____ SEX _____

PLAN OF INSURANCE

MEMBER ONLY

- ☐ PLAN A-1
☐ PLAN AA-1

MEMBER & SPOUSE

- ☐ PLAN A-2
☐ PLAN AA-2

MEMBER SPOUSE & CHILDREN

- ☐ PLAN A-3
☐ PLAN AA-3

METHOD OF PAYMENT ☐ Annual ☐ Semi-Annual

This insurance coverage may only be issued to AFA members. Please check the appropriate box:

- ☐ I am currently an AFA member.
☐ I enclose \$7 for annual AFA dues (includes subscription (\$6) to to AIR FORCE/SPACE DIGEST).

I enclose my initial premium in the amount of \$_____ (Refer to premium table to determine correct premium amount.)

Please complete this section only if you are requesting coverage for dependents (Limited Family or Family Plan) and list only those persons for whom you are requesting coverage.

FULL NAME	RELATIONSHIP TO AFA MEMBER	SEX	DATE OF BIRTH
	WIFE (HUSBAND)		
	child		
	child		
	child		
	child		
	child		
	child		

In applying for this insurance coverage, I understand and agree that:

- coverage shall become effective on the last day of the calendar month during which my application together with the proper premium amount is mailed to AFA.
- only hospital confinements commencing after the effective date of insurance are covered, and
- any condition for which I or any of my eligible dependents received medical treatment or advice or have taken prescribed drugs or medicine within twelve months prior to effective date of the insurance coverage will not be covered until the expiration of twelve consecutive months of insurance coverage without medical treatment or advice or having taken prescribed drugs or medicine for such condition.

DATE _____ SIGNATURE _____

Application must be accompanied by check or money order. Send remittance to:

INSURANCE DIVISION, AFA, 1750 PENNSYLVANIA AVE., N.W.,
WASHINGTON, D.C. 20006

Form 2332MGC App.

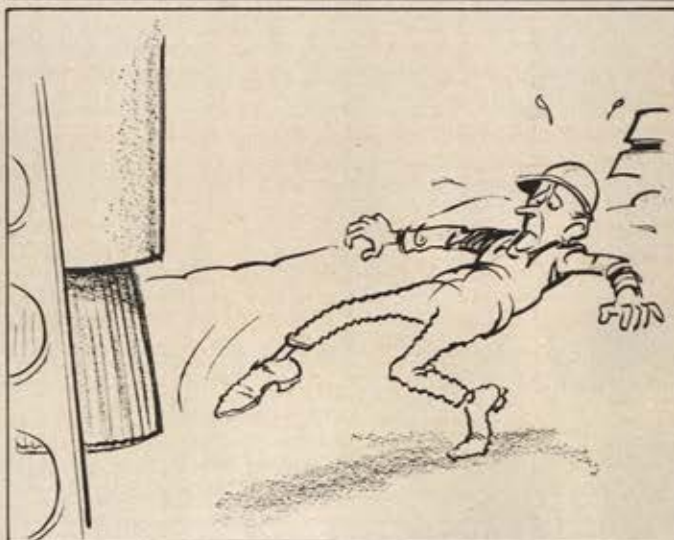
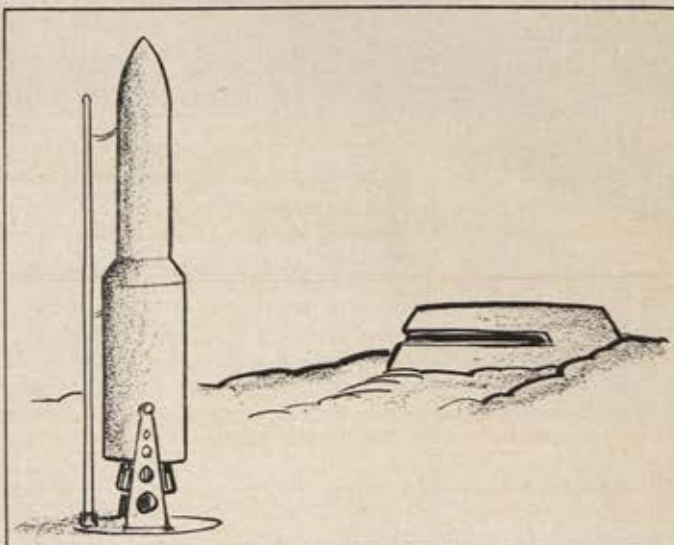
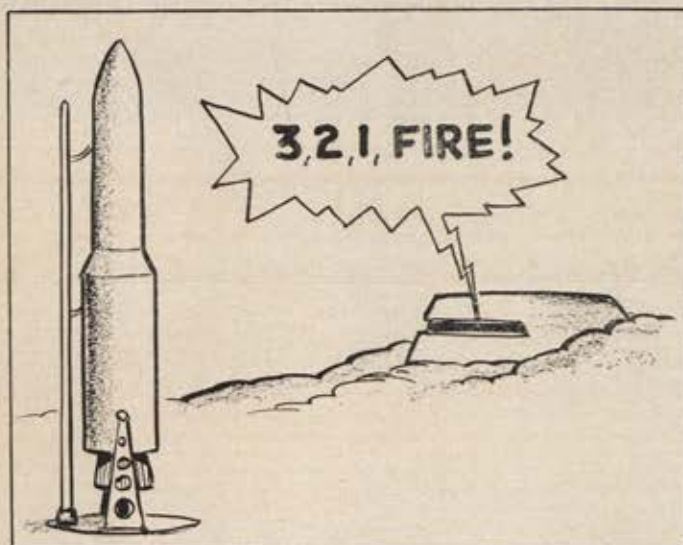
11-68



Bob Stevens'

"There I Was..."

After waiting for the weather to clear, after those days of checking and rechecking, after the suspense of the countdown—nothing could go wrong—wrong—wrong . . .



**Do Crucible
vacuum arc remelted steels
meet advanced aircraft specs?
Competitively?
Ask General Dynamics,
Lockheed, Boeing...**

Components for such aircraft as the Boeing 727 and 747, the General Dynamics F-111A, Lockheed C-5A, Boeing Vertol helicopters need super steels. Specifications for these ultra-pure VAR[®] vacuum arc remelted steels are beyond the capabilities of air-melting. They must be refined in vacuum furnaces under the most stringent control.

Crucible pioneered "VAR" and owns important patents on the process. A few months ago Crucible started up another vacuum furnace, one of the largest and most modern in the industry. We have blooming equipment large enough to handle 32", 21,000 pound ingots and to roll round corner square billets from 2" to 16" at a fully competitive price.

Crucible is a specialty steel producer. Ultra-pure, super-strength "VAR" steels are right down our runway. Try us and you'll agree. We have a new booklet on "VAR" steels we'll be glad to send you if you'd like more details.

Crucible.

Crucible Steel Corporation
Midland Div., Midland, Pa. 15059

Boeing CH-47 Chinook helicopter—Vietnam.



We tip the scales in his favor.

A Phantom pilot has a built-in advantage over his adversary.

High strength, weight-saving titanium alloys in selected critical structures reserve more of the F-4's thrust for combat performance, and leave

more lift for carrying combat ordnance.

We're the world's largest user of titanium. We use over two million pounds of titanium in production fighters, jetliners and spacecraft each year.

Because of this experience, our mission-conscious designers plan extensive use of titanium as an economically sound means to superior performance in a new generation of fighter aircraft.

MCDONNELL DOUGLAS

