

MARCH 1969 / 60c

AIR FORCE

and **SPACE DIGEST**

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



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- Administrator

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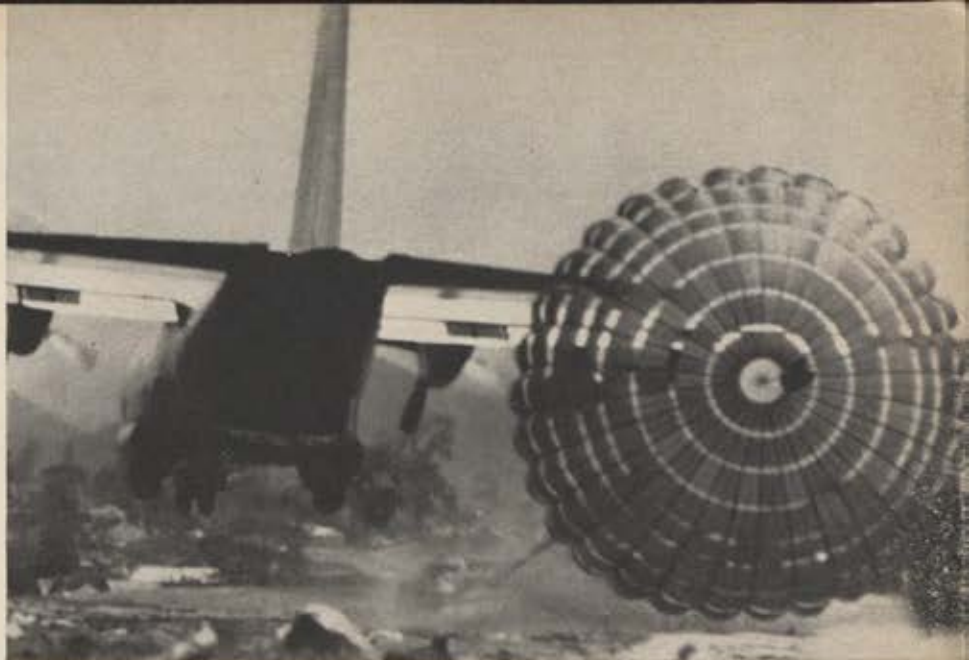
To survive, it must endure

quick, steep descents and jarring impacts as it hits down on remote airstrips. It has to dodge its way into danger zones, unload up to 20-plus tons of arms, men and supplies, then turn around fast and scoot for home with a new load — hopefully over a flak-free route.

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Bendix avionics vs. nature.

Coping with the Critics

By John F. Loosbrock

EDITOR, AIR FORCE/SPACE DIGEST

MR. DOOLEY recognized the phenomenon, way back in nineteen and ought-ought. Wade with us through Finley Peter Dunne's phonetic interpretation of an Irish brogue and the wisdom of what he wrote at the turn of the century will come as clear as Tullamore dew.

"A war expert," said Mr. Dooley, "is a man ye niver heerd iv befure. If ye can think iv annywan whose face is onfamilyar to ye an' ye don't raymimber his name an' he's got a job on a pa-aper ye didn't know was published, he's a war expert."

The trouble is, Mr. Dooley, that today everything is done on a grander scale. We have a war-expert-explosion coupled with a knowledge-gap compounded by a problem-proliferation exacerbated by a fact-famine. It's a simple case of supply and demand. The supply of facts just isn't large enough to satisfy the demands of the growing number of war experts. Or, as they say in the knowledge industry, the software is a bigger problem than the hardware.

The situation, of course, is much more serious than the above treatment of it might indicate. The military mind, if there is such a thing, is in for hard times. The slings and arrows are flying thick and fast. Pygmies can bring down an elephant, and you'd better believe it. Never in our memory has there been such a spate of critical darts hurled at the military establishment. More important, they more and more take the shape, not of mere attacks on how things are done, but upon the necessity of doing them at all. The very *raison d'être* of the defense establishment is coming under heavy fire in a kind of reverse McCarthyism which seeks conspirators against the peace in the Pentagon with the same twisted zeal that alleged Comsymps once were pursued through the halls of the State Department.

"Where there is so much smoke there must be some fire." An easy thesis to sell, as easy now as it was in an entirely different context in the early 1950s. But might it not be more logical to assume that where there is so much smoke there might be a few smokepots?

The temptation, of course, is to lash back in kind. To label the critics as conspirators. To lump together the addled with the intelligent, the irrational with the reasonable, the misguided with the mischievous. Or, to go the other way, to pull one's brass hat down over one's ears and, in the words of a famous Texan, "hunker up like a jackrabbit in a hailstorm." The former would be fatuous. The latter would be ignoble. There has got to be a better way.

A good place to start is with reality, a recognition

of things as they are. And an understanding that things as they are are not the same as they were four years ago, or eight years ago, or sixteen years ago. The country is in the midst of deep social change. It is not necessary either to applaud it or regret it. It is enough to recognize it and adjust to it. Society cannot be expected to adjust to the military. The military must adjust to the society it is sworn to support. Otherwise, the very worst things the critics are saying would ring true.

That is the first step.

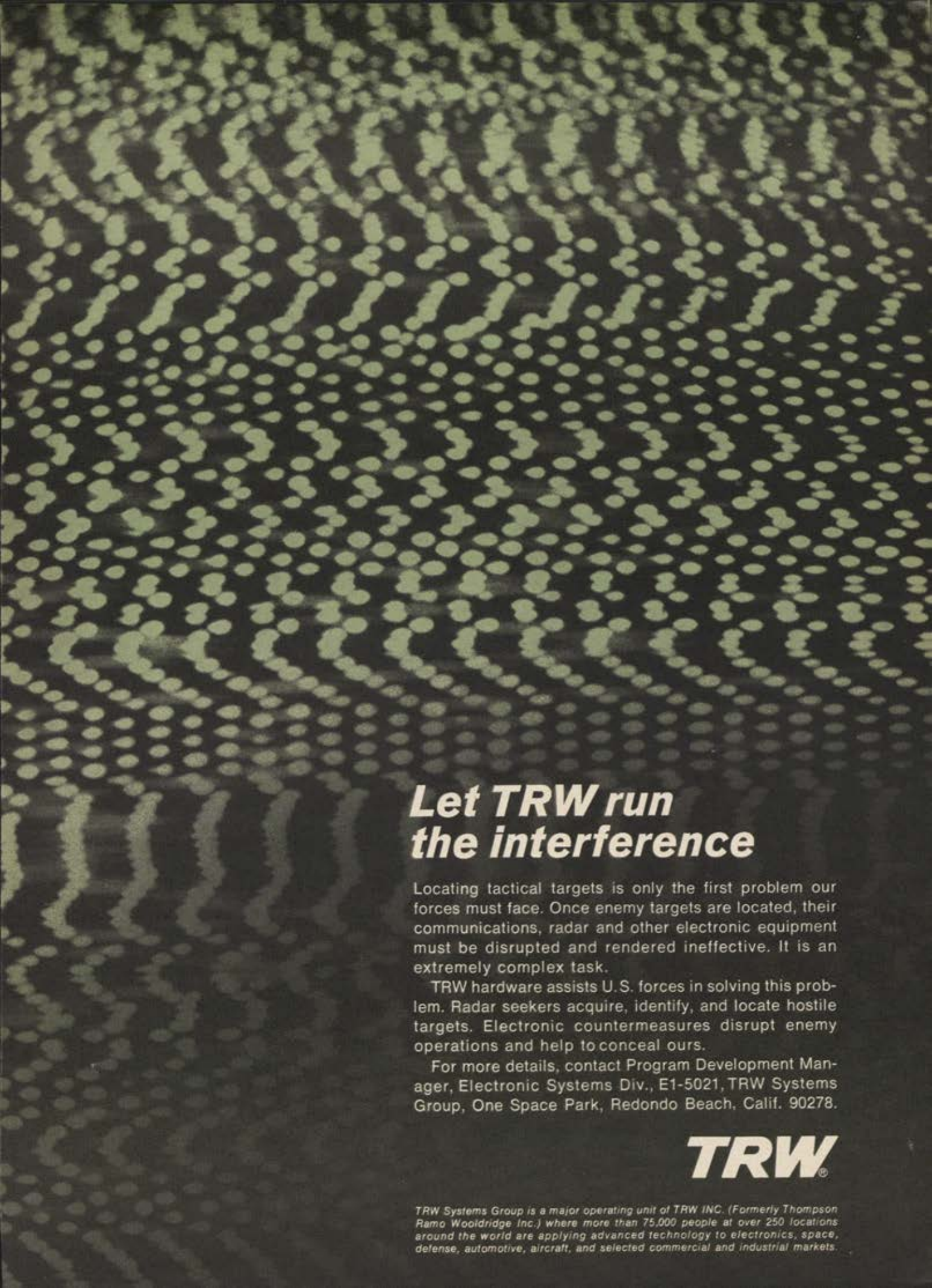
The next is to attempt, in a reasonable way, to help fill the knowledge gap, not with propaganda, but with sound factual information. Misconceptions and misinformation about the military are startlingly widespread, especially so in the intellectual community. But the response should be one of candor and conviction, not of anger or mistrust of motivation.

The legitimacy of certain criticisms must be recognized and admitted. Very often they serve to point up deficiencies which thoughtful military men have privately acknowledged. One needs help to swim against the strong currents of inertia and tradition, and a critic may sometimes prove to be an ally in disguise.

Much thought must be given to the credible articulation of the threat, its parameters, its posture, its very existence. If there is no threat, or not a very serious threat, then all the critics become justified *ipso facto*. Again it is necessary to look at things as they are. In years past, when the credibility of the threat began to dwindle, one could invariably count on the Russians to bail us out. They would blockade Berlin, or fire off a Sputnik, or move missiles into Cuba, or something. But the climate has changed. The military, in a sense, is the victim of its own success. People have become inoculated against the threat, much as flies become immunized against DDT. We don't think we need the doctor any more because he has done such a good job of keeping us well. We remember only that his medicine tastes bad and we don't like it. A Czechoslovak crisis blows by us like news of an epidemic in Afghanistan.

In all this, the military must be able to expect the good will and cooperation of its civil superiors. Many of its current difficulties have been brought on, or compounded, by the civil hierarchy behaving like a trial lawyer before a hostile witness. Perhaps an alliance atmosphere is too much to expect, but a working coalition should be the least.

Meanwhile, look for the critical climate to get worse before it gets better.—END



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Thank You, Mr. Secretary

Gentlemen: As I end my tour as Secretary of the United States Air Force, I want to thank [AFA] and AIR FORCE/SPACE DIGEST for the interest and assistance you have given my office and our service in the past three years.

Through the journalistic expertise of you and your staff, Air Force efforts in defense of freedom around the world have been made known to your many readers. I am very grateful to [AFA] and AIR FORCE/SPACE DIGEST for your concise coverage of Air Force activities.

I am sure that Dr. Seamans and the Air Force will continue to benefit through your professional coverage.

Harold Brown

20/20 Vision

Gentlemen: Reference the article by Technical Editor J. S. Butz, "Man's Eye in the Sky Is Sharp Indeed," January 1969. The figures quoted for 20/20 vision are inaccurate by a factor of five. A man would indeed have sharp vision if he could identify a letter 0.07-inch high (a little over 1/16") at a distance of twenty feet. In actuality, each Snellen-type letter is inscribed within a square which subtends a visual angle of five minutes, with the width of each component limb of the letter subtending an angle of one degree. Thus, the letters which a man must identify when standing twenty feet from a Snellen chart are 0.345-inch high, with the width of each limb of the letters being 0.07-inch thick.

I do not mean to detract from the veracity of the remainder of the article, but merely to correct this one technical error.

LT. COL. RICHARD A. DAVIDSON,
USAF, MC
Wright-Patterson AFB, Ohio

Early Bird Chopper Pilot

Gentlemen: Reference Maj. Charles O. Weir's letter in your issue of January 1969—helicopter pilots.

I was, as a member of the Staff of Eastern Flying Training Command, Project Officer of the First Army Air Force helicopter school established in 1944 on a section of the Basic Flying

School, Freeman Field, Seymour, Ind. My assignment was made because I held an autogiro rating, and few persons then knew the difference between an autogiro and a helicopter.

I must disagree with the letter's statement that we who flew these early machines were "daredevil pilots . . ." and that the Sikorsky R-4Bs were "out of control . . . most of the time" and could reach a height of only a thousand feet. Those descriptions are dramatic but not facts.

The letter's suggestion of the formation of an Air Force Association of helicopter pilots and crewmen disregards the splendid work being done by the Helicopter Association of America, whose meetings are attended by high government personnel. Also, the Aerospace Industries Association of America and other like organizations have their active V/STOL divisions. The "Twirly Birds"—pioneer helicopter pilots—and the "Whirly Birds," international women helicopter pilots, do their part to further the industry.

As a pilot in three wars, with fifty-eight years of active flying experience, I share Major Weir's enthusiasm for the future of V/STOL craft, but exuberance should be tempered with cold facts.

COL. HARRY D. COPLAND, USAF
(RET.)

Pres., The Early Birds of
Aviation-1969
Ft. Lauderdale, Fla.

WW II Declassified Document

Gentlemen: While researching World War II Air Force files I recently came across the one remaining copy of a just-declassified "secret" document entitled "Complete Mission Summary of All 331 Twentieth Air Force Attacks on Japanese Empire, 10/44-8/45."

This 340-page report is extremely detailed, giving dates, times, targets, Air Force units involved, B-29s involved, altitudes, weather conditions, B-29 losses, enemy opposition and losses, bombing results, and Air Force Intelligence résumé of each mission.

As a member of the Association and a Twentieth Air Force veteran, it occurred to me that others may be in-

terested in obtaining bound copies of this historic document. To reproduce a single copy would cost over \$70, but if as few as 200 express interest, I can arrange to have this document reproduced, bound, and mailed at \$15 per copy. All interested please advise.

RICHARD M. KEENAN
4640 Reservoir Rd., N. W.
Washington, D. C. 20007

CAF Flying Museum

Gentlemen: The Confederate Air Force is a patriotic organization dedicated to the preservation of the world's greatest combat aircraft, 1939-1945.

The Flying Museum of the CAF now consists of thirty-one different World War II aircraft of which all but three are in flying condition, and these are being rebuilt. Our collection of World War II bombers includes the B-17 Flying Fortress, A-20 Havoc, B-24 Liberator, B-25 Mitchell, B-26 Marauder, A-26 Invader, and the B-29 Superfortress. Of 5,200 built, the Martin B-26 in this group is the last remaining flyable Marauder in existence.

We need the help of interested people from all over the world to enable us to maintain these great aircraft in flying condition. The CAF, under command of the mythical Col. Jethro E. Culpeper, now consists of a First Bomb Wing, a First Trainer Wing, and a First Fighter Wing. We are now forming a B-17, a B-24, a B-25, and a B-26 "Squadron." These planes will be flown in public exhibitions across the nation with the other aircraft of the Confederate Air Force "Ghost Squadron" as a living memorial to the thousands of men who built, serviced, and flew them to help keep our country free.

For further information on our organization call Area Code 512, GA 5-1057, or write

THOMAS W. SHORT, Executive
Director
The Confederate Air Force
Rebel Field
Hurlington, Tex. 78550

Glider Pilots Association

From time to time AIR FORCE/SPACE DIGEST receives inquiries from
(Continued on page 13)

SCIENCE/SCOPE

Apollo 8 voice and television communications depended heavily on Hughes-built equipment:

...the 20-watt microwave traveling wave tube that sent Apollo 8's signals earthward (one of the more than 100 flight-quality TWTs built for NASA since 1962 and used on the Syncom, Early Bird, Intelsat 2, and ATS satellites and the Pioneer, Mariner, Lunar Orbiter, and Surveyor spacecraft);

...the antenna-feed subsystems aboard three special vessels stationed on the high seas around the globe to receive and relay Apollo 8's signals;

...the ATS satellite used in support of the Apollo 8 splashdown; it relayed TV FROM USS Yorktown to Brewster Flats, Wash., for commercial distribution.

The first European-built equipment for NADGE -- the \$300-million air defense system that will guard NATO nations from Norway to Turkey -- is now undergoing integration testing at Hughes in Fullerton, Calif. The data display console built by Selenia S.p.A. of Italy and the video extractor by N.V. Hollandse-Signaalapparaten of The Netherlands are linked with a general-purpose computer and other equipment built by Hughes.

The first of two LN-3 Flight Line Testers being built by Hughes for the West German Ministry of Defense was delivered three weeks ahead of schedule after being rated "excellent" in acceptance tests. The computer-controlled testers, through the use of preprogrammed test sequences, enable relatively unskilled operators to perform fast, accurate checkups on the F-104G Starfighter's LN-3 inertial navigation system.

An infrared night sight for the Army's Cheyenne helicopter, now being built by Hughes under contract with Lockheed-California, will give the gunner a picture of ground targets nearly as clear as he would see in daylight. The PINE (for Passive Infrared Night Equipment) system enables him to locate targets and fire automatic guns, rockets, grenades, machine guns, or Hughes-built TOW wire-guided anti-tank missiles.

A new method of detecting flaws in metals was presented at the eighth Symposium of Physics and Nondestructive Testing in Chicago recently by a University of Arizona professor and a Hughes engineer. Their method sends ultrasonic Lamb waves throughout a solid material to find defects, much like a submarine sends out sonar waves. Engineers can pinpoint the location and size of flaws by noting the magnitude of the echo signals and the time they take to return.

An orbiting "windowshade" of solar cells, which will capture enough of the sun's energy to produce 1500 watts of power, is being built by Hughes under contract to the Aero Propulsion Laboratories of the U.S. Air Force. Designed to supply future satellites with electricity, it consists of two flat sheets of solar cells (called arrays), each 5½ x 16 feet long, which will unroll into space from a drum. Space testing of the system is scheduled for late 1970.

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83-foot main parachute after it. These are also reefed at first to soften the opening shock.

After another eight seconds the reefing lines are cut and the three main chutes blossom in the sky.

When the spacecraft settles gently to earth the parachutes are cut free and our brief job is done.

Every U.S. astronaut returning from space has been lowered to earth by a Northrop landing system developed for the National Aeronautics and Space Administration.

We won't say the last five miles are the hardest. But if you're an astronaut you probably think our specialty is **NORTHROP** rather important.

our readers wanting to know if there is in existence a Glider Pilots Association. Maj. Charles O. Weir of Granada Hills, Calif., recently forwarded to us a newspaper clipping mentioning such an organization. Many glider pilots, though scattered to the four winds, have been located and are members of the association. To be eligible for membership you must be a qualified Military Glider Pilot and entitled to wear the silver Pilot's Wings bearing the letter "G." Anyone who is interested in becoming a member of the association should write to Lt. Col. Frank J. Moore, USAF (Ret.), National Commander of the National World War II Combat Glider Pilots Association, 56-47 196th St., Fresh Meadows, N. Y. 10365. Our thanks to Major Weir for bringing this to our attention.—THE EDITORS

UNIT REUNIONS

Army Air Corps Bomb Groups

A reunion of the following units will be held June 2, 3, and 4, 1969, at the Brown Palace Hotel, Denver, Colo.: 310th, 321st, and 340th Bomb Groups (M); the 57th Bomb Wing (M); and the 308th Signal Corps (Detachment). For further information contact

Lt. Col. John W. Dillin
130 E. Orange Ave.
Lake Wales, Fla. 33853

CBI Hump Pilots Association

Members of the China-Burma-India Hump Pilots Association will hold their 24th Annual Reunion at Nashville, Tenn., on August 22, 23, and 24, 1969, at the Holiday Inn (Downtown), 710 James Robertson Parkway. For further information contact

Herb Fisher, President
CBI Hump Pilots Association
Port of New York Authority
111 Eighth Ave., Rm. 1409
New York, N. Y. 10011
Phone: (212) 620-8396

National Pilots Association

The Annual Summer Fly-In Weekend of the National Pilots Association will be held June 13-15, 1969, at Basin Harbor Club, Vergennes, Vt. Members and nonmembers are invited. Nonmembers are welcome for all or part of complete three-day program. For more information all pilots are invited to write

NPA
806 15th St., N. W.
Washington, D. C. 20005

4505th Air Refueling Wing

Former officers of the 4505th Air Refueling Wing will hold a reunion at Langley AFB, Va., on March 15, 1969. All KB-50 officer veterans are invited to attend or send greetings. Contacts for the reunion are

Lt. Col. Carel T. Humme
Hq. TAC
CMR-1, Box 2285
Langley AFB, Va. 23365
Phone: (703) 764-2119, 2232
or
Lt. Col. Eugene McClurg
4440th Aircraft Delivery Group
Langley AFB, Va. 23365
Phone: (703) 764-2467, 3867



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By Claude Witze

SENIOR EDITOR, AIR FORCE/SPACE DIGEST

Is It Guns vs. Ghetto?

WASHINGTON, D.C., FEBRUARY 11

There is no dodging for the Administration of Richard M. Nixon. The United States is heading into the most heated debate on national security issues it has experienced since Franklin D. Roosevelt gave some old destroyers to Great Britain and wound up in an argument with the America First Committee.

In that case, the President was opposed by an airpower expert—Charles A. Lindbergh—and supported by a Republican—Wendell Willkie—despite the political power he commanded as a Democratic President. The lineup of opponents in 1969 probably will include the same kind of dissimilarities.

As defined by Clark Clifford in his statement, quoted on page 42, the basic issue is between the people who fear the threat to our national security and those who are more concerned about the "economic and social costs" of a defense program. Another popular way of putting it is that "it is easier to sell Congress a shiny new missile than a slum-clearance project."

This business of equating the nation's social security with its defense security has been seized by a portion of the press and spurred by some members of Congress, and is being turned into a running campaign. Senator George S. McGovern, who made an abortive attempt to capture the Democratic presidential nomination last summer, is denouncing the "mounting influence of the military-industrial complex" in terms of how we can "improve the quality of our society" with \$30 billion "now being squandered in Vietnam." This man also has told the Senate how many schools and hospitals can be built for the price of an aircraft carrier or a fleet of bombers.

There are many other efforts to heat up the argument, far more of them, in fact, than there are efforts to throw light on the problem. At the White House, Henry A. Kissinger, President Nixon's special assistant for national security and himself no enemy of peace, had to give a hearing to some draft resisters. They seek amnesty. One of the reasons given by the Rev. William Sloane Coffin, Jr., Yale chaplain who led the delegation, is that "we just cannot see the relationship between the continued fighting [in Vietnam] and the talks in Paris." The calamity of the week is that Dr. Kissinger's response was off the record. He gave his response not long before the beginning of the Tet holidays, which the Communists celebrated last year by burying a thousand people alive at Hué.

On another front, we learn that forty-five professors at the Massachusetts Institute of Technology are sponsoring a one-day strike, also planned to hit at Cornell and Yale, to protest government "misuse" of science and technology. The proposed deployment of an ABM is the prime target—now they have buttons that say STOP ABM—and it appears to be the "misuse" of science that has the physicists most exercised. There is no report of any buttons protesting the contributions of science and technology to the flight of three astronauts around the moon at Christmastime.

It is a short step from this kind of congressional and

public activity to the point where some of the more naïve and sympathetic press is used as an outlet. One local reporter, inexperienced in the aerospace field, took note recently that "some government officials and economists have been suggesting that the major aerospace companies are capable and ready to use their considerable managerial skills and engineering expertise to solve a broad array of pressing social problems."

The idea, of course, is nothing new. Industry spokesmen say it had its roots in some programs initiated by John F. Kennedy when he was President and aerospace leaders were welcomed at White House conferences on these subjects. And those conferences were held long after the Senate debates of 1958, familiar to more experienced reporters, when the same Kennedy, representing Massachusetts, charged there was a gap developing in defense. And the reason for the gap? The Eisenhower Administration had been putting emphasis on economic strength rather than military strength. The exact words are in the *Congressional Record*.

Nevertheless, looking at the scene for the first time in 1969, our young journalist went through what he called "an extended survey of industry leaders" in "the heartland of the aerospace world" and gave his paper material for a headline that said these leaders SHOW LITTLE INTEREST IN APPLYING SKILLS TO DOMESTIC ILLS.

The truth is exactly the opposite. Competent observers believe the aerospace industry has put more talent, effort, money, and enthusiasm into "pressing social problems" than any other industry. There is freely available, for the asking, a twenty-four-page report put out by the Aerospace Industries Association called "Aerospace Technology: Creating Social Progress." This compilation demonstrates the diversity of the industry programs. Lockheed is busy on school-community relations in California. In the same state, Aerojet-General is trying to find some way to manage waste.

The same company created the Watts Manufacturing Co. in the Los Angeles area of that name. It recruits and trains workers locally. General Dynamics has a number of programs designed to train and employ people formerly classified as unemployable. Roger Lewis, president of that company and a former Pentagon official himself, is one of the industry's most vigorous leaders in the effort, and gives much of his time to it.

The job-making drive is shared by Sperry Rand, United Aircraft Corp., Fairchild Hiller, Cessna, Bendix, Boeing, Hughes, and many others. The entire story, along with the pilot projects aimed at the application of the industry's technology to urban problems, has been widely publicized and is known to aerospace industry sophisticates. Last year, one of the leading trade news magazines ran a series of articles to summarize the programs. AIR FORCE and SPACE DIGEST, our own compilation shows, ran at least ten feature articles in 1968, all dealing with social, not military, matters. In December, we carried an account of the birth and growth of Progress Aerospace Enterprises, Inc. It was called "PAE of Philadelphia: Black Enterprise in Aero-

(Continued on page 19)

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space" and told how General Electric's Missile and Space Division had helped create a new business, owned and operated by Negroes. No Washington newspaper, to our knowledge, has covered the story. It would be a suitable assignment for a reporter who needs seasoning in covering business activity.

There are other examples of the kind of distortion that can be effected with existing material about the defense program. And the file will grow. From time to time there is an effort to check the spread of misinformation. Recently, the *Washington Post* posed an editorial question. It said laymen are at a disadvantage and asked:

"Why does the Government Accounting Office have more men poking into the affairs of Pride, Inc., the local antipoverty agency, than it does poking into the affairs of the aerospace contractors who spend more money before lunch than Pride will ever spend?"

The answer, of course, is that GAO doesn't do this, any more than the editor beats his wife. Elmer B. Staats, the Comptroller General, replied a few days later that GAO had ten auditors working on Pride for six months. In the same period it had 980 auditors assigned to Defense Department activity.

There is an increasingly negative approach being used by the press all across America, with some notable exceptions. Perhaps the most telling observation can be drawn from President Nixon's recent assertion that he considers the Department of Defense as a Department of Peace. The chasm should be evident to the readers of a local newspaper whose reporter in the Pentagon refers to that building as a "citadel of war."

From this it will be a short step to the point where the misrepresentation gets more personal. Last week a group of Senators, led by Indiana's Vance Hartke, offered a bill to establish a Department of Peace, called the Peace Act. Mr. Hartke made a long speech about it and inserted some telegrams in the *Congressional Record* that support the proposal. They were signed by representative US citizens, such as Nancy Sinatra, Tommy Smothers, and Mr. and Mrs. Jackie Cooper. Anyone who speaks against the bill, or contends, with President Nixon, that the Defense Department seeks to ensure peace, now is in danger of being labeled a warmonger.

On the other side of the coin, Mr. Clifford said in his final message to Congress that there are people who are primarily concerned with the threat to our national security. They tend, he indicated, to accept the technical feasibility of proposed new weaponry and accept the high cost along with it.

So far as the threat is concerned, the retiring Defense Secretary said the most significant development of 1968 was the large increase in deployment of Soviet hardened, land-based ICBMs. By the end of 1969 the Russians will have more than a thousand deployed. This, it is emphasized, is not the result of any shift in Russian policy. It is the hard result of a long-term program, one supported by a continuing fast-paced research and development effort.

At another point, Mr. Clifford took a quick look at some of the things the Russians *could do* in the 1970s that would degrade US capabilities. He listed the possibilities of highly accurate multiple warheads in the big Soviet missiles, vastly improved missile accuracy, an extensive ABM system, a large AWACS/interceptor force, and a more effective SAM system. Any one of these, Mr. Clifford said, is no particular threat. But if the Russians were to do all of them at once, providing they could afford it, they could degrade our "Assured-Destruction" capability. How? Like this:

"A Soviet ICBM force with a substantial hard-target kill capability would be able to destroy a large number of our land-based missiles in hard silos. An extensive, effective Soviet ABM defense might then be able to intercept and destroy a large part of our residual missile warheads, including those carried by submarine-launched missiles. A large AWACS/interceptor force (with a good look-down, shoot-down capability) coupled with an extensive, effective low-altitude SAM system, could destroy a very sizable number of our bombers before they could reach their targets.

"While the foregoing threat is both quantitatively and qualitatively far greater than that projected in the latest intelligence estimates, we cannot foreclose the possibility that all of these developments may occur, and occur simultaneously.

"Accordingly, we must take timely action now to place ourselves in a position where we can move forward promptly to meet any or all of these threats should they actually materialize."

The Secretary was listing here some items that we know are technologically feasible. He made no reference to the deeper Russian scientific effort, pregnant with possible breakthroughs. Such breakthroughs could take place in areas not known today as having military significance. Considered in this sense, advanced technology itself can contribute to war prevention; a position in the forefront of the technological contest, by preventing technological surprise, can prevent war.

This is a concept that would not occur to Nancy Sinatra, Tommy Smothers, or the Cooper family. Yet, our best-informed experts on the Russian technological effort are looking beyond even the menace of military activity in space by an adversary. They are looking, instead, at the over-all march of the adversary's talent into the adversary's laboratories.

There is support for this apprehension, even from unexpected places. For example, in 1957, which was during the last Republican Administration, Jerome B. Wiesner addressed a meeting of the Committee for Economic Development in Washington. There remains this memorable quote:

"One of the frightening things to me, and a source of real danger to us, is that some inconceivable development, some new idea, some new scientific insight might give the discoverer a decisive advantage if he chooses to exploit it, and the more fundamental investigations scientists do, the more likely such a discovery is."

Dr. Wiesner since has said he rejects the idea that technology has any place to go. He is scheduled to testify soon on Capitol Hill in opposition to the ABM program. Some Senator should ask him whether it is not possible that he is using the wrong arguments against the Sentinel system. The real one, according to his 1957 opinion, is that Sentinel can be made obsolete in a stroke, by an ABM system based in space, for instance.

The 1969 defense policy debate must not leave us blind to the fact that because modern weaponry is so destructive, defeat can be assured by a lag in technology. Another way of expressing it, used at some of the war colleges, is that tactics, strategy, and defense policy must gravitate in the direction accommodated by the best technology can afford.

None of this, really, has anything to do with the economic and social costs of defense. Without survival, there will be no ghetto to rehabilitate.

The fact that the ghetto needs rehabilitation, which no man can or does deny, stands as a reality, alongside the threat.—END



By William P. Schlitz

NEWS EDITOR, AIR FORCE/SPACE DIGEST

In many instances statistics are meaningless unless they can be interpreted. But no interpretation is necessary concerning the records chalked up by the men flying air rescue missions in Southeast Asia. In this case the figures speak dramatically for themselves. For example, the 3d Aerospace Rescue & Recovery Group flying out of twenty-three locations in Southeast Asia is one of the most decorated units in history—and with just cause.

Since rescue operations began, the group, with associated support units, has been responsible for the rescue of 2,202 persons as of January 1, 1969. These "saves" were of personnel who undoubtedly would have met capture or death if not rescued. Of them, 1,508 were classified as "combat saves," meaning the man or men rescued were exposed to enemy action or were recovered from a hostile area (also meaning that the rescue team probably came under fire).

The rescuemen's dedication to their mission is reflected in the grim figure of 100 casualties they themselves had taken up to January 1, of these twenty-seven killed (six were lost during a single mission). But for the loss of each rescueman, sixty other persons were saved from death or capture.

The 3d AR&RGp has used three types of helicopters in its missions—

HH-43 Pedros, HH-3E Jolly Green Giants, and HH-53 Jolly Green Buffs—owned by the Military Airlift Command. They receive supporting cover from A-1 Skyraider Sandys and Spads of the Pacific Air Forces, and all are under operational control of the Seventh Air Force, headquartered at Tan Son Nhut Air Base, near Saigon.

The rescuemen and their aircraft have seen the long and short of it. One mission involved a grueling 9½-hour effort to rescue twenty-six soldiers, while in another case just six minutes elapsed from the time an F-4 Phantom pilot left his aircraft until he was picked up by a rescue helicopter.

Once a man is down, almost no effort is spared to retrieve him. For example, over the Memorial Day weekend in 1968 Air Force and Navy pilots flew 189 strike sorties to assist in the rescue of one Navy pilot.

In 1968 alone a record 915 lives were saved by the 3d AR&RGp. Of these 572 were counted as combat saves. But the rescuemen are not interested in figures, and their devotion to their job certainly fits their motto: "That others may live."



For observers of the Soviet space program, the guessing game has always been hazardous. One school has

maintained that the Russians, for reasons of international prestige, could not allow a US moon-landing "first" and would consequently mount a vigorous program to be first on the lunar surface. The other school, noting the sustained Russian earth-orbital satellite program, has insisted that the Soviets would concentrate on developing the ability to put together large manned space stations in near space.

The recent successful rendezvous, docking, and exchange of Soyuz crews in earth orbit seems to favor the latter interpretation. The roominess of the Soyuz crew quarters, the fact that for a long time the Russians have successfully used a cabin atmosphere close to what we breathe on earth, and the crew transfer between two spacecraft, combine to suggest an orderly push toward operational space platforms—facilities in orbit for scientific/military uses in the near future as well as potential launch points for manned lunar missions later.

The Russians themselves late last year declared they were not planning a circumlunar flight and that they were not able to land a man safely on the moon at present. At the same time, they said they "consider construction of manned orbital space platforms a high-priority goal." One US

(Continued on page 22)



One vital component of the Southeast Asia air rescue force is the Sikorsky HH-53 Jolly Green Buff, the crews of which recorded their 100th combat save just before the year's end. Ninety-nine of the saves were made in 1968. The Buffs get their acronym nickname from "big ugly friendly fellows."



Men of the 38th Aerospace Rescue & Recovery Squadron repair a wounded Pedro. The Kaman HH-43 was hit during mission near Nha Trang Air Base. The pilot, Capt. Daniel A. Nicholson, landed in a jungle clearing. The damaged helicopter was forced to remain in the clearing overnight.



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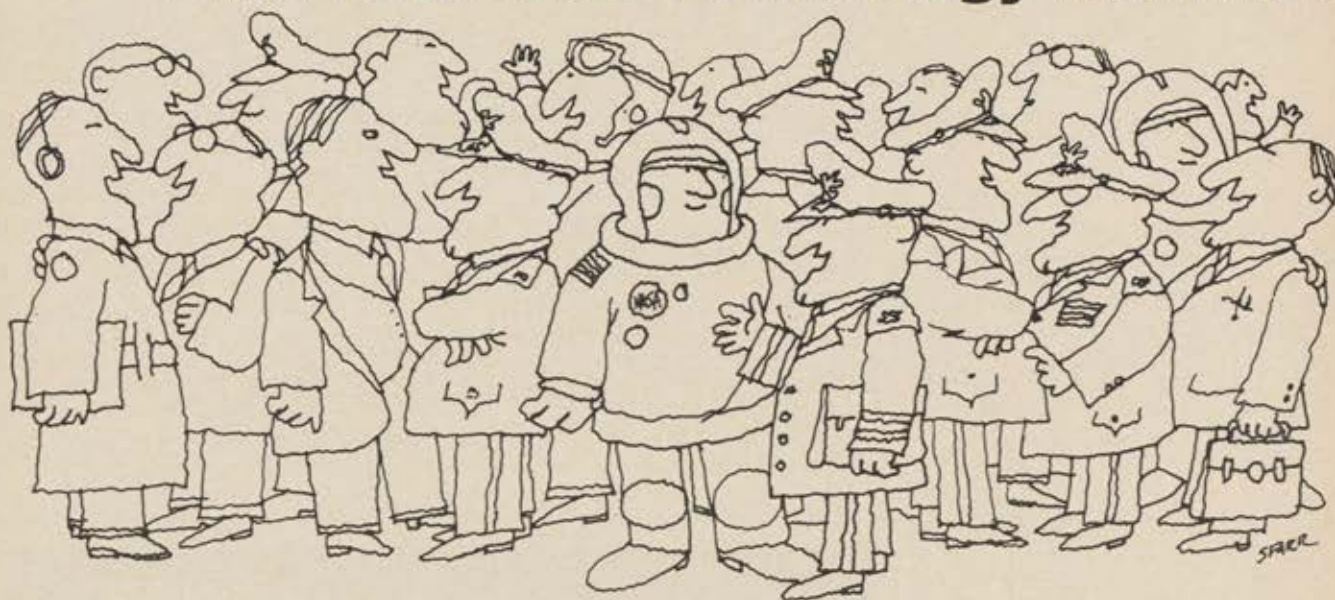
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Col. Allen K. McDonald has succeeded Col. Paul P. Douglas, Jr., as Commander of the 388th Tactical Fighter Wing stationed at Korat Royal Thai AFB, Thailand. Colonel Douglas is now inspector general for TAC's Twelfth Air Force, Bergstrom AFB, in Texas.

expert, C. M. Bertone of the Bunker-Ramo Corp., flatly predicts "the main Russian goal will be the orbiting of larger and larger manned earth-orbital laboratories" containing not only earth atmospheres but also "earth or near-earth gravity fields."

Such a trend unnerves some US space planners, particularly those concerned with the military significance of space. They wonder if future US moon expeditions will, in the words of one observer, "have to pass through Soviet customs in orbit."



One suggestion is to paint miniature Cuban flags on an airliner's fuse-

lage to indicate the number of times the aircraft has been hijacked to Havana. One way would reduce hijackings by playing the Cuban national anthem just before takeoff, and arresting those who stand up.

The airlines, far from amused, are pressing for more practical solutions to the hijacking problem because of the persistent danger of crashes and the high cost involved when an airliner is diverted, estimated at \$10,000 to \$15,000 per hijacking.

The airlines have asked the US Senate to ratify the Tokyo Convention, which requires members to return control of aircraft to its commander and to permit passengers and crew to continue their journey.

Other steps involve the study of weapon-detection devices and a plea to the news media to accentuate the gravity of such acts and the severe penalties attached.

Most experts believe that an agreement with Cuban authorities to return hijackers for prosecution would be big medicine in curing the hijacking craze. This is directly related to the minimum twenty-year prison term for such crimes specified under the law, and the \$25,000 reward for information leading to the arrest and conviction of a hijacker offered jointly by the Air Transport Association and the Air Line Pilots Association. (No reward would be paid, however, for apprehending a hijacker while in the air, because of the danger to passengers and crew.) A potential fault in this plan is that mentally disturbed persons might not be put off by the likelihood of prosecution and a lengthy prison term.

Be that as it may. One theory expounded is that there is a correlation

between the frequency of hijackings and the rash of armed robberies of banks and other financial institutions around the country. This sobering theory holds that to blame is the very speed with which our mass communications media can spread ideas, such as the ease with which banks can be held up or planes hijacked, that produce, like the rapid spread of disease, a plague of acts detrimental to our society.



It weighed 250 tons, but even so the "cobra on an orange crate" could fly at altitudes and speeds no fighter aircraft of the day could touch. Originally conceived in the '50s as a replacement for the Strategic Air Command's deterrent force of B-52 Stratofortresses, the B-70 Valkyrie was designed to fly intercontinentally at an altitude of more than 70,000 feet and at a constant speed of more than 2,000 mph. It was to be capable of delivering an assortment of weapons including both conventional and nuclear ordnance.

Some 200 of the aircraft were to be built by contractor North American Aviation and integrated by the Air Force into its mixed arsenal of missiles and manned bombers.

But in 1963, the then-Secretary of Defense, Robert S. McNamara, decided that missiles could more effectively and economically do the B-70s' job, and so two of the huge planes were all that were ever built, both destined to become high-speed research aircraft.

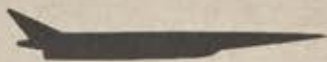
The first was flown initially on September 21, 1964, and the second, ten months later. On June 8, 1966, one
(Continued on page 25)

The 360-passenger Boeing 747, the world's largest commercial jetliner, made its maiden flight on February 9 from Paine Field in Everett, Wash. The 710,000-pound red, white, and blue giant lifted off the runway smoothly at a takeoff speed of 162 mph. The planned one-hour, sixteen-minute flight was cut short because of suspected flap misalignment.



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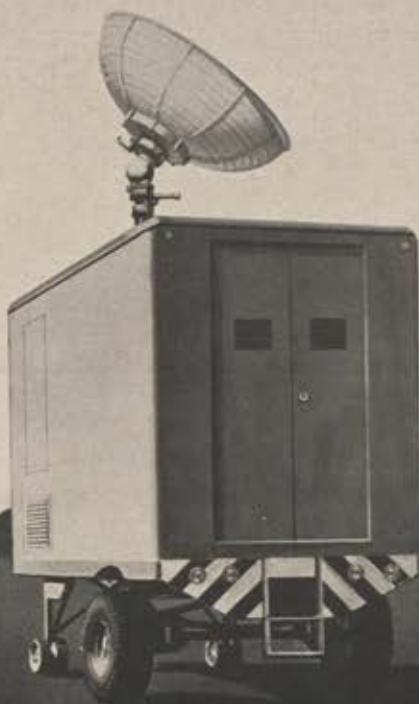
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was destroyed when it crashed during a test flight.

And in mid-February, the final survivor of an abortive program that cost more than \$1 billion made its last, sad flight, to Wright-Patterson AFB, Ohio, where the B-70 Valkyrie has gone into retirement at the Air Force Museum (see story beginning on page 102).

In Germanic mythology it was Odin's beautiful handmaidens, the Valkyrie, who selected the heroes to be slain in battle and conducted them to Valhalla. Now a space-age Valkyrie itself has come to a final resting place.



The enormous spectrum of weaponry being employed by our combatants in Vietnam certainly reflects the all-encompassing nature of that war. But the big surprise has been the return to weapons considered outmoded until recently, such as the US Navy's battlewagon *New Jersey*. Currently other weapon systems of the past are being studied for possible recall. One of these, the venerable 10,000-pound bomb, has been operated under actual combat conditions in Vietnam with encouraging results.

Built decades ago for possible delivery by B-36 bombers, the bombs have remained in storage until now. The Air Force intends to use the bombs not against the Viet Cong primarily, but against another tenacious enemy—the jungle.

The bombs are viewed as a new capability in denying the enemy use of jungle areas as sanctuary. The plan is to support ground operations by blasting out clearings in jungle areas for use as instant assault and rescue helicopter landing pads. The bombs should allow the Army and Marine Corps more flexibility in selecting artillery and observation bases,



Retired Lt. Gen. James H. Doolittle last month proudly pinned Air Force wings on another flyer, his grandson, 2d Lt. James H. Doolittle, III, at Williams Air Force Base in Arizona.

—Wide World Photos

among other things. It also is hoped that use of the bombs will reduce casualties among engineers building landing pads for assaults in heavily wooded terrain and allow evacuation of wounded from areas otherwise inaccessible.

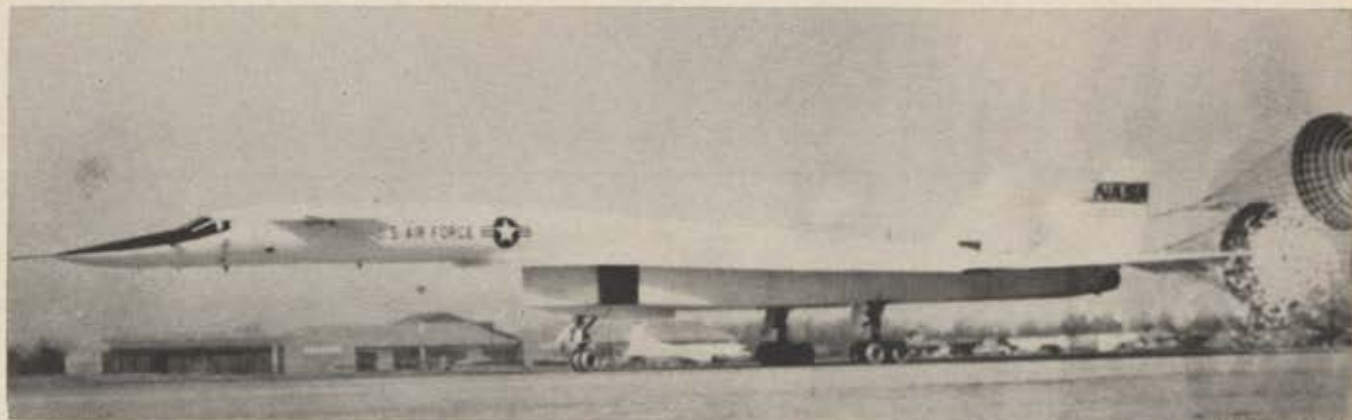
The bombs have been test dropped from both C-130s and Army CH-54 flying crane helicopters, using parachutes to slow the five-ton objects' rate of descent and allowing the delivery aircraft to escape the blast, which is timed to occur at treetop level.



As for the future, some civilian Pentagon planners are enthusiastic about a new, dual-purpose weapon that may mean reemployment of yet another weapon system also deemed outmoded—the big strategic bomber.

The weapon under consideration, dubbed Subsonic Cruise Armed Decoy (SCAD), is visualized as a small pilotless aircraft that could be carried aboard the big bombers. The theory is the SCADs could be launched in considerable numbers from bombers as decoys to confuse enemy radar, and also as powerful offensive weapons, since they would be armed with nuclear warheads.

There is considerable speculation among observers concerning what possible effect the development of SCAD might have on procurement of the medium-range FB-111 and on development of a new long-range bomber, the advanced manned strategic aircraft (AMSA), a follow-on to the B-52 now being phased out. AMSA would have twice the B-52's payload. (Continued on following page)

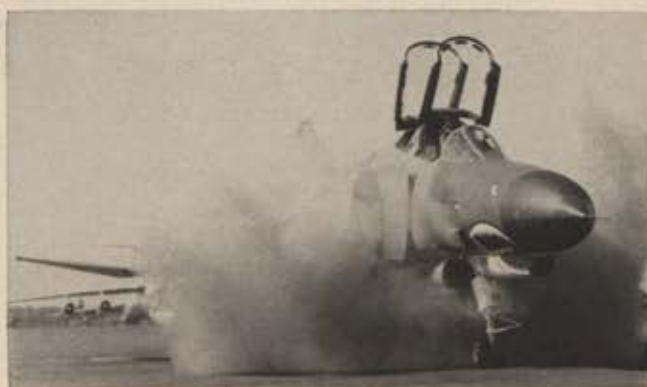


—Wide World Photos

Parachutes help slow B-70 Valkyrie during its final landing, at Wright-Patterson AFB, Ohio. The Air Force planned to replace its B-52 fleet with 200 of the aircraft, capable of cruising at 2,000 mph at 70,000 feet, but the project was canceled in 1962 by the Pentagon after a decision that missiles would be more effective. Of the two B-70s built, one crashed during a test flight after a midair collision with a chase plane. The survivor has been retired to the AF Museum (see also p. 102).



—UPI Cable Photo



McDonnell Douglas F-4E Phantom stirs up a cloud of dust and smoke (above) as a starting cartridge activates engines. On the flight line at Hickam Field, this Phantom is one of the first E-version contingent being sent to Southeast Asia.

Phantoms also are stirring up dust on the international scene. Shown at the left are Phantoms lined up at an RAF station at Coningsby, England. They will be formed into Number 6 Squadron, RAF Support Command, in May. The Phantoms are the initial part of a total of about 170 Britain is buying from the United States at a cost of over \$1 billion.

And Japan's National Defense Council has decided that it will build 104 of the Phantom aircraft domestically as the next mainstay fighter for the island nation's Air Self-Defense Force. The Japanese defense agency hopes to have forty-eight of the aircraft on line by 1971, with the remainder coming along quickly.

be faster, lighter, and have a range of 7,000 to 10,000 miles, all seemingly prerequisites for a SCAD delivery system.

SCAD would be equipped with an electronic device to give it the appearance of a large aircraft on enemy radar screens and a homing device to guide it to its target. The carrier aircraft also could be armed with short-range attack missiles (SRAMs) to knock out close-in air defenses.

Of course, with the new Administration reviewing current Pentagon projects, such as the Sentinel air defense system which has been halted pending the outcome of such a study, it remains to be seen what the out-

come will be for any proposal that has a large-scale cost angle.



In the aftermath of the *Pueblo* incident many loose strings remain, not the least of which is the effect the event is having on the Air Reserve and Air National Guard units called up during the crisis.

The units remaining to be released (see schedule below) are to return to their home bases prior to deactivation, and personnel assigned individually or as members of "split" units will rejoin their parent organizations to be deactivated with them.

Of the 20,000 men mobilized by

the two presidential orders, most will have served eighteen months of active duty. Many men undertaking their military obligation by serving six years in the Air Reserve or Air Guard are expected to request release from their units upon returning home, since those with one year in a "combat zone" and others with an extended period of active duty will have fulfilled their service obligation.

This probably will necessitate an intensive recruiting drive, as many of the units will have to be rebuilt almost from the ground up.

Certain Reservists may arrive home at their permanent bases to discover

(Continued on page 29)



These photos, enlarged from motion-picture footage, show an Air Force jet being caught by the BAK-11 aircraft-arresting device. In the first photo, the cable, released when the aircraft's nosewheel runs over it, loops up in front of the main landing gear. In the second photo, the cable has engaged the struts and has begun to stop the moving plane. The device, produced by the American Machine & Foundry Co.'s York, Pa., Div., is designed as a means of stopping free-rolling or aborting aircraft and to help reduce damage and loss of life when such planes threaten to leave a runway.



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acquire and track the target. Sensors feed target coordinates into the computer which aims the illuminator and furnishes the pilot with the necessary approach and aiming information. The computer program then provides altitude, airspeed and ballistic corrections for four discrete fire control missions. And if you want to convert back to a cargo mission? In 30 minutes, it's done. Complete information is avail-

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B. John F. Dealy, vice president and corporate general counsel. Has overall responsibility for legal and contracting operations of the corporation. Formerly attorney-advisor to Secretary of Air Force. Joined Fairchild Hiller in 1968.

C. Tom Turner, corporate vice president, marketing. With company since 1952. Member initial design team for F-105 Thunderchief. Leader of U. S. team that developed US/FRG V/STOL fighter.

D. James H. Maravel, program manager, F-105. Joined company in 1947. Has 17 years' experience in Mach 2 fighter design.

E. John Williamson, chief engineer, F-15 program. Mach 2 fighter designer of 17 years and responsible for flight testing F-105. With Fairchild Hiller since 1942.

F. Alexander Kartveli, chief engineer emeritus. Dean of world's fighter designers, designed F-47 Thunderbolt, F-84 Thunderjet, F-105 Thunderchief. Actively participated in F-15 program.

G. Donald J. Strait, vice president, general manager of Republic Aviation Division. P-47, F-105 pilot, 122 combat missions; 13½ victories. DFC, Silver Star, Air Medal.

H. Dr. Norman Grossman, vice president; program manager of F-15. Working with Mach 2 fighters since 1952. Was responsible for development of F-105.

I. A. Theodore Mattison, vice president, finance. With company since 1955. Senior corporate executive for weapons systems procurement contracts.

J. Charles Collis, executive vice president. Directs operations of company's five divisions. Twenty-three years with company and former manager of Republic Aviation Division.

K. John Stack, vice president, engineering. Formerly Director of Aeronautics for NASA and pioneer in supersonic flight research. Developed first high-speed wind tunnel. Joined company in 1962.

L. Alexander Wadkovsky, project manager. In Mach 2 fighter development over 15 years. Produced winning designs for ADO-12 and US/FRG fighters.

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that their parent units are nonexistent, having been cannibalized to beef up other units during the crisis. These men are not assured jobs and may have to scramble to find slots when their original units are reconstituted.

Orphaned Guard technicians, on the other hand, are protected under law, and once demobilization is complete can return to their reinstated units.

Following are Air Reserve primary units to be released on dates indicated:

June 1:

445th MAWg, Dobbins AFB, Ga.
904th MAGp, Stewart AFB, N.Y.
918th MAGp, Dobbins AFB, Ga.
349th MAWg, Hamilton AFB, Calif.
921st MAGp, Kelly AFB, Tex.
938th MAGp, Hamilton AFB, Calif.
941st MAGp, McChord AFB, Wash.

June 18:

305th AR & R Sq., Selfridge AFB, Mich.

930th TAGp, Bakalar AFB, Ind.
34th AME Sq, Kelly AFB, Tex.
52d MS Sq, Scott AFB, Ill.

Primary Air Guard units:

(Continued on page 31)



A Ryan supersonic Firebee II marks another milestone in its development as the advanced aerial jet target is launched from the Naval Missile Center, Point Mugu, Calif., with its external fuel tank in full mission configuration. Ryan is flight testing fourteen supersonic Firebee II prototypes.

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U-1000 Systems meet all these needs in airborne, marine, fixed-station or mobile applications. Function changes are accomplished at user level simply by selecting appropriate planar sections.

The U-1000 series digitally tunes 3500 channels in the 225- to 400-MHz range. Solid-state design and extensive use of reliable microcircuits provide extended MTBF. Typically, the AN/ARC-138(v) has an MTBF of up to 1,500 hours. No relays are used. All-solid-state switching offers 2-millisecond T/R turnaround time.

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For complete information on the U-1000, contact Government Marketing, Collins Radio Company, Cedar Rapids, Iowa 52406.

COMMUNICATION/COMPUTATION/CONTROL



April 30: 140th TFWg, Buckley ANGB, Colo.

May 28: 185th TFGp, Sioux City MAP, Iowa.

June 4: 150th TFGp, Kirtland AFB, N.M.

June 9: 152d TRGp, Reno MAP, Nev.

123d TRWg, Standiford Fld., Ky.

June 11: 107th TFGp, Niagara Falls IAP, N.Y.

June 18: 184th TFGp, McConnell AFB, Kan.

121st TFGp, Lockbourne AFB, Ohio.

113th TFWg, Andrews AFB, Md.

177th TFGp, Atlantic City Apt., N.J.



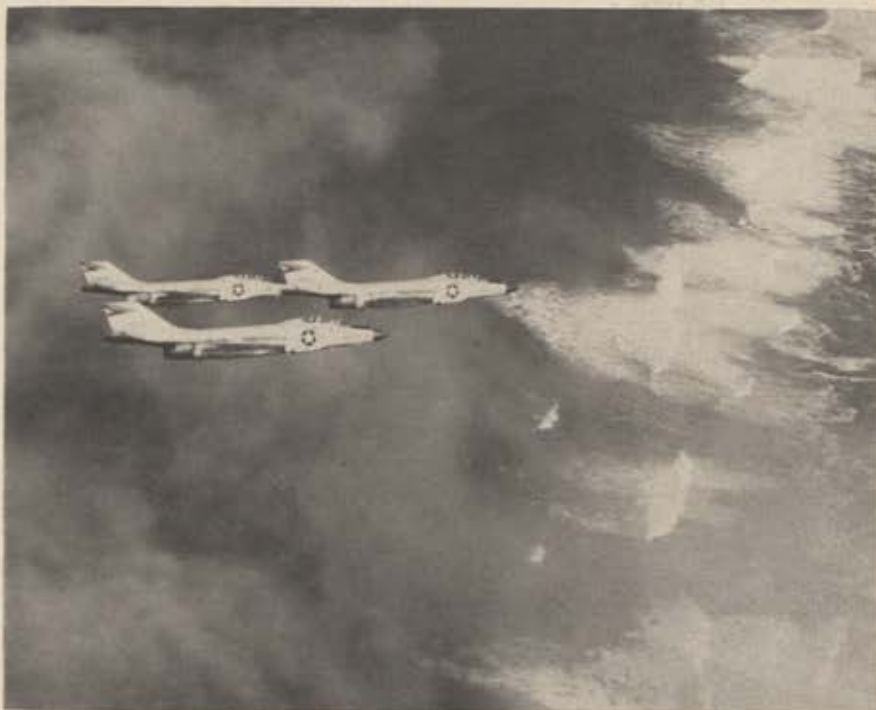
The Department of Commerce, in its report entitled *US Industrial Outlook 1969*, predicts a bright future for the aerospace industry this year. It estimates that sales of complete aerospace vehicles—aircraft, spacecraft, and missiles—will total \$15.3 billion in 1969, up five percent from such sales in 1968. As a comparison, 1968 gained only one percent over 1967.

Civilian aircraft sales in 1969 are expected to increase nine percent over 1968, for a total above 17,080 units. Value, however, will exceed \$4 billion, for an anticipated decrease of about 5.5 percent from 1968. In
(Continued on following page)



Wide World Photos

Lt. Col. Ralph D. Albertazzie, Martinsburg, W. Va., has been named personal pilot to President Nixon. The Colonel holds the Bronze Star and two Air Medals for service in Vietnam. He and his wife Carol have two daughters: Lynette Murphy of Columbus, Ohio, and Sally, who is a student in college.



A practice alert puts this tight formation of three McDonnell Douglas F-101B Voodoo fighter-interceptors in a surfing position on the Pacific coast. The aircraft, from Aerospace Defense Command, help with the defense of the North American continent. The two-place F-101s have all-weather, long-range capability and are armed with a combination of Genie rockets, Falcon missiles, and four 20-mm cannon.

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this category are about 591 commercial transports worth more than \$3.4 billion. Also included are sales of general-aviation aircraft, projected to exceed 16,490 units with a value of above \$624 million, for a new annual record, the report says.

Sales of aerospace vehicle parts and such related equipment as aircraft engines are expected to top \$12 billion in 1969, compared to an estimated \$11.1 billion in 1968, an increase of eight percent.

Concerning aerospace exports, a ten percent gain is expected over 1968 to \$3.2 billion and a new high, but nowhere near the whopping thirty-two percent rise to \$2.2 billion in exports in 1968 over 1967.

Sales of transport aircraft abroad will remain substantial, the Commerce report predicts, but not quite in the value or unit volume experienced in 1968.

For exports, the European market will continue to dominate the picture,

but the Department cautions that securing foothold sales in developing countries in the Middle East, Africa, Latin America, and Asia is critical to the future of US aerospace exports.

The Department says that non-US airlines have on order about fifty Boeing 747s for long-range needs, but seem to be awaiting results of Europe's airbus proposal before ordering either the McDonnell Douglas DC-10 or the Lockheed L-1011 US airbus entries. If, as predicted, Europe declines to build an airbus, the report says, a market for about 500 such craft worth \$15 million each will open up.

Exports of helicopters in 1969 are expected to climb to an estimated high of 300 in 1969, up from 177 units in 1966.

On the import side, aerospace vehicles and equipment are to total about \$333.5 million in 1969, 4.7 percent above 1968. Imports of executive-type aircraft are increasing, while efforts to export comparable US aircraft are not as successful, the report says. Commercial transport exports also are meeting stiff competition from overseas manufacturers.

The Commerce report says that a huge aerospace backlog combined with a stable labor environment is providing the incentive for continued capital investment and over-all growth in the industry for the long term, and any change in the Vietnam situation will have no drastic effect on this trend.

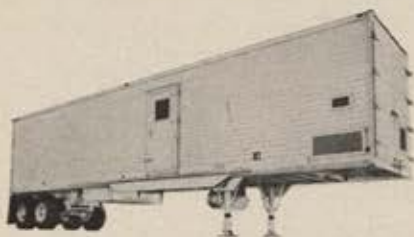


Formation of a Military Airplane Systems Division has been announced by Boeing Co., reflecting industry's reemphasis on military aviation markets. Richard W. Taylor, previously director of engineering for the Commercial Airplane Division's Seattle Branch, has been named General Manager of the new division and will report to Boeing President T. A. Wilson. Taylor joined Boeing in 1946. He was a test pilot on the B-47 and B-50 programs, and was chief of flight test and engineering manager on the B-52 program.

Headquartered in Seattle, the new division will identify and bring Boeing into a competitive position for potential new military systems incorporating airplanes, such as the advanced manned strategic airplane system. Other military airplane programs of the company may eventually become the new division's responsibility.

The division will be staffed with specialists in weapon system analysis, electronic systems, advanced systems management techniques, airplane design, and other needed skills.—END

TRAILERS FOR THE SPACE AGE by *DORSEY*



ELECTRONICS EQUIPMENT for making dynamic tests on structures of NASA Saturn space vehicle is contained in this mobile test unit built for Brown Engineering, a Teledyne Company, Huntsville, Ala.

IN VIVO RADIATION MONITORING LABORATORY is housed in this 40' Dorsey van specially built for the Oak Ridge Y-12 Plant, operated by Union Carbide Corp., Nuclear Division, for the U.S. Atomic Energy Commission.



SPECIAL BUILT-IN EQUIPMENT in this unit for the Hazeltine Corp., Braintree, Mass., includes refrigerator, desk, cabinets and "Unistrut" equipment mounting tracks.



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Sperry stability specified

Years of developmental work on VTOL stabilization projects for the Army and Navy, involving a dozen different aircraft, have led to the selection of Sperry to provide stability augmentation systems (SAS) for two major VTOL programs.

Lockheed-California has selected Sperry's single axis yaw SAS/heading hold system for the U. S. Army's AH-56A Cheyenne. This system provides extensive built-in test equipment, a "must" for efficient VTOL operation. Sperry equipment was also specified by Canadair for hover and transition flight in the CL-84 prototype and

now in the three Canadian Armed Forces CX-84 aircraft. Three-axis systems being produced for this aircraft are fully fail operational in the pitch axis and fail safe in the yaw and roll axes.

Other funded development contracts and company-sponsored study in the VTOL areas includes work on automatic terrain following/avoidance and hover augmentation. In addition, Sperry's work on a versatile hybrid AFCS, full IFR AFCS and fly-by-wire AFCS for future VTOL aircraft will enable air frames and using agencies to continue specifying Sperry with confidence.

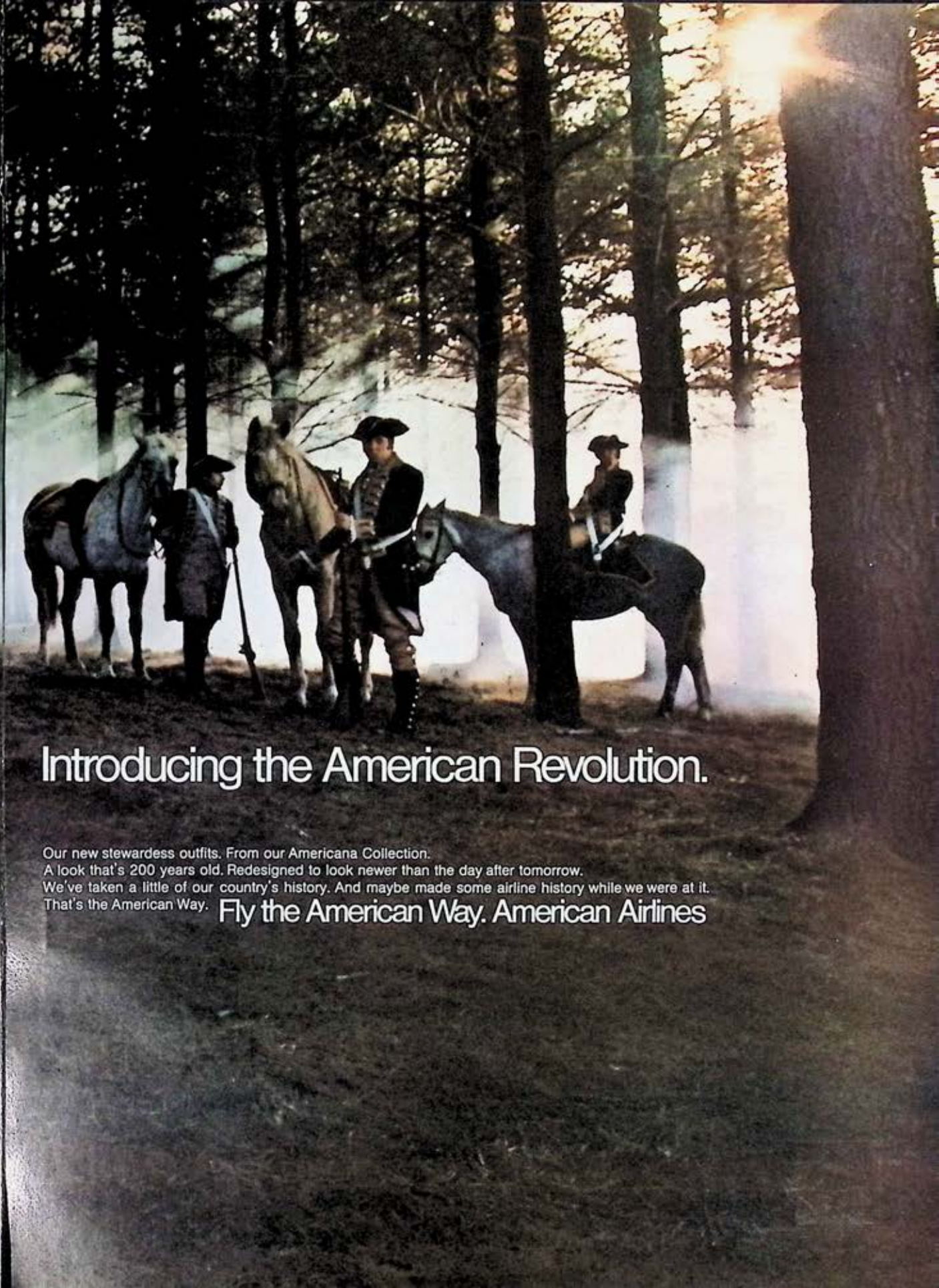
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The Nixon Administration, elected on a platform that suggested big changes will be made, is moving slowly and—in the Pentagon, at least—is retaining a large number of appointees from the McNamara-Clifford regimes. The growing debate over ABM and political sensitivities that are evident in Washington help make the approach cautious, but the new President still looks upon the Defense Department as the Department of Peace, which it has been all along . . .

Mr. Laird Takes Over

By Claude Witze

SENIOR EDITOR, AIR FORCE/SPACE DIGEST

WHEN Richard M. Nixon was sworn in as thirty-seventh President of the United States on January 20, 1969, he had already filled ninety-nine top policy-making and administrative posts in his new Administration. Thirty-five of these were positions in his own Executive Office. Only nine were in the Department of Defense.

At this writing, more than three weeks later, Mr. Nixon's Secretary of Defense, Melvin R. Laird, still has fifteen prestigious vacancies in the Pentagon. Of the thirteen policy-making jobs that have been filled there, six went to appointees who served in the previous Administration.

This kind of a kickoff makes it difficult to evaluate the ball game. A new team is supposed to come in with new players as well as plays. But Mr. Nixon and

Mr. Laird have indicated, in the instances brought up so far, that they are going to reevaluate a lot of old decisions as well as old job-holders.

That this is not an unreasonable idea, in view of the Washington climate these days, is evident in any day's headlines. The local press, which sometimes works almost as hard to make news as to report it, senses a lot of political winds and says they are blowing toward the Pentagon. There are howls of protest, if a good example is needed, being heard against the decision of the previous Administration to proceed with construction of the Sentinel ABM system.

Now, Mr. Nixon and Mr. Laird both are on record as favoring a strong defense posture for the United States, an idea they have shared with many of their predecessors. Clark Clifford, who stepped aside on
(Continued on following page)

The new Secretary of Defense, Melvin R. Laird, is sworn in by Chief Justice Earl Warren at a White House ceremony on January 22. President Richard Nixon and Mrs. Laird look on.



January 20 as Defense Secretary, delivered a swan song to Congress, in which he evaluated the threat to the United States.

"The most significant development of the past year," Mr. Clifford said in his message to the Hill, has been a change in Soviet strategic posture. He reported a "large increase in deployments of hardened, land-based ICBMs." He said that by the end of 1969 the Russians will have deployed more than 1,000 ICBMs.

At another point, the retiring Secretary said work on the only known Soviet ABM complex, at Moscow, has been slowed down, "apparently because of technical difficulties, rising costs, and system inefficiencies." He also reported that our "thin" ABM system, as proposed and started, is for a defense against the Chinese threat, adding that "we are equally convinced that such a defense against the Soviet threat is not presently attainable."

What Mr. Clifford had to say about Soviet missilery and our own ABM goal is widely understood and has been well publicized. The part of his posture statement that has been ignored, in Congress and the press, is his highly accurate definition of our dilemma. Mr. Clifford, basically an attorney with a high level of knowledgeability about national security, said bluntly that "no single defense issue in recent years has engendered greater controversy than the question of deploying an ABM defense" (see box, page 42).

The Nixon Administration's inheritance of this row, on top of the malaise that has grown out of the war in Vietnam, explains fully the effort of the President and his Secretary of Defense to move with caution, listen carefully, and retain the services of selected men from the previous Administration. Congress, after all, is still controlled by Democrats. Only the White House was captured by Republicans.

At his second press conference, Mr. Nixon said he does not "buy the idea" that our early ABM effort is anything but part of the nation's many moves to achieve an acceptable posture. ABM will add to our over-all defense capability, Mr. Nixon said, and that posture is under examination. He considers both the Defense and State Departments as part of our machinery to ensure peace.

THE SECRETARIES OF DEFENSE

Melvin R. Laird is the tenth man to serve as Secretary of Defense since the establishment of the Defense Department in 1947. Here are the names of the men who have served in the nation's highest civilian defense post:

James V. Forrestal	Sept. 17, 1947	Mar. 27, 1949
Louis Johnson	Mar. 28, 1949	Sept. 19, 1950
George C. Marshall	Sept. 21, 1950	Sept. 12, 1951
Robert A. Lovett	Sept. 17, 1951	Jan. 20, 1953
Charles E. Wilson	Jan. 28, 1953	Oct. 8, 1957
Neil H. McElroy	Oct. 9, 1957	Dec. 1, 1959
Thomas S. Gates, Jr.	Dec. 2, 1959	Jan. 20, 1961
Robert S. McNamara	Jan. 21, 1961	Feb. 29, 1968
Clark M. Clifford	Mar. 1, 1968	Jan. 20, 1969
Melvin R. Laird	Jan. 22, 1969	

All of this came almost within minutes after Mr. Laird disclosed that work is temporarily suspended on the ABM system. And, in turn, the Laird announcement followed, only by a matter of hours, notification from the House Armed Services Committee that it is blocking site acquisition for the Sentinel ABM program.

It is not necessary to belabor the issue. The Johnson Administration, when Robert McNamara was Defense Secretary, made the basic decision to go ahead with a "thin" ABM. Mr. Nixon and Mr. Laird, who favor a strong defense posture, are being asked to defend the decision in the face of rising criticism.

Only fools would try to predict how this debate will be resolved. The halls of Congress already are resounding, and it is not without significance that Secretary Laird came from Congress. He had been there since 1952 and had been a prominent member of the House Appropriations Committee.

On this committee, he drew assignments to two subcommittees. The first was defense. The other was the Subcommittee on Labor, Health, Education and Welfare, and Related Agencies.

Now, if Mr. Clifford is right, that the "division of opinion" on ABM can be traced in large part to differences between those who fear the threat and those who fear the "social costs," Melvin R. Laird should be able to see both sides of the question.

In this connection, the House Appropriations Committee report on the Fiscal 1967 Defense Appropriation Bill includes a lengthy statement of minority views, signed by Mr. Laird, along with Glenard P. Lipscomb and William E. Minshall, two other minority members of the subcommittee. The statement laments the trend in weapons development under the Democrats and warns that US options, in the face of the nuclear threat, have been reduced.

To reverse the situation, Mr. Laird and his confreres declared, four things are needed:

- A more objective and realistic assessment of the threat coupled with a thorough reevaluation of our foreign policy.
- A return to greater participation by and acceptance of military judgment in what are predominantly military affairs.
- A more aggressive pursuit of research and development, especially in the area of advanced weapons.
- A reassessment by the Congress of its own role in the area of national security.

That was in 1966, when Mr. Laird subscribed to these tenets.

At his confirmation hearing before the Senate Armed Services Committee, Mr. Laird said his new responsibility is to maintain, economically, the superior military position of the United States. This is necessary, he said, in order to negotiate from strength with the Soviet Union.

He agreed with President Nixon that we are leaving an "era of confrontation" and entering one of negotiation with the Russians. He spoke out against arms parity with Russia and said it is important "that the United States maintain a superior position."

It was only a few days later that President Nixon announced that "sufficiency" was a better term than



At a Pentagon ceremony on January 24, David Packard, right, is sworn in as Deputy Secretary of Defense by his new boss, Defense Secretary Melvin R. Laird, as Mrs. Packard looks on.

"superiority," and the Defense Secretary hastened to agree with him. To Mr. Laird's credit, he pointed out that "sufficiency" is not a new word. It was used in the Eisenhower Administration, and used well, by Donald Quarles, who was then Secretary of the Air Force.

There is no reason to believe Mr. Laird has fluctuated widely in his opinions. He is, in fact, a veteran Congressman, who recognizes how checks and balances work in this government. And he is surrounding himself, slowly, with the men who can help the most in keeping the balance.

The choice of Dr. John S. Foster, Jr., to continue in his position as Director of Defense Research and Engineering, is one of the most significant of such decisions. Dr. Foster, much earlier in this decade, testified on Capitol Hill in opposition to the nuclear test-ban treaty. He said it entailed a number of military risks.

He was, presumably, the top technological adviser to the previous Defense Secretary when the decision was made to go ahead with the ABM. He believes ABM is technologically feasible.

There are other examples in the still-incomplete Pentagon roster of administrative appointments. Stanley R. Resor will continue as Secretary of the Army, and Robert C. Moot retains his post as Assistant Secretary of Defense (Comptroller). Both should be of assistance in dealing with a Democratic Congress.

So will Barry J. Shillito, who has been promoted from Assistant Secretary of the Navy for Installations and Logistics to Assistant Secretary of Defense for Installations and Logistics. Before going to the Pentagon, Mr. Shillito was president of the Logistics Management Institute, a think-tank organization created to serve the Pentagon.

David Packard, the new Deputy Secretary of Defense, clearly was hired for his management capabilities, and they are so impressive that they swept aside what Mr. Packard himself called "an impossible conflict-of-interest problem." There still are some grumblings about the compromise that put the appointee's massive stock holdings in escrow, but Mr. Packard already is handling an equally massive job.

Mr. Packard has been assigned responsibility for a complete review of the Defense Department's program

and budget. Secretary Laird has made it clear this review will look at many "items" and do so "not only as to decreases but also as to increases." The Sentinel was included in that list, along with the Air Force C-5 transport, the Navy's new F-14 fighter, USAF's FB-111, and a number of other pieces of equipment, down to the Main Battle Tank and Navy shipbuilding.

As we go to press, the only USAF civilian appointment is that of the new Secretary, Robert C. Seamans, Jr. (see page 40). An Undersecretary and four Assistant Secretaries are yet to be named.

Like Mr. Laird, Dr. Seamans is inheriting a long list of unanswered questions. The deferrals have been piling up for several years. Robert McNamara built much of his reputation on the decisions he made; yet Clark Clifford, in his final message, put the emphasis on a number of decisions that had not been made.

The Fiscal 1970 budget, Mr. Clifford reported, is restricted by the financial situation. "We have eliminated, stretched out, or deferred less essential projects and activities," he wrote. At the same time, there are new programs that Mr. Clifford held to be of "great importance to our future security," and funds are sought for some of them.

One is the advanced manned strategic aircraft (AMSA), down in the budget for an additional \$77 million to let USAF proceed with a request for proposals. AMSA is only one of the issues facing the new Administration, as defined by Mr. Clifford.

President Nixon recently paid a visit to the Pentagon and made a little speech to the employees. He paid high tribute to the men in uniform, those of the armed services who have heard so little praise since 1961. The President noted that there are people who think we need a Department of Peace because, by their lights, we have a Department of War.

This, says Mr. Nixon, is not true.

"This is the Defense Department," he said, "and without it we could not negotiate for peace. This is an integral part of our peace forces in the world."

Negotiating for peace will be a critical part of the Nixon Administration effort. Its success in this effort will come, in a major part, from the Defense Department.—END

USAF's new civilian chief comes from MIT and NASA, with a lifetime of experience working for and with the Air Force. An acknowledged expert in automatic control systems for aircraft, systems that later helped to steer our guided missiles, Dr. Seamans says USAF's mission is a most important one. That is one reason Robert C. Seamans, Jr., took the job as . . .

New Secretary of the Air Force

By Claude Witze

SENIOR EDITOR, AIR FORCE/SPACE DIGEST

WHEN Dr. Robert C. Seamans, Jr., was first introduced as Air Force Secretary, he said he already had been working with USAF and the Defense Department "for more years than I like to think." This, from a man who is only fifty years old, big and vigorous, was not intended to sound disparaging. The truth is that Secretary Seamans has spent all of his adult life, at least from the time he was old enough to vote, working on the problems of aeronautics and aerospace. He is the only Secretary USAF has had in its twenty-two-year

life with these qualifications combined with genuine expertise in aeronautical and space technology.

Asked recently why he accepted the appointment, Dr. Seamans replied that the job as civilian head of the Air Force was the only one he would accept in the Nixon Administration. He considers the USAF mission the most important in our national security effort and a mission he has been familiar with "all of my professional life."

Interviewed on one of his early visits to his new office, Dr. Seamans had been talking only three or four minutes before he had both hands open and extended, depicting two aircraft in flight, just like the hottest pilot at the officers' club bar describing a well-remembered dogfight.

Dr. Seamans was never a pilot. But in his early work for the old Army Air Forces (AAF) he had a pilot assigned to him, a certain Lt. L. I. Davis, who today is retired Lt. Gen. Leighton I. Davis. General Davis, in recent years, was in charge of the Atlantic Missile Range while that facility was used by the National Aeronautics and Space Administration. NASA's Deputy Administrator and real operating boss was Dr. Seamans.

That early flying, with Lieutenant Davis at the controls, was done in New England and at Eglin Field, Fla., while the youthful Seamans was working on improved gunsights and aircraft instrumentation. Early in his career at the Massachusetts Institute of Technology, where he worked with the famous Dr. C. Stark Draper, Dr. Seamans undertook a tracking-control project, which he describes as "something that grew out of my discovery that if the weapons were to be more accurate, the flying had to be more precise." It is a truism in 1969's Air Force as well.



Air Force Chief of Staff Gen. John P. McConnell confers with the man who was to become his new civilian boss, Secretary of Air Force designate Robert Seamans, Jr., just prior to Pentagon ceremony at which the latter was sworn in.

Dr. Seamans was born in Salem, Mass., on October 30, 1918. He was graduated from Harvard in 1939, completing the four-year course in three years. From there he went to MIT, where he took an M.S. degree in 1942 and his Sc.D. in 1951. It was at MIT that he met and worked with Dr. Draper on instrumentation and control of airplanes. He became an instructor at the age of twenty-two, while working on his master's degree.

The new USAF Secretary was a teacher and project manager at MIT for fourteen years, during which he worked only on aeronautical problems. Dr. Draper has said that "Seamans actually established the principles in guidance equipment which have been used since those days. He [made] a series of automatic control systems that became the prototypes for much of the high-performance control equipment that has been built since that time. This automatic control equipment really started the developments that later became guidance systems for ballistic missiles."

Although Dr. Seamans comes to the Nixon Administration from an MIT professorship—he has filled a chair endowed in memory of Dr. Jerome Hunsaker—he has been absent from Washington only about a year. It was in January of 1968 that he resigned from NASA after nearly eight years of service, most of it as what NASA chief James Webb called "general manager."

Dr. Seamans joined NASA during the Eisenhower Administration, first as Associate Administrator. It was the top career post in the agency and put him in charge of the field laboratories, research centers, rocket testing, launching facilities, and a worldwide network of tracking stations. At the outset, Dr. Seamans was the No. 3 man in NASA. The Deputy Administrator was Dr. Hugh Dryden, who was advanced in years and devoted to the pursuit of policy matters. When Dr. Dryden died, Dr. Seamans was moved into his position.

Another important part of the Seamans background lies in the five years—1955 to 1960—that he worked for an important Air Force contractor, Radio Corporation of America. There he was Manager of the Airborne Systems Laboratory and Chief Systems Engineer of the Airborne Systems Department. In 1958 he became Chief Engineer of the Missile Electronics and Controls Division, where he supervised all scientific, engineering, and technical personnel.

It is, perhaps, this industry background that surfaced a couple of times when the Senate Armed Services Committee, headed now by Senator John C. Stennis of Mississippi, examined Dr. Seamans and prepared to approve his nomination for the job.

At one point, Senator George Murphy of California, a new member of the committee, posed a long-winded question that raised the issue of decision-making in the field of weaponry. Senator Murphy did not mention cost-effectiveness, the much-debated yardstick of the Robert McNamara regime, but Dr. Seamans did, and here is what he said:

"I think the term 'cost-effectiveness' may sometimes have been used ineffectively. I think we all agree that cost, particularly with these large defense budgets, is extremely important and we must keep the cost down.

"But we should never lose sight of the word 'effec-

NINTH SECRETARY OF THE AIR FORCE

Since the United States Air Force became a separate service on September 18, 1947, nine men have served as its civilian head. Here are the Secretaries of the Air Force, with their dates of service:

Stuart Symington	Sept. 18, 1947	Apr. 24, 1949
Thomas K. Finletter	Apr. 24, 1950	Jan. 20, 1953
Harold E. Talbott	Feb. 4, 1953	Aug. 13, 1955
Donald A. Quarles	Aug. 15, 1955	Apr. 30, 1957
James H. Douglas, Jr.	May 1, 1957	Dec. 10, 1959
Dudley C. Sharp	Dec. 11, 1959	Jan. 20, 1961
Eugene M. Zuckert	Jan. 24, 1961	Sept. 30, 1965
Harold Brown	Oct. 1, 1965	Feb. 15, 1969
Robert C. Seamans, Jr.	Feb. 15, 1969	

tiveness.' We are not talking about the effectiveness with which we handle the budget. We are talking about the effectiveness of our whole defense posture."

It is a concept that will win endorsement from Dr. Seamans' colleagues in USAF. So, too, will his recognition of the military potential of space. He told the Senators that he views USAF's Manned Orbiting Laboratory (MOL) project as an experimental program, but feels "the experimental results of that program are significant and [I will] press to get the data as soon as is reasonably possible. I think that data is required to make subsequent decisions." He added that the reason he would press ahead with MOL would be to pay priority attention to the possible military uses of outer space.

Earlier, at a press conference where his selection was announced, Dr. Seamans put it this way: "There are clearly requirements for a strong space program as part of the defense activity, and one of my jobs is to see that we make maximum use of all the new technology coming along for this purpose. . . ."

At the same time, Defense Secretary Laird, asked whether the Seamans nomination meant that he and President Nixon favored a larger military space program, said this "should not be read into the appointment."

It also is true that Dr. Seamans, in his NASA position, had been working for some years with Dr. John Foster, the Pentagon's Director of Research and Engineering. The two men have served as cochairmen of the Astronautics Coordinating Board—where NASA is kept aware of military security possibilities and problems—and of another committee that ensures coordination of the Gemini, MOL, and Apollo manned flight programs. The relationship with Dr. Foster will continue at a new level. The latter has been retained in his position by Defense Secretary Laird.

In his appearance before the Senate Committee and in a meeting with this reporter, Dr. Seamans has refused to speculate on the outlook for specific USAF weapon system proposals. All queries on such subjects as the advanced manned strategic bomber (AMSA), a

(Continued on following page)

new interceptor, and the F-111 are met with the plea that he must review the total USAF program before forming opinions.

Another former affiliation with USAF has been Dr. Seamans' service with the USAF Scientific Advisory Board. He was a consultant to SAB from 1957 to 1959, an SAB member from 1959 to 1962, and has been an associate adviser since then. He also served ten years on technical committees of the old National Advisory Committee for Aeronautics, predecessor of NASA.

On the management side, Dr. Seamans' experience with RCA has been far overshadowed by his years with NASA. There, he was both an engineer and a manager while the agency grew and mobilized hundreds of thousands of people—and the resources of 20,000 industrial firms—for the assault on space. The procurement and training efforts were not unlike what he will meet in his new position.

At NASA, Dr. Seamans is credited with giving strong support to research and development efforts in such fundamentals as nuclear propulsion and advanced materials, the kind of programs that will pay off in years to come. It is the kind of work, he says, that

generates more than the capabilities needed now; it looks ahead, far ahead.

Dr. Seamans was married in 1942 to Eugenia A. Merrill, and they have five children. He is a yachtsman, a member and former commodore of the Manchester Yacht Club. In addition to sailing, he enjoys skiing and bicycling.

Recently, Dr. Seamans was elected President of the American Institute of Aeronautics and Astronautics, the major professional organization of engineers and scientists working in this area.

He also is a member of Sigma Xi, the American Association for the Advancement of Science, American Astronautical Society, American Ordnance Association, American Society for Public Administration, Institute of Electrical and Electronics Engineers, American Academy of Arts and Sciences, the National Space Club, and the Air Force Association.

Among his professional decorations are the Naval Ordnance Development Award (1945), the AIAA Lawrence Sperry Award (1951), the Godfrey L. Cabot Aviation Award (1965), and the NASA Distinguished Service Medal (1965).—END

Former Defense Secretary Clifford's Thoughts on Deploying an ABM System



Mr. Clifford

In the traditional Posture Statement, sent to Congress a few days before he left office, former Defense Secretary Clark M. Clifford explored a major debate now raging in the United States. Here is what he said:

No single defense issue in recent years has engendered greater controversy than the question of deploying an ABM defense. Differences in viewpoint on this matter range across the entire spectrum—from no deployment at all to massive deployment against the Soviet threat.

Involved in this issue are a variety of foreign policy, strategic, technical, and economic questions—all of which are interrelated.

High on the list of foreign policy questions is the effect of a US ABM (antiballistic missile) deployment on the prospects for successful negotiations with the Soviet Union on the limitation of strategic forces, and, in the absence of negotiations, its impact on the US-Soviet strategic competition.

The strategic and technical questions are closely intertwined and have to do chiefly with the action-reaction phenomena inherent in the "Assured-Destruction"—"Damage-Limiting" problem, both for ourselves and the Soviet Union. It stands to reason that if both sides are indeed determined to maintain an "Assured-Destruction" capability against each other, then each side will be forced to react to any attempt by the other significantly to increase its "Damage-Limiting" capability.

The economic questions involve primarily the high cost of ABM defenses and the impact of these costs on other national programs, both military and civilian.

To a considerable extent, the deep division of opinion on the ABM deployment issue is a result of the widely differing emphasis given to these various questions. For example, those who are primarily concerned with the economic and social costs of the program tend to denigrate the technical feasibility of the system and take a more relaxed view of the threat. In contrast, those who are primarily concerned with the threat tend to stress the technical feasibility of the system and take a more relaxed view of the economic and social costs.

Certainly, there is ample room for differences of judgment on each of these questions, but these differences should not be allowed to obscure the basic facts about the system—its technical feasibility, its cost, and its effectiveness in various roles and against various threats.

After almost a decade and a half of research and development effort and the expenditure of more than \$4 billion, Defense Department and contractor personnel most closely associated with the project are fully convinced that an ABM defense system is technically feasible in the sense that they believe we can develop and install a system that would be able to identify, track, and destroy an incoming ballistic missile warhead under certain specified conditions.

How effective such a system would be against an actual attack is quite another matter. That would depend on the purpose the system is intended to serve.

One of the more pressing problems challenging the Nixon Administration is the complex civil aviation crisis which, if unchecked, may lead to catastrophic safety breakdowns and marked impairment and rationing of all but military air traffic. Spurred on by congressional demands for rapid action, the new Administration has announced that in the field of transport policies, aviation and its ground environment will be given the highest priority. But it will require great persuasiveness and ingenuity to unite all segments of the aerospace community to unravel . . .

The Tangle in Air Transport

By Edgar E. Ulsamer

ASSOCIATE EDITOR, AIR FORCE/SPACE DIGEST

TIME to study civil aviation and its problems at leisure would seem to be denied the Administration of President Richard M. Nixon. The crisis that exists, coupled with a number of deadlines for action which this Administration inherited in the form of expiring legislation and pending programs, have, as a White House spokesman put it, created many "sword of Damocles" issues in the air transport and basic transportation field that clamor for rapid action.

As yet little more than principles are discernible. But the new Administration gives every indication of being deeply and sympathetically concerned with the fate of civil aviation, as well as being willing to act swiftly and decisively.

The new Secretary of Transportation, John A. Volpe, a former Federal Highway Administrator and former Governor of Massachusetts, already has stressed that the most serious transport problem and the one des-

(Continued on following page)



Typical of aviation's burgeoning growth and how it outgrows the ground environment is the Boeing 747, a 360-passenger giant that is scheduled to enter airline service this fall. It can be expected to inundate present facilities in the terminals, but at the same time the 747 will make for a better utilization of the airways, runways, and ramp space. The 747 will be followed next year by the only slightly smaller L-1011s and DC-10s.

Secretary of Transportation John A. Volpe, former three-time Governor of Massachusetts and former Federal Highway Administrator who launched the gigantic Interstate Highway Program in 1956, has pledged top priority to aviation problems.



tioned to receive his first and most intense attention is the "aviation crisis." It takes clear precedence over such other urgent issues as mass transit and highway construction, he said.

Key to the new Administration's position on civil aviation is President Nixon's statement on "National Air Transport Policy," issued last fall. These policies, however, have been refined and modified by the President's transportation task force, whose findings, according to the White House, "will not be released, now or in the near future." The policy statement makes clear that the Nixon Administration has either decided on, or is viewing with great favor, a trust fund approach to financing vitally needed air systems expansion, estimated at \$10 billion over the coming decade. Understandably, this was linked to the success of the trust fund concept in launching the national highway system in the Eisenhower Administration.

The position paper charged that "years of neglect at the highest levels of government have produced a crisis in US air transportation which requires new and imaginative solutions," especially since traffic keeps increasing at a rate of fifteen percent annually.

As the then-candidate Nixon put it, "Our airport facilities are overtaxed and in urgent need of rapid expansion and imaginative solutions. Our navigation facilities and equipment are stretched to the limits and must be improved. Our traffic controller force, which has not been increased for four years, despite a sixty percent increase in its workload, works long hours, under tension-filled conditions, with inadequate pay and retirement benefits."

Mr. Nixon's air transportation policy statement focused on a number of specific requirements, which included the need for additional airports in "many cities," as well as runway lengthening, parallel air carrier runways, parallel light aircraft runways, heliports, and STOL runways on "several thousand airports" as a means to serve aviation's legitimate interests "without rationing."

Other specifics included the need for enlarged terminal buildings, improved baggage-handling facilities, and improved ground transportation services.

"My Administration," the President pledged, "will take swift action to meet our immediate needs and to ensure that long-term problems are soundly resolved." Because the air transport system serves many sectors of society, from general aviation to the federal govern-

ment and national defense, the President stated that "each [sector] should pay its fair share of the cost of the airways, and each should be consulted in reaching an agreement in that allocation."

President Nixon's aviation policy would appear to include a niche for a "National Aviation Planning Commission, which would eliminate the threat of another crisis like the one we face today." Creation of such a body had been proposed by the Airport Operators Council.

At the same time, there exists the intent to reconsider the 1966 incorporation of the Federal Aviation Administration in a subordinate role within the Department of Transportation. Stating there were "serious questions" about the propriety of this move, President Nixon added, "I have pledged a thorough study of the Executive Department by an independent commission patterned on the Hoover Commission, and the proper role of the FAA will certainly be high on its agenda."

The probability of such a move does not seem overly high at this time. First, the Democratic-controlled Congress is not likely to dismantle the newest Cabinet department that most of its powerful members helped create only three years ago. Second, few authoritative members of the aviation community feel that the nation's total transport problem can be solved without one central federal agency riding herd over the divergent elements and interests to bring about a workable synthesis. This, of course, is not to say that the present organizational arrangement as it relates to DOT overall, and FAA in particular, does not need change and improvement.

The Nixon Administration has already superimposed a new agency over the transport field, the so-called Urban Council. It is presided over by the President and is composed of the Secretaries of Transportation, Housing and Urban Development, and Health, Education and Welfare. Its Executive Secretary is Daniel P. Moynihan. Creation of a "seamless web," as HEW Secretary Robert H. Finch put it, which would blend the total air system with the urban ground transport system, especially in terms of passenger flow, is one of the challenges the Council faces.

'We Need to Act Now'

The fulcrum for future action in civil aviation matters, nevertheless, continues to be the Department of Transportation. Transportation Secretary Volpe, shortly after taking office, acknowledged that the "air traffic congestion, the lack of airport capacity, and associated problems" have reached such a critical level that "we need to act, and we need to act now."

The President himself directed DOT to launch an immediate examination of the "urgent problems" involving airport development, air traffic control, and regulations of the Federal Aviation Administration. Congressional groups are also pressing DOT toward immediate action. Mr. Nixon's reference to FAA quite probably refers to the latter's intention of instituting a quota system for aircraft movements at five major airports in New York, Chicago, and Washington on April 27. These stringent restrictions are premised on the concept that civil aviation is a scarce national resource.

Assistant Secretary of Transportation for Policy and International Affairs Dr. Paul Cherington, a former operations officer of the Air Transport Command, has suggested creation of a "Comsat-like" organization to handle the national air traffic system.



Pan American World Airways President Najeeb E. Halaby, a former FAA Administrator and Navy test pilot, feels that a non-profit organization, constituted along the lines of Aerospace Corp., should be formed at once to augment operations of the FAA.

This approach was formulated by the previous Administration and became the principal guideline for the FAA.

Enforcement of the quota system would result in at least one instant fatality: Eastern Air Lines's shuttle service between Washington, New York, and Boston. The airline has announced that if the quota system goes into effect, it will cancel this service, a unique and successful method of handling short-haul mass air transportation and one that serves between seven and eight out of every ten passengers traveling by air between these cities. The airlines industry sees in this development a further threat that is more ominous than its obvious economic implications. It is felt that the invocation of hourly quotas denies airlines managements the last remaining element of freedom of action, namely, scheduling. The Civil Aeronautics Board already regulates which routes and under what conditions the airlines fly, and sets the price of tickets. The FAA is in full charge of all operational aspects of airlines operations. Airline executives complain that governmental control places them in a position comparable to that of the government-owned airlines of many foreign countries, except, as one put it to this reporter, "we don't have the benign sponsor they do."

A number of schemes are under consideration. These can be expected to receive a favorable audience in the light of Mr. Nixon's pledge to roll back "big government" and because some of these schemes were formulated by transportation experts now closely associated with the new Administration.

Highly significant is the idea of creating either a quasi-public or private organization to operate the airways system in the United States. A number of approaches have been suggested, and some of them are included in the recommendations of the President's transportation task force.

A 'Comsat-Type' Organization?

DOT's new Assistant Secretary for policy and international affairs, Dr. Paul W. Cherington, formerly professor of transportation at Harvard, proposed last fall the creation of a "Comsat-like organization" to take over from the FAA development of the airways and the nation's Air Traffic Control System. Former FAA Administrator and now President of Pan American World Airways, Najeeb E. Halaby, endorsed this

approach with the modification that such an organization should be chartered along the lines of such nonprofit institutions as MITRE Corporation and Aerospace Corporation.

Formation of such an institution as outlined by Mr. Halaby is favored by the majority of both the airlines and the manufacturers, but many details remain yet to be settled by the new Administration.

Mr. Halaby stated that in spite of his own best efforts and those of the other past Administrators—Generals William F. McKee and Elwood R. Quesada—it has not been possible to implement a satisfactory "planning, research, and development program" involving the national airport-airways requirement. Cause for this failure, he said, is the fact that "we have not invested enough money. We have been unable to attract into the service of the operationally oriented FAA enough engineers and scientists with the right qualifications. We have been unwilling to give them the freedom and resources to get the job done."

The only alternative, Mr. Halaby said, was to "create at once a nonprofit corporation to research, plan, systems engineer, and technically direct the creation of a national system for the safe and efficient utilization of aerospace and airports of the United States." Such a "National Air Transportation Development Corporation," much freer from restrictions than the FAA, he believes, would have "the advantage of greater flexibility in reorganizing or changing its composition to meet evolving needs in all aspects of air transportation."

Such an organization should "research, analyze, and plan the evolving air transportation system. This would require trade-off studies in depth to evaluate the various engineering alternatives for future growth in terms of the complete spectrum of effects—the capacity of the airways for both passenger traffic and freight, the total transit time from point of origin to final destination, flight safety, passenger comforts and convenience, the cost of the trip, and the minimizing of external inconvenience to the inhabitants of the metropolitan areas being served."

Other functions should include the pricing of development and operations, and formulas to spread the financial burden among the users; setting specifications to guide development programs; and conducting or stimulating research in various critical technical areas,

(Continued on following page)

the former Federal Aviation Administrator suggested.

Such an organization, Mr. Halaby cautioned, "should not compete with producers of hardware which it might be technically directing. . . . Nor should it ever take a contract from a private firm which it might be directing, even on a project unrelated to air transportation, for then it might be accused of bias on behalf of its financial sponsor."

The possibility that such an institution may sell its services to the airlines and actually perform all air traffic control functions, including ILS, VOR, and control-tower operations, is also under consideration. The reasons why these approaches are considered promising vary, and most of them are more concerned with practical, rather than political, considerations. Assignment of air traffic control functions to the government more than thirty years ago was motivated by the then-valid belief that the controllers would not be able to strike if they were government employees. This, of course, was not true when the airlines themselves operated the system.

The traffic "slow-downs" by FAA controllers during 1968 have made clear that this argument may no longer be valid. There is a relatively large body of opinion, in and out of government, which believes that the private or semipublic approach offers responsiveness and efficiency of operation far superior to that of a government agency, because the latter is encumbered in terms of budgets and authority. These beliefs are encouraged by the fact that, in spite of an investment of about \$10 billion and annual operating expenditures of about \$700 million, the present system is wholly inadequate. Airways utilization is woefully below the potential inherent in new, technologically advanced systems, many of which were pioneered by the Air Force. The efficacy of the present airspace system is said to be comparable to an interstate highway that forces all cars to be spaced at least two miles apart from each other. (The efficiency of the national air traffic control system is of major importance to the military because military aircraft make up between twenty and thirty percent of its usage.)

New Aviation Systems

Current efforts by Eastern Air Lines and American Airlines to demonstrate the feasibility of creating an air system which, on the ground as well as in the air, can function separately from but complementary to the present system have elicited considerable government interest. These demonstrations employ STOL aircraft, which use separate runways and terminals and rely on area navigation and inertial guidance systems. Many of the major aerospace companies, Battelle Memorial Institute, MIT, and other organizations participate in these efforts.

A number of studies indicate that an adjunctive, short-haul system should revolve around a V/STOL, rather than a STOL, aircraft to permit rooftop access to urban centers, but higher development costs for the moment militate against V/STOL. The Air Transport Association has urged the government to create the post of Associate Administrator for V/STOL matters in the FAA to furnish comprehensive technical guid-



Eastern Air Lines first, and American Airlines two months later, launched special demonstration programs centered on new methods of area navigation and McDonnell Douglas 188 STOL aircraft to prove feasibility of the new air system.

ance and assistance in the decision between a STOL or V/STOL system. If the Air Force's Light Intratheater Transport (LIT) program, centered on a medium-sized, tilt-wing, turboprop configuration, and considered adaptable for civilian application, moves along quickly, commercial V/STOL may yet win out over STOL.

On a longer-term basis, there are plans to develop V/STOL prototypes in much the same manner as the SST prototypes—by government funding of research and development on a cost-plus-interest recoupment basis. It is not yet known how this approach will be received by the Nixon Administration. Nor is there any indication of whether the new President plans to insert himself into the continual tug of war between the Department of Transportation and the National Aeronautics and Space Administration over who should conduct basic aeronautical research. In the past this responsibility has rested with NASA, but during 1967 and 1968 DOT officials tried unsuccessfully to persuade the Administration and Congress to shift this function to their department.

Another potential shift involves the Supersonic Transport Development Directorate, currently assigned to the FAA. Since certification of the SST is the FAA's responsibility, there looms a possible conflict of interests in the present arrangement.

As for the SST program itself, the Nixon Administration has not yet indicated what position it will take. The FAA's SST development office is currently in the process of evaluating the Boeing Company's new fixed-wing design. A decision on whether the redesign meets the government's criteria was to be made February 15, based on the findings of 100 experts from NASA, USAF, and other agencies, as well as recommendations by the technical experts of the user airlines. At this writing all indications are that the Boeing redesign, which replaced the variable-sweep-wing configuration abandoned last year, will be approved.

Transportation Secretary Volpe has already announced formation of an intergovernmental committee comprised of such other departments as Defense, State, Commerce, Interior, and HEW to establish by March

(Continued on page 49)



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U.S. Army Photo



US SST, considered the key to continued US preeminence in aeronautics, is in a state of limbo. The Johnson Administration allocated no funds for the SST program in the current budget, leaving the final decision to President Nixon.

15 whether the government should go ahead with the prototype production phase of the program or whether further research is called for.

With the Soviet Union already having flown its TU-144, and the British-French Concorde scheduled to have done so during February, political pressures can be expected to mount in favor of continuing the US SST program. Since Senator Warren G. Magnuson (D-Wash.), a strong supporter of the SST program, continues as Chairman of the Senate's Commerce Committee, which oversees civil aviation matters, over-all congressional support will probably continue.

The Transpacific Case

No single agency exerts more influence over commercial aviation than the Civil Aeronautics Board (CAB), which awards routes, sets tariffs, and regulates competitive practices, mergers, cooperative working arrangements, and accounting practices. Its five members are elected for six-year terms and do not account to the President except in cases involving international routes. However, the President does name new members, subject to congressional approval, and he has the right to name one of the five members to serve as chairman with a one-year tenure. The present chairman, John H. Crooker, Jr., was named by President Johnson to a term beginning in January of this year. President Nixon, therefore, will not be able to name his own chairman until next year. At present there are three Democrats and two Republicans on the Board, which means that the Board may be less than responsive to the wishes of a Republican President.

All this is of vital importance to the new Administration because, just before he left office, Mr. Johnson acted on the lucrative transpacific routes. Representing the potentially fastest growing traffic market, several

carriers feel they need Pacific routes for their economic survival. In addition, the fate of billions of dollars in new aircraft orders is at stake.

In the epicenter of the controversy is the fact that American Airlines, which had been recommended by the CAB for a route to Japan, was denied this route by President Johnson on grounds that the addition of a third carrier to serve Japan "is not in the national interest at this time." Over-all, the awards, which differed substantially from what the industry had expected and considered equitable, drew loud, negative press and congressional reactions—including the charge of "cronyism." A number of carriers immediately asked CAB to stay the decision.

Not too surprisingly, and, in the words of President Nixon, "at the request on the part of both the Chairman of the House Foreign Affairs Committee and the Chairman of the Senate Foreign Relations Committee," the new Administration, on its fifth day in office, sought to reexamine the awards. In a letter to Chairman Crooker, President Nixon told the Board: "Please do not take any further action on the international aspects of this matter until I have had an opportunity to finally advise you of my decision upon the merits." Because they are thoroughly intertwined, reopening of the international segment of the case is considered tantamount to reopening the domestic portion also.

At this time the experts are not quite certain how much, if anything, the new President can do to reopen the case and whether the CAB will actually act on his request. For the moment, CAB spokesmen will say only that they expect the certificates awarded by the Board and amended by President Johnson to take effect "as is" by February 17 for the international portion, and by March 5 for the domestic portion.

The new Administration's attempt to enter what is one of the most explosive and thankless tasks in aviation would seem to underscore its intent to be an aviation-minded Administration. With the rather strong pledges its members have made so far, the Nixon Administration will have a great deal to live up to in the years ahead.—END



Supersonic Concorde, designed and developed by a British-French consortium, ready for flight test at this time, as well as the Soviet TU-144, which flew late in 1968, are certain to influence the US government's decision on the SST.

The Military Pay Structure

With the bright promise of a big "automatic" July hike in basic pay already in hand, some are wondering why the Pentagon is seeking to substitute an entirely new military pay structure—the so-called Hubbell Plan. Many are unaware that the "automatic" boost would fail to provide ninety percent of the career force with salaries comparable to those of civilians, an objective that would be fulfilled by the Hubbell "salary" concept . . .

Answers to Some of the Tangled Questions About The Hubbell Pay Proposals

By Louis R. Stockstill

WHAT'S wrong with the present military pay structure? This question, voiced in bafflement or belligerence, is popping up more and more from men in the field. Many of those in the Air Force are reasonably content with their present pay, or, more particularly, with the higher basic pay rates due to take effect by mid-summer in the form of automatic across-the-board percentage increases for everyone in uniform.

Some wonder, unhappily, why a Pentagon organization—the "Hubbell group"—wants, instead, to create a revised pay structure that would revamp commissary and exchange rights, alter dependent medical benefits, affect retired pay, and, most of all, come between them and the otherwise automatic basic pay hike of about 12.6 percent which is expected to fall into their pockets by August.

To get a firm grip on the controversy one must first understand what the "Hubbell group" is, how it came into existence, what it does and does not propose (and why), how its proposals relate to both current pay and to the expected "automatic" pay boost, and what immediate and future effect the proposals could have on the individual and the armed forces as a whole.

To digress for a bit, however, it should be noted that one of the biggest obstacles to endorsement of the Hubbell pay proposal by men in the field is that the men themselves too often do not know what they

currently are receiving in total pay and fringe benefits.

Letters lodging complaints about the Hubbell Report have poured into Pentagon and congressional offices. And, while not necessarily representative of the views of the entire armed forces community, essentially all of the letters have one thing in common: They reinforce a finding of the Hubbell study that the present pay structure is so complex that few people understand it. Containing almost two dozen component parts, the present structure is like an iceberg—only a few of its features are clearly visible.

The letters also demonstrate that most of the complainants have turned deaf ears to a basic "starting point" of the Hubbell pay study—a promise (made in advance and adhered to in the recommendations) that no man would take a pay *cut* if and when a revised pay structure should be adopted.

To better understand where the Hubbell group came from, why it exists, and what it proposes, it is necessary to also take a closer look at the "iceberg."

For at least twenty years—ever since enactment of the landmark Career Compensation Act of 1949—Congress has been legislating military pay on what can only be described as a piecemeal basis. For a great many years—most of those prior to 1963—Congress did nothing at all about military pay. In other years it added a little here, a little there, and a heavier layer elsewhere (sometimes only as a token increase to go along with pay boosts granted to government civilians;

sometimes on the basis of broader pay studies initiated by the Administration).

But, invariably, the changes that were made in military pay were not attuned to some new and revolutionary formula, but were simply lumped into an existing and complex pay system that was steadily moving toward obsolescence.

The first formal notice of a shift in this policy took place some four years ago when Congress wrote into the 1965 military pay act a provision requiring the Defense Department to undertake a major review of the principles and concepts of the entire military pay structure. Congress stipulated that this over-all review of the pay structure was to be repeated every four years (quadrennially), and that military pay rates should be assessed and updated as necessary in each year between the quadrennial studies.

To comply with this law, the Pentagon set up the so-called Hubbell task force headed by, and thereby gaining its popular name from, Rear Adm. Lester E. Hubbell, USN.

Although formed within the Defense Department, the Hubbell group drew most of its members from the military ranks of the Army, Navy, Air Force, and Marine Corps. The Deputy Director is an Army infantryman, Col. Gorman C. Smith. The officer in charge of the detailed pay computations is Air Force Maj. Jerome D. Julius.

Thirty-five other uniformed officers and enlisted personnel and a number of civilian specialists constitute the remainder of the staff.

From its inception, therefore, the group was essentially a military entity whose members themselves are affected by the recommendations of the Hubbell Report. Moreover, their findings have been reviewed and approved not only by top-echelon Pentagon civilians but by military personnel chiefs and other uniformed leaders.

While this may not mean that the findings and recommendations are sacrosanct, it does underscore the fact that the report received detailed scrutiny and appraisal before acceptance.

Without delving into the day-to-day operations of the Hubbell study as it progressed, it is enough to recount that the group exhaustively examined all elements of the military pay structure to arrive at a better understanding of how it compares with the compensation of government civilians and with the pay of civilians in the private sector of the economy.

The objective of the study was to revamp the present military pay structure (or devise a new one, if such was deemed necessary) to provide an armed forces pay scale that would give military people compensation generally comparable to that available to them in the civilian labor market, depending on their age, education, training, skills, and experience.

An Essential and Overriding Objective

The Hubbell study saw this as an essential and overriding objective if the armed forces are ever to overcome a recurring complaint about military pay—namely, the complaint by many military men that they “can earn more as civilians” or that their civilian

counterparts in government—with whom they often work side by side—are better paid for essentially the same type of work.

To assure the greatest degree of objectivity, the Hubbell group not only tackled this problem on its own, but it also asked the Bureau of the Budget and the Civil Service Commission to undertake related but independent studies, particularly in comparing service pay with civilian pay. (Both agencies ultimately will be asked by Congress to evaluate the Hubbell proposals, and it was therefore considered highly important to bring them into the study from the start.)

Fortunately, all of the studies came to basically the same conclusion: that the armed forces in many areas (but particularly in the career ranks) are not compensated nearly as well as their civilian counterparts.

In April 1968, the Hubbell group released its findings.

Boiled down, the essential conclusion was this:

The current armed forces pay structure is outmoded. It is too complex for most individuals to fully comprehend, and it fails to provide income for the bulk of the career force which is “comparable” to that of civilians—particularly at levels where the armed forces are fighting a losing battle to retain their best men.

In answering the question “What’s wrong with the present military pay structure?” the Hubbell Report underlined the fact that the current pay system was devised for a military force and a civilian world that no longer exist.

Back in the days when the services were small and concentrated at a relatively few installations, most uni-
(Continued on following page)

ABOUT THE AUTHOR

Among Washington newsmen, Louis R. Stockstill is generally regarded by both military and congressional pay experts as preeminent in his knowledge of military pay legislation. As an editor and reporter (he resigned last September as Editor of the Armed Forces Journal where he had served for twenty-one years, including more than seventeen years on the Capitol Hill beat), Mr. Stockstill has written about every military pay bill and every military pay proposal since the Career Compensation Act of 1949. During most of this long time span, he also attended all open House and Senate hearings on military pay and sat through the debates on the floor of both houses.

When Mr. Stockstill left the Armed Forces Journal last year, House Armed Services Committee Chairman L. Mendel Rivers (D-S. C.) and the Committee’s ranking Republican, Representative William H. Bates, lauded his achievements with the comment that his reporting “has always been fair, accurate, deeply knowledgeable, and lucidly presented.” They said that the “dignity” that characterizes his work has made him “a credit to the profession of journalism.”

The two legislators also observed that Mr. Stockstill “influenced the passage of much worthwhile military personnel legislation,” and said that his “penetrating, accurate appraisal” of congressional activities “will not soon be equalled nor ever surpassed.”

SALARIES FOR THE ACTIVE-DUTY CAREER FORCE

*COMMISSIONED

Pay Grade	1 or less	Over 1	Over 2	Over 3	Over 4	Over 6	Over 8	Over 10	Over 12
O-6	\$15,038	\$15,815	\$16,593	\$17,371	\$18,149	\$18,927	\$19,705	\$20,482	\$21,260
O-5	13,535	14,169	14,804	15,438	16,072	16,707	17,341	17,976	18,610
O-4	12,430	12,941	13,451	13,962	14,473	14,984	15,495	16,005	16,516
O-3	11,125	11,532	11,939	12,346	12,753	13,160	13,567	13,974	14,381
O-2	9,762	10,084	10,406	10,728	11,050	11,372	11,694	12,015	12,337
O-1	8,144	8,396	8,648	8,900	9,152	9,404	9,655	9,907	10,159

WARRANT

Pay Grade	1 or less	Over 1	Over 2	Over 3	Over 4	Over 6	Over 8	Over 10	Over 12
W-4	\$11,187	\$11,647	\$12,106	\$12,566	\$13,026	\$13,486	\$13,946	\$14,405	\$14,864
W-3	10,524	10,858	11,192	11,526	11,860	12,194	12,528	12,862	13,197
W-2	9,067	9,335	9,603	9,871	10,139	10,407	10,675	10,943	11,211
W-1	7,706	7,923	8,140	8,356	8,573	8,790	9,006	9,223	9,440

ENLISTED

Pay Grade	Over 2	Over 3	Over 4	Over 6	Over 8	Over 10	Over 12	Over 14
E-9	...	...	...	...	...	\$11,750	\$12,012	\$12,273
E-8	...	...	...	...	\$9,655	9,870	10,084	10,299
E-7	\$7,631	\$7,812	\$7,994	\$8,176	8,357	8,539	8,721	8,902
E-6	6,945	7,103	7,261	7,418	7,576	7,734	7,892	8,050
E-5	6,443	6,583	6,723	6,863	7,003	7,143	7,283	7,423
E-4	6,189	6,315	6,441	6,568	6,694	6,820	6,820	6,820

* Recommended salaries for general and flag officer ranks are tied in with salaries of civilian "executives" in government, and at press time had not yet been resolved.

formed personnel lived on base and were provided housing—and often food—in kind. Thus, it made sense to authorize housing and subsistence allowances for the few (the "exceptions") who were forced to fend for themselves off the base.

Today, however, the study found, the situation is entirely different. The bulk of the career men and women (defined by the Hubbell Report as all officers, and all enlisted personnel in pay grade E-4 and above, if the E-4 has at least four years' service or is otherwise career-committed) no longer are provided with on-base housing or messing facilities. Those currently assigned to government quarters are now the "exceptions" instead of the other way around.

When cash allowances do not cover actual costs—which is the case more often than not—the man receiving allowances has to make up the difference out of his basic pay. If his quarters allowance won't pay the rent, too bad—he has to dig into his own pocket to pay the extra amount. This puts him behind his contemporary who is assigned to government quarters.

If this were the only problem, it could be cured by some sort of variable allowances. But two other complications, highlighted by the Hubbell Report, make this a poor solution. First, because both the cash allowances and the value of quarters or subsistence furnished by the government are nontaxable, military men pay lower income taxes than they would if the full amount (basic pay plus quarters and subsistence) were taxed. The amount "saved" is called a

"tax advantage," but some military men are only vaguely aware of its existence, many cannot compute what it means to their pay, and most are unaware that it is no real "advantage" since, for all intents and purposes, their paychecks are held down to account for the amount they supposedly "save."

Second, while military personnel make no actual cash contribution to a retirement fund, the Congress has said that military basic pay likewise had been held down by 6.5 percent as an "imputed" (taken out before you see it) retirement contribution.

To appreciate the full value of his present earnings on the same basis as a civilian, the military man must add up five items: his basic pay, his quarters allowance, his subsistence allowance, the amount he "saves" by not having to pay taxes on the two allowances, and the amount of the "imputed" charge for retirement.

Yet, his basic pay is the only item every man gets in cash every pay period, and it is all that shows up on his W-2 form at the end of the year as taxable earnings.

Ignoring Other Elements

So, the natural tendency is to ignore or undervalue the other elements of gross military pay when comparing service income with that of civilians. Too often, basic pay or basic pay plus cash quarters and subsistence is all that the military man considers in his evaluation. This practice, the Hubbell group notes, under-

AS PROPOSED BY THE HUBBELL STUDY GROUP

OFFICERS

Over 14	Over 16	Over 18	Over 20	Over 22	Over 24	Over 26	Over 28	Over 31
\$22,038	\$22,816	\$23,594	\$24,371	\$25,149	\$25,927	\$26,705	\$27,483	\$28,260
19,245	19,879	20,514	21,148	21,782	22,417	23,051	23,051	23,051
17,027	17,538	18,049	18,559	19,070	19,581	19,581	19,581	19,581
14,788	15,195	15,602	16,009	16,009	16,009	16,009	16,009	16,009
12,659	12,659	12,659	12,659	12,659	12,659	12,659	12,659	12,659
10,411	10,411	10,411	10,411	10,411	10,411	10,411	10,411	10,411

OFFICERS

Over 14	Over 16	Over 18	Over 20	Over 22	Over 24	Over 26	Over 28	Over 31
\$15,324	\$15,784	\$16,244	\$16,703	\$17,163	\$17,623	\$18,083	\$18,543	\$19,003
13,531	13,865	14,199	14,533	14,867	15,201	15,535	15,535	15,535
11,479	11,747	12,015	12,283	12,551	12,551	12,551	12,551	12,551
9,657	9,874	10,091	10,308	10,308	10,308	10,308	10,308	10,308

MEMBERS

Over 16	Over 18	Over 20	Over 22	Over 24	Over 26	Over 28	Over 31
\$12,534	\$12,795	\$13,056	\$13,317	\$13,578	\$13,839	\$14,100	\$14,362
10,513	10,728	10,943	11,157	11,372	11,586	11,801	11,801
9,084	9,266	9,447	9,629	9,811	9,992	9,992	9,992
8,208	8,366	8,523	8,523	8,523	8,523	8,523	8,523
7,563	7,703	7,703	7,703	7,703	7,703	7,703	7,703
6,820	6,820	6,820	6,820	6,820	6,820	6,820	6,820

† Officers in this pay grade with more than thirty-four years of service would receive \$29,038.

‡ Two additional pay steps under-2 are provided for men who may have advanced rapidly to these pay grades.

states the true value of military pay by amounts ranging from ten to forty percent.

For all of its wordiness in details, the guts of the 200-page Hubbell Report—as it relates to active-duty pay for the career force—is contained in recommendations that propose two simple steps to develop military salaries comparable to those available to civilians.

Step one would *combine* all five of the elements now included in gross military pay (basic pay, quarters allowance, subsistence allowance, the tax advantage on these allowances, and the “imputed” retirement contribution) into a single salary. Standing alone, this step would not add or subtract anything from what the man already is receiving, but it would give much-needed *visibility* to his paycheck. For the first time, he would be able to clearly see all features of the “iceberg,” including those now submerged.

Although this “salary” would be fully taxable and each man would be making actual cash contributions to a retirement account, remember that the additional taxes and retirement payments do not *reduce* in any way the compensation the man already is receiving. This will be more readily understandable as it is discussed in greater detail a little later.

It is first more important to talk about step two.

After combining the five major elements of present gross pay into a single salary, the second step in the Hubbell proposals—as they relate to the active-duty pay of the career force—was to take the new “sal-

aries” thus produced and add to them the number of dollars needed to *raise* them to full comparability with salaries paid to civilians doing comparable work.

Thus, every man in the force would gain (1) full visibility of his present gross pay, (2) full dollar-for-dollar credit for what he currently is receiving in gross pay, and (3) an increase in pay to assure comparability.

The new salary would not touch other special pays such as hazardous-duty pay, sea pay, proficiency pay, special pay for doctors, dislocation allowances, or family-separation allowances.

The change to the proposed new “salary” concept may still sound complex to some, and perhaps can be fully understood only by looking at a representative “complaint” letter from the Hubbell group files. It shows what a specific individual currently receives, what he thinks he receives, and what his pay would amount to under the Hubbell concept (*other examples are shown on page 55*).

Our example is an E-7 with more than twelve years’ service and with three dependents. He wrote to one of his Senators to say he is convinced that civilians who have completed twelve years of service with a company in private industry must earn at least \$7,000 a year, but that he has never filed an income tax return for that amount of money even though he has to buy the same things a civilian buys. He suggested to the Senator that military pay should be raised

(Continued on following page)

enough so that an E-7 with over-twelve earns at least \$7,000.

Yet, under the present pay system, this man already is receiving \$5,331.60 in basic pay, \$1,378.80 in quarters allowances, and \$481.80 in subsistence allowances—for total cash payments of \$7,192.20. True, his income tax return shows only the amount of his basic pay—\$5,331.60, but that is one of the troubles with the “invisible” pay factor in the present system.

The man's actual take-home pay, after taxes, totals \$6,593.22—an amount which again is higher than the amount of income that shows up on his income tax return.

But so far the full extent of the earnings has not been properly valued. Although he receives \$7,192.20 in combined basic pay and allowances, he pays no tax on the \$1,860.60 he receives for quarters and subsistence. If he did, he would have to hand back to the government approximately \$350.80 in additional taxes.

Neither does he make a cash contribution toward his retirement, as does the civilian. If he did (at the 6.5 percent rate charged his Civil Service contemporary) he would have to hand back to the government another \$346.55.

So, to fully appreciate the value of his present compensation, he must add up all of these amounts: \$5,331.60 in basic pay, \$1,378.80 in quarters allowances, \$481.80 in subsistence allowances, \$350.80 in tax savings, and \$346.55 in retirement benefits—for a grand total of \$7,889.55.

This is almost \$900 a year more than the amount he suggested to his Senator as “fair pay,” and it is illustrative of what the Hubbell group means when it says that the complexity of the present pay system causes many military men to underevaluate their earnings.

Now, what would the same man receive under the Hubbell proposal?

His new salary would be higher—\$8,721, to conform with the comparability levels set by the Hubbell Report. His take-home pay, after all taxes and deductions for retirement and Social Security, would also be higher—\$7,258.84. And, importantly, he would be credited with a “refundable” retirement deposit worth \$192.47. Currently, he has no refundable equity in the military retirement system since he makes no dollar contribution to a fund, as do his Civil Service counterparts.

Importance of ‘Salary’ Concept

The full importance of the “salary” concept cannot be gauged solely on these *visible* dollar advantages, however.

At present, if a member of the armed forces goes to a bank to secure a home loan, or to borrow money to buy an automobile, the bank looks at his “income” essentially in terms of basic pay. Few, if any, lending agencies consider all elements of a military man's pay in assessing his income. Thus, if the basic pay of the man in our example (\$5,331.60) is not considered sufficient in the bank's eyes to guarantee a loan in the amount he seeks, his application may be

rejected. Even though his cash allowances might sometimes count, they often do not, for the lender assumes that they could be stopped or withdrawn.

But under the Hubbell pay scales, the same man could confidently tell the bank that his salary is \$8,721. The difference between this amount and the amount now appearing on his W-2 form—more than \$3,400—could probably spell the difference between a loan approved and a loan rejected.

The Hubbell study found that even military credit unions, as well as other lending institutions, almost invariably underestimate the full value of a military man's income, just as the man himself rarely recognizes the true worth of his earnings.

The example of the E-7 is not fully explanatory of the complexity of the present system, however, unless one also takes into account another point emphasized by the Hubbell Report: The present system also is not a fair system because it does not fully base pay on what a man is expected to do or on the job he performs.

One has only to look at another E-7 with more than twelve years of service—but this time a bachelor—to appreciate the unfairness built into the current pay scales.

Many bachelors, under the present system, either receive no quarters allowance or a lesser amount than the married man. Thus, they not only get less take-home pay than the married man, but they also lose out on the full quarters allowance tax-saving enjoyed by the married man. Yet, both are expected to do the same work.

Under the Hubbell proposal, the bachelor and the married man with the same rank and years of service would receive exactly the same salary. This practice is generally standard in civilian life where men with the same education and experience are compensated on an equal footing regardless of marital status. And it is one Hubbell recommendation that has received almost universal acceptance.

But the present pay system also is unfair in another way. Many military men do not complete a full career in the armed forces and therefore never receive military retired pay. Yet the hundreds of thousands of uniformed personnel who will never benefit from military retirement are, nevertheless, helping to pay for the cost of retirement. Their pay is held back by the “imputed” retirement contribution mentioned earlier, in the same manner it is held back for those who do complete full careers.

Under the Hubbell salary concept, the E-7 bachelor of our example would not only earn the same salary as the E-7 married man with three dependents (\$8,721), but he would also be credited with the same refundable retirement deposits (\$192.47)—an amount that would continue to grow each year he spent in uniform and one which he could withdraw should he leave the armed forces short of retirement.

This is one of the most significant recommendations of the Hubbell study, but also one of the most inflammatory to those who fail to understand its implications.

It long has been argued within the Defense De-
(Continued on page 58)

HOW CURRENT PAY STACKS UP WITH THE HUBBELL PROPOSAL AND WITH THE AUTOMATIC 12.6% INCREASE

Shown on this page are four examples (two officer and two enlisted) showing how current pay for these grades compares with what the individuals would receive under the proposed Hubbell salary system and with the 12.6 percent congressional increase in basic pay, which will take effect automatically next summer unless the present military pay structure is revised. All examples shown here include some items such as flight pay, incentive pay, VRB, clothing maintenance allowance, and the

like, to show that there would be no change in these entitlements under either the Hubbell concept or the 12.6 percent automatic increase. In each of the four examples (selected at random), *individuals would receive more cash take-home pay under the Hubbell plan than under the automatic pay boost.* In addition, the Hubbell concept would give all military personnel substantial amounts in a retirement deposit account (a benefit that is denied by both the present system and the automatic boost).

0-5, 20 YEARS, 3 DEPENDENTS (Receiving Flight Pay)

ENTITLEMENTS:	CURRENT	HUBBELL PROPOSAL	12.6% INCREASE IN BASIC PAY
Basic Pay	\$12,985.20		\$14,619.60
Salary		\$21,148.00	
Flight Pay	2,940.00	2,940.00	2,940.00
Quarters	1,890.00		1,890.00
Subsistence	574.56		574.56
Tax Advantage	821.52		881.75
Imputed Retirement	844.04		950.27
Gross Pay (Salary)	\$20,055.32	\$24,088.00	\$21,856.18
DEDUCTIONS:			
Federal Income Tax	\$ 2,391.30	\$ 4,600.16	\$ 2,799.90
*Tax Advantage	821.52		881.75
*Imputed Retirement	844.04		950.27
Contributory Retirement		587.86	
Social Security Contribution	374.40	374.40	374.40
Total Deductions	\$ 4,431.26	\$ 5,562.42	\$ 5,006.32
CASH TAKE-HOME PAY:	\$15,624.06	\$18,525.58	\$16,849.86
Vested Retirement Deposit	(None)	587.86	(None)

0-3, 8 YEARS, 3 DEPENDENTS (Receiving Incentive Pay)

ENTITLEMENTS:	CURRENT	HUBBELL PROPOSAL	12.6% INCREASE IN BASIC PAY
Basic Pay	\$ 8,578.80		\$ 9,658.80
Salary		\$13,567.00	
Incentive Pay	1,320.00	1,320.00	1,320.00
Quarters	1,560.60		1,560.60
Subsistence	574.56		574.56
Tax Advantage	542.03		586.03
Imputed Retirement	557.62		627.82
Gross Pay (Salary)	\$13,133.61	\$14,887.00	\$14,327.81
DEDUCTIONS:			
Federal Income Tax	\$ 1,096.69	\$ 2,147.14	\$ 1,299.97
*Tax Advantage	542.03		586.03
*Imputed Retirement	557.62		627.82
Contributory Retirement		507.46	
Social Security Contribution	374.40	374.40	374.40
Total Deductions	\$ 2,570.74	\$ 3,029.00	\$ 2,888.22
CASH TAKE-HOME PAY:	\$10,562.87	\$11,858.00	\$11,439.59
Vested Retirement Deposit	(None)	507.46	(None)

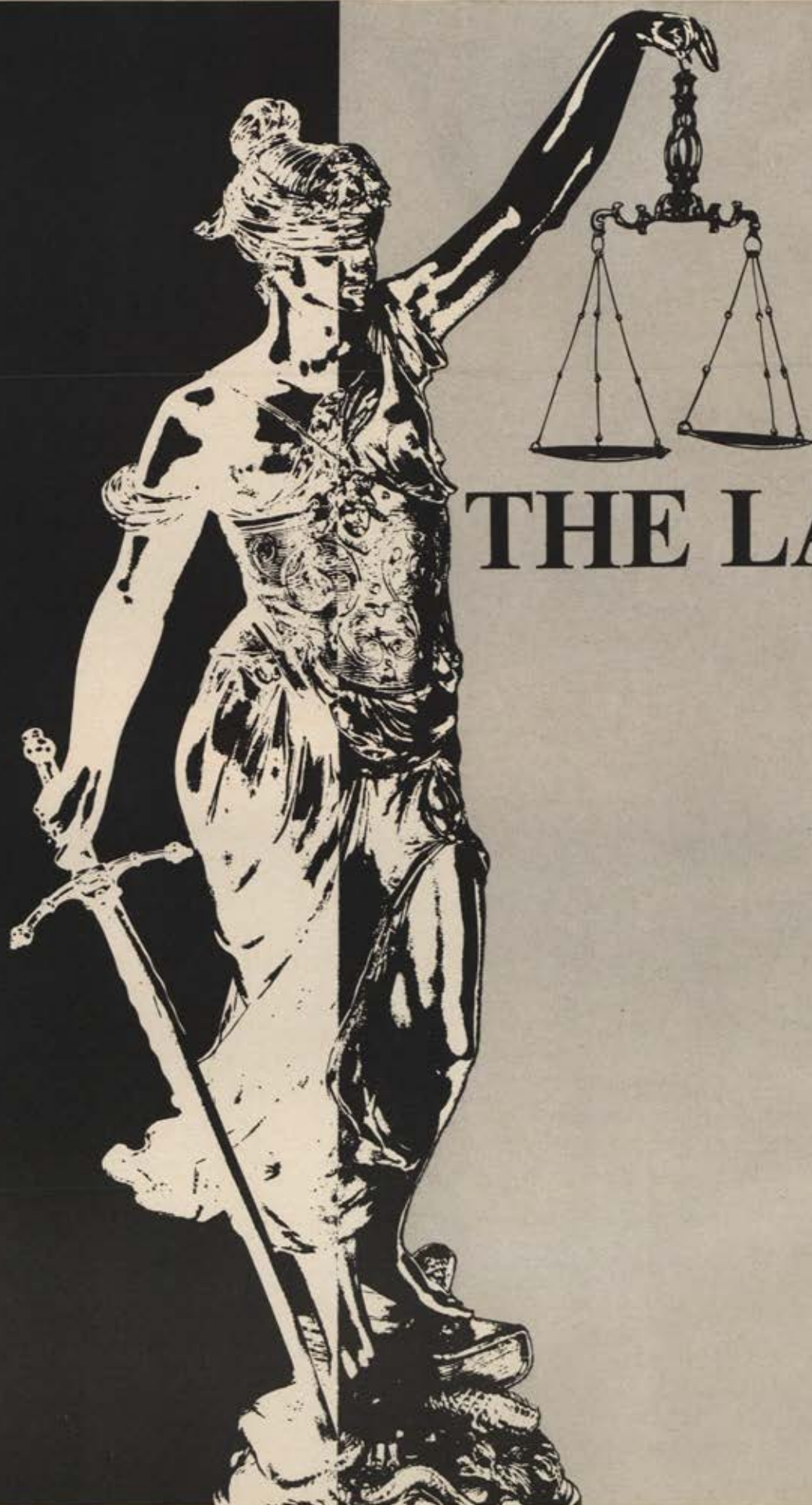
E-8, 20 YEARS, 3 DEPENDENTS (Receiving Proficiency Pay and Duty-At-Certain-Places Pay) (And including clothing maintenance allowance)

ENTITLEMENTS:	CURRENT	HUBBELL PROPOSAL	12.6% INCREASE IN BASIC PAY
Basic Pay	\$ 6,760.80		\$ 7,614.00
Salary		\$10,943.00	
Proficiency Pay	900.00	900.00	900.00
Duty at Certain Places	270.00	270.00	270.00
Quarters	1,440.00		1,440.00
Subsistence	481.80		481.80
Clothing Maintenance Allowance	86.40	86.40	86.40
Tax Advantage	422.52		442.54
Imputed Retirement	439.45		494.91
Gross Pay (Salary)	\$10,800.97	\$12,199.40	\$11,729.65
DEDUCTIONS:			
Federal Income Tax	\$ 760.17	\$ 1,536.86	\$ 906.06
*Tax Advantage	422.52		442.54
*Imputed Retirement	439.45		494.91
Contributory Retirement		357.74	
Social Security Contribution	324.52	353.55	365.47
Total Deductions	\$ 1,946.66	\$ 2,248.15	\$ 2,208.98
CASH TAKE-HOME PAY:	\$ 8,854.31	\$ 9,951.25	\$ 9,520.67
Vested Retirement Deposit	(None)	357.74	(None)

E-5, 8 YEARS, 3 DEPENDENTS (Receiving Proficiency Pay and Variable Reenlistment Bonus) (And including clothing maintenance allowance)

ENTITLEMENTS:	CURRENT	HUBBELL PROPOSAL	12.6% INCREASE IN BASIC PAY
Basic Pay	\$ 4,057.20		\$ 4,568.40
Salary		\$ 7,003.00	
Proficiency Pay	900.00	900.00	900.00
VRB	1,000.00	1,000.00	1,000.00
Quarters	1,260.00		1,260.00
Subsistence	481.80		481.80
Clothing Maintenance Allowance	86.40	86.40	86.40
Tax Advantage	352.21		363.15
Imputed Retirement	263.72		296.95
Gross Pay (Salary)	\$ 8,401.33	\$ 8,989.40	\$ 8,956.70
DEDUCTIONS:			
Federal Income Tax	\$ 443.15	\$ 926.41	\$ 521.67
*Tax Advantage	352.21		363.15
*Imputed Retirement	263.72		296.95
Contributory Retirement		242.99	
Social Security Contribution	194.75	212.20	219.28
Total Deductions	\$ 1,253.83	\$ 1,381.60	\$ 1,401.05
CASH TAKE-HOME PAY:	\$ 7,147.50	\$ 7,607.80	\$ 7,555.65
Vested Retirement Deposit	(None)	242.99	(None)

*The tax advantage and imputed retirement must be counted as deductions as well as entitlements inasmuch as both, in effect, are "added" and "withheld" without ever being seen.



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According to Rear Adm. Lester E. Hubbell, USN, detailed calculations of pay grade, longevity, and dependency status show that "every man would get an increase in both gross pay and cash take-home pay from [the] proposed reforms."



partment and by a few knowledgeable members of the Congress (although many others take an opposing view) that armed forces personnel have an "earned equity" in retirement. This argument is based on the premise—supported by official congressional committee reports—that military pay has been held down because servicemen do not make a cash contribution to an actual retirement fund.

But "earned" or not, the fact remains that the only way to start collecting the benefit is to remain on active duty for a minimum of twenty years. It is not possible to withdraw the amount by which military pay has, in effect, been kept at artificially low levels to help pay retirement costs.

The only exception is that men who leave active duty short of twenty years and then join the active Reserve can continue to earn retirement credits until they qualify for retired pay.

Yet a Defense Department civilian employee, from the highest rank to the lowest, can withdraw the entire amount he has paid into the civilian retirement fund if at any time he elects to leave government service.

The Hubbell study has recommended a related but modified system for the military.

But "why?" you may ask. Why should our own people recommend that we contribute toward our retirement fund when we already receive retirement benefits without having to pay for them?

The question can be resolved only if military men understand that they no longer—if, in truth, they ever did—receive retirement benefits free of charge.

The US Senate has specifically defined military pay as "... basic pay, plus quarters allowance, plus subsistence allowance, plus tax advantage, plus a 6.5 percent imputed deduction for retired pay costs ..." (italics supplied).

And the US House of Representatives has utilized the same formula in computing previous military pay increases.

The Congress, in effect, has said: Even though members of the armed forces don't contribute to their own retirement fund, they are entitled to retired pay and must therefore be charged, on an "imputed" basis,

for the same contribution that is made in cash by government civilian employees.

The Hubbell Report says, in effect: Since we already are being charged for retirement costs under the "imputed" formula, why shouldn't we have a retirement-deposit account just like civilians from which we can withdraw payments we have made, if we leave uniform before retirement? This way, there will be no lingering doubts or questions about our retirement equity, and no man will be footing part of the cost of someone else's retirement.

That's the way it works in the civilian arm of government and in most private civilian employment. If military pay is to be placed on a parity with that of civilians, the Hubbell study concluded that this is one element of armed forces compensation that also must be brought up to comparability standards.

To accomplish this objective, the Hubbell Report proposes that all career military men contribute 6.5 percent of their new "salary" to the government as a joint payment to cover both a retirement contribution and the Social Security contribution.

Capitol Hill Flak

This proposal has stirred up a little flak on Capitol Hill. Some view the recommendation as a method of giving the military man two retirement benefits for the price of one.

While this is simply not the case, the explanation is so tortuous that it would require a separate article to make it easily understood.

For the purposes of this discussion, perhaps it is enough to offer two reminders:

One (to those on Capitol Hill who are eyeing the recommendation with suspicion) reminding them that the services already receive both benefits, but make only one cash contribution—not 6.5 percent of salary, but 4.8 percent of basic pay, for Social Security contributions.

The other (to military personnel) reminding them that they will not lose either benefit, and that they already are being charged with an "imputed" deduction for retirement as well as the cash contribution



At January 30 press conference Defense Secretary Melvin Laird spoke of modernization of the compensation plan as vital to the creation of voluntary US forces. He has directed DoD budget review group and Bureau of Budget to review their positions on Hubbell proposals.

for social security. Those already retired or nearing retirement also need to be reassured that the proposal, if adopted, would not in any way alter such Social Security benefits as they already have earned by virtue of military service.

Both Capitol Hill and military people also need to be reminded that, under the proposed system, the military man could never withdraw from the retirement account more than he actually had paid into it (6.5 percent of his salary, less the full Social Security contribution he is required to make).

With such limited light as this may shed on the retirement-contribution feature of the Hubbell proposals, it is important once again to review the benefits proposed for the active career force by the Hubbell Report.

Remember, the proposals will give every man in the force more total pay than he now receives in five combined elements, more take-home pay, a new vested-retirement deposit, and equal pay for bachelors and married men. The retirement deduction and the increased tax payments on that portion of his pay that formerly constituted untaxed allowances would be painless "charges" because both are essentially bookkeeping maneuvers, which first add the amount to military paychecks and then withhold it.

Since this is the case we must once again ask why it is that some military personnel continue to complain about the Hubbell proposals.

Congressional Action of 1967

The air can be cleared only by going back and taking a look at a complicating factor that arises from action taken by Congress in 1967.

That year, pending the report of the Hubbell pay study and to assure that military pay would not be ignored in the interim, Chairman L. Mendel Rivers (D-S.C.) of the House Armed Services Committee authored a plan (subsequently approved by Congress) which stipulates that until such time as Congress acts to otherwise revise the military pay scales, the government is required "automatically" to give all military personnel equivalent across-the-board percentage increases in basic pay each time the pay of government civilian employees is increased.

At the same time that this "automatic" formula was adopted, Congress bowed to an Administration plea to move the pay of government civilian employees closer to industry levels. This resulted in an immediate increase for the civilians in 1967, another increase last year, and the promise of still another this year.

The action on civilian pay set the "automatic" military formula into motion, and members of the armed forces likewise received a 1967 pay boost, another in 1968, and are due to receive a third automatic increase this summer.

The only barrier that could affect the "automatic" 1969 increase would be (1) congressional substitution of a new military pay structure—as proposed by the Hubbell study, or (2) congressional action to hold off a 1969 pay increase for government civilians. The latter seems most unlikely.

As would seem obvious, this is where certain of the more vocal objections to the Hubbell plan come into play. Some career men think they would get more under the automatic formula than they would get under the Hubbell pay scales.

A few would find a larger pay increase under the automatic formula, but many others would be disappointed. Only ten percent of the career force would be given bigger boosts under the automatic formula than they can expect to get under the Hubbell formula.

Members of this small group are writing most if not all of the "complaint" letters. Although they constitute a relatively tiny minority, they are extremely vocal in airing their misgivings about the Hubbell plan.

The ninety percent of the career force who would receive more from the Hubbell plan than from the automatic formula are, on the other hand, remaining strangely quiet. Their reticence probably stems from a failure to understand that it would give them higher pay than the automatic boost, and that it would bring their salaries up to levels comparable with civilians.

Both groups also seemingly ignore the fact that the automatic formula was not designed or intended as a replacement for the Hubbell recommendations. The automatic formula had two basic purposes: (1) to assure that military pay wouldn't further bog down while Congress was waiting to take a look at the in-depth Pentagon study of the over-all pay structure, and (2) to hold the Pentagon's feet to the fire and thus speed up completion of the DoD pay study.

This has not, however, prevented a great deal of vocal discontent among the relatively small number of men in the career force who would benefit most from the automatic formula. Their letters are having serious impact on Capitol Hill. Many legislators are unaware that the complainants represent only ten percent of the career force.

The Hubbell group declares that "there is nothing fair about holding the pay of nine members below the comparability standard so that one member can get ahead of the standard. What the Hubbell proposals do is ask this one member—who has for years been closer to the standard than others—to take a smaller raise this year . . . while the other nine members catch up."

Once everyone has "caught up," the Hubbell group comments, then "all members can march along in step, drawing full comparability salaries under a fair pay system that is fully visible. This will be better for all members than what we now have, better for more than nine out of ten members in 1969, and better for all members over the long haul."

To phrase the problem another way: Armed forces compensation currently has not achieved comparability with the civilian arm of government, nor will it do so for ninety percent of the career force under the automatic formula. The Hubbell proposals are designed to provide comparability for the entire career force.

The comparability test is perhaps the most significant aspect of the entire controversy.

(Continued on following page)

Pay alone is not the issue. It is simply a means to an end. And that end is to move armed forces pay scales to levels comparable with scales in the civilian world, *so as to improve military retention rates.*

To illustrate that basic-pay increases, as such, have not provided a solution to the gnawing retention problem, the Hubbell group points out that while basic pay was going up forty percent between 1962 and FY 1968, reenlistment rates among first-term Regulars continued to decline by thirty percent.

In some critical-skill areas—which are hardest to fill and keep filled—the retention rates have fallen still lower.

With many pay grades in the armed forces already well below comparability standards, the automatic increase would only add more frosting to a cake that already is iced too heavily in some spots and too thinly in others. And since the cake itself would remain unchanged, there could be little expectation that the higher frosting levels would solve the retention problem.

One Goal: Improved Retention

Improved retention is one of the main goals of the Hubbell recommendations. And the Hubbell salary concept would not only change the size and shape of the cake but would assure that the frosting is distributed on the same levels as frosting on civilian cakes.

Cost of the Hubbell confection would be about \$1 billion more than the automatic pay boost, but it is designed not just as a pay raise but as a solution to the perplexing problems of comparability and retention.

Although the questions and complaints about the Hubbell plan are being aired for the most part by the ten percent of the active-duty career force who would fare better under the automatic increase, there are other recommendations in the Hubbell Report that also have raised doubts in the minds of some of those in uniform.

In devising a new system to bring military pay up to desired comparability standards, the Hubbell group had to look at all of the many elements that constitute some portion of current armed forces compensation.

These included such things as exchange and commissary benefits, mortgage insurance premiums that are paid by the government on FHA homes purchased by military men, reenlistment bonuses, separation pay, and medical care.

As a result of the review, the Hubbell Report recommended a number of changes in the latter benefits.

The report suggests, for example, that exchanges and commissaries be placed on a self-supporting basis, that the mortgage insurance premium payments be dropped, that "normal" reenlistment bonuses be withdrawn, that separation pay rules be revised, and that charges for in-patient dependent medical care in service hospitals be increased.

These recommendations have not been warmly embraced.

But what some military people do not readily real-

ize is that Congress already itemizes the cost of each of these programs in appropriating funds for over-all military personnel expenditures. All are toted up and assessed against the personnel budget, so that the benefit often is less tangible than it appears on the surface.

It is important to recall here that one of the basic "policy decisions" made at the outset of the Hubbell pay study was that "no uniformed services member was to suffer any net reduction in total pay as a result of the study's recommendations."

This did not mean that no single "element" of pay would be reduced or eliminated. But it did mean—in the words of the Hubbell group—"that the total value of the pay package to the individual member would be no less after than before the review."

Some members of the armed forces will ask: But how can this be true if (to take just one example) we are to lose our commissary benefits?

The answer is simple. The \$105 million the government will save by putting commissaries on a paying basis will not be "taken away," but will be shifted over into the military pay account proper to help defray the cost of the new salary concept.

Here it is important to remember that commissaries historically have been provided for military personnel because (1) their income was lower than that of civilian contemporaries, and (2) there frequently were either no shopping facilities in the areas to which they were assigned or the facilities were inconvenient to reach.

With the proposed new salary concept providing wages comparable to those of civilians, the Hubbell Report concluded that the first "needs" test is no longer valid. And, with civilian shopping centers close at hand today throughout the nation, the second "needs" test no longer appeared to have the merit it once did.

However, to assure that the commissary benefit would not be completely wiped out, the Hubbell Report recommends that existing commissaries be continued, and that the government continue to bear the burden of any "extraordinary" expenses required to operate such facilities at recognized hardship and/or isolated posts and in certain overseas localities. All other facilities would be placed on a self-supporting basis.

Comment on Related Factors

In reaching these conclusions, the Hubbell group commented on related factors that must also be taken into account in any consideration of the present commissary system. The report notes, for instance, that the present system creates savings that "accrue unequally to members expected to do the same work" because the value of the benefit depends on family size, income class, availability of and access to the facilities, and on individual family consumption preferences.

Bachelors, for example, make little if any use of commissaries, and families separated when the husband is on an unaccompanied tour may not have

(Continued on page 63)



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access to a commissary because the wife and children temporarily are living apart from a military installation.

Yet, the Hubbell Report noted, if commissary benefits are to be treated as an element of compensation, the government should be obliged to provide armed forces personnel with "cash compensation in lieu thereof whenever the benefits are not available."

As previously noted, \$105 million the government now pays to help operate the commissaries would be shifted from the commissary budget into the military pay account, thus helping offset the additional cost of bringing armed forces salaries into line with those of civilians.

The commissary benefit would not be literally "lost."

The same would be true of other benefits the Hubbell group recommends be "reduced" or "withdrawn."

For example, payments on FHA mortgage insurance premiums now total about \$5.4 million, normal reenlistment bonus payments add up to about \$178.5 million, certain dependent medical care costs (which would be changed) total about \$10 million, but all of this money—almost \$200 million in all—would just be shifted from these accounts to the military "salary" account.

In the case of medical care for dependents, the charge currently assessed for in-patient care in service hospitals is \$1.75 per day. Under the Hubbell recommendations this would be boosted to \$5 per day for the first ten days and then revert to \$1.75 daily. The maximum additional amount that a family would pay per hospitalization in a service facility would total \$32.50—and the \$10 million the government would "save," as already pointed out, would continue to be appropriated and would be included in the new armed forces "salary."

Many of the misunderstandings about the Hubbell Report arise from the inability of military people to fully comprehend these complicated shifts within the present personnel budget. What many fail to see is that some elements of pay that appear to be eradicated are, nevertheless, returned to the military man in another form. Some men are looking at isolated elements of pay and failing to evaluate the *total pay package* as it now exists and as it will look if the Hubbell recommendations are adopted.

To bring armed forces salaries up to comparable civilian standards, the Hubbell Report actually proposes that about \$2.5 billion be added to the military payroll *over and above the \$1.8 billion that would be the cost of the automatic boost*. The reason the Hubbell plan would cost the government only about \$1

billion above the \$1.8 billion in the automatic formula is that a substantial portion of the over-all cost would be accounted for by funds shifted from other personnel accounts (as observed here), and another \$600 million, in round figures, would be returned to the government in the form of tax collections on currently untaxed allowances.

By comparison, although the \$1.8 billion automatic increase would be fully taxable (since it applies only to basic pay), the government would continue to lose not only all of the amount it is not now collecting on untaxed quarters and subsistence allowances, but added taxes on the same uncollected payments that would result from the fact that many men would move into higher tax brackets. And, there would be a further loss to the government of some \$6 billion of added liabilities for retirement costs.

Noncareer Men Would Benefit

Furthermore, an enormous proportion of the \$1.8 billion automatic increase would end up in the pockets of the noncareer ranks who (according to the Hubbell findings) were "appropriately compensated both in method and amount" at the time the study was conducted. Men in these ranks (E-1 through E-3, and all E-4s and E-5s with less than four years' service who are not otherwise career-committed) would nevertheless receive a 9.1 percent increase in pay under the Hubbell plan, to assure that their average residual income (cash left after providing for food, housing, clothing, medical care, and taxes) would continue to exceed that of their civilian contemporaries.

Monthly take-home pay for this group would range from \$119.40 for a raw recruit to \$318 for an E-5 with three years' service who is not career-committed. E-4s and E-5s can become career-committed as early as the two-year point in their service by the simple expedient of signing up for another four-year hitch. When they do, they are immediately advanced to the career-force salary proposed by the Hubbell Report.

Finally, and most importantly, in comparing the automatic pay boost with the Hubbell salary concept, it must be reemphasized that if the automatic boost prevails and the Hubbell plan loses out, ninety percent of the career force will continue to be underpaid, they won't have salaries comparable to civilian salaries, much of their pay won't be visible to them, won't show up on their W-2 earnings statement, won't be considered by lending institutions, and there will continue to be a wide disparity between the pay of married and single men who are required to do the same work.

Additionally, many men who will never serve to retirement will have to continue paying a portion of the retirement costs for those who do, and no military man will have a retirement deposit such as that enjoyed by civilians.

The irony of the situation is that the bulk of those in the career force—who would benefit most from the Hubbell proposals—have done practically nothing to urge their Congressman or Senators to press for action on the Hubbell plan.—END

WHERE YOU CAN GET A COPY OF THE HUBBELL REPORT

The detailed report of the Hubbell task force—a book of about 200 pages, entitled "Modernizing Military Pay"—can be obtained from the Government Printing Office, Washington, D. C., for \$2.

Revolutionary New Fire-Control Systems

The hazards of straight-in attacks by aircraft in close air support missions have been amply demonstrated. Now nearing readiness are airborne detection and delivery systems that promise to revolutionize air strike tactics. With the continued sophistication of antiaircraft defenses, the application of this new strike capability is vital if aircraft are to continue to dominate battlefields and be able to . . .

Hit 'em Where They Is!

By J. S. Butz, Jr.

TECHNICAL EDITOR, AIR FORCE/SPACE DIGEST

THAT currently overworked word—revolutionary—must be used once again to describe properly the latest technical development in close air support.

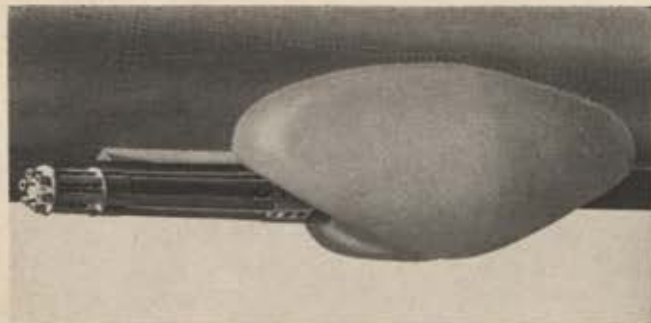
It isn't enough to say that the new hardware now nearing the operational state is important, or outstanding, or exceptional, or a major step forward. Revolutionary is the only adjective that comes close to describing accurately the combined effect of the new guns, new sighting systems, and new sensors for locating targets that soon will become standard military equipment.

Together, these new devices will not only make close air support far more effective than it is now; they will change the whole character of these operations by opening up completely new methods of attacking ground targets. The traditional technique of diving

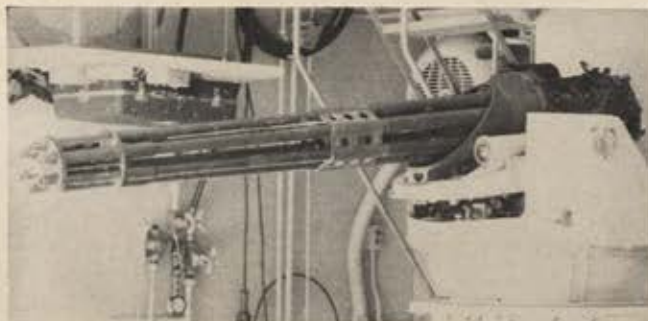
straight into a target to discharge forward-firing armament still will be important, but it will be augmented by highly accurate turret-mounted weapons that will allow fighters to destroy point-targets, such as tanks, which lie more than a mile away off each wing, or to the rear.

The armament systems which provide this all-around, 360-degree capability are so quick that the attack aircraft may undertake violent evasive maneuvers, while the guns continue to track, fire, and hit the target. Moreover, the computer systems, which allow simultaneous maneuver and track, are powerful enough to engage several targets at once.

In terms of complete ground-attack systems, the new armament opens a cornucopia of possibilities. The Army, first service to apply this technology to the
(Continued on page 66)



This artist's conception shows a weapons turret for a fighter airplane. The installation carries a 20-mm Gatling gun of the type shown in the photo at right. Use of such turreted systems is expected to bring revolutionary improvements in the effectiveness of close air support and accuracy of gunfire.



TAT-16, in the final stages of development at Emerson Electric, is under close study for use in Army helicopters and for retrofit into USAF tactical fighters now in the inventory. Total weight of the gun plus its turret, sights, and 700 rounds of ammunition is less than 1,500 pounds.

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This new rotor gives the aircraft excellent vertical lift with low downwash.

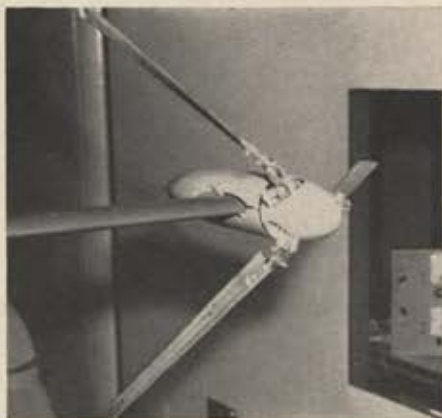
It also provides a high hover capability on hot days.

When the rotor is used as a propeller the aircraft will travel at speeds up to 250 knots.

For flight above this speed, the blades are folded back to a minimum drag configuration. Conventional jet aircraft cruise speeds of 400 knots or more can then be attained.

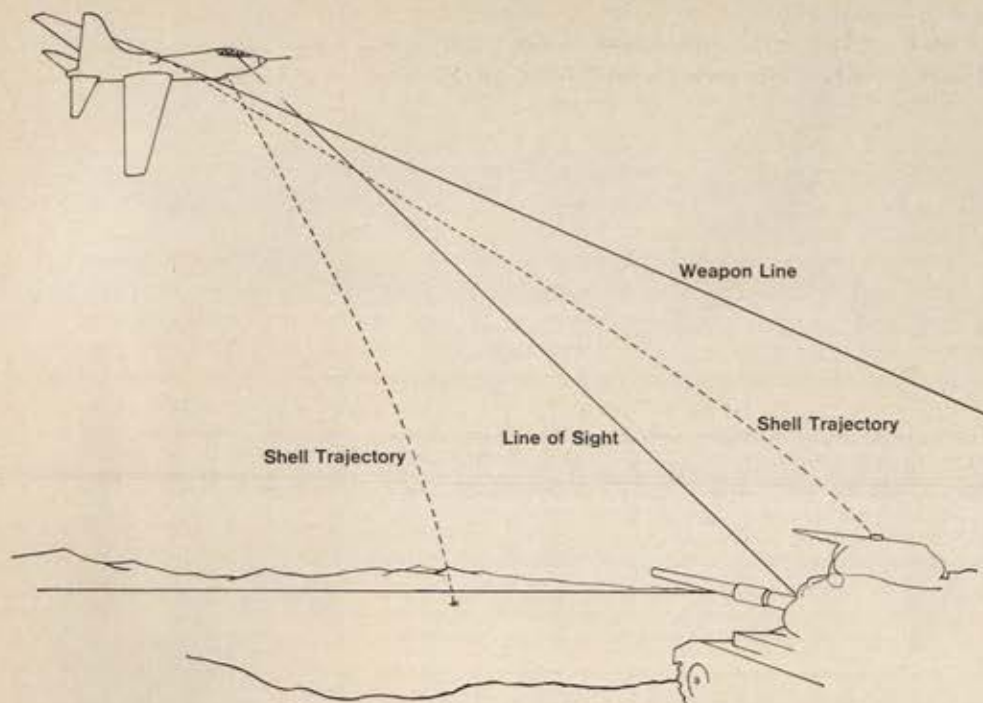
When will this V/STOL with helicopter take-off and landing capability and jet speed cruising be ready?

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New armament systems should allow aircraft to attack several ground targets in a single pass and score hits with every burst. Extremely accurate solution of the basic gun-aiming problem now is possible using laser radar, inertial guidance, and a high-speed airborne computer. The gunner in the aircraft (at left) would place his sight on a target, press the fire button, and the automatic system would compensate for the motion of the aircraft and continue to deliver accurate fire as long as the target was in range. The gunner could engage a second target at the same time.

close-support problem, has put it on a helicopter, the Lockheed AH-56A, Advanced Aerial Fire Support System (AAFSS). The Air Force also plans to conduct extensive tactical tests, using heavy, 20-mm cannon systems. Initial work will be done at Eglin AFB, Fla.

Beyond these, however, the aircraft designer has many options. For the major war situation, against an armored mobile army protected by a first-class anti-aircraft umbrella, the new gun systems might be married to a high-speed fighter-type airframe. The issue from this marriage could be a wildcat of astounding proportions, combining the most potent qualities of the F-4 and "Puff the Magic Dragon," the converted transport gunships that have proved so effective in breaking up Viet Cong attacks.

Such a vehicle could fly low across a battlefield at more than 400 mph, bouncing and turning in evasive action, while scoring repeated hits with large-caliber weapons during the entire range of the pass. The targets could range from those previously designated by friendly ground forces to targets of opportunity picked up by airborne sensors or eyeballed by the gunner during the pass itself.

No longer will it be necessary to make circling searches or to straighten out into dives on targets in defended areas. The experience in North Vietnam has left no doubt that even a few seconds of such predictable flight are extremely hazardous against an AA system of missiles and sophisticated electronic gun pointing.

For operations against weaker air defenses, the design of attack aircraft logically could shift toward the transport, with less emphasis placed on maneuverability and more on ammunition-carrying ability and endurance in the air.

Regardless of the tactical application or the design concept of attack aircraft, it is clear that the hardware is now available to revolutionize air-to-ground operations in the next few years. The revolution is being forced by two technologies. One is providing a com-

pletely new ability to detect targets on the ground. The other is yielding a vastly improved accuracy in delivering ordnance from the air.

First Truly Automatic Weapons

The accuracy improvement derives from the fact that it is now possible to measure, to extremely close tolerances, all of the factors that affect this accuracy.

First, the position and attitude of the attacking aircraft itself, and the rates of change in position and attitude, are known through use of inertial, or gyro-stabilized platforms. These systems have become standard around the world in the past decade on ballistic missiles, and on aircraft bombing and navigation systems.

Second, the range to the target now can be measured with an error of only a few inches in a mile, and this will make gunfire of all types, ground or airborne, a far more deadly proposition than in the past. Range measurement always has been the prime uncertainty because it was much more difficult to measure than azimuth or other angles affecting accuracy of fire. This has led to the use of bracketing fire and tracer streams for final range adjustment.

Today, relatively simple lasers have eliminated the range-finding problem. Moreover, they perform radar-type functions and measure the rates of change in range, and the rates of change in the angles between the attacking aircraft and the ground target. That is, the path of a moving target on the ground can be determined accurately.

Theoretically, if one knows the path of two vehicles, and the ballistic characteristics (*i.e.*, tendency to curve in free flight) of a projectile, then one should be able to launch the projectile from one vehicle so it will hit the other every time.

Practically, the modern airborne computer makes it possible to take this information on the path of the two vehicles, plus data on the sensitive ballistic characteristics of projectiles fired into high-speed air-

streams, and convert them in fractions of a second into aiming instructions for an automatic gun.

The accuracy of this system is sobering. For a starting reference by which to judge, it has been estimated that a man firing a swivel-mounted gun from the door of a helicopter has a fifty- to 100-mil accuracy. In other words, his bullets would hit within fifty to 100 yards of a target 1,000 yards distant.

Some observers would even question this accuracy, for Viet Cong soldiers more than once have stood in the open, firing automatic rifles at US helicopters while tracers from the helicopters' door guns splattered over half an acre around them. Occupants in the helicopters usually judge that the Viet Cong have the best chance of scoring a hit in an exchange with a single helicopter.

Much improvement is gained through the more sophisticated sighting systems used with fixed, forward-firing, and turret-mounted helicopter armament that has been in use during the past few years in Vietnam. Accuracies of ten to twenty mils usually are claimed, or misses of ten to twenty yards at a little better than half a mile.

These sighting systems are essentially the same lead prediction-type sights developed for fixed-wing airplanes, and they require a range estimation and adjustment by the pilot.

With laser-ranging and computer-driven gun laying the error in the sighting system can go down to one or two mils. Dispersion expected in a good automatic cannon of 20-mm to 40-mm size is two to three mils. And the errors introduced by a flexible airframe would be about the same. Consequently, the total system accuracy for an airborne 30-mm turret-mounted cannon with the most modern sighting equipment would be about five mils. At a range of one mile, it should be possible to score hits on a tank with the first burst, if ten rounds or so were fired per burst.

The gunner would achieve this simply by putting the "bippie" of his sight on the target and pressing a button, which would lock on the automatic tracking

and fire a selected number of bursts. While the firing was under way, the gunner could lock onto another target, and, if the aircraft carried enough weapons, more than one target could be engaged at the same time.

Revolution, Not Breakthrough

In the semantics of our time, the new gun systems are bringing a revolution, but they are not breakthroughs. All system components have a substantial development history and most of them have seen extensive operational service. None of them, under any method of evaluation, could be called technical risks. All are decidedly within the state of the art and have been for a substantial period.

The armament on the AH-56A and all others now planned are descended directly from the AN/ASG-21 fire-control system developed by Emerson Electric, which controlled a General Electric 20-mm Gatling gun in the tail of late-model B-52s. The ten-year-old AN/ASG-21 consists of a stabilization subsystem to keep track of the position of the gun; a radar to search, track, and lock on the target; and an analog computer for automatic gun aiming and firing. The system was also rigged to handle two targets at once.

Basically the same system was adapted by Emerson for the "stinger" in the tail of the B-58 bomber.

Today, further adaptations are being made for the air-to-ground mission, and additional sensors are being added to increase system versatility. These sensors are newer than the AN/ASG-21, but most have been under intensive development for more than five years.

The laser range finder, for example, has been regarded in most quarters as the earliest practical military application of this new technology. All three services have supported the development substantially, and the Army already has ordered production models for tanks.

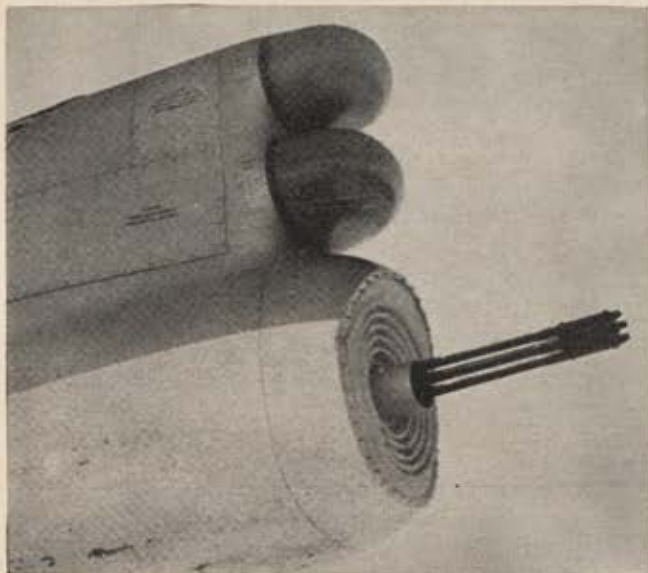
Low-light-level TV equipment, which is to give the
(Continued on following page)



The TAT-102 chin-turret installation (above) with a 7.62-mm Gatling gun and a simple lead angle prediction sight played an important role in the renaissance of turret-mounted ground-attack systems, which is now affecting all of the military services. Emerson Electric developed the TAT-102, using company funds, and the weapon's effectiveness was proved in tests aboard the Army/Bell Huey Cobra several years ago. Much heavier guns, with laser sights, are being tested on the Cobra. Weapons as large as 105-mm and rocket-assisted ammunition are being considered.



Heavy turret-mounted armament is planned for the Army/Lockheed AH-56A. In the configuration above, a 40-mm grenade launcher is in the nose and an Aeronutronics 30-mm "soft-recoil" cannon is in a 360-degree turret on the bottom of the aircraft. A multisensor sight is located between these two weapons. It will carry a laser range finder, low-light-level TV, and probably several other sensors. Other AH-56A configurations will carry 20-mm Gatling guns, and all of them have a very high ammunition capacity. It can lift the same payload as the Douglas A-1.



Granddaddy of the new turret-mounted, automatic gun systems for close air support is the AN/ASG-21, developed about ten years ago by Emerson for the late-model B-52s.

AH-56A crew the best night vision any airmen have ever enjoyed, is said to be "somewhere between the second and third generation." At any rate, it will be substantially better than the first-generation devices now in use in Southeast Asia.

Moving target radar, designed to illuminate moving vehicles instantly, is ready for the new gunships. Radar also is available to take over the range-finding task in bad weather when laser effectiveness can drop to zero.

Infrared instrumentation, which can sweep large areas quickly and reveal man-size targets through their temperature differences with their surroundings, is available commercially. Devices in the millimeter wave band provide still another means of detecting differences in radiometric temperatures and are a powerful means of identifying targets.

All of these sensors are employed in some form or another in conventional aerial reconnaissance when they form an image that is examined by humans to locate targets. Now some of them can be used to actually aim a gun automatically, in the fashion of radar. They will search an area, locate a target, lock on, and aim the weapon. The resolution of these sensors certainly is not as good as radar or lasers, but they provide an important means of extending all-weather strike capability and of overcoming camouflage.

Air-to-Ground Capability

The new gun-aiming accuracy and the capacity to score hits with the first burst raise some serious questions about increased potency for antiaircraft defenses against low-flying aircraft. Undoubtedly, these defenses can be improved using modifications of the airborne fire-control systems.

However, the advantage still lies with the low-flying airplane. This is so, first, because it is moving in three dimensions while the ground gun is either fixed, or moving rather slowly on a two-dimensional plane. Then, too, the aircraft can measure its own evasive maneuvers quite accurately, to provide corrective in-



An early Navy attempt to give tactical fighters the capability to hit targets off their wing is pictured in this quadruple .50-caliber gun installation on a Grumman F9F.

puts for aiming the on-board guns. But it is another matter for a ground system to track an airplane during violent maneuvers and predict its course well enough for hits by a cannon.

In the face of the AA system upgrading that is certain to be brought about by the laser range finder, it would seem logical to this writer that ground-attack aircraft with very high speeds and outstanding maneuverability would have the best chance to survive. This solution, however, is not obvious to all military men, and the Army is certain to press the case for such relatively slow attack vehicles as the AH-56A.

In any event, the ancient controversy over aircraft vulnerability to ground fire seems certain to heat up during the 1970s, and AA systems may become so sophisticated that only the most sophisticated aircraft can survive.

On the air-to-ground side, however, the new gun systems should just about still any residual argument about the capacity of aircraft to dominate a battlefield.—END



A key element in the new airborne sights is the laser range finder. This Hughes model has been ordered into production for tanks. Lasers can determine range to an accuracy of a few inches in a mile, and this precise range determination makes it possible to hit a target with the first rounds that are fired from an aircraft's weapon.

THE SPACE AGE IN PERSPECTIVE

SPACE

DIGEST

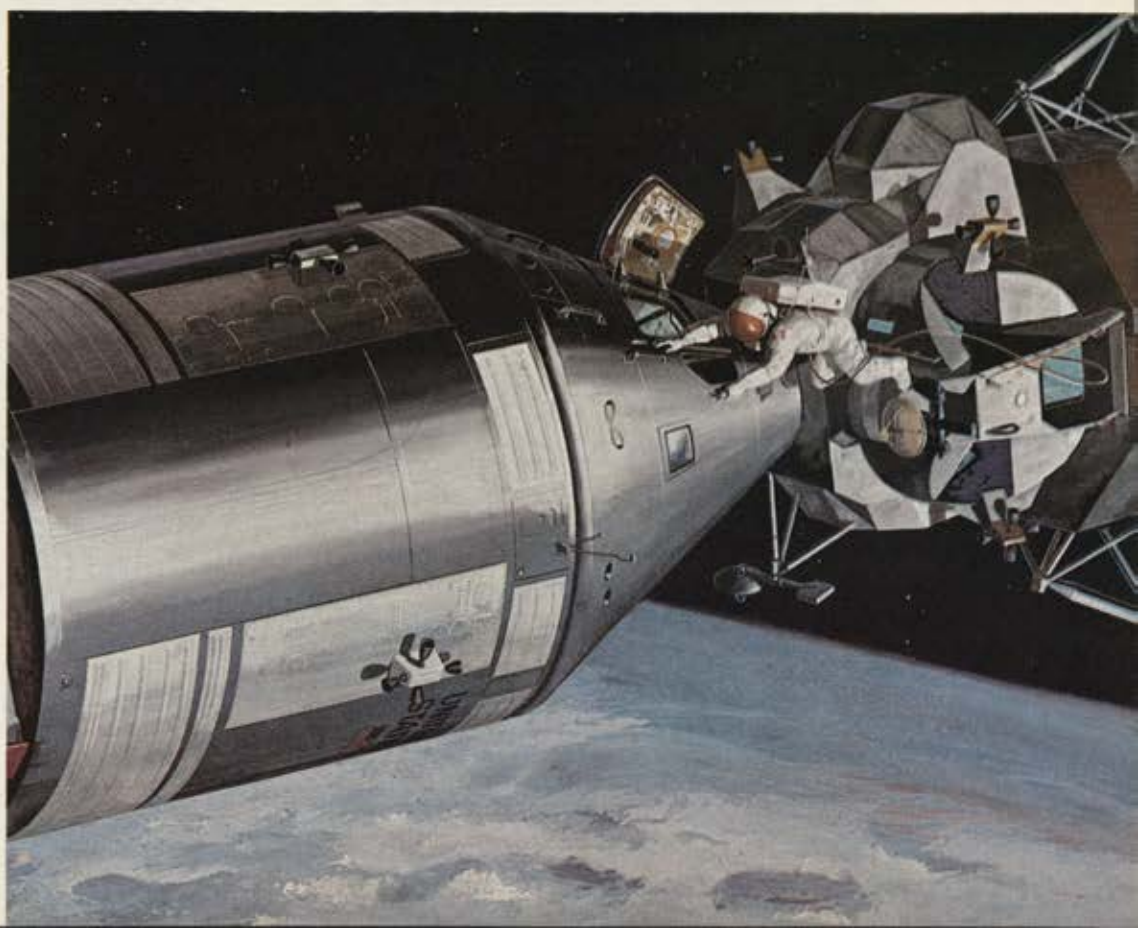
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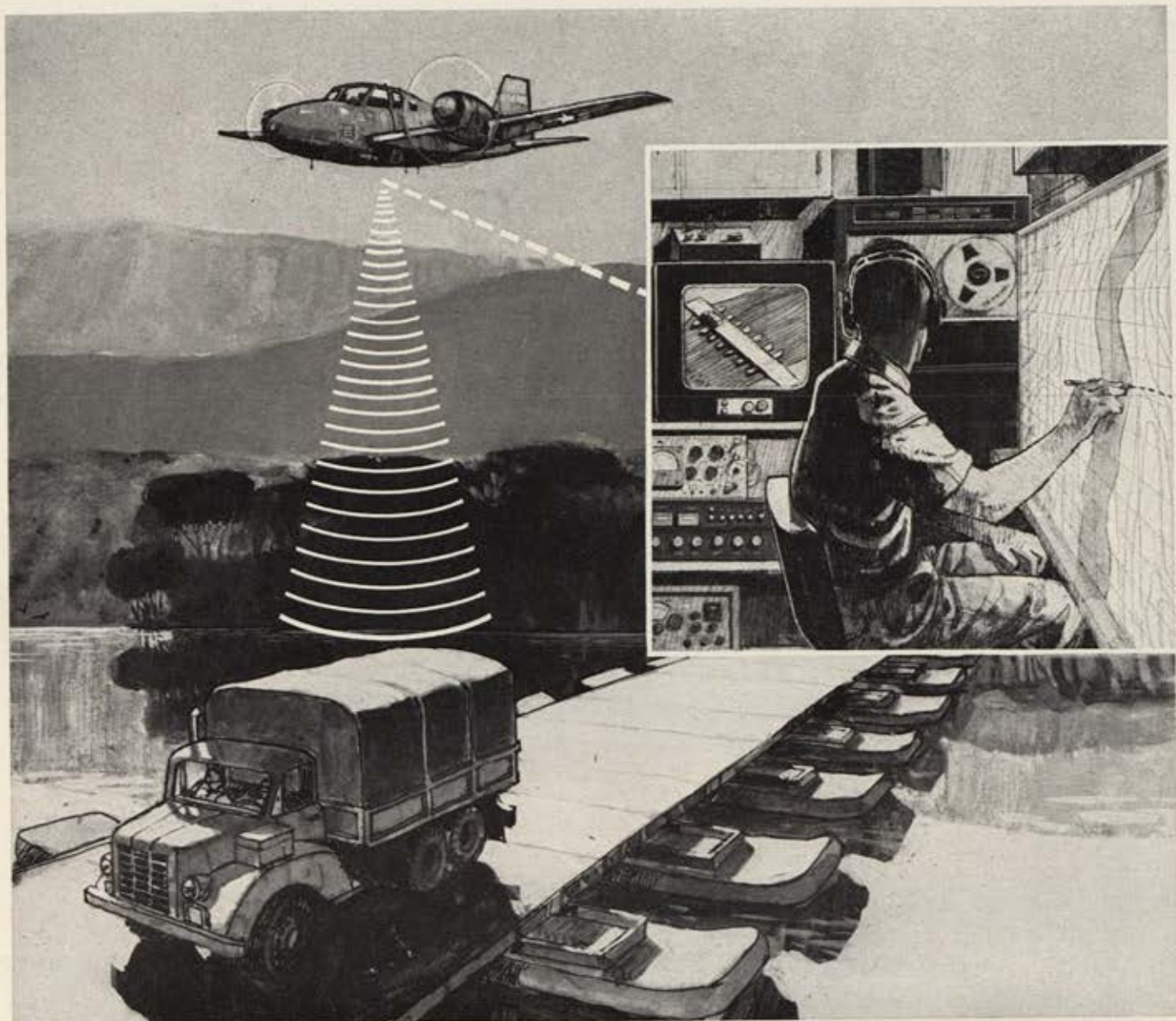


• Technology • Education • Science and Public Policy

The Space Investment—Planning for the 1970s

Apollo-9 astronaut, tethered and using handrails, wends his way, in this North American Rockwell artist's conception, from lunar landing module to Apollo mother ship, in earth-orbital rendezvous and crew transfer demonstration.





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CUBIC CORPORATION



SYSTEMS DIVISION

AFA's 1969 Convention site—Houston, Tex.—is also the home of the National Aeronautics and Space Administration's Manned Spacecraft Center, "mission control" for manned spaceflight. For AFA Convention participants, here is an informal . . .

Profile of MSC— NASA's Houston Manned Spacecraft Center

BY ARTHUR HILL

Science Editor, the Houston Chronicle

THE dynamic city of Houston offers many attractions, most of them, like the Astrodome, built within this decade. It is not a city of antiques and tradition, but a town with frontier spirit operating in the technological environment of the mid-twentieth century. This works out fine for business and badly for the police department, which has to contend with an impressive homicide rate.

The NASA Manned Spacecraft Center (MSC), con-

trol point for the Apollo program, fits well into the community pattern, what with space, as a certain television series reminds us, being "the final frontier."

It has been only seven years since MSC came into being, yet the Center now attracts more tourists than the rockets at Kennedy Space Center in Florida.

The speed with which the Center has grown, and its lack of a past, is whimsically noted in several offices, where photos of "MSC headquarters—1960" are dis-



On a once bucolic site rose the National Aeronautics and Space Administration's Manned Spacecraft Center. There was criticism of the selection of the Houston area for the Center at the outset, but the controversy has slipped into memory. This is an aerial view of a portion of MSC's Site I, showing the Mission Control Center, in the center, looking northeast.



Robert R. Gilruth, a longtime veteran at NASA, has, as Director of the Manned Spacecraft Center since its inception, presided over the buildup of the giant facility. His manned spaceflight background dates back to the old Space Task Group days at NASA's Langley, Va., Research Center.

played. The pictures show a herd of cattle standing around a shack of privy-like construction, contentedly surveying their swampy domain.

MSC can truly say it had a humble beginning, for the 1,620 acres on which it is built were once owned by the oil company of the same name. Most of the land was donated by Humble Oil to Rice University, which then turned the acreage over to NASA, although the space agency did pay \$1.6 million for 600 acres.

NASA announced the establishment of the Manned Spacecraft Center on September 19, 1961. It was really a new home for the Space Task Group that was then operating out of the NASA Langley Research Center in Virginia. MSC's basic functions, which continue to this day, were to be the selection and training of astronauts and the control of manned space missions from liftoff through recovery.

The move from Virginia began immediately. Robert

Five astronauts study lunar surface mosaic in the Mission Operations Control Room during the Apollo-8 flight. Seated, left to right, are Gerald Carr, Donald Slayton, Neil Armstrong. Standing, at left, are Harrison Schmitt and, at right, Edwin Aldrin. Slayton, one of original seven astronauts, is Director, Flight Crew Operations, MSC.



During manned missions, MSC Mission Control is the focus for worldwide monitoring of astronauts' progress and the source of communications with the spacecraft. Actually, there are two mission-control setups—one to handle a flight in progress, the other ready to cope with follow-on flights.



Two scientist-astronauts, Joseph Allen (left) and Brian T. O'Leary, ride an MSC centrifuge and experience forces of up to nine Gs during tests of the Apollo launch abort system, all part of MSC's lengthy preparations for Apollo flights, a main activity at Manned Spacecraft Center.

R. Gilruth, head of the Space Task Group, became director of MSC, a post he still holds. Selection of Houston, rather than Florida, for the site of MSC evoked some suggestions of porkbarreling, revolving around Lyndon B. Johnson, who was then Vice President and chairman of the National Aeronautics and Space Council, and the late Congressman Albert Thomas, then chairman of the subcommittee on the House Appropriations Committee that considers NASA funding. Mr. Johnson insisted that he had stayed out of the decision-making process that led to the selection of the Houston area for the new Center.

Echoes of the controversy continue to be heard today, but the question is now as academic as second-guessing the decision of a baseball umpire. At any rate, MSC has clearly played a large role in the over-all growth of Houston as the nation's newest large science and technology center and the only one in the South and Southwest. Houston now ranks ninth in the nation in terms of scientific manpower, according to the National Science Foundation.

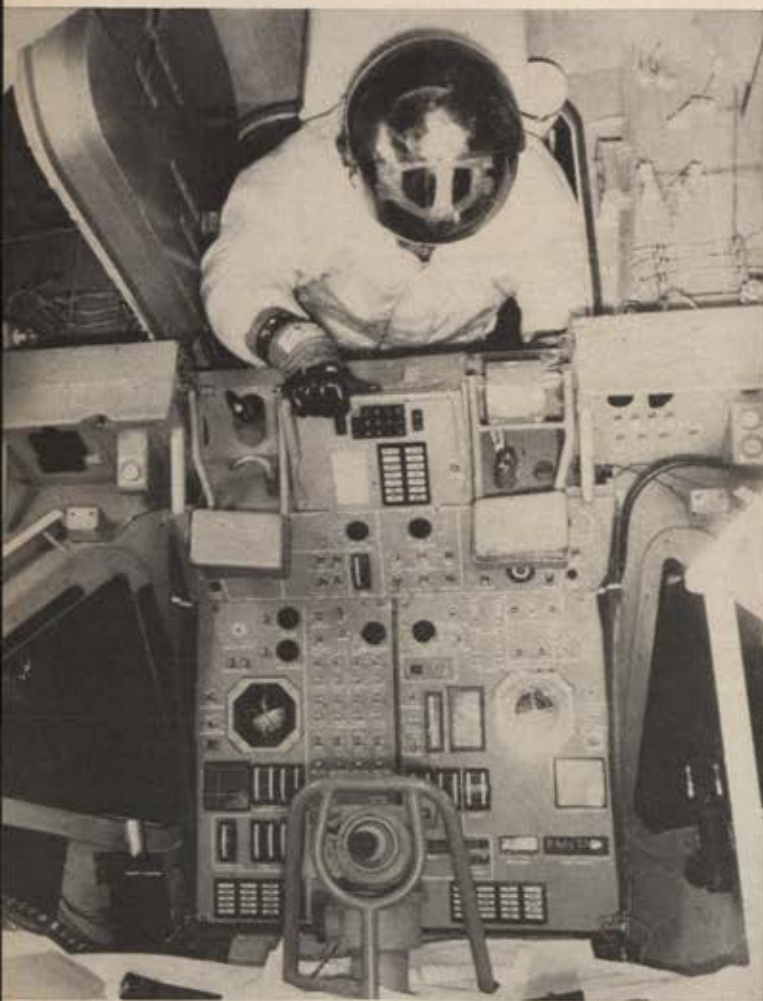
When MSC employees first came to Houston, they had to wait about two years before the first on-site building was completed and ready for occupancy. During the interim, NASA leased office space in fourteen buildings at various locations along Interstate 45, known locally as the Gulf Freeway because it leads south of Houston to Galveston and the Gulf Coast. They also used a lot of surplus space available at Ellington Air Force Base.

The first building on the MSC site was finished in September 1963. There are more than eighty steel-and-concrete buildings now, arranged in a pleasant campus-like setting that seems designed to proclaim that beauty and government architecture need not be mutually exclusive.

MSC may be the only government installation with



More centrifuge time. Three test subjects ride inside the gondola of the Manned Spacecraft Center's spinner during test runs made to man-rate the training facility. During this run, the subjects experienced a maximum load of ten Gs. One of the subjects shot this photo by using an extension cord which activated a camera mounted inside the front wall of the gondola.



Hours and hours and hours of training are necessary to perfect techniques for space missions. Here a full-suited astronaut practices crawling in and out of an Apollo Lunar Landing Module training device, no mean task with all that gear.

a duck pond, populated by extremely well-fed ducks, despite orders cautioning against the feeding. Whether the setting is also used for romancing is not known. There may be some workers who wander over to the pond to watch the submarines come in.

Although national television coverage leaves the impression that MSC is in Houston, the site itself actually is some twenty-five miles south-southeast of downtown (in Texas, "downtown" is defined as the location of the courthouse; in this case, the Harris County courthouse).

Establishment of the Center created instant suburbia in what had been snake-infested prairie good for hunting wolf, turkey, fox, and deer. Even in Houston, with its outstanding track record in real-estate dealings, the building boom near MSC was fantastic.

The astronauts live in many of the housing developments, including Clear Lake City, El Lago, Seabrook, Friendswood, Taylor Lake Estates, and Kemah. Houston's climate is generally quite humid and mild the year round, so the houses have the look and style of California, rather than the East or South.

As buildings were finished at MSC, personnel at temporary locations were transferred to the site.

By spring, 1964, major staffing at the Center was completed, although it was not until a year later, with the flight of Gemini-4, that MSC began its control of spaceflights. The construction investment alone at MSC approaches \$200 million.

Some 4,500 government employees work full time at the Center with another 4,500 employed at nearby facilities by aerospace firms such as North American Rockwell, Grumman Aircraft Engineering Corp., McDonnell Douglas, Aerojet-General, and others. MSC also employs some 4,000 contract support personnel.

At first, MSC employees were drawn mainly from private industry but the trend in recent years has been to recruit professional people from colleges and universities. In 1967, a study of MSC employees produced

this picture of the average worker: age, 35.1 years; years of government service, 8.6; salary, \$10,038.

The study also estimated the primary and secondary impact of the Center and contractor employees on the Houston area and came up with such figures as \$105 million in annual personal income, a population increase of 51,000, bank deposits of \$34 million, and retail sales of nearly \$50 million.

MSC is responsible each year for the expenditure of more than a billion dollars in research and development funds. Most of this now goes to the Apollo program. In Fiscal Year 1968, \$1.15 billion was budgeted for Apollo; in 1969, \$366 million less.

Probably the most famous MSC facility is the three-story Mission Control Center, better known on campus as Building 30. This, of course, is where the action is whenever a mission is on. There are two identical control rooms, one on the second floor and another on the third.

This permits one control room to work on the flight at hand, while the other is set up for the following mission. The flight controllers work at individual consoles, with an eighty-six-channel closed-circuit television system and computerized, continuously updated data charts to assist them on demand.

The worldwide communications, tracking, and data network feeds into Mission Control Center (MCC) and, among other tasks, the data automatically drives a ten-by-twenty-foot displays at the front of the control room.

The display pinpoints graphically the position of each space vehicle being tracked, in either earth or lunar orbit or anywhere between. A relatively recent development has been the automation of the tracking stations, freeing controllers from having to station themselves around the world. Mission Control Center voice transmissions, for example, automatically go to the proper tracking station and up to the spacecraft when the transmit button is pushed in the MCC.

Flight control is both a science and an art, requiring accurate, quickly made decisions that sometimes must

go beyond the data available and into the realm of intuition. The director of flight operations at MSC is Christopher C. Kraft, Jr., an old Space Task Group hand. As the Gemini program ended and Apollo flights came on line, Kraft turned over the actual business of flight directing to several young men in his organization. He has grouped these men into more or less permanent teams that shift as units from one flight to another.

Another familiar building at MSC, and one the public may visit any afternoon of the week except Saturday, is Building 1, the auditorium and public affairs office. Space exhibits fill the hallways around the auditorium, and there is even a display of space-related art currently hanging on some of the walls. The auditorium is used for news conferences during the flights, showings of NASA films for the public, and a variety of scientific and technical meetings.

A third building, which should become quite familiar this summer, is the new \$8 million Lunar Receiving Laboratory and quarantine facility. The first lunar landing crew—Apollo-11 Astronauts Neil Armstrong, Edwin (Buzz) Aldrin, and Michael Collins, according to present plans—will spend about two weeks in isolation there when they return from the moon. The lunar samples also will receive their first scientific examination at the facility.

"The idea for the facility," says MSC Deputy Director George S. Trimble, Jr., "was generated back in 1964 because we wanted to be able to handle samples that would be returned from the moon and also because we had a lot of folks worrying about contamination from the moon. They wanted to be sure we didn't bring any organisms back that would be potentially dangerous to people or plants or anything else on earth."

The Lunar Receiving Laboratory also had to be designed to protect the lunar samples from contamination by terrestrial organisms, so the samples could be examined in their original condition.

The formal MSC organizational chart doesn't reflect it, but Deputy Director Trimble notes that most of the



MSC Lunar and Earth Sciences Division's Dr. Elbert King (left) briefs a foreign visitor, Prof. Wolf von Engelhardt, on work of the Lunar Receiving Laboratory, future focus of examination of specimens to be brought back from moon.



It looks for all the world like a space-age jungle gym that kids would go wild in, but it is the MSC Apollo Mission Simulator, one of the principal astronaut training facilities crucial to preparation for the real thing—coming soon.

The action, for the moment, was at Cape Kennedy, as Apollo-8 "Green Team" Flight Director, Clifford E. Charlesworth, monitored the epochal launch. After launch is completed, control of manned missions is turned over to the Houston Manned Spacecraft Center. Controller teams spell each other as lengthy missions proceed through their paces.



Center is involved in either flight or spacecraft operations.

"It isn't generally recognized that half of the people working here at the Center are involved with flight operations. The other half are involved with procuring and developing the spacecraft itself," he says.

In the chain of command, Trimble is No. 2 man to Bob Gilruth, who reports to Dr. George E. Mueller, Associate Administrator for Manned Space Flight at NASA headquarters in Washington. Others in the director's office at MSC include Paul E. Purser, special assistant; Wesley L. Hjernevik, associate director and another Space Task Group veteran; and Duncan R. Collins, who is assistant for Air Force MOL coordination and works out of Los Angeles.

The chart gets quite complicated as one delves into the internal workings of MSC, but generally the program offices decide what needs doing to meet their particular goals, and then they may call upon several service groups to provide the expertise they need for a particular job.

MSC presently has two program offices: one for Apollo and one for Apollo Applications (AAP). The Apollo office is headed by George M. Low, and Robert F. Thompson is in charge of AAP. Center watchers say the signs point to the establishment soon of a lunar exploration program office to take over the planning of moon flights after the first two Apollo landings.

If this third program office is formed, it will be a spinoff from the lunar exploration working group headed by John Hodge.

MSC has established directorates for administration, flight crew operations, medical research, engineering and development, flight operation, program control and contracts, and science and applications.

The science and applications directorate, headed by Dr. Wilmot N. Hess, is the newest branch to be formed at this level. It was established as a point of contact with the scientific community, in the expectation that NASA will be doing more science in future flights. The Lunar Receiving Laboratory is part of this directorate, which has divisions for earth resources, space physics, and lunar and earth sciences.

The Air Force has a sizable representation at MSC in four different categories: Three officers are assigned to the Department of Defense interface office, which is primarily concerned with communications between the

military services in the landing and recovery area. These people are assigned to the Eastern Test Range, but work out of MSC.

One officer, Lt. Col. Thomas J. Borgstrom, is assigned to the Air Force Systems Command scientific and technical liaison office, which deals with the exchange of scientific information between MSC and the Air Force.

Five men work out of the Air Force MOL Systems Field Office, and they are responsible for liaison between the MOL office in California and the various MSC offices that deal in areas that would be of interest to MOL.

Finally, 154 men currently are detailed from the Air Force specifically to MSC. Fifteen of these are astronauts on indefinite term assignment. There are some others on special status, like Brig. Gen. C. H. Bolender,



There's a little bit of the moon at MSC, in the form of simulation of lunar surface conditions and special hardware to approximate conditions under which astronauts will operate on the moon. This gadget gives the lunar-G effect.



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Solar flares are an important potential hazard to manned spaceflight, and this optical telescope in the dome of the Solar Particle Alert Network Facility at MSC works from dawn to dusk. The telescope automatically tracks the sun and records on film—at the rate of a frame every ten seconds—the activity of the solar disc 93,000,000 miles from earth. The best researchers can do these days to alleviate the solar-flare problem is to watch for unusual activity that might presage a serious solar event.

who is manager of the lunar module in the Apollo Spacecraft Program Office. A total of 108 of the Air Force people are pulling a regular two-year duty cycle.

"They work for NASA as if they were NASA civilians. The majority work in the flight operations directorate and the directorate of flight crew operations," says Capt. Kirk L. Byerly, a Vietnam veteran in charge of detailed Air Force personnel at MSC.

The program is approaching the end of its second two-year cycle. The first Air Force group of 126 men arrived in August 1965. When they left in 1967, ninety percent were reassigned to Air Force space programs, Captain Byerly says, adding that he expects the same ratio to hold true for the second group of 108 officers when they leave this summer.

"These men serve a two-year tour as if they were on training status. In a way, they are in training, learning on the job the operational aspects of a space program and how to run the program and actually perform the mission," according to Captain Byerly.

The Air Force people selected for MSC duty are carefully chosen on the basis of intellectual ability and experience. They must pass the scrutiny of both the Pentagon and NASA. Most of those in the first group

have had missile experience with the Strategic Air Command. Those that did not have this experience had an engineering scientific degree at the bachelor's level.

For the second group, the Air Force tried to choose people with master's degrees in specialties that would be particularly useful at MSC. The third group is expected to follow the pattern of the second, Captain Byerly says.

For record-keeping purposes, the MSC Air Force group is a detachment of a squadron from Ft. Myer, Va., that is assigned to Bolling Air Force Base. The group is under Headquarters Command, USAF, Maj. Gen. Nils Ohman, Commander.

"In my opinion, this is one of the best things the Air Force has ever done in order to provide an experience base for its officers. We use this program as our gateway to space," is the way Captain Byerly puts it.—END



As Science Editor of the Houston Chronicle, Arthur Hill regularly covers the space scene at the NASA Manned Spacecraft Center. This article was prepared especially for AIR FORCE/SPACE DIGEST.

Speaking of Space

Clearly President Nixon's problem in developing a space program for the 1970s is how to deal with success.

A huge space capability, built up during the past decade, now exists. The Administration has to find ways to use it wisely, to avoid duplication, to meet public and congressional demands for practical payoffs...

The Space Investment— Planning for the 1970s

BY WILLIAM LEAVITT

Senior Editor / Science and Education

AS HE sets out to lead the nation into the uncertain 1970s, President Nixon's task on the space front clearly is how to cope with success. As this was written, the National Aeronautics and Space Administration was confidently putting the finishing touches on its planning for the Apollo-9 mission in which the rendezvous, docking, and crew-transfer capabilities of the Apollo mother ship and its companion lunar-landing module were to be rigorously tested in earth orbit. If Apollo-9 is a success, it will be followed in short order by an Apollo-10 mission, which will take three astronauts to lunar orbit for a final dress rehearsal of the lunar landing. During Apollo-10, two astronauts will board the lunar landing module and descend, without landing, almost to the moon's surface, then ascend to a rendezvous with the moon-orbiting mother ship for the flight home. Success of the Apollo-10 mission would clear the way for the Apollo-11 mission and the actual landing next summer.

At the same time, the Air Force, with no fanfare, is pressing ahead with its Manned Orbiting Laboratory program to explore the military utility of man in space and test a collection of highly secret instruments that future military spacecrews may well be using. Assuming sufficient funding—nearly \$600 million for MOL was requested in the Fiscal 1970 budget, prepared by the outgoing Johnson Administration—there could be unmanned launches of the MOL in late 1970 and the start of manned launches in late 1971. This is admittedly later than originally anticipated, for three reasons: First, more sophisticated equipment for the MOL mission became clearly feasible as project planners completed their first set of analyses; second, moving to the more sophisticated equipment took time; and third;

some of the more recent program delay was occasioned by a cut of some \$85 million in current fiscal year funding for MOL, part of the spending reductions forced on the Defense Department.

Understandable Caution

Against this background, the deliberateness with which the new Administration is approaching post-



—Wide World Photos

For President Nixon, the problem on the space front is how to cope with success in the planning of programs for the 1970s. Aiding Mr. Nixon in the decision-making will be Dr. Lee DuBridge, newly appointed science adviser.



The Apollo-9 crew, left to right, Russell Schweickart, David Scott, and James McDivitt, have the task of proving in earth orbit the rendezvous, docking, and crew-transfer capabilities of the Apollo lunar module, a tricky business.

Apollo planning has strong elements of frustration for proponents of a vigorous space program for the 1970s. But the caution of Mr. Nixon and his advisers is understandable. There remains a big job of sorting out not only what the country should concentrate on in space during the coming decade but also who should do what. At the moment, there are few major morsels of evidence as to what Mr. Nixon will decide. His space task force, headed by Dr. Charles Townes, California Institute of Technology physicist, several weeks ago turned in its report to the White House. But the report, which presumably poses a set of alternative courses of space policy for the 1970s, has not been released publicly, nor, if White House sources are correct, will it ever be released. Beyond that, at this writing, the new President has not named a successor to former NASA Administrator James E. Webb. This has left the widely respected Acting NASA Administrator, Dr. Thomas O. Paine, presiding over the civil space agency in a kind of limbo.

By the time this is read, Dr. Paine himself may have been named to the NASA post. There is much to recommend him. He is an unusually articulate man who has had extensive experience at both the scientist's bench and the administrator's desk. He has a broad view of the potential benefits to society of properly managed technology. His service at NASA thus far has helped to depoliticize the agency at a time when accomplishments in themselves should be sufficient to justify a reasonably balanced space investment for the 1970s.

Whether Dr. Paine gets the NASA job or not, his

views are worth noting. He believes that in this period of hiatus, NASA should be doing a "good job of formulating alternatives" and that "the agency should do enough preliminary study to make sure that we know what our [space] resources are, and what data we need in order to create a proper menu for decision" on future space commitments.

Updating Applications

"Our task now," Dr. Paine says, "is planning the uses of the capabilities we've built up during the Apollo program." As the acting NASA chief sees it, we would do well to update, in the light of state-of-the-art advances, the "older" space applications. These would include communications, spaceborne weather watching, geodesy, and navigation, among others. He is also a strong advocate of taking early advantage of the scientific potential of space technology in terms of deep-space planetary probes and manned orbital astronomy. Dr. Paine would like to see his agency get the green light for such efforts as the development of long-term space stations and shuttle spacecraft to serve such facilities (for a detailed report on current studies in these areas, see "Letter from Los Angeles," page 118). He also advocates some real advances in the campaign to develop an operational nuclear space rocket. He emphasizes, too, that so far as he is concerned, NASA stands for National AERONAUTICS and Space Administration, and that he would like the agency to do even more aeronautical research. He is a strong believer in the prototype approach, noting, by way of example, that such problems as those posed by the F-111 aircraft's engine inlets could and should have been solved by the prototype method "years ago."

Mr. Nixon inherited a collection of space budget proposals from the outgoing Johnson Administration which in sum provide for not much more than a holding action—a few more landings on the moon after the initial landing, a modest Mars and Venus probe program, and a collection of space-station and lunar-exploration studies. The largest commitment in the Johnson proposals was for the Orbital Workshop portion of the NASA Apollo Applications program. Orbital Workshop amounts to a deployment, in the early 1970s, of a testbed "space station," using an emptied-out Saturn S-IVB booster in which NASA astronauts will spend up to fifty-six days.

Workshop and MOL

The Orbital Workshop, as noted on these pages many times, has been considered by many observers as duplicative with respect to the Air Force MOL, which is scheduled for deployment in the same general time frame, the early 1970s. To a considerable degree, this complaint illustrates the continuing dilemma of those who are charged with sorting out the space program. People at quite high levels in space-planning circles have spent considerable time in recent months examining the allegations of duplication with respect to Orbital Workshop and MOL. Their conclusions were that, if the crunch came on Capitol Hill and one or the other programs had to be canceled for cost reasons, some of what NASA would like to do aboard Orbital Workshop

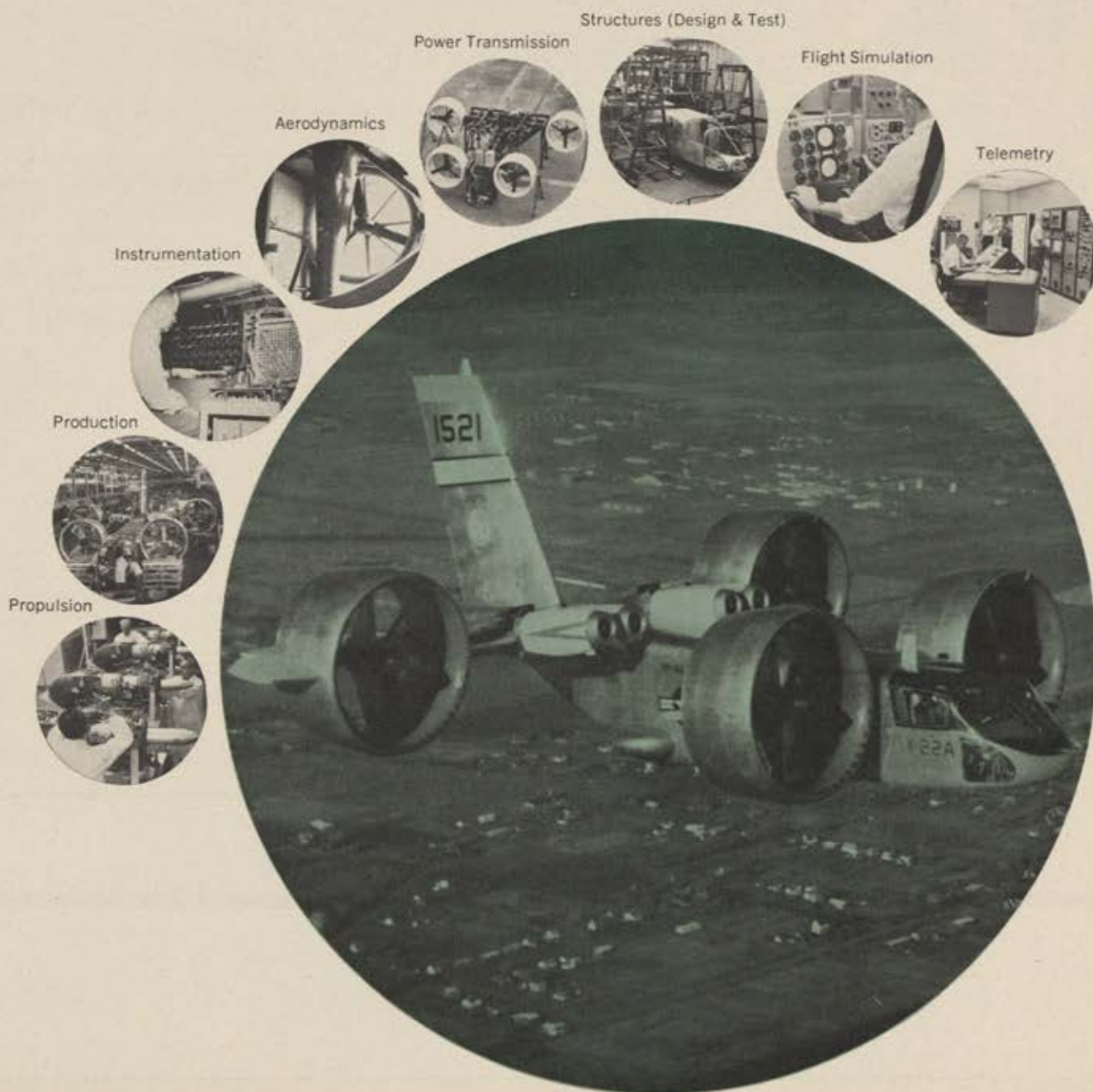
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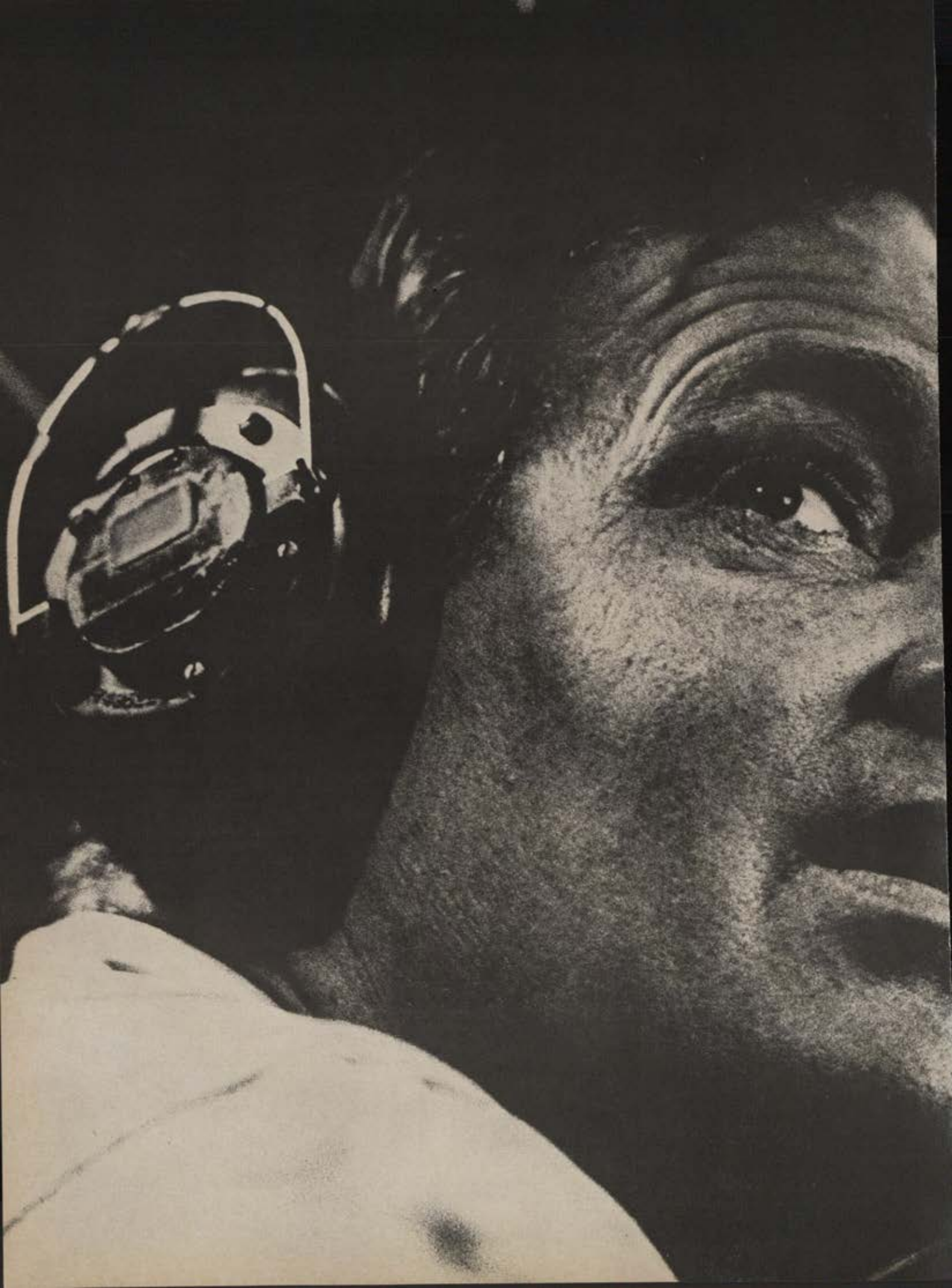
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could be done aboard MOL, but conversely, *virtually nothing* that the Air Force wanted to do aboard MOL could be done aboard Orbital Workshop. The reasons for these conclusions were rooted in the planned altitudes and polar orbits of MOL, as opposed to the higher and equatorial orbits of the Workshop. These conclusions could suggest to some critics that it would be better for NASA to "buy" into MOL. But the rub there is that such a NASA decision would be costly for the agency, which already has on hand surplus boosters for Orbital Workshop.

What it comes to is that the space agency, with a surplus of boosters and other space hardware, is convinced the best way to use them is through an interim "space-station" program such as Orbital Workshop. The Workshop effort will keep a lot of NASA technical teams together during a kind of "slack season" for the space agency. It is not so much that Orbital Workshop is crucial to later large space-station development. Rather, the project is a kind of holding action by NASA. So far as MOL is concerned, its validity as a military experimental program has been confirmed several times within the Defense Department, and there is probably little doubt that, assuming the success and payoff of its early manned deployments, it will lead to a continuing program for many years ahead. Also, in view of the conclusions that emerged from close study of the MOL and Orbital Workshop, and in view of the strong support for MOL among the membership of key committees on Capitol Hill, it is likely that MOL will stay in business for a long time.

An Object Lesson

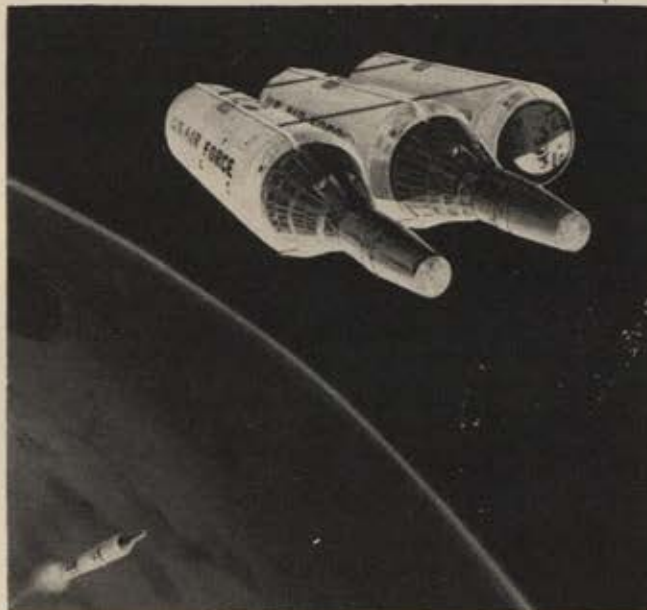
There is an object lesson for the new Administration in the MOL-Workshop situation. One of the most important policy questions the Nixon Administration must face soon in its space planning is how best and most economically to use the space capability we have built up in the past several years. Now that the moon landing has nearly been achieved, there needs to be a close examination of the future role of NASA. Should the space agency continue to be a huge operating agency or are there ways to reorient NASA to a greater support role in terms of producing, through research and development, new techniques and systems for turnover to user agencies, whether they are military or civilian?

Some will argue that such a course would hand over control of space technology to the military or that NASA efforts would be fragmented by a lessening of its operating-agency role. But unless such a reexamination occurs, there is a continuing danger that the costs of competing hardware systems will balloon out of proportion as time goes on. As matters stand, for its purposes the Defense Department has had to develop expensive sites and to buy costly hardware for its space programs during the same period NASA has undergone its multi-billion-dollar buildup for the Apollo program. There is no logical reason for what happened in the past. For the most part the rush of events ruled policy. But now that we have had the experience of a decade of space development, we should be wise enough to chart a less costly and more manageable course for the future. Such a course would require a more careful distribution of space tasks among the various research and develop-

ment agencies of the government, military and civilian, a greater standardization of boosters and hardware so that in future years the kind of policy problems and costs surrounding development of both Orbital Workshop and MOL would be avoided.

As to President Nixon's choices in space for the years ahead, it may well turn out that, in contrast to his predecessors, he will lean more heavily on Congress for policy direction. Not because he is a weaker or less dynamic man than either John Kennedy or Lyndon Johnson, but rather because there is a wealth of sophistication on space matters on Capitol Hill that simply didn't exist when all the excitement began after Sputnik so long ago.

There is another even more important reason. These days, there is a sturdy hunk of public opinion that, for reasons ranging from concern with social problems at home to plain economy, opposes the space program in general. Even the dramatic Soviet demonstration of prototype space-station capability, the sort of event that once could be counted on to bolster NASA budgets, passed rapidly out of public notice. Since it is Congress that is most responsive to the popular will, it

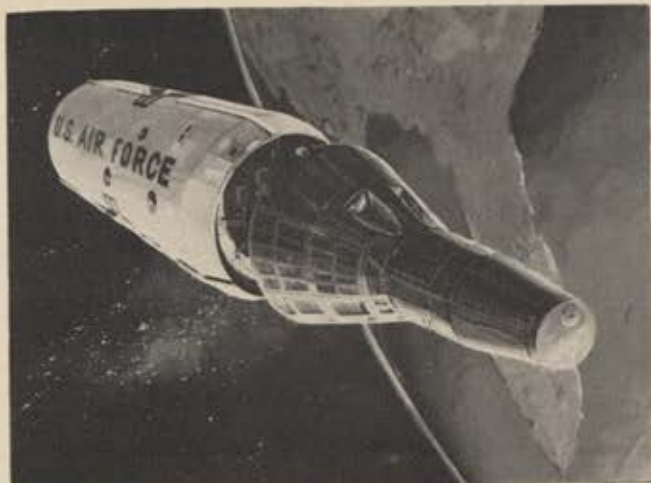


USAF's Manned Orbiting Laboratory (MOL) program could mature, after first collection of flights, into more complex effort. Present program involves only a single canister.

Dr. Thomas O. Paine, who has served as Acting Administrator of NASA since departure of former NASA chief James Webb, sees now as a good time to appraise US space capabilities in order to create proper menu for decisions on space program for the 1970s.

—Photo Courtesy Pace Magazine





MOL, above, and NASA's Orbital Workshop proposal have been considered duplicative by some. Close study by DoD and NASA shows MOL's purposes could not be served by Workshop but that MOL could do some Workshop missions.



NASA, in 1970s, hopes to put up Workshop, using Apollo-Saturn hardware, in which astronauts would operate for up to 56 days. Workshop is currently about all that's left of earlier, broader NASA post-Apollo manned orbital program.

makes sense for the new President to depend fairly heavily on the legislators for counsel on space priorities.

The Name of the Game

The name of the space game these days on Capitol Hill is practical payoff from the space investment of the past decade. An illustration of this theme is given in the recent toughly worded report on the proposed Earth Satellite Resources System by the House space committee's Subcommittee on Space Science and Applications, headed by Rep. Joseph E. Karth (D-Minn.). The report expresses the subcommittee's view that "an earth resources [survey] satellite system (ERS) unquestionably presents NASA with an excellent opportunity, perhaps the best possible opportunity, to achieve tangible economic returns from the substantial investment already made by the American taxpayer in the US space program. . . ."

But at the same time, the report complains that "among those who have studied its implications, there is virtual unanimity that an ERS system constitutes an idea whose time has arrived, and many believe that NASA's response is overdue.

"The pace of the [ERS] program to date has been much too leisurely, and financial support has been inadequate," the report says.

The subcommittee strongly recommends that NASA "concentrate a much larger portion of its efforts and resources on this project, and [that] the launch schedule should be compressed, if possible."

The subcommittee argues, too, that the earth resources satellite program ought to be unmanned and automated.

"The conclusion is inescapable" the report goes on, "that an automated ERS . . . project has been delayed because earth resources experiments were, as a matter of NASA policy, designated to be carried out as part of the manned spaceflight program. Presumably such experiments have been viewed as a partial justification for the Apollo Applications program, and this may well have been the major obstacle to the exploitation of ex-

isting technology for development of an automated ERS spacecraft."

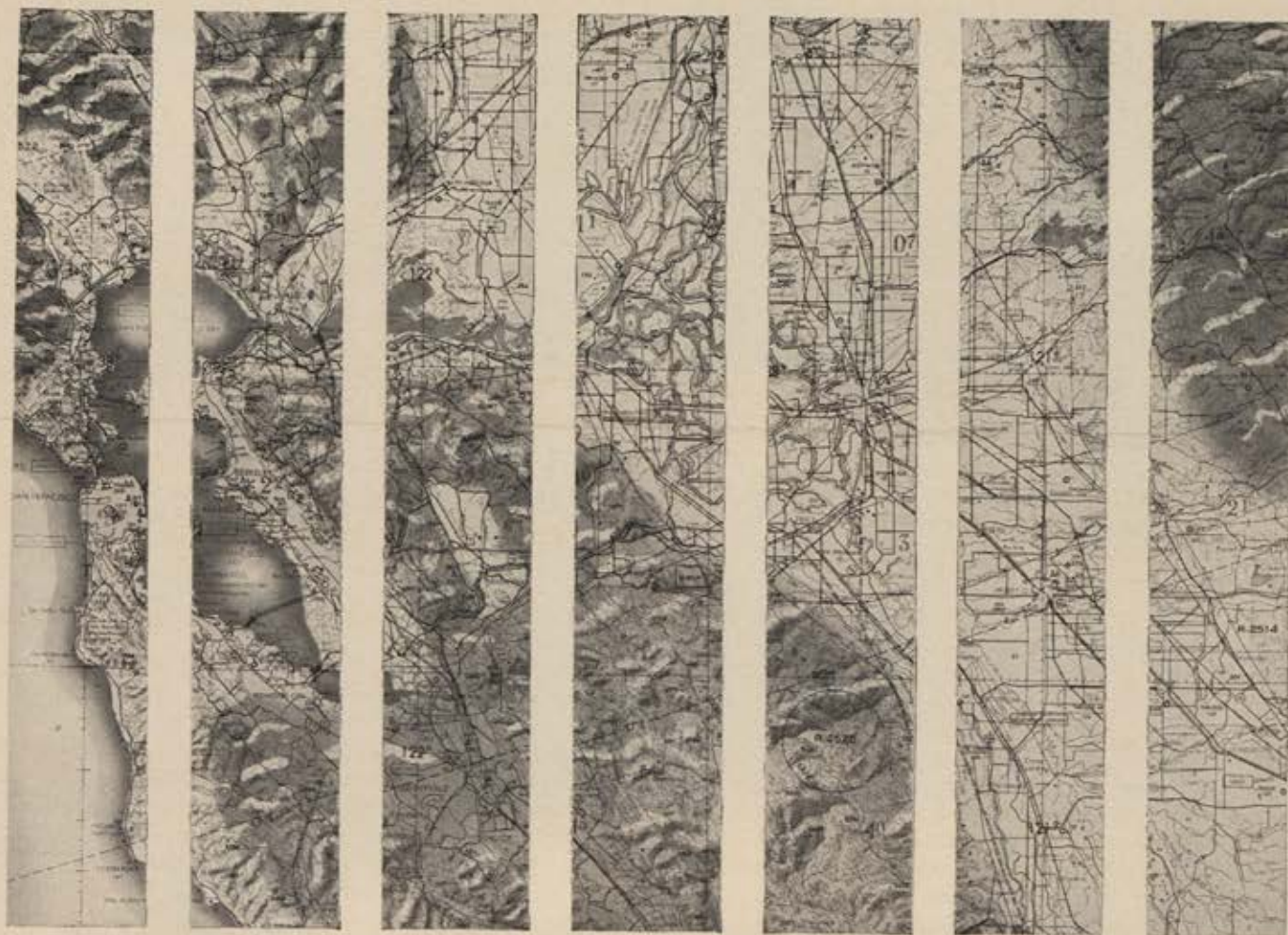
The report goes on to warn that with all due respect to the value of man in space, NASA's declining budgets may not allow for many Apollo Applications manned flights in the 1970s and that "a meaningful [unmanned] ERS program should not be required to wait upon such a contingent activity as Apollo Applications."

The report asserts, too, that "a truly productive ERS system will require much longer periods in orbit than are now contemplated for manned spaceflight," and that as NASA itself has observed, "the orbital inclinations in manned flights generally are not considered ideal for ERS work."

All this from Capitol Hill is not so much an argument over manned vs. unmanned spaceflight. It rather represents the strong view of a sophisticated legislative panel that in its understandable enthusiasm for carrying forward manned spaceflight operations, the space agency has tended to sacrifice less glamorous but obviously important other programs in the applications field.

Clearly the question for the 1970s is not manned vs. automated spacecraft. They both have their place. It is rather the question of how the taxpayers who have to pick up the large tab for space research and development can best benefit from the investment. For a pragmatic President, the message of the Karth subcommittee report—which happens to concern itself with but one aspect of the space-planning problem—should ring loud and clear.

No matter how enthusiastic some Americans are about the space adventure, it is still but a portion, albeit exciting, of the total national task in the 1970s. This reality calls for the closest examination of every future proposal in terms of its benefits to society and with a view to the most economical utilization of resources. The days when we ooh'ed and ah'ed at space spectacles are long past. Even the landing on the moon, spectacular as it will be, will elicit but a momentary thrill. For the decade ahead, the best space plan will be the one that helps make life better on earth.—END



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Modern technology is constantly enriching the vocabulary of the English language, enhancing English's position as a world tongue. The processes by which new words are being pumped into our language from technological sources are traced here in fascinating detail . . .

Tek·nol'o·ji and Its Effect on Language

BY THOMAS H. LONG

Reprinted from *RCA Electronic Age*

THE combination of advances in technology and the communications media has wrought a greater change in the lexicon of the English language in the past twenty-five years than in any similar period in its past history. In fact, it is said that more new words have come into being during the past fifty years than in the 900 years preceding the twentieth century.

However, the influence of science on language is not new. As early as the sixteenth century, scientific words that are now part of the common vocabulary, such as *skeleton* and *smallpox*, were being introduced. The process has continued since at an accelerated pace. What distinguishes the present century is not only the enormous number of technical terms being created but also the rapidity with which these terms are made available to the average speaker as part of the general vocabulary. *Antihistamine*, *LSD*, *laser*, *digital computer*, *cryogenics*, *phenacetin*, *Rh factor*, *ICBM*, and *stereophonic* are good examples.

Although the average person might not be able to define all of these words precisely, each term is probably known to him. With the possible exception of *phenacetin* (also known as *acetophenetidin*—one or the other term appears on almost every bottle of patent aspirin combinations), none of these words existed twenty-five years ago.

Though linguists still do not fully understand the means by which new words are brought into a language, the major role that technological culture is now performing in this process is unmistakable. It is difficult to predict which of the newly created technical words will become as assimilated by the general vocabulary as have *skeleton* and *oxygen*. But it is certain that a large number of them are already on the way "in."

There are, however, indications as to the acceptance of words. For example, if the hypothetical average person were challenged on his use of certain words, his

response would give an indication of what degrees, from the basic to the very specialized, exist in the English vocabulary, and how the central core of the language is being changed and increased. If accused of misusing *tree* or *hat*, he would probably not take it seriously at all. He is absolutely confident of the meaning of these words that have been in general use since Anglo-Saxon times. If he were accused of misusing *stereophonic* or *LSD*, he might be a little more hesitant but still ready to argue. If his use of *cryogenics* were questioned, he might admit, right away, that he was open to correction. His feeling of confidence and familiarity with such words is a clue as to where they lie in respect to the core vocabulary.

Along the Road of Popularization

None of the words such as *antihistamine*, *LSD*, *laser*, and others cited at the beginning of this article is ever likely to be a part of the general vocabulary in the same way as *tree* or *hat*. But it still is too early to say how far some of them will advance along the road of popularization. Widely used terms like *eliminate*, *acid test*, *potential*, and *ultimate analysis* were originally technical and limited to the vocabulary of chemistry and physics. And *by and large* and *under way* came into general use from the specialized language of sailors. It is safe to assume that many of the new words will undergo a similar development and become what Fowler's *Modern English Usage* labels "popularized technicalities." It is also probable that they will be popularized quickly, since many are creations of the typically modern fields of nuclear physics, space science, and electronics—highly publicized disciplines that have a pervasive influence on modern life.

Though the student of language cannot accurately predict which of the new terms will prove to have staying power in the vocabulary, he does know the

methods by which they will be created. There are three general possibilities for creating technical terms: extend the meaning of existing words; borrow words from other languages; and coin new words from resources already existing in the language.

The first possibility—old words whose meanings are being extended or changed—is the most difficult to analyze. As cultural and social contexts change, so do the associations of old words. Certain meanings become dominant, sometimes to the extent of canceling other meanings. A list of these words might include: *jet*, *missile*, *film*, *cartridge*, *probe*, *program* (verb), *bug*, *tape*, *space*, and *channel*.

The pressure of the technological associations has not completely changed the older meanings of any of these words, but it is easy to see what influences are at work. It is doubtful that even a young schoolboy, if asked to give an example of the word *missile*, would write "snowball." Similarly with *jet*—which in its most frequent current use has been boiled down from *jet-propelled*—it is evident from the readiness with which it combines with other words in certain phrases (*jetport*, *jet set*) that its aeronautic meaning is highly active. The verb *program* has been around for a long time, but the context in which it is now used—in popular journalism, for instance—seems almost always to be that of computer technology. As for *space*, it is most unlikely that the average person, if asked to write down his first association, would ever write "roominess." In the unlikely event he had never heard of an astronaut, the spaceships of the comics and science fiction have been around too long not to exert a powerful influence on his choice. These shifts in meaning suggest the lively relationship that exists between technical usage and established words.

The second method, borrowing whole words from foreign languages, is characteristic of earlier periods of science, not of twentieth-century technology. This is true primarily because the linguistic orientation of the technology of today is definitely English.

Borrowing from Latin and Greek

In the past, Latin and Greek have always been the primary sources for borrowings, as, for example, in the eighteenth century, the age of Linnaeus and of the great descriptive systems and classifications in botany and zoology. However, few of these learned borrowings have ever moved into any kind of general use. Because their meanings are not self-evident to the average English speaker, they have on the whole maintained the technical senses for which they were originally needed, and their meanings have not undergone the adulteration typical of "popularized technicalities."

A few of the more familiar classical borrowings are *genus*, *habitat*, *saliva*, *bacillus*, and *quantum*, all from Latin, and *cotyledon*, *thorax*, *pneumonia*, *iris*, and *psyche*, from Greek. If a complete list of such borrowings were drawn up, there would, of course, be a huge number of words with which any educated layman would be perfectly familiar. However, very few of these are of recent technological vintage; most are older terms from such fields as medicine, biology, and mathematics. Moreover, in words that English has borrowed from

modern foreign languages, it is often found that, like the French *hélicoptère*, it is a coinage involving elements that could have as easily been put together in English. It is only in the narrowest sense that these words could be called French or German. Thus, *vitamin* was, strictly speaking, borrowed from German, but it was initially coined from classical elements—Latin *vita* ("life") plus *amine*—that have nothing peculiarly German about them. *Thermometer* was coined originally as a seventeenth-century French word, *thermomètre*. But only a few years later, it had gained the status of a technical word in English, with its Greek elements intact, but with no traces of its French origin. This stateless, cosmopolitan quality is characteristic of so many technical words that it is superficial to consider them merely as foreign borrowings. Rather, they occupy a middle position between true foreign borrowings, like *chassis* or *coupé*, and words coined in English from elements originally non-English, like *cyclotron*.

Cyclotron is an example of the final heading—the creation of new words from resources already existing in the language. *Cyclo-* and *-tron* are what linguists call combining forms. Though they are learned and foreign in origin, they are illustrative of the elements that the English language freely adapts in compounding, one of its most characteristic methods of forming words. At present, vast numbers of technical terms are entering the language as compounds. The most common of these may be roughly divided into two types: those like *cyclotron* or *television*, which are composed of combining forms that are available or well established in English though not of English origin, and those like *feedback* or *fiberglass*, made by joining words that, in isolation, do not have technical meanings. Some examples of the first type are: *automobile*, *astronaut*, *insecticide*, *osophone*, *telephone*, *antibiotic*, *television*, *supersonic*, and *vinyl*.

With the exception of *osophone*, all of these are familiar to the layman. *Automobile*, surprisingly, is a word, like *helicopter*, originally compounded in French. It also illustrates a type of compound that purists once referred to as "barbaric"—the kind having elements from two or more languages. From this extreme point of view, *telephone* (Greek *tele-* plus Greek *phone*) is acceptable but *television* (*tele-* plus Latin *visio*) is not. (A satisfactory all-Greek compound for a television set could be made up—*teleopticon* would do—but would probably lose the adaptability that *television* has shown in producing other forms like *televise*.)

Of the three terms, *aquaplane*, *seaplane*, and *hydroplane*, the purist is willing to admit only the last, a Greek-plus-Greek compound. This view is, of course, pedantic and leads to absurdities. But it is less in evidence nowadays than it formerly was, perhaps because a knowledge of Latin and Greek is no longer considered the basic requirement of a good education.

The second type of compounding is deceptive because it involves technical and sometimes highly specialized terms that are produced by juxtaposing nontechnical words with obvious meanings. Examples are: *waterproof*, *airtight*, *takeoff*, *throughway*, *underpass*, *fiberglass*, *countdown*, *input*, *output*, and *feedback*. These terms offer a convenient shorthand in naming processes, states, structures, and so forth, that are often highly

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complex. The simple juxtaposition of the elements, which obscures the usual indications that English gives as to part of speech, number, and modifiers, is perhaps a sign that the language is becoming more analytical and less inflectional. In short, it is becoming more like Chinese, which does not indicate grammatical relationships by declensions, conjugations, and singular and plural endings, and less like German, which makes heavy use of these inflectional endings.

The Age of the Acronym

A number of technical terms are being created as acronyms, blends, and portmanteau words. An acronym—itsself a technical term coined in 1944—is literally a “peak-name,” a word that is pronounced as a word and composed of the initial letters or syllables (the “peaks”) of other words. Acronyms were first popular as names for governmental and military agencies and offices during World War II. They have also been used by commercial organizations, a widely known one being *Nabisco* (National Biscuit Company).

Strictly speaking, acronyms should be pronounceable, like *NATO*, and not merely abbreviations, like *WPA*, or some sort of in-between creatures like *STOL*, *VTOL*, or *V/STOL*, in which the first letter is pronounced as a letter and the rest as a word. They have proved of use in technical vocabularies for the obvious reason that they conveniently condense often unwieldy phrases, as *radar* (radio detecting and ranging), *sonar* (sound navigation ranging), *scuba* (self-contained underwater breathing apparatus), and *napalm* (naphthene palmitate).

Closely related to acronyms are blends and portmanteau words that combine two or more words into a new whole, as *smog*, from *smoke* and *fog*. Like puns, these words have been favorite devices of humorists, a famous instance being Lewis Carroll's blending of suggestive sounds in the verses of *Jabberwocky* (“’Twas brillig, and the slithy toves/Did gyre and gimble in the wabe . . .”). Carroll's poem, in fact, gives a clue to one requirement for a blend: whatever emerges, it must sound to English-conditioned ears the way a word ought to sound, and the sounds must occur in an order normal to the language. *Quasar* (quasi-stellar radio source), *transceiver* (transmitter receiver), and *bit* (binary digit) are three examples of useful technical blends.

Occasionally, blending causes confusion in the etymological elements of the word. Thus, *triphibious* (*triph* *amphibious*) obscures the fact that in the model word, *amphibious*, the correct division is *amphi-* (Greek for “both”) and *-bious* (“life”), not *am-* plus *phibious*. Looked at in this way, *triphibious* is related to a number of words that have been formed on the basis of false analogy. The derivatives of *hamburger*—*cheeseburger*, *beefburger*, and *chiliburger*—are perhaps the most famous examples. They became possible because of the mistaken analysis of *hamburger* as *ham* plus *burger* instead of (as is correct) *Hamburg* (the city) plus *-er*, the same suffix as in *New Yorker*.

Some technical words often take the form of shortenings of longer words (*stereo*, *audio*, *strobe*, *intercom*, *Moho*) or back formations (*televise*, *destruct*). Sometimes they are onomatopoeic (*tweeter*, *woofer*, *growler*,

flip-flop), though these seem to be fewer of late. They can be based on proper names (*hertz*, *mach*, *tesla*, and *baud*, which is actually a shortening of the proper name *Baudot*). They may be arbitrary or seemingly arbitrary coinages (*Kodak*, *nylon*, *chad*, the latter being that piece of material removed in punching a hole in perforated tape). All of these examples are representative of the ordinary means by which English increases its stock of words.

The Need for More New Words

However, there is a need for even more new words to keep pace with the advances in modern technology. This need is shown by the abundance and variety of words created by analogy. An analogical formation is a word created on the model of another word. From the model *automat*—a shortening of *automation*—a number of analogical formulations are constructed, such as *laundromat*, *dialomat*, *gasomat*, *vendomat*, and *sodamat*. In science, *electron* has served as the model for one series of *-on* words, the end of which is not in sight. Some of these are *proton*, *neutron*, *meson*, *baryon*, *lepton*, *fermion*, and *boson*. In another set of *-on* words, most likely modeled on *rayon*, the ending has come to denote “synthetic fabric” (*nylon*, *Dacron*, *Orlon*). And there are other groups in which the value of *-on* changes to indicate gases (*neon*) or vacuum tubes (*klystron*).

Similar series have developed for *-tron* words (*cyclotron*, *bevatron*, *betatron*). Often, it is difficult to say precisely which word is the model for these long series of technical terms formed by analogy. Whatever the model, however, certain words that have been developed by this means often seem to be monstrosities, as far as normal English prose style is concerned. Thus, *fadeometer*, *densitometer*, *intensitometer*, *absorptiometer*, and *optical interferometer* are derived from the highly fertile *-meter* model. With *resistance* as the probable technical model, there are such creations as *absorptance*, *capacitance*, *elastance*, *inertance*, and *reactance*.

The danger here is that such words easily become true barbarisms if they are generally adopted and their technical meanings distorted or lost, as is often the case. A student of the future, for instance, may use *leakance* for *leakage* because he thinks it gives his writing a more authoritative or “scientific” ring. To cite actual classroom instances, freshmen sometimes use the “scientific” word *analyzation* when all they mean is *analysis*.

The need for new technical terms will multiply in a world in which man's store of knowledge doubles every decade or less. Even now, the rapid advance of technology is being reflected in the English language. As a result both the professional and layman, who is also bound to encounter many of the new terms, may be helped by knowing the variety of ways that English has for enlarging itself.—END

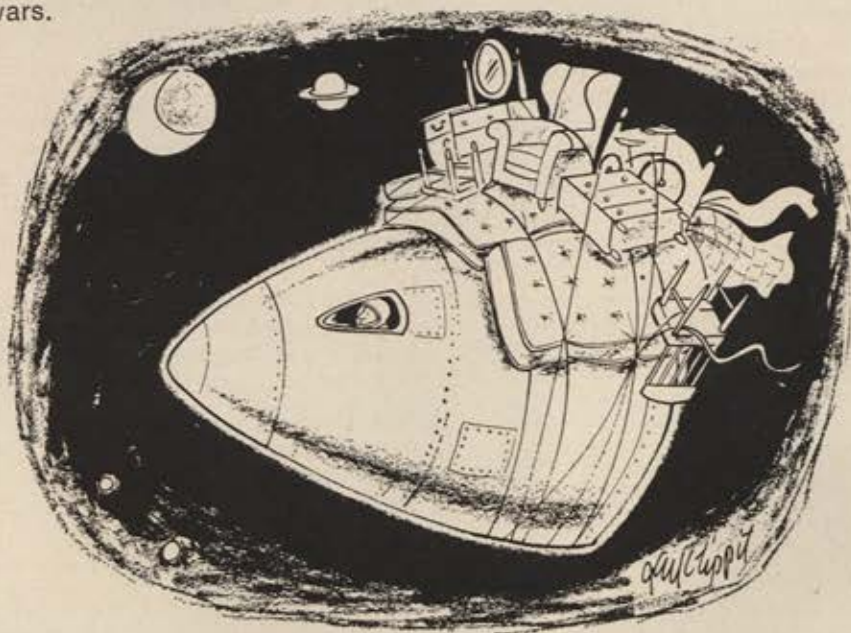
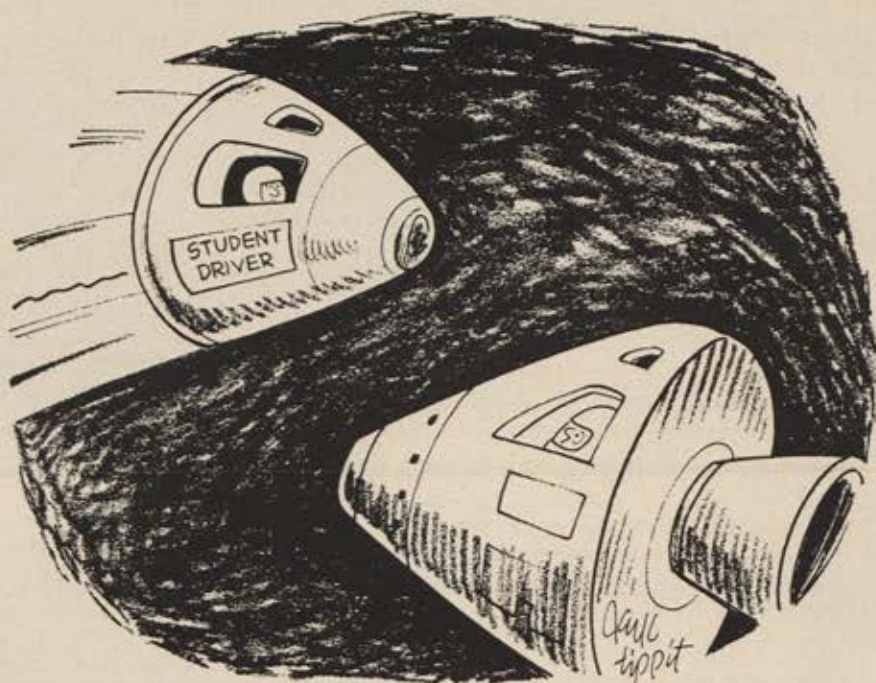


The author of this article, Thomas H. Long, is a Senior Editor in the reference library of Random House, the New York publishing firm. Mr. Long's article appeared originally in the Autumn 1968 issue of *RCA Electronic Age* and appears here with permission.

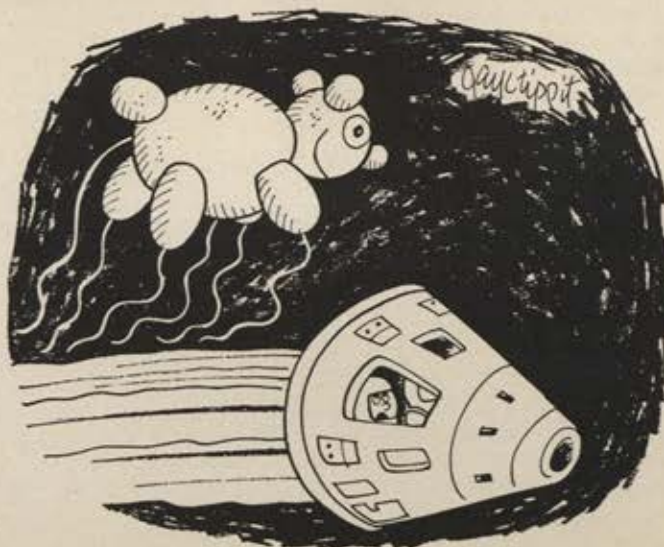
Out of This World . . .

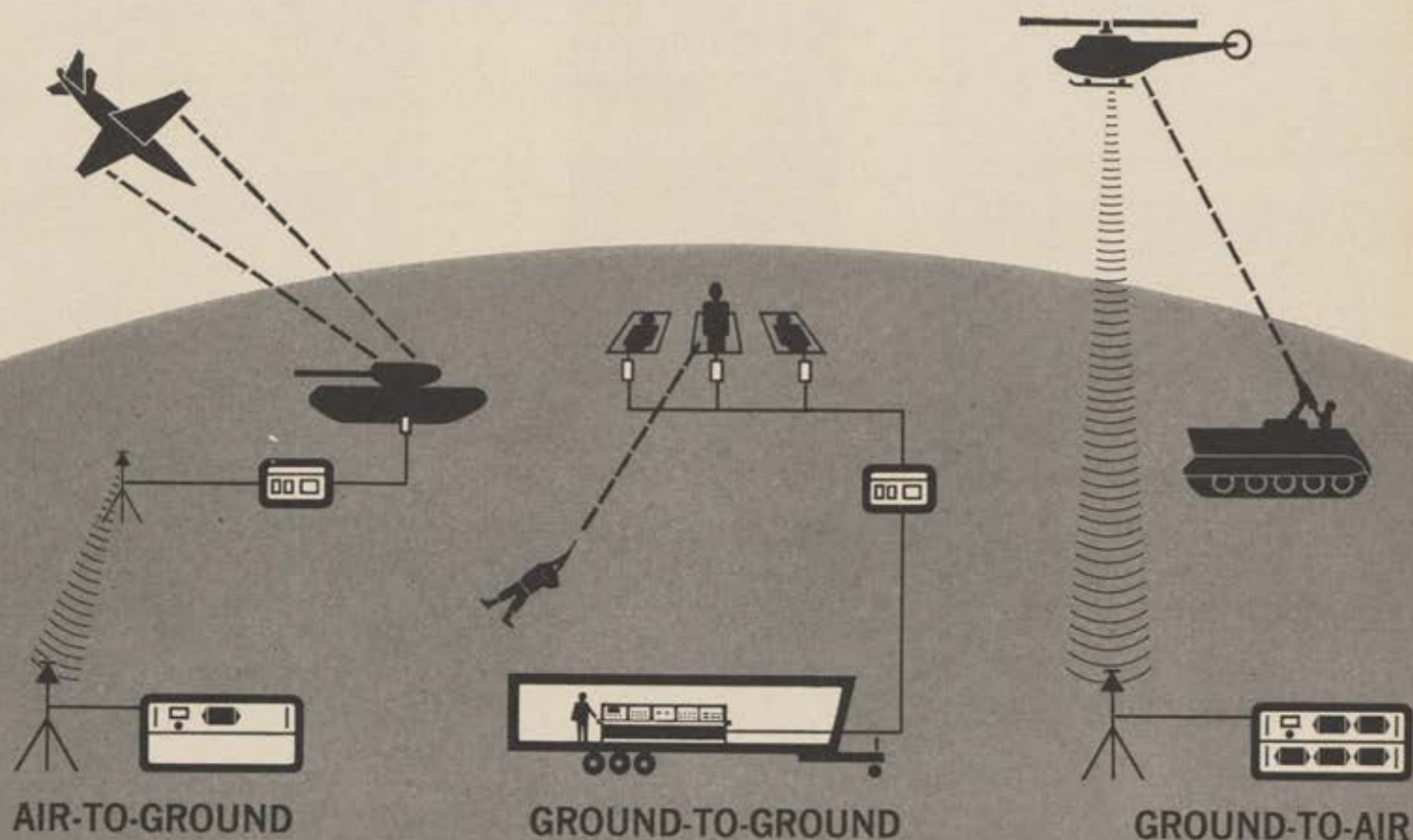
MAN IN SPACE— what the future holds

Here Jack Tippit, an AFRes lieutenant colonel with a Reserve assignment in Washington, looks a generation ahead to predict what's in store after man reaches the moon. Tippit, whose cartoon "Amy" is syndicated nationally, has piloted everything from bombers to jet fighters for the Air Force in the last three wars.



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WE HAVE SOMETHING OF
INTEREST TO REPORT"





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for range control, and the interfacing of all the new elements with the existing, government-furnished, position-locator equipment and microwave link for long-distance data transmission.

EXAMPLE 3 — GROUND-TO-AIR (DA-1) Del Mar has produced both towed and droned rotary-wing aircraft targets with hit-count skins and miss-distance-indicating acoustic sensors, along with the associated telemetry and readout instrumentation, for the Army's helicopter vulnerability studies. For these studies, both the towed and droned targets realistically simulated the appearance and performance of the UH-1B helicopter. The hit and miss information transmitted from such Del Mar aerial targets is received and displayed on compatible Del Mar equipment, located in a permanent or mobile control center. This "ground-to-air" system is completely adaptable to "air-to-air" application.

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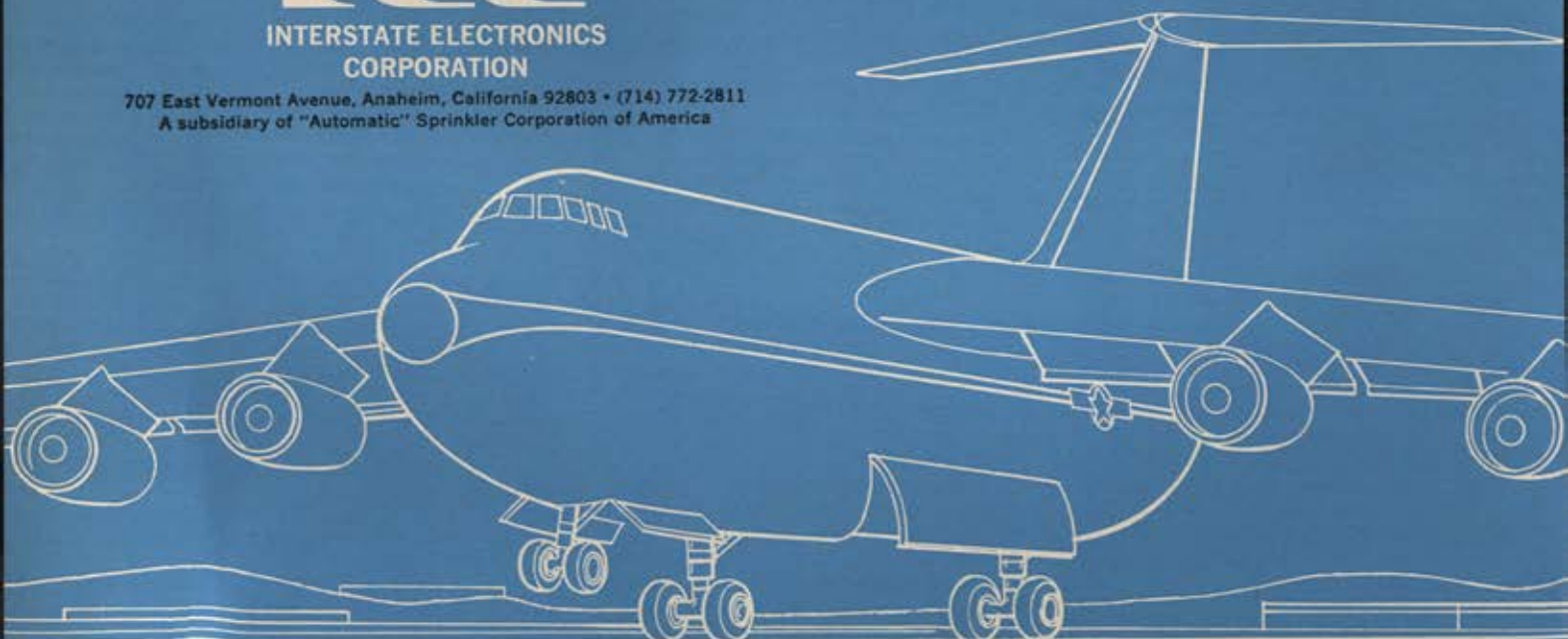
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For the Apollo-8 astronauts, after the mission and debriefing, it was the cheers of the crowds and reunion with their families. But for the Apollo-8 spacecraft that carried the circumlunar trio it was back home to North American Rockwell for rigorous postflight analysis . . .

The Apollo-8 Capsule Comes Home



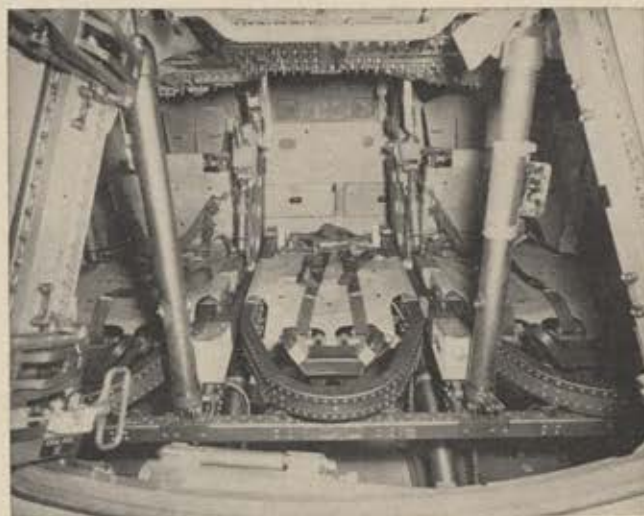
The Apollo-8 spacecraft command module, having flown around the moon and back, has more work cut out for it at home base at North American Rockwell's Space Division, Downey, Calif., as Apollo "came home" for analysis.



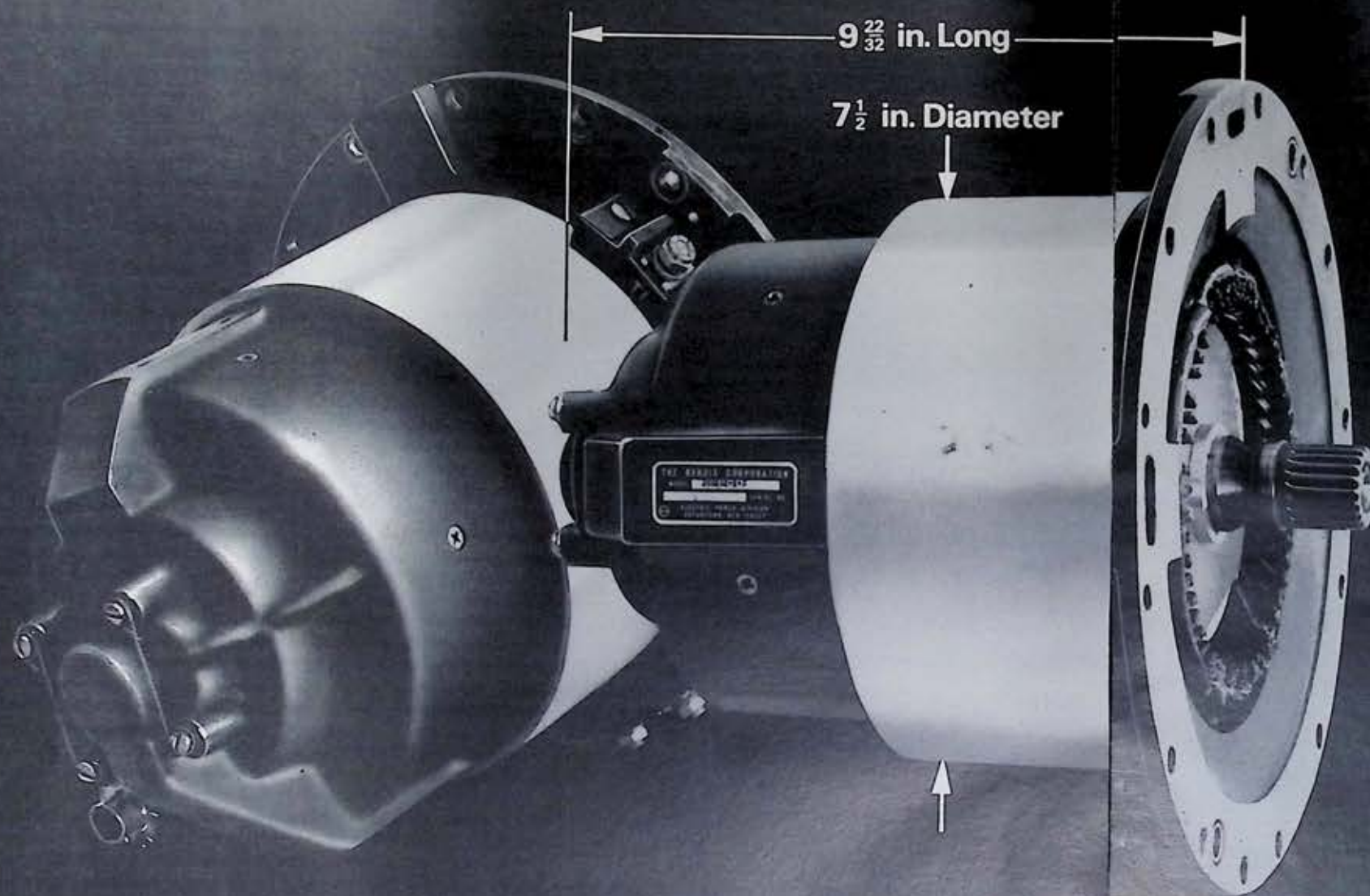
Reentry is a fiery maneuver, as can be seen from appearance of capsule. Maximum temperature on hot, leading edge of Apollo-8 spacecraft as it seared homeward through atmosphere was some 4,700° F. Hatch side was coolest.



The capsule gets a closer look from a very interested party at North American Rockwell, George Jeffs, chief program engineer and assistant program manager of the spacecraft command and service modules. Windows are taped for test.



This is an inside view, through the hatch, of the Apollo-8 command module. The capsule is roomy, compared to the Mercury and Gemini craft. The three couches are visible (center one is movable) as is the array of electronic displays.



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Write: Manager Field Sales, Electric Power Division, The Bendix Corporation, Eatontown, N.J. 07724.



Rating of unit shown: 62.5 KVA, .75 P.F., 12,000 RPM, 400 Hz, 115/208, .85-.86 efficiency.

The thoughts and motivations of a man under fire whose conduct is such that it earns the time-honored tribute "above and beyond the call of duty" have frequently been the subject of detailed analysis. Why did the man act the way he did? There are as many answers as there are men. But in the case of Medal of Honor winner Air Force Lt. Col. Joe M. Jackson, his was a cool and reasoned professional approach all the way, the day he pulled off his . . .

AIR FORCE
MARCH, 1969

Rescue at a Place Called Kham Duc

By Flint DuPre

FEWER than 15,000 people live in Newnan, Ga. Located some thirty-five miles southwest of Atlanta, Newnan is the county seat of Coweta County. The town is a center of textile and lumber mills and the site of a market for horses and mules. That such a small and relatively remote center of American society should produce a Medal of Honor winner is noteworthy; that two men who call Newnan home should receive Medals of Honor on the same day is extraordinary.

Yet, on January 16, when President Johnson, in one of his last official acts as President, awarded Medals of Honor to representatives of the four branches of the armed forces, two of the recipients were from this little town in Georgia.

One of these men, USAF's Lt. Col. Joe M. Jackson, a forty-five-year-old C-123 pilot who risked his life to rescue three airmen inadvertently left behind when a Special Forces camp was evacuated, thus became the Air Force's fifth Medal of Honor hero of the Vietnam War.

His fellow townsman, also honored in the White House ceremony, was Marine Corps Maj. Stephen W. Pless, twenty-nine. At the same time, President Johnson presented Medals to Army SSgt. Drew D. Dix, twenty-four, from West Point, N. Y., and to the Navy's Lt. Clyde E. Lassen, from Fort Myers, Fla.

These awards brought to seventy the number of Medal of Honor winners thus far in the Vietnam War.

Colonel Jackson's heroic act took place on May 12, 1968, during the final phase of the withdrawal from the Kham Duc Special Forces Camp, about forty-four miles south-southwest of Da Nang Air Base, in South Vietnam. At that time Colonel Jackson—who is now a Plans officer at Hq. USAF in the Pentagon—was based at Da Nang in command of a detachment



Smiling proudly, Air Force Lt. Col. Joe Jackson wears the Medal of Honor—fifth of the Vietnam War to go to an AF man. Jackson earned his by rescuing three fellow airmen.

of the 311th Special Operations Squadron, headquartered at Phan Rang AB.

The Special Forces camp had been under enemy attack and heavy fire for three days when the decision was made to pull the friendly forces out. This meant air-evacuating more than 1,000 men, and the pullout was managed successfully.



The four winners of the Medal of Honor flank President Johnson at the White House after the January 16 ceremony. At the President's left, and talking with him, is USAF winner, Lt. Col. Joe M. Jackson of Newnan, Ga. The other native of Newnan, Marine Corps Maj. Stephen W. Pless, is on the other side of President Johnson. At far left in the photo is Navy Medal of Honor winner Lt. Clyde E. Lassen, Fort Myers, Fla. The Army's winner, SSgt. Drew D. Dix, West Point, N.Y., is far right.

At this point, shortly after the last evacuation plane had left, it was discovered that a three-man Air Force Combat Control team had inadvertently been stranded. By then enemy forces were overrunning the forward outpost and establishing gun positions on the airstrip itself, sealing off the three Americans, whose lives were endangered by the steady flow of small arms, mortar, automatic weapons, and rifle fire. Meanwhile, exploding ammo dumps added flames and debris to the chaotic scene.

Forward Air Controllers and radiomen tried unsuccessfully to locate and contact the men in the besieged area. The orbiting C-130 Airborne Command Post then asked a nearby C-123 Provider to attempt a rescue. The plane landed but was quickly forced back into the air by intense enemy fire. On regaining altitude the crew spotted the Air Force team's position on the ground. ACP then contacted another C-123, being flown by Colonel Jackson and Maj. Jesse W. Campbell. Disregarding the extreme danger and the likely failure of the mission, they volunteered to go in, since the already marginal weather conditions were rapidly deteriorating.

Colonel Jackson reasoned that an unorthodox approach might enhance his crew's chances to rescue the three stranded men—Maj. John W. Gallagher, TSgt. Morton J. Freedman, and Sgt. James D. Lundie.

Jackson flew his cargo plane almost as if it were a fighter, diving from 9,000 feet. He encountered enemy fire from 4,000 feet to almost treetop level.

With one eye on a burning helicopter that had been shot down earlier and was blocking the runway, Jackson touched down and used only 2,200 feet of runway.

Small-arms fire came from all directions, some passing underneath the belly of his plane. Though he wanted to stop as quickly as possible, Jackson decided against reversing the props on his two engines as he knew this would automatically shut off the two auxiliary jet engines they'd need for a fast getaway. He stood on his brakes to bring the heavy cargo craft to a halt.

Major Campbell spotted the three men crouching in

a culvert to the left of the aircraft, near the runway, but debris and shell holes prevented Colonel Jackson from taxiing any closer to them. The men on the ground knew a good rescue operation when they saw it. They left their cover and raced for the C-123. SSgt. Manson L. Grubbs quickly lowered the rear door, and he and TSgt. Edward M. Trejo helped the three men aboard and secured the door.

As the Combat Control team was scrambling aboard the C-123, Jackson was turning the plane around to take off in the direction from which they had landed.

At that moment Campbell yelled, "Look out!"

Down the runway, straight at them, came a giant 122-mm rocket, whose normal range is six to eight miles. It had apparently been fired at point-blank range and with zero elevation from a ridge off the end of the runway.

The rocket hit short, bounced off the runway, hit
(Continued on following page)



Colonel Jackson and his Congressman, John J. Flynt, Jr., of Georgia's Sixth District, discuss the photo of the C-123 on the strip at Kham Duc (see enlargement, page 101).



Georgia Gov. Lester Maddox and Lt. Gov. George T. Smith were among those at celebration January 29 in Newnan, Ga., hometown of Maj. Stephen W. Pless, USMC, and Lt. Col. Joe M. Jackson, USAF, who earned Medals of Honor in Vietnam. From left: Maddox, Pless, Smith, and Jackson.



The Air Force Reserve Band from Robins AFB, Ga., leads the parade that was part of the ceremony in Newnan, the small town in Georgia that two Medal of Honor winners call home. The awards to Major Pless and Colonel Jackson brought to seventy the Medals awarded thus far in the Vietnam War.

again, bent into a horseshoe shape, and skidded to a stop just ahead of the C-123.

The warhead did not explode.

Jackson taxied carefully around the weapon and applied maximum power for takeoff.

During the tense minutes the C-123 was on the ground, the enemy poured fire at the aircraft and at the running men, but miraculously scored no hits. Now firing continued from both sides, but Jackson kept his eyes locked on the runway ahead until he gained enough speed to become airborne.

Final bursts from the enemy at the end of the runway were as futile as the earlier barrage had been, and the C-123 clawed its way into the sky.

Once out of range, Colonel Jackson turned the plane toward Da Nang AB and safety.

Examination of the craft later showed that not a single enemy bullet had struck it!

Colonel Jackson completed his tour in Vietnam last

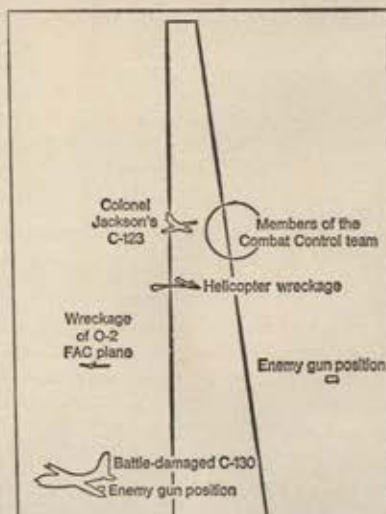
August with 296 sorties flown. During the Korean War he flew 107 combat missions in F-84 jet fighters, earning the Distinguished Flying Cross and other decorations. He had entered the Air Corps in 1941 as an enlisted man and served as crew chief of a B-25 medium bomber before taking pilot training. Later in his career, in the late 1950s and early '60s, he was among the original half-dozen SAC U-2 pilots, based at Laughlin AFB in Texas.

Jackson is the fifty-first airman in history to earn the coveted Medal of Honor in combat. His four predecessors in the Vietnam War are: Capt. Gerald O. Young, a helicopter pilot who helped save a number of surrounded US soldiers (AF/SD, July '68, p. 43); Maj. Merlyn H. Dethlefsen, an F-105 pilot whose persistent attacks destroyed a key North Vietnam SAM site (AF/SD, March '68, p. 42); Capt. Hilliard A. Wilbanks, a FAC who protected a South Vietnamese Army battalion at the cost of his own life (AF/SD, March '68, p. 42); and Maj. Bernard F. Fisher, a Skyraider pilot who landed under fire at the A Shau Special Forces Camp and saved a fellow pilot, in an action in many ways similar to Colonel Jackson's (AF/SD, March '67, p. 42).

The five Medals of Honor earned in the Vietnam War exceed the four awarded to airmen in the Korean War, all of which were posthumous awards. Four airmen, including Capt. Eddie Rickenbacker and "Balloon-Buster" Frank Luke, received the Medal of Honor in World War I, and thirty-eight in WW II. Two other famous flyers—Gen. Billy Mitchell and Col. Charles A. Lindbergh—received Medals of Honor that were authorized by special congressional legislation for peacetime achievements.—END

This remarkable photo of Colonel Jackson's C-123 turning around on the runway at the Kham Duc Special Forces Camp on May 12, 1968, is believed to be the only picture ever made during an action that later resulted in the award of the Medal of Honor. The three members of the AF Combat Control team are toward the right of the photo, opposite the C-123 and running toward it. The C-123, which landed from the top of the picture, could use only about half the 4,000-foot strip, which was blocked midway by a still-burning helicopter.

After turning around and taking on survivors, the C-123 took off toward the top of the photo. Seconds after this picture was made, a 122-mm enemy rocket was fired point-blank down the runway at the aircraft. The rocket failed to explode, and crashed to a stop within yards of the C-123. In the left foreground is a battle-damaged C-130. Skid marks show where it left the runway and crashed into a dirt bank. An enemy gun position is between the C-130's lower wing and tail. Above the C-130 is a damaged O-2 FAC plane that crash-landed. Another gun position is across the runway from the O-2. Debris is scattered over the runway's near end. The smoke in the upper part of the photo is from burning ammunition dumps. The light area at the far end of the runway is a section of the strip that has been patched.





The Air Force Museum is much more than just a repository for old airplanes; it is an open-ended history book that depicts the Air Force saga, in terms of its men and machines, from the first hesitant flights at Kitty Hawk to the marvels of the space age. The Museum's role is summed up eloquently in its preamble: "Since the beginning of time, there have been those men who looked to the sky, who envied birds their graceful, soaring flight, who said to themselves, 'If I could but fly. . . .' This is the story of those men, and how they learned to fly, and the remarkable things that have happened since."

The Air Force Museum— Caretaker of a Legend

By William P. Schlitz

NEWS EDITOR, AIR FORCE/SPACE DIGEST

A METAL sentinel guards the entrance to the Air Force Museum at Wright-Patterson AFB, Ohio. It is the Douglas A-1E Sky-raider flown by Maj. Bernard Fisher the day he bounced to a landing on a rough patch of ground in South Vietnam to rescue a downed fellow pilot being fired on by surrounding enemy troops. For that deed Major Fisher became the first Air Force man of the Vietnam War to be awarded the Medal of Honor (*see AF/SD, March '67*).

That plane and the story behind it symbolize the recurring theme of the Air Force Museum—the men and flying machines that together created the Air Force legend from Kitty Hawk to the technical marvels and achievements of the space age.

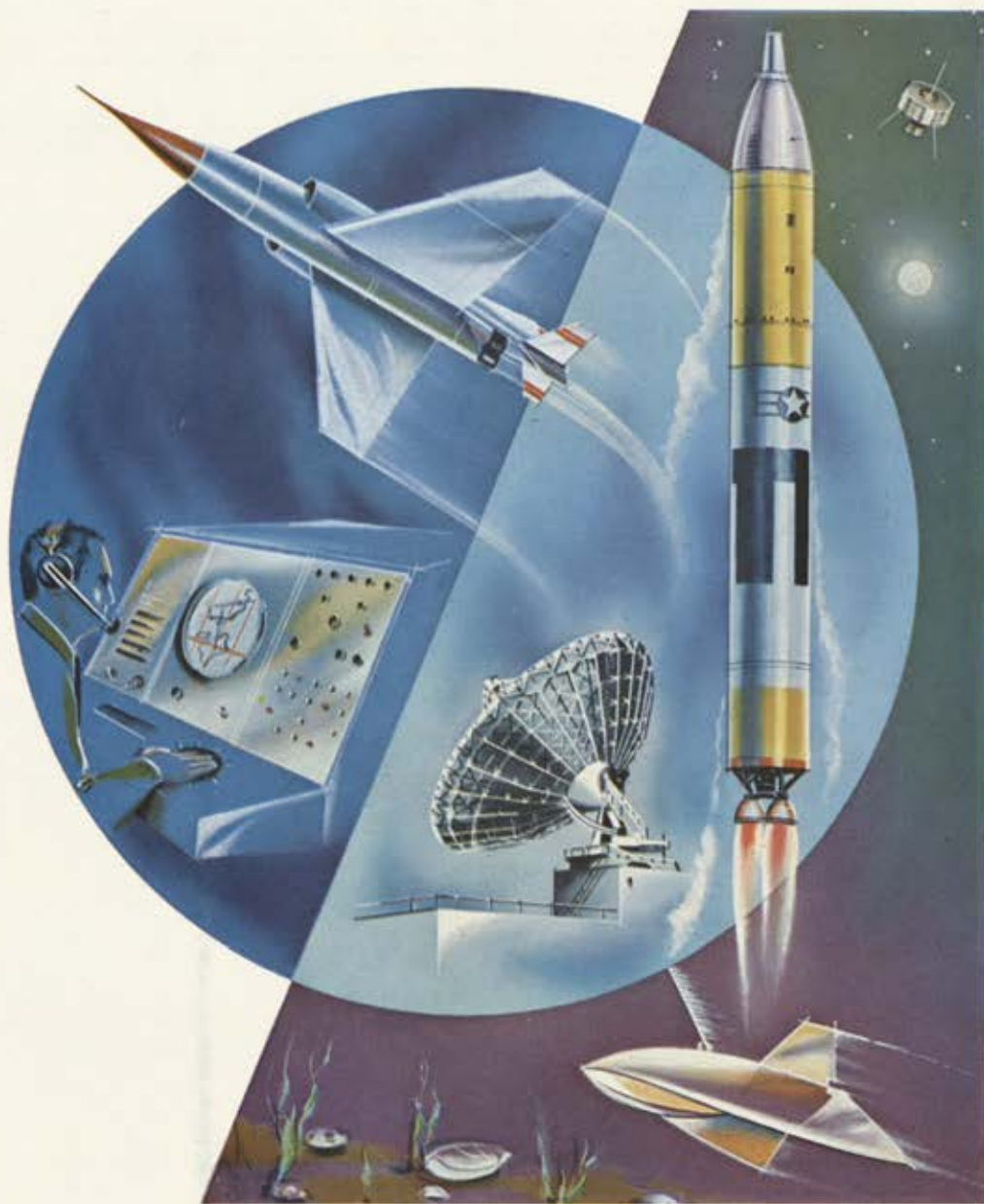
The Museum, then, is much more than a display case for old airplanes. It is an open-ended history book that tells the chapter-by-chapter story of aviation and airpower through the sixty-odd years of manned flight. And thanks to the diligent efforts of the Museum staff, very few pages are missing from the book.

The Museum, under operational control of the Secretary of the Air Force's Office of Information, is located appropriately enough near Dayton, Ohio, home of the Wright brothers during many of their early flights. It is free to the public and open every day except Christmas.

Currently housed in a converted engine-overhaul
(Continued on page 106)



A recent addition to the Air Force Museum that is stirring considerable interest is this B-70, which made its final landing when it reached Wright-Patterson AFB last month. The North American plane had been serving as an SST research aircraft.



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Processed film goes straight to one of two interpretation labs. Flash reports can be issued immediately. Film duplicates are then prepared and routed to other modules for enlargement, printing, titling and storage.

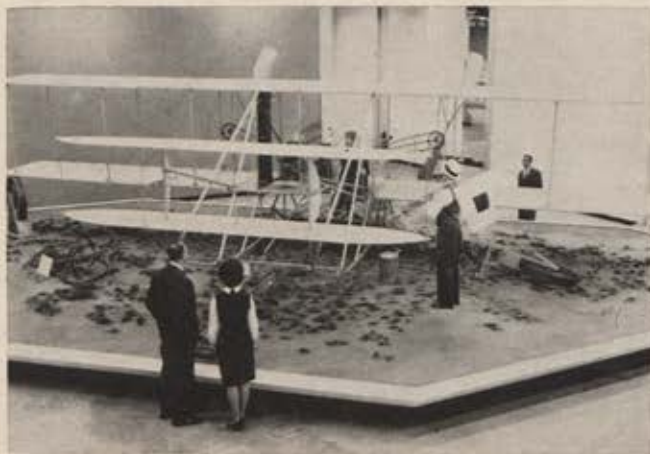
Chemical labs supply WS-430B with its own processing solutions. Maintenance shelters even have lathes and drill presses. All modules are linked by intercom and passageways, served by electrical, water, drainage and air conditioning systems.

Yet WS-430B can be bisected into two self-contained 12- or 13-module facilities. Or used in three- and four-module units where needed.

Goodyear Aerospace, prime contractor for WS-430B Photographic Processing and Interpretation Facility, cuts time and costs by building it from off-the-shelf components. Goodyear Aerospace is now delivering the ES-75 system, consisting of 8 self-contained modules, having the same capability, for *color* aerial reconnaissance photography.

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GOODYEAR
AEROSPACE



On exhibit at the Air Force Museum is this reproduction of the Wright-built, modified Model "A" aeroplane known as the 1909 Military Flyer, the first military aircraft in the world. While in flight the plane averaged 42.583 mph.

shop, the Museum dates back to the wood and fabric aircraft brought back from Europe for testing following the end of World War I. Initially established in a corner of a hangar building at old McCook Field near Dayton in 1923, the Museum since has experienced a turbulent history of moves and interruptions.

With its growth through the years, the Museum has become a major point of interest. Last year some 600,000 visitors passed through it. Because of the vast number of people who have been involved in aviation during its brief span, the Museum has almost universal appeal, and the number of visitors is expected to continue to grow. Grayheads of the '30s era bring their grandchildren to admire the planes that helped set altitude and speed records. Teen-age sons are introduced to the types of jets their fathers piloted above the barren Korean landscape.

The Museum's exhibits are arranged chronologically to reflect the development of aviation. And the displays have been set up with considerable thought to make the best possible use of the limited floor space—an excellent job by the Museum staff that is frequently remarked upon by visitors.

At the outset of a tour, one first sees models and scenes demonstrating man's early experiments with and concepts of flight. A blue panel depicting birds

in flight bears a message that sets an eloquent theme: "Since the beginning of time, there have been those men who looked to the sky, who envied birds their graceful, soaring flight, who said to themselves, 'If I could but fly. . . .' This is the story of those men, and how they learned to fly, and the remarkable things that have happened since."

Next is a portrayal of the Wright brothers' achievements, without which no air museum would be complete. A reproduction of the Wright 1909 Military Flyer equipped with an engine donated by Orville Wright brings to mind how the rich adventure of those first hesitant flights by the two brothers drew the era's reckless young men to their banner. Those men surely appreciated the fantastic potential for manned flight, but each certainly would have been astounded to stroll through the Museum's six decades of aviation history and emerge—in the space age.

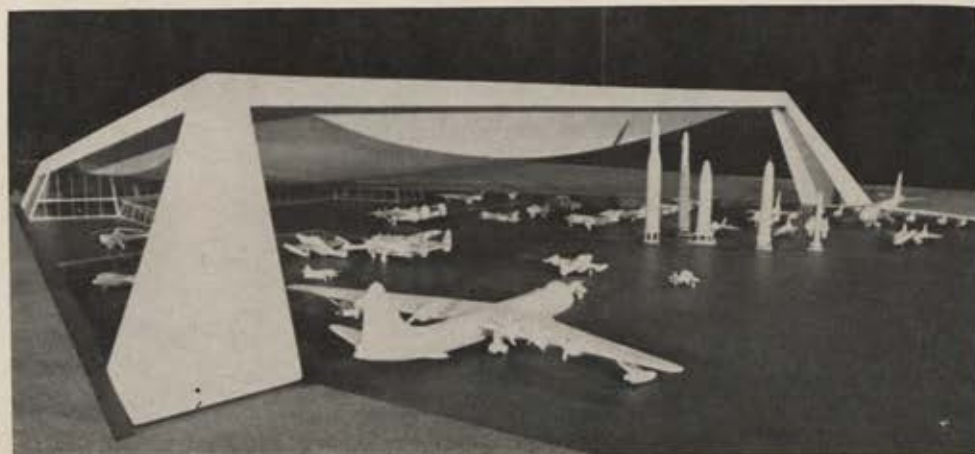
The backbone of the Museum's collection of memorabilia, of course, are the aircraft, many representing almost miraculous breakthroughs in the progress of aviation. Forty-three are exhibited in the Museum. Youngsters viewing such World War I and 1920s aircraft as the famous Curtiss JN-4D "Jenny," the Standard J-1, and the de Havilland D.H. 4 at last are able to put into context such phrases as "flying by the seat of your pants" and learn what "barnstorming" was all about.

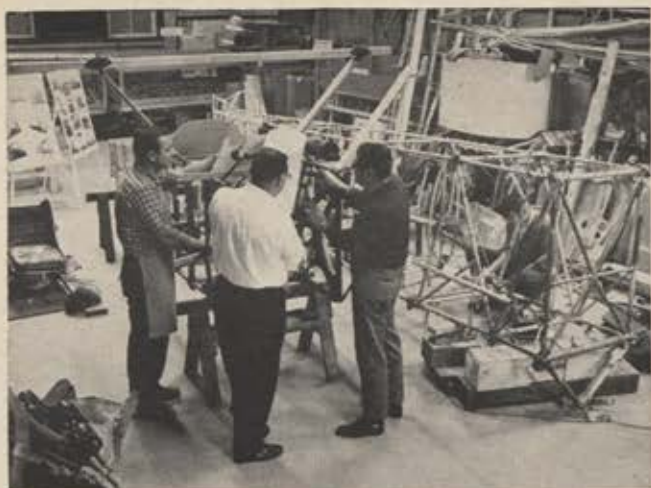
At the opposite end of the Museum's time spectrum is the "now" look of the section devoted to aerospace, where reside the X-1B rocket plane and such other space-age hardware as a Discoverer capsule snatched in midair after reentry. Being prepared for exhibition is the space capsule that carried astronauts Virgil Gribson and John W. Young during the historic Gemini-3 mission in March 1965. Other aerospace items will be added as they become available.

It is difficult to imagine, in this technically sophisticated age, the stir that resulted in 1924 when the World Cruiser *New Orleans*, now in the Museum's possession, was one of two Douglas-built aircraft to complete the first aerial circumnavigation of the globe. The trip took 175 days, with fifteen days of actual flying time. Another, more recent, acquisition of the Museum is the Boeing B-52 *Lucky Lady III*, which, in a similar round-the-world flight in 1957, was able to cover the distance in considerably shorter time—forty-five hours and nineteen minutes nonstop. (This

Model of new Air Force Museum shows giant wedge-shaped arch that will act as an open-air canopy for most of the exhibits.

Funds currently are being raised by the Air Force Museum Foundation to build the new facility. Tax-free donations can be sent to the Foundation, c/o P. O. Box 2586, Wright-Patterson AFB, Ohio.





The chief of aircraft restoration Charles Gebhardt (second from left), inspects work undertaken on the Sopwith Camel being built from scratch. To right of it is the carcass of the O-38 observation plane that crashed in Alaska in 1941.



Still deadly looking is this Russian-built MIG-15 that was flown to South Korea by defecting North Korean pilot Noh Keun Suk on Sept. 21, 1953. MIGs such as this battled our F-86 Sabrejets in "MIG Alley," over North Korea.

aircraft is not to be confused with the *Lucky Lady II*, a B-50 which made the first nonstop circumnavigational flight in 1949.) Of special interest at the Museum also is a Curtiss P-6E Hawk, the last in existence and still considered by many as the most beautiful airplane ever built.

At the outset of both Great Wars, adventurous American lads went off to get in the fight long before their country was openly committed. Consequently, they flew airplanes built by other nations, such as the Spad and Spitfire, both now displayed at the Museum. It was in those planes and others like them that members of the Lafayette Escadrille and the Eagle Squadron helped make air warfare history.

In one area of the Museum, two once-deadly adversaries now at peace face each other across the aisle: a North American F-86 Sabrejet and a Russian-built MIG-15. The MIG was flown to Kimpo Air Base in Korea in September 1953 by defecting North Korean pilot Noh Keun Suk, who received sanctuary and a

\$100,000 reward. He has since graduated from engineering school, has married, and is living in the United States.

It is with nostalgia that many visitors view the famous World War II Mustang and Thunderbolt on display. Once again in memory the old arguments are heard regarding the respective merits of the two aircraft. The North American P-51 Mustang had great range and speed, its proponents would say. Yeah, but the ol' Jug was sure to get you home, Republic P-47 pilots would counter.

Where possible, the stories of the men who flew the planes are featured in original photographs and text displayed on panel walls, along with other items of interest. And in a special room is the Aviation Hall of Fame, established to give recognition to those who contributed much to the advancement of flight.

Although the Museum is designed for touring without guides, at fifty locations brief electronic messages explaining exhibits can be heard through wireless "By-Word" headsets rented for a small fee from a concessionaire. And on Saturdays, Sundays, holidays, and when otherwise requested, films on a variety of Air Force and aviation subjects are shown in the Museum theater. Contemporary paintings in the Museum's art gallery can be viewed at any time and offer a panorama of Air Force activity from a remote radar station in Alaska to a street scene in Tokyo.

(Continued on following page)



The P-40 was one of America's leading fighters at the outset of World War II, winning enduring fame as the aircraft used by the Flying Tigers trying to stem the Japanese tide in Southeast Asia. The P-40 also saw action in North Africa.



Affectionately called the "Jug" by the men who flew it, the P-47 Thunderbolt was known for its ability to take tremendous punishment from enemy fire and return safely to base. It could more than match German planes in dogfights.



The Standard J-1 used by the Aviation Section during World War I for primary flight instruction. The airplane on display has only sample fabric covering to show wood and wire-braced construction in vogue during 1917-18 period.



Another World War I-vintage aircraft is this Standard E-1 single-seat advanced training pursuit plane operational during late 1918. Most aircraft flown by American pilots in World War I were manufactured by the British and French.

The Museum is constantly on the lookout for vintage aircraft it can add to its collection. But competition from other museums, private collectors, and manufacturers is fierce. Of the thousands of military aircraft produced during the two World Wars, few remain intact. Treaty stipulations brought about the destruction of many following World War I, and vast fleets of aircraft were destroyed after World War II because of the cost of storing and maintaining planes considered outmoded.

The Museum will accept any World War I aircraft. On its shopping list from the 1919-1941 era are a Boeing P-12 and B-9; Curtiss A-8 or A-12; Martin B-10 or B-12; Northrop A-17; and Seversky P-35. World War II planes the Museum would like to acquire are a Messerschmitt 163 and a Mitsubishi Zero.

The Museum, of course, can rely on Air Force help in obtaining planes to fill the gaps in its collection. When Charles Gebhardt, head of the Museum's Aircraft Restoration Division, got wind of the location of a pre-World War II O-38 observation plane that had crashed in the Alaskan wilds in 1941, he enlisted Alaskan Air Command assistance in a salvage effort. (See "Operation O-38, A Salvage Adventure in Alaska's Deep Freeze," February '69 issue, p. 56.) The carcass of the aircraft, remarkably preserved during its long sleep, is now in the hands of the Museum, and Mr. Gebhardt hopes to have the plane completely restored and on display within a year or so.

If an aircraft specimen is simply not to be had, the Museum has experts among its staff of forty-three who can build historic replicas from scratch using original plans and designs. They often will incorporate resurrected armament, engines, and other equipment once aboard the original. Fans of comic-strip character Snoopy will be glad to know a Sopwith Camel is being constructed in such a manner.

The stress in such projects is authenticity, as it is in the other exhibits.

Over the years the Museum has gathered together a huge amount of historical material, much of it donated by the individuals involved, such as flight



Beautiful to look at and, according to the men who manned it, great to fly was the P-51 Mustang, which earned high marks during World War II for its speed and range. Many consider it the best fighter aircraft produced in WW II.

clothing from World War II ace Don Gentile; personal items from the B-25 crews of the Tokyo raid led by Jimmy Doolittle; and items such as compasses and tunneling equipment ingeniously constructed from bits and scraps of material by escape-minded prisoners of the Stalags during World War II. In fact, the activities of the men behind the wire merit much more attention than the Museum is capable of giving them because of its space limitations.

That is a major problem. The infusion of such a large amount of hardware and other material has put a severe strain on Museum space, with the result that many items of particular interest cannot be shown. Adjoining the Museum building is a four-and-a-half-acre airplane park that currently accommodates an air armada of more than forty aircraft, exposed to the deteriorating effects of the weather.

A project to build a new home for the Museum to solve these and other problems has been in the works

A success from the start, the French-produced Spad VII fighter was put into immediate production after its initial flight in 1916, and saw action in both French and English units. Americans in the Lafayette Escadrille were equipped with it.



for some time. The Air Force has set aside a 200-acre site at Wright-Patterson to house a new facility, and architectural and exhibit designs have been drawn up under the direction of the Air Force Museum Foundation (see "Space for Our Air Heritage," January '65 AF/SD, p. 40). The central problem is funds, and although the Foundation has been successful in generating almost \$4 million in contributions, considerably more is needed before actual construction of a new home for the Museum can begin.

The main architectural feature of the new home planned for the Museum is a huge space-age canopy made of steel cables and topped by a steel deck. It is to cover eight acres or about 350,000 square feet, four times the space of the current facility. The canopy, designed by Kevin Roche John Dinkeloo & Associates (formerly Eero Saarinen & Associates), of Hamden, Conn., will be supported only at the four corners and will form a wedge-shaped arch, running from ground level entry at the narrow end to 130 feet high and 700 feet across at the wide end. Three sides will be open.

Both indoor and outdoor space will be used in the new facility but all will be under cover. As previously, the displays will be arranged in chronological order, with the early, fragile aircraft contained in an air-conditioned enclosed area. Herb Rosenthal & Associates of Los Angeles designed the new structure's interior displays.

Upon being admitted into the new Museum facility at the low and narrow end of the structure, visitors will move past the replica of the 1909 Wright Flyer and the unfolding story of military aviation out of the sunken air-conditioned area to the larger end of the Museum arch. Later model aircraft will be in an open environment but still under the immense canopy. The larger planes will be near the open end where the ceiling is highest. Outside the high end the most modern aircraft will be on display, parked in the open air and on a ramp, thus placing them in a realistic setting.

To present important phases or aspects of such aviation developments as propulsion and armament technology, various clusters of displays called "inner museums" will be seen on promontories and elevated floors. These will provide the thread linking the Air Force story in the flow of time. Smaller "time capsule" clusters will detail specific events such as the Berlin Airlift or development of the atomic bomb.

In talking with the Museum's director, Col. Joseph D. Hornsby, a visitor learns that the long-range goal of the Air Force Museum is not simply to be a repository for items having historical interest in respect to military aviation. One main objective is to serve as an educational facility to teach the young about aviation through a panoramic view of its advancing technology, and to acquaint them with the vibrant excitement of aviation's past.—END



The P-26 marked the transition from liquid-cooled, fabric-covered biplanes to air-cooled, metal-skinned, low-wing monoplanes. Hopelessly outdated by 1941, it was no match for Japanese fighters and was quickly replaced by more advanced aircraft.





Tough machine for a tough war.

What happens when a Light Observation Helicopter has to get right down in the trees to root out Charlie?

When it often has to slug its way out of a tight corner?

When it's loaded with wounded GIs, extra guns, extra ammo, assorted field gear . . . pushed to maximum performance day after day?

When the LOH in question is the Army's Hughes-built OH-6A Cayuse, it inspires raves like these from the men who fly it:

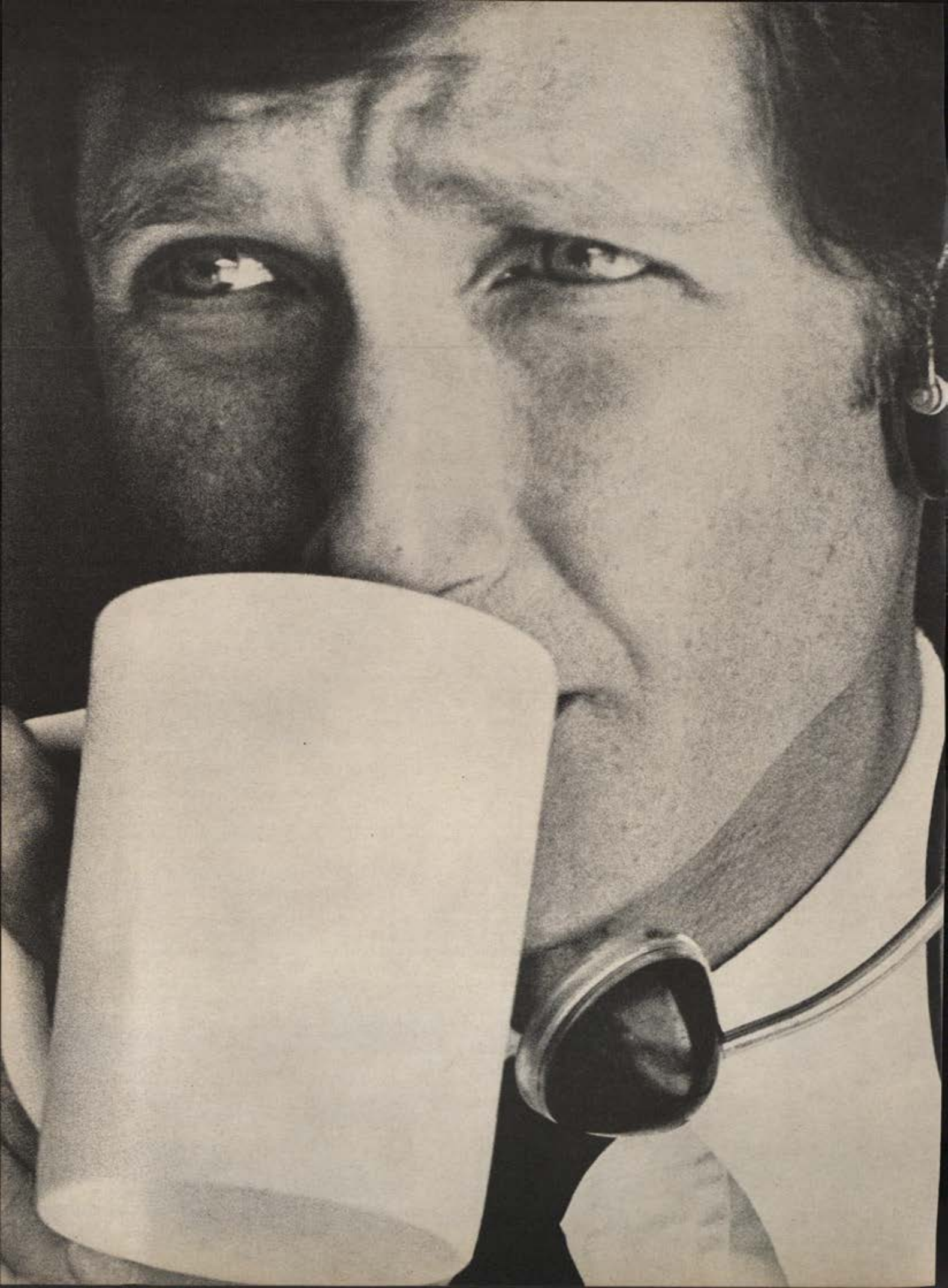
"A very survivable aircraft . . . Will take one hell of a lot of punishment and still fly home. It will stay flyable after it has been pretty well mauled." — Aviation Unit Commander.

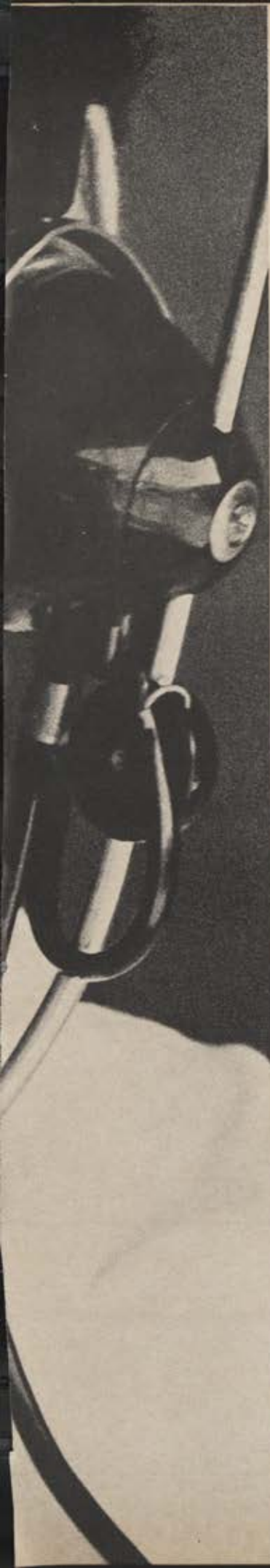
"Pilot and ground-soldier response to the Cayuse has been described by a two-star general who says soldiers are 'absolutely delighted' by its performance." — Trade journal article.

"This bird continues to fly under the most extraordinary conditions. It is the only ship to be in if you have a crash." — OH-6A Squadron Commander.

It's the kind of machine the men who fly it deserve. The Cayuse — world's most proven light turbine helicopter — made by Hughes Tool Company, Culver City, California.

Hughes Helicopters





Meet George Carver, tower controller. Right now there's a no ceiling condition. 150 foot RVR. And he's just assigned runway three-one to eight aircraft. They'll all land within one-and-a-half minutes.

Are you kidding, George?

Nope. All eight airliners are locked onto a predetermined flight profile. Each one different. From different directions. At different altitudes. The one directional ILS is a thing of the past. The big stack jobs have been eliminated. The tower guys don't sweat so much anymore.

That's the function of our automated Path Guidance System. For tomorrow's V/TOL and STOL configurations. It should be operational on the passenger shuttle helicopters in the near future.

It's being tested on a Sikorsky CH-3 V/TOL flying test vehicle under Air Force sponsorship right now. And we're working up to further testing in an actual V/TOL aircraft.

The Path Guidance System's not limited to one-direction/one-glide slope. Multiple courses and artificial glide slopes are selected by tower control. These are numbered approach profiles selected from 360° which, on instruction, the pilot sets into an on-board real-time letdown computer. (We have them working up to thirty miles out now. The goal is a hundred.)

The letdown from cruise altitude and final approach is taken over by the path guidance system. That system gives command signals to the aircraft AFCS and displays. It consists of a letdown computer, flight command computer and displays.

The letdown computer is digital; it holds the aircraft to within 5 feet (from

3½ miles out to touch down) within a selected glide path. The interface between it and the aircraft sensors from the AFCS and the displays is the flight command computer.

A new vertical situation display shows the whole flight path to the pilot whether he is locked on fully automatic or flying manually. Additional new displays show altitude rate, radar altitude, flight path angle, and command information being fed to the AFCS.

For Commercial V/STOL applications, this means that the old 2½°, five mile glide slope is out. Variable approach path is provided. More efficient operation. Aircraft approach profile can be adjusted for noise abatement and obstacle clearance. All this will be vital for faster arrivals and departures in the up-coming higher density air travel.

For the military, it's lives. Return of downed crewmen and wounded soldiers. Fast. Out of range of hostile guns. And on the beam. Without having to be told by the man on the ground, move here, move there. And it can be done with one directed rescue plane. Not a groping group.

It's a pretty exciting prospect. And well past the slide rule stage. Not operational yet but in test. We've prepared a pamphlet on "Flight Path Guidance Systems for STOL and V/TOL Aircraft". It's easy to understand and is available by writing.



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By Stefan Geisenheyner

AIR FORCE/SPACE DIGEST EDITOR FOR EUROPE

Germany's VC 400 VTOL Transport

For several years the Vereinigte Flugtechnische Werke, Bremen, Germany, has had under way development of a medium VTOL transport destined for military as well as commercial use. This aircraft, designated VC 400 (Vertical Cargo), is a four-engine, tandem, tilt-wing design. Ground tests are scheduled for this year, and the first flight is planned for mid-1970.

The VC 400 will combine the properties of a helicopter during vertical takeoff with the characteristics of a high-speed turboprop transport aircraft in conventional flight. For military applications it fills the gap between helicopters and light STOL transports. It is additionally capable of several operations normally carried out by either of these aircraft types. The maximum speed of the VC 400 is given as 466 mph. The radius of action, including four VTOL operations for a lo-hi-lo mission with a payload of five tons during outbound flight and 2.5 tons during the return leg, is estimated to be 746 miles without refueling. The aircraft will have a ferry range of at least 3,790 miles.

The German Ministry of Defense has funded the research since 1967 with the goal of having two experimental prototypes flying by 1970. Ground-based testing of a non-flyable aircraft system is to begin this year to be followed in 1970 by the maiden flight of the first experimental model. To keep developing costs at a minimum, VFW designers have incorporated off-the-shelf hardware wherever possible. For new developments, contracts were awarded only to companies possessing extensive experience in the pertinent field. One example of this might be the propulsion system.

The heart of the VC 400 concept is the propeller and engine design. The propulsion system consists of four turboshaft engines, reduction gears, and a shaft system that interconnects the four propellers. The VC 400 standard model is to be equipped with engines capable of delivering 5,000 hp each at takeoff. The test models will use General Electric's T64-GE-16 of 3,980 hp that became available



The VC 400, destined for both a military and commercial role, combines the properties of a helicopter during vertical flight with the characteristics of a high-speed turboprop transport aircraft performing a conventional flight.

last year. This engine is produced for the US Army's AH-56A Cheyenne combat helicopters, and the predecessor of this engine is used in LTV's XC-142 V/STOL transport.

The choice of this off-the-shelf propulsion unit lowers the design costs considerably. All four engines are interconnected by a shaft system that balances power demands and propeller outputs. Uneven power demands are created by center of gravity shifts in flight or power decay in one or more engines. The shaft system can compensate for the loss of one engine without requiring trim changes in the aircraft.

The propeller is the other design factor critical to the success of the VC 400. High thrust on the ground must be combined with excellent efficiency at high-speed flight. The Hamilton Standard Division of United Aircraft is responsible for development and construction of the unusual propeller and the associated reduction gears. Since the length of the propeller blade is about twenty-one feet, it had to be designed as a hollow structure. A main spar of titanium alloy serves as the core for the outer skin, which consists of a laminated glass fiber epoxy compound.

Owing to the moderate downwash effect of the propellers as compared to jet-lift VTOL, the VC 400 can operate from any landing surface that a helicopter can use. For civilian use, the low noise level makes it suitable for use on city-center heliports, and its high cruise speed, range, and payload capabilities promise excellent productivity. Additionally, the VC 400 concept offers a high degree of design flexibility. With a minimum of risk, cost, and time, larger or smaller VTOL aircraft can be derived from the basic concept.

RAF Survival Training in the Alps

For several years the Royal Air Force has been operating a survival training school in the Bavarian Alps during the first three months of the year when snow and sub-zero temperatures create conditions of nearly Arctic severity in isolated valleys that are not too far from celebrated Alpine ski resorts.



Ground tests of the VC 400 being developed by Germany's Vereinigte Flugtechnische Werke are scheduled for sometime later this year, with first flight of the four-engine, tandem, tilt-wing aircraft to be undertaken in mid-1970.



The RAF's survival training school in the Bavarian Alps offers ten-day courses that teach students how to cope with the environmental and physiological problems of winter survival when a minimum of equipment is on hand.



Practice sessions in the snow help men from RAF bases in Germany, Britain, and Cyprus to harden for the school's big test of four days and nights in a lonely mountain valley. Above is a happy "survivor" of the Arctic conditions.

This year, 150 RAF aircrew members and a team of doctors reported to the RAF Winter Survival School at Bad Kohlgrub near Oberammergau, Bavaria. They came from RAF bases in Germany, Britain, and Cyprus.

In a series of ten-day courses the students begin with the environmental and physiological problems of winter survival and how to cope with them when the only equipment available is a parachute and the standard personal survival pack. Practice lessons in the snow help to harden the students for the rigors of four days and nights in a lonely mountain valley. Frostbite, exhaustion and hunger, snow, and icy cold are their enemies. Discipline, ingenuity, the few square yards of the parachute's nylon, a heavy knife, and a bar of chocolate are their only friends.



Late last year, US airlift forces in Europe were reorganized, with the Airlift Command's 322d Air Division becoming the 435th Military Airlift Support Wing. European airlift is supplied through use of planes like this C-141.

Watching from the sidelines during the field survival phase of the exercise, and ready to step in if a student shows signs of permanent danger to his health, is a tough instructional staff from the RAF school of Combat Survival and Rescue at Mountbatten, Plymouth, England, one of the world's leading "universities" of practical survival training.

MAC Reorganizes European Airlift

A reorganization of airlift forces in Europe in December 1968 included the redesignation of the Military Airlift Command's 322d Air Division to wing status and establishment of a US Air Forces in Europe (USAFE) Airlift Control Center at High Wycombe Air Station, England, the home of the wing's headquarters. The 322d Air Division was redesignated the 435th Military Airlift Support Wing to operate aerial ports of embarkation and debarkation in Europe in support of USAFE and MAC. The 435th is directly assigned to MAC's Twenty-first Air Force, headquartered at McGuire AFB, N. J.

Units under the 435th include MAC support squadrons in Libya, Spain, England, Greece, Turkey, and Germany, and an aeromedical evacuation squadron at Rhein-Main. The support squadron at Torrejon, Spain, also directs a network of operating locations for airlift support in an area including such remote places as Addis Ababa in Ethiopia, Karachi, East Pakistan, and Teheran, Iran.

Originally constituted as the 435th Troop Carrier Group in January 1943, the unit was assigned to drop paratroops of the 101st Airborne Division into France on D-Day of the Normandy invasion in World War II.

Similar combat airlift jobs kept the unit busy flying troops, supplies, and equipment into Italy, France, and Germany. Many old-timers who were in German prison camps at the end of World War II will remember the 435th as the unit that flew them back to more agreeable surroundings.

British Ship Strengthens NATO Flank

Britain's 12,000-ton helicopter assault ship *HMS Fearless*, with Royal Marines of No. 45 Commando Group on board, sailed from Devonport in the south of England for the Mediterranean on January 15.

The ship is the first installment of the enlarged British naval contribution to the North Atlantic Treaty Organization defense whereby an assault ship, commando ship, or aircraft carrier will be deployed in the Mediterranean almost continuously throughout the year. The increased Soviet activity in this area provoked a strong NATO re-

(Continued on following page)

sponse, of which the stationing of these ships is an essential part.

While in the Mediterranean, the *Fearless* and the embarked forces will carry out amphibious training exercises in conjunction with the forces of other NATO nations and pay a number of courtesy visits to ports of friendly countries. She also will give demonstrations of her capabilities to NATO military observers. As an assault force headquarters ship with a worldwide communications system, the *Fearless* is one of the most modern ships of her type in the NATO alliance.

RAF Orders New Trainers

The British Aircraft Corp. (BAC) has received a contract to build more than 100 Jet Provost Mk 5 basic trainers for the RAF. This followed the decision to replace the existing Mk 4 Jet Provosts as announced in Britain's 1967 White Paper on Defense.

The new aircraft is designed to meet the RAF's growing training requirements for the '70s and beyond. The Mk 5 is equipped with the well-proved Rolls-Royce Viper II engine of 2,000 pounds thrust, which also is used in the Mk 4. The major attribute of the Jet Provost Mk 5 is an improved high-altitude performance due to a fully pressurized cockpit. This makes high-altitude flying much safer than in the unpressurized Mk 4 since it reduces fatigue and results in more efficient performance of the instructor-pilot, who may be required to climb to 35,000 feet four or five times a day.

The Mk 5 has greater wing strength and a substantially longer estimated airframe life and is better equipped to withstand the repeated takeoffs and landings involved in training. The wing carries more fuel than the Mk 4 so that all normal training can be carried out without the use of tip tanks, which can be fitted for extra range while flying navigational exercises.



Royal Marine Commando unit set to board helicopters of Britain's assault ship *HMS Fearless* in training exercises in the Mediterranean in conjunction with other NATO forces. Britain has agreed to beef up its Med contingent.



Pictured here are the Jet Provosts of the RAF Central Flying School formation team, the Red Pelicans. More than 100 of the Mk 5 version have been ordered by the RAF to meet its training requirements in the 1970s and beyond.

The Mk 5 is a version of the BAC 167 "Strikemaster," a company-financed development of the basic Jet Provost. The BAC 167, of which seventy-six have been sold to foreign customers, is equipped with the more powerful Viper 20 engine of 3,410 pounds thrust. This aircraft retains the good basic training characteristics while doubling as a light ground-support and strike fighter. Strong points on the wings enable the aircraft to carry a weapon load of up to 3,000 pounds.

Low-Cost Parachute for Supply Drops

A new type of parachute, to which extra panels can easily and quickly be added to increase the size of the canopy and enable it to carry larger loads, promises to achieve substantial cost reductions in military and civilian supply dropping.

Developed by the G.Q. Parachute Co., Ltd., of Britain, the canopy, manufactured in polypropylene reinforced with Terylene cloth, is constructed in a series of square sections that are actually tied together by hand, producing a cruciform shape. By adding extra panels the load-carrying capacity can be increased. The whole design is aimed at easing storage and handling, and the parachute is also easily repairable since the damaged panels can be quickly exchanged.

The cost of each parachute is claimed to be up to fifty percent lower than for any conventional parachute of comparable performance and the canopy can therefore be regarded as expendable if recovery is difficult.

Four different parachutes in load capacities ranging from 300 pounds to 2,000 pounds were demonstrated recently for the RAF when a variety of containers were dropped. No decision has been made yet about mass procurement of the new device.—END



Our van delivery area takes in the Los Chiles swamp strip

Los Chiles is on the Pacific coast of Costa Rica, but you won't easily find it on the map. For about three months recently, it seemed that nobody knew that it was there.

Because Los Chiles isn't accessible on the San José to Puntarenas railway line. No road reaches it. And its tiny airstrip cut into the jungle was water-logged.

So when our Skyvan appeared over Los Chiles and came in to land it was a very welcome sight.

It brought rice, sugar, insecticides, beds, bedding and a bicycle. It was the only way they could reach Los Chiles. No other aircraft capable

of a 4,000 lb payload could possibly have landed.

For Skyvan it was all in a day's work. In less time than it took for the ox-carts laden with goods to make their way off the airstrip, Skyvan had unloaded, taken on its outgoing cargo, and left.

In just six minutes Skyvan can be converted from a 780 cubic feet freighter into a 19-seat passenger aircraft with toilet and baggage compartment. Its twin Garrett AiResearch 331-201 turboprop engines develop 715 shaft horse power each. Take-off without significant payload penalty can be made in ISA + 20°C

conditions even from airstrips 5,000 ft above sea level.

Is this the sort of all-purpose sturdy workhorse capacity you could use? Drop us a line, and we'll send you full details. Let us show you what Skyvan can do.

'Hasta la vista', as they say in Los Chiles.

SHORTS
SKYVAN
Short Brothers & Harland
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By Irving Stone

WEST COAST EDITOR, AIR FORCE/SPACE DIGEST

F-15 Tactical Fighter Costing

The request for industry bids for the new F-15 tactical fighter specified a fixed-price-incentive (FPI) contract for the aircraft's development and production. But it appears that the Air Force has opened the door for the shift of risk from the contractor back to the government for this major program.

The proposals were submitted for the current contract, definition phase late last year. Possibly because of several "no-bid" responses, potential contractors then were invited to suggest a definitive alternative contractual approach which would lead to a fixed-price contract at an early, appropriate point in the acquisition phase.

Indications are that, as a result of this invitation, competing contractors have elected to propose a cost-plus-incentive-fee (CPIF) reimbursement for development, with an early transition to a fixed-price arrangement at some point in the initial limited-buy of the aircraft. This is a distinct departure from the fixed-price contractual arrangement used to acquire the huge C-5 logistics aircraft, and for the planned acquisition of the Navy carrier-based VSX antisubmarine warfare aircraft for which Lockheed and Grumman are competing.

The consideration for change in the contractual approach in the F-15 program may have been stimulated by the receipt of four "no-bid" responses out of eight contractor solicitations. The Air Force may have felt that the projected fixed-price contract possibly could have been a strong consideration in the "no-bid" responses.

Contractors solicited included Boeing, Fairchild Hiller, General Dynamics/Ft. Worth, Grumman, Lockheed, McDonnell Douglas, North American Rockwell, and Northrop. "No-bid" responses were submitted by Boeing, Grumman, Lockheed, and Northrop. After the remaining contractors submitted proposals, Fairchild Hiller, McDonnell Douglas, and North American Rockwell each were awarded \$9.6 million contracts for the six-month definition phase.

Sandpiper's Hybrid Power

The Air Force's Armament Development Center, Eglin AFB, Fla., is supporting a program to static-test a full-scale hybrid rocket motor engine for the operational version of the Sandpiper target missile. United Technology Center, Sunnyvale, Calif., developer of the engine, will perform the task under the Air Force contract, and will measure infrared emission plus engine performance.

The engine uses a common plastic as its solid propellant and a combination of nitric oxides as the liquid oxidizer.

Flight tests to demonstrate the engine's feasibility and performance for application to the Sandpiper's role were conducted in 1967 and 1968.

Space Station Coming Up

Recent space feats—the astounding Apollo-8 manned lunar orbit and the orbital docking of the Soviets' Soyuz 4 and 5 sister spacecraft highlighted by the transfer of crew members—is sure to focus increased attention on the space-



Astronauts Pete Conrad (left) and Dick Gordon (center) study Apollo spacecraft model under harsh light in Lockheed's Solar Illumination System, Sunnyvale, Calif. Solar glare might be a problem in future docking operations.

station programs contemplated by both the US and the Soviet Union.

The closest US approach to a hardware-implemented space-station effort has been the Air Force's Manned Orbiting Laboratory (MOL) program. And this program has been dragging since its inception because of national policy ramifications and the brake on funding. There are but five flights planned—three unmanned and two manned—and the first will probably not occur before mid-1971. No follow-on effort has been approved.

The National Aeronautics and Space Administration undertook initial space-station studies both in-house and within industry some years back. But in light of space program advances, these would seem, at best, useful for background data only.

However, new basic analyses in NASA indicate that the time is ripe for initiating a new space-station effort to be kicked off with a program-definition phase, with bids for industry response which tentatively were scheduled to be issued late last month for a nine-month study. This program definition would encompass preliminary planning and conceptual design. On this phase and such associated ancillary studies as definition of experiments and engineering requirements, experiment module concepts, launch facility requirements at the Eastern Test Range, and data management, NASA may spend slightly over \$10 million in 1969.

As the NASA space-station program and the Air Force's MOL program proceed, particularly when MOL becomes manned-operational, government scrutiny can be expected to focus on aspects of cost, commonality features, and feasibility of conducting a consolidated program. One indicator pointing to increased cooperation between NASA and

the Air Force is the appointment of the new Secretary of the Air Force—Robert C. Seamans, Jr.—who in January 1968 resigned the NASA post of Deputy Administrator, after long service with the space agency. With this background and his new responsibilities as Air Force Secretary, space-station evolution probably will get close analysis from him. A long-term resupply space station could function in numerous workhorse roles to pace future manned spacecraft developments—both civil and military.

The new NASA space-station planning is being handled by its Office of Manned Space Flight at NASA headquarters. A NASA over-all committee is expected to select two winners from industry members responding with proposals. And to spread the workload, NASA is expected to direct that one winner report to its Manned Spacecraft Center, the other to its Marshall Space Flight Center. Each of the two industry contracts may be funded at approximately \$2.5 to \$3 million.

Anticipated are configurations accommodating a minimum of three astronauts and a maximum of twenty-four. The configuration may evolve to house nine to twelve crew members—a sizable complement for a beginning.

The space station could gross about 200,000 pounds. It's possible that the boost vehicle could be a combination of two Saturn stages—the Boeing S-IC (first stage) and the North American Rockwell S-II (second stage). This booster probably would be used to loft partial space-station payloads up to 150,000 pounds to a relatively low earth orbit, with assembly of the entire station in orbit.

Space-Station Ferry

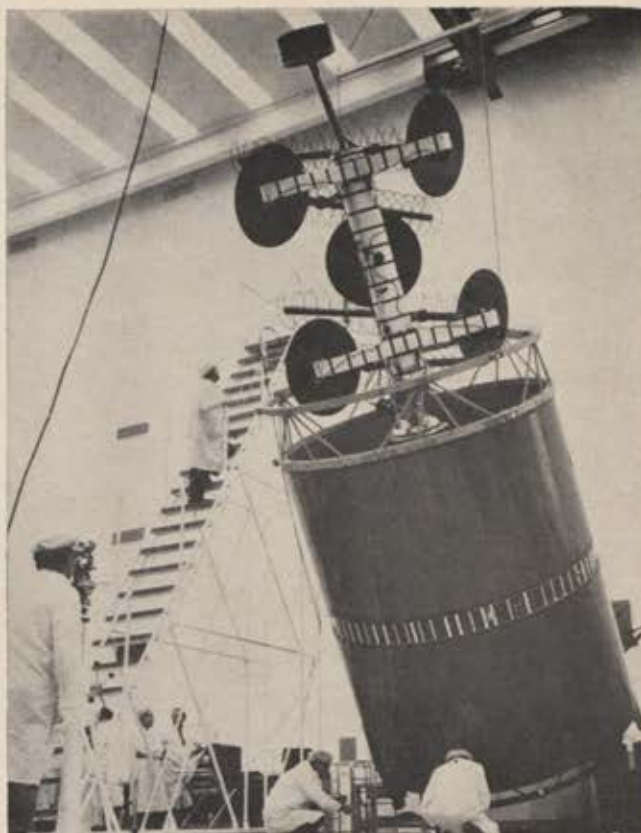
Complementing NASA's projected space-station effort is a requirement for an analysis of a logistics vehicle—an integral launch and reentry system—for transport of a crew and cargo between the earth and orbit. The operational period for this space ferry is visualized for sometime after 1974, with the vehicle concept stressing greatly improved safety and targeted to achieve drastic cost reductions.

Proposals for the study, submitted late last year by industry members, are being evaluated jointly by NASA's Manned Spacecraft Center and Marshall Space Flight Center. The NASA plan is for each center to award one contract, so that parallel eight-month analyses, patterned after the same requirements and guidelines, will be available for comparison.

The approach to the study contemplates new technologies such as medium to high lift-to-drag relationships and one and one-half propulsion stages for attaining orbit, as might be expected in a combination launch and spacecraft with expendable tanks. The expendable tanks are considered to be the half stage in this concept and are jettisoned prior to orbit. The spacecraft would contain additional propellant so that the remaining stage could enter orbit. A cargo/propulsion module in the recoverable portion of the vehicle will be considered in the analysis.

The space station to be resupplied by the logistics vehicle would have nominal orbital characteristics of a 260-nautical-mile altitude and an inclination of fifty degrees, but a range of altitudes between 100 and 300 nautical miles and inclinations from twenty-eight to ninety degrees also will be considered. Payload capabilities to be analyzed would be 5,000 to 50,000 pounds, exclusive of the spacecraft's weight.

The vehicle will accommodate up to twelve people plus a significant amount of return cargo inside a reusable compartment. And the cargo and crew accommodations would be interchangeable. The use of external provisions to accommodate one-way cargo in disposable containers also will be analyzed.



Experimental 1,600-pound tactical communications satellite built by Hughes Aircraft Co. is to provide 10,000 two-way telephone channels when put into synchronous orbit. The DoD satellite recently arrived at Cape Kennedy, Fla.

Transfer of the crew from the logistics vehicle to the space station would be by internal passage—no extra-vehicular transfer operations will be considered.

Required durations for the logistics vehicle would include up to 180 days in quiescent orbital storage. For the terminal landing scheme, deployable rotors, variable-geometry wings, power-on landings, and propulsive lift devices will be investigated.

The logistics vehicle would have to be able to land at a preselected site in the continental US but would incorporate a twenty-four-hour post-landing capability with recovery aids and survival gear.

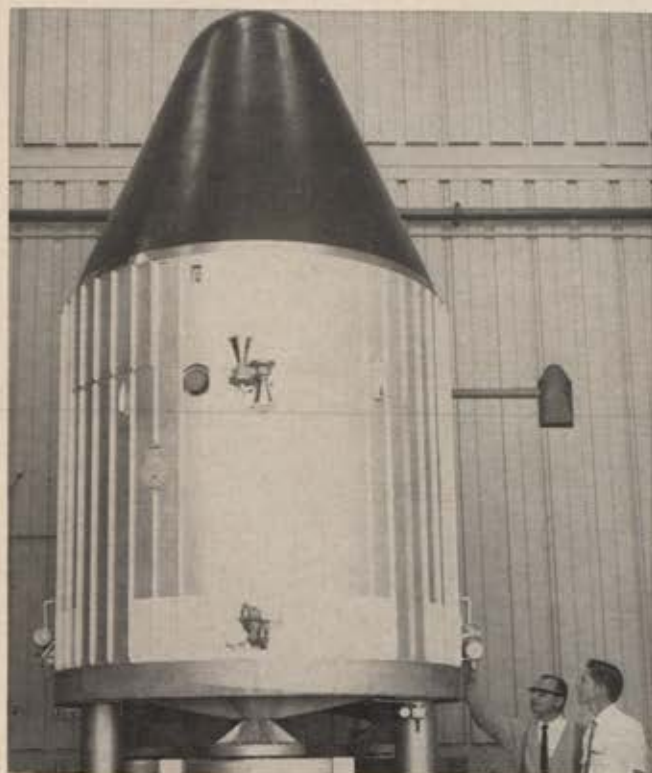
The logistics role may not be the vehicle's only function; the study also will analyze the feasibility of it serving as an "orbital tug" to maneuver space stations, if this is deemed necessary.

Hard Silo Progress

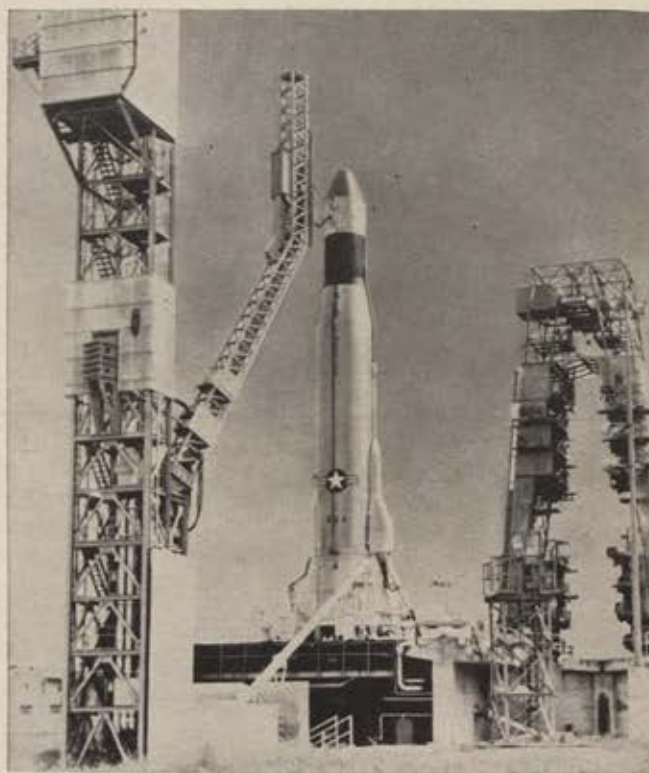
Preparations for underground land-basing of USAF's next-generation ICBM took a big step near the close of 1968 when the design phase for the hard-rock silo got under way, with requests to large construction-engineering companies to submit competitive proposals. At least six companies were expected to try for the design study contract.

The technical and management aspects of the design proposals were submitted to Air Force's Space and Missile Systems Organization on February 17, to be followed by silo cost data on March 3. As much as \$50 million may be allocated to the hard-rock silo effort in fiscal 1970.

A number of potential hard-rock silo emplacements have
(Continued on following page)



Build by Space and Reentry Systems Division of Philco-Ford, the Reentry Measurements Program Phase B payload delivery vehicle gets final check before being placed aboard an Atlas missile for its launch down the Western Test Range.



Reentry Measurements Program Phase B payload delivery vehicle atop Atlas missile at Vandenberg AFB, Calif., prior to launch. Data from Philco-Ford, joint AF-Army project will help determine reentry effect on space-shot payloads.

been selected tentatively in the US. But probably none has been firmed. There's a distinct possibility that hard-rock locations may be surveyed by remote sensing from aircraft to establish the feasibility of eliminating the conventional and laborious routine required for surface and subsurface analyses by ground-based crews.

One location was surveyed in the summer of 1968 as a pilot site to establish the feasibility of airborne remote sensing. The data, now being evaluated by the Air Force, were to be verified by comparison with established (ground-truth) information. A second phase in the aerial remote-sensing effort, also aimed at indicating the most suitable instrumentation to acquire adequate site information, probably won't be flown until this April or May.

Along with hard-rock basing, the possibility of using old mines for advanced ICBM basing still hasn't been written off. And fixed emplacements are not being studied exclusively; mobile basing with off-road slow- and fast-speed capabilities still is under consideration.

Meanwhile, a specific configuration for the next generation ICBM isn't firm yet. The probability is that it won't be larger in diameter than could be accommodated in existing Minuteman silos, if necessary.

Unmanned Resources Satellite

In February industry members who had been conducting preparatory in-house studies to promote sensing earth resources from space were waiting for NASA's Goddard Research Center to issue requests for design bids for an unmanned earth resources technology satellite (see AF/SD, February '69, p. 91). Companies seen as possible contenders in the competition include Ball Bros., General Electric, Hughes Aircraft Co., Lockheed Missiles & Space

Co., North American Rockwell, RCA, and TRW Systems.

For this design study, expected to last approximately four months, it is possible that NASA would fund two contractors at about \$500,000 each. For this relatively large support, each contractor would be required to propose a work statement and cost data for a follow-on operational phase contemplated for the earth resources technology satellites (ERTS). Under this approach it would appear that the bulk of this funding really was to obtain industry ideas for the operational phase.

The manned ERTS concept is further down the road. One possibility may be the use of the Air Force's MOL. NASA, with the aid of the McDonnell Douglas Astronautics Co., has studied aspects of adapting MOL as an ERTS monitored by onboard astronauts. Such an application would involve a low earth orbit, accommodate at least two crew members, and, to be practical, would require no less than a two- or three-month resupply cycle.

Mars Viking

In 1973 NASA intends to soft-land a capsule on Mars. Lines of management responsibility are being readied for the mission, designated Viking. NASA's Langley Research Center will be program manager for Viking and also will be responsible for development of the landing capsule, to be farmed out to industry for construction. California Institute of Technology's Jet Propulsion Laboratory will manage development of the spacecraft or bus to put the lander in orbit around Mars. This vehicle likely will be a modified version of the Mariner spacecraft planned for the 1971 Mars orbiting mission. It may be developed in-house at JPL or contracted in part or entirely to industry.

The Air Force-developed Titan IIIC probably will be used to launch the spacecraft and its lander capsule. After the spacecraft is in orbit around Mars, the lander will be separated and placed into a landing trajectory by a lander propulsion component and will be slowed in its descent by a retro-propulsion unit. Since these propulsion units will impact on the Martian surface, they must be sterilizable to avoid contamination of any existing Martian organisms.

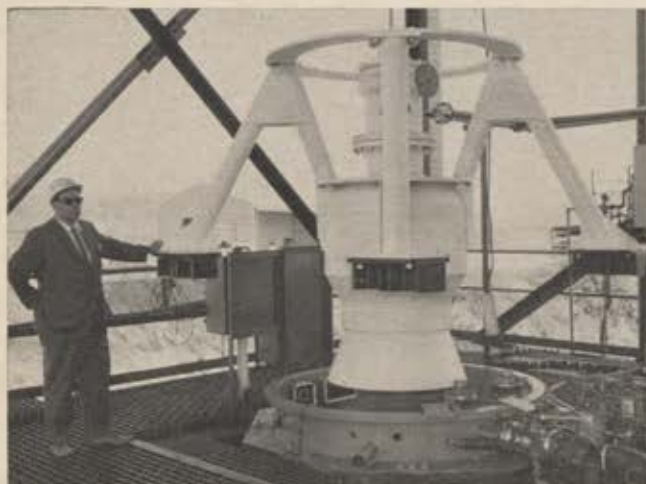
Big Push/Low Cost

The space booster for any size payload is a complicated maze of physical and operational interfaces involving structure, propulsion, staging, and guidance. And when the booster's job is done, it is tossed away, so it's logical that it should be a low-cost unit. But low cost, minimum weight, and reliability generally pull in opposite directions. So the approach becomes a compromise.

This compromise philosophy has been applied to an Air Force projection called the "big dumb booster" (BDB)—discussed in detail in AF/SD, July '68, p. 90. Briefly, it aims to fill a gap in current booster capabilities for lofting relatively large payloads into low earth orbit at minimum cost—possibly involving the use of heavier, lower-cost hardware of inherent reliability, leading to simple design. A key component in achieving this goal would be the propulsion system. And the Air Force is pushing for an answer.

USAF's Rocket Propulsion Laboratory, Edwards AFB, Calif., has funded a \$356,000, fifteen-month program to demonstrate potential propulsion schemes for the BDB. TRW's Systems Group, performing the contractual task, will design and build 250,000-pound-thrust liquid-propellant injectors and uncooled thrust chambers for short-duration firings at the Edwards high-thrust facility. Following this, TRW will build several thrust chambers for long-duration firings. Storable propellants will be used.

TRW won't start from scratch; it previously designed a prototype of the 250,000-pound-thrust engine, fabricated for it by a producer of piping systems for powerplants and oil pumping rigs. Commercially available steel was used and the extremely close tolerances normally used in aerospace practice were not incorporated. The prototype has been fired successfully at reduced thrust.—END



Forerunner of the "big dumb booster" engine concept to be demonstrated for the AF's Rocket Propulsion Lab is this low-cost prototype of a 250,000-pound-thrust liquid-propellant engine designed by TRW Systems. Made of commercial steel, it has been successfully fired at reduced thrust.

the dream of a drone controller

Vega's Model 626C portable tracking system is designed to provide range and bearing data as well as seven channels of telemetry data for tracking and monitoring the performance of an airborne vehicle. The system is a transponding type which utilizes an airborne package as well as a ground based tracker package for use on land or shipboard.

The ground based tracker package consists of two units: the *Antenna Assembly* and the *Electronics and Display Assembly*. The Antenna Assembly contains the antenna, azimuthal pedestal, transmitter, receiver, basic video circuitry and the azimuthal servo system. The Electronics and Display Assembly consists of a plotter, range gate logic, acquisition circuitry, telemetry demodulators and the basic display and control console.

The overall system is capable of providing range, bearing and telemetry data over a distance of 100,000 yds. Four of the telemetry channels provide real time monitors in the form of meters so that functions such as air speed, altitude, fuel, etc., can be monitored. The entire 7-channel telemetry output is provided so that the telemetry data may be recorded in serial fashion if desired. Provisions can be made for displaying event functions in real time as well as providing recorded outputs for a permanent record.

The system is designed to function within its specified accuracy when installed on shipboard and has a special vertically shaped antenna beam so as to negate the necessity of vertical tracking during ship's pitch and roll. It is also capable of operation when installed on a mobile land vehicle without deterioration of performance.

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'THEY ALSO SERVE'

By Frances I. Hathaway



Illustration by Sharon Farr

The SEA (Southeast Asia) Wives Club at Patrick Air Force Base, Fla., whose activities are described in this article, and its companion organization for the wives of noncommissioned officers are typical of many groups—at Patrick and elsewhere throughout the Air Force—that are specifically designed to help bolster the spirits of the women who are left behind when their men go off to war. Members of these clubs have a variety of activities, but mostly members merely keep themselves available to help each other—because they've all discovered that the worst part of illness, emergencies, or loneliness is having to face it alone. This article appeared last December 9 in the Miami Herald and appears here by special arrangement.

YOU see her out mowing the lawn, struggling to cut the straight swatch.

You see her bundling the kids into the car for a late-afternoon run to the hospital emergency room, her face pale as she gently places her daughter in the back seat. ("Please, God, don't let her leg be broken!")

You happen to catch her poignant expression as she glances up the street where the neighborhood couples are gathering for dinner and bridge.

You see her outside church—smiling and standing straight—but you can almost feel the hurt in the line of her body as other families drive off to real or imagined Sunday delights together.

She is doctor and nurse, father and mother, homework adviser, gardener, repairman, financier, cook, chauffeur, and general tower of strength for the children—who don't understand why she's a bit touchy at times.

Late at night, when there's nothing on television to dispel the lurking shadows, she may collapse a little inside from the strain and loneliness.

Hers is the total responsibility. Her husband is in Southeast Asia.

For a year. For 365 days of twenty-four hours of sixty minutes each. Count them. She has.

"Nobody breezes through this year," says one girl with three youngsters whose husband is in Vietnam. "Whether it's a woman living through her third war or a bride, they hang on by their teeth. But nobody complains. And we give each other courage."

Some read the Vietnam War news avidly. Others avoid newspapers and news broadcasts like the plague.

How the 'Longest Year' Begins

For the majority of military families, the receiving of orders for duty in Southeast Asia does not come as a surprise. But the prospect of the job ahead for husband and wife is almost too painful to contemplate.

For all, it is a time of preparing for the year to come, physically and mentally. All possible home repairs are made. Husband sits wife down and goes over all the papers in that forbidding metal box—the tax forms, automobile registration, stocks, bonds, and insurance papers.

For some men who must attend special schools before leaving, the time away stretches to more than a year, and women find themselves looking forward to their husbands' departure, the sooner to begin and thus end "the longest year."

But no matter how well they think they have adjusted to the idea, the reality often comes as a jolt.

"I didn't fully realize what these women were going through until my own husband left," admits one girl. "I actually didn't think I could take him to the airport. Fortunately for me, I came home from seeing him off to find a SEA Wife waiting for me. She didn't

ask if I needed help to get over the next few hours. She KNEW I did.

"She ordered me into her car and took me shopping. When I finally returned home I was ready to start coping."

The story of the SEA (Southeast Asia) Wives at Patrick Air Force Base is a rewarding one—of understanding hands and hearts reaching out to touch those of other women in the same situation, giving needed strength for the tour of duty alone on the home front. In many ways, the group resembles Alcoholics Anonymous and Parents Without Partners in that it is made up of people sharing their experiences to help each other solve common problems.

How the Organization Started

The idea for the SEA Wives germinated about three years ago when a rather unfortunate incident occurred. A girl whose husband had just left for a year in Korea attended a social function at the nearby officers' club.

An acquaintance, seeing her, gushed, "Say, you don't have any right to be here. Your husband isn't stationed here anymore!"

The girl was crushed and, as she confessed tearfully to a friend, "I don't know where I belong. I don't know anyone else whose husband is on a remote tour."

The friend was Connie McIntyre, and the more Connie thought about the girl's plight, the angrier she got. That a woman whose husband was serving his country abroad was not given better treatment at home seemed shameful to her.

Early in 1967, she found herself discussing the subject with Chris Kaisler, a friend and the new president of the Officers' Wives Club at Patrick AFB. More and more men were wending their way to Southeast Asia every day, she pointed out. More and more women and children were being left behind. What could the OWC do to involve and thus help such women?

"These girls looked so lonely when they came to club functions," Connie recalls. "We decided to find out how many there were."

Frank Raffensperger, officers' club secretary, helped. All families of men serving remote tours, he said, were given courtesy club memberships. Connie got on the telephone and sent her enthusiasm zinging across the wires to all the women she could find. Slowly a group began to form. The OWC sponsored a coffee for them in September 1967. They came and were enthusiastic.

A Unique Identity Develops

The girls organized bus tours for shopping trips and to interesting events in the area. They played bridge together and decided to sponsor an orphanage

(Continued on following page)

outside Saigon. More than anything else, the sixty members were developing a unique identity. In the Air Force's great alphabetical soup, they were finally something. They were SEA Wives.

The SEA Wives have instituted an important first at Patrick. They have set up an emergency card file system which operates in the case that one of their husbands should be reported killed or missing in action.

Such notifications are always made in person by four individuals, which is why any SEA Wife comes quickly to attention when she hears a car door close in her driveway late at night. In one instance, however, the four persons who delivered such grave news were total strangers to the wife.

Today, every member of SEA Wives fills out a card which is kept at the Personal Affairs office. It includes her religion so that, if necessary, her clergyman may be one of the four who visit her. Also, the names of two officers of SEA Wives have been added. If the worst should happen to any member, she will not be alone in her grief.

When a man is wounded in action, the news arrives via telegram. One woman received such a wire—at midnight—informing her that her husband had been critically wounded. She had no idea how to determine whether the wire was official or how to find out her husband's condition.

A SEA Wife came to her rescue, putting her in contact with people who could give her the information she so desperately craved.

Most SEA Wives look on the bright side. They are determinedly optimistic. Connie McIntyre will tell you why. She has served as SEA Wives president this first year, although at the outset her husband was with her.

Since he received orders for Thailand and departed in June, however, Connie has known personally what it's like to play the waiting game. While some women tick off every minute of their year, Connie refuses to do this.

"You must settle into a way of life that's good for you and the children," she explains. "It would be only too easy to live from hour to hour, to lose interest in keeping the house neat, fixing nice meals, and maintaining an attractive appearance.

"The temptation to go to pot is very strong. But you must try to carry on a normal routine. The children feel it tremendously if Mom doesn't keep her chin up. Too, much as we all prefer not to think it, what would you do if your husband didn't come back?"

One thing is certain. You won't hear these women bemoaning their lot. For one reason, they're too busy. They've got to be jolly enough for two parents this year.

For another, they have immense pride in their husbands. And occasionally, when they have a free moment to think about it—when they're not helping with the new math, fixing the doll bed, or taking the kids fishing—they're pretty proud of the job they're doing, too.—END

Could little Frazier Aviation build the C-5A or SST?

Partly.



S.A. Representative, Lemcke, S.A., Avenue Franklin Roosevelt 39, Grupo 1117-1118, Rio de Janeiro, Tel: 52-4430

The AFA Constitution has been amended to provide for an Arnold Air Society Alumni Council.

The new body now is functioning and promises to strengthen the tie between AFA and AAS . . .

AFA Establishes New Advisory Council

Through action by the Air Force Association's National Board of Directors, AFA's Constitution and By-Laws have been amended to provide, as a standing body, an Arnold Air Society Alumni Council. The Council, composed of a Chairman and six members, plus one consultant, will have the following objectives:

- Recommend ways and means by which the Association may possibly increase its support to the Arnold Air Society, its Areas, and its Squadrons.
- Recommend ways and means by which the Association may bring its Chapters into a closer working relationship with Arnold Air Society Squadrons.
- Recommend ways and means by which Association membership may be more meaningful to Arnold Air Society Cadets, while Cadets, and to Arnold Air Society Alumni who remain members of AFA. This also would include recommendations by which Arnold Air Society Alumni may be encouraged to affiliate with, and participate in, AFA Chapter activities.
- Recommend ways and means by which the Association may best serve the Arnold Air Society Alumni as a whole; and by which the Alumni as a whole may best serve the Association.

The Council replaces the Arnold Air Society Alumni Division, which was inactivated as a result of AFA's Board action to amend its Constitution and By-Laws to eliminate Divisions as an organizational structure within AFA.

Among the motivating factors behind the decision were (1) AFA's long-held desire to have more young people within its membership, especially within its leadership; (2) to permit these people to become active in AFA Chapters (the Division status precluded this); and (3) to relieve the Arnold Air Society Alumni of

AFA administrative details, which were requiring an excessive amount of time.

Since the formation of the new Council, Arnold Air Society's National Commander, Cadet Donald Johann, has appeared before AFA's Board with an annual report on the Society. AFA staff members also have appeared before a number of AAS Regional Conclaves.

AFA now is providing one page in each issue of the *Arnold Air Letter* for the purpose of apprising the Society of various AFA activities. In addition, AFA is arranging for copies of its Annual Report to be given all Arnold Air Society Advisers and Arnold Air Society Commanders. The AFA staff will assume a more active participation in support of the AAS Conclave and is encouraging a closer working relationship between its many Chapters and the Arnold Air Society Squadrons.

The Arnold Air Society Directory, formerly published by the Division, will now be published by AFA. Notice of this has been sent to all AAS alumni who are also members of AFA, with the request that personal information such as full name, rank, home address, current assignment, former AAS affiliation and school, year commissioned, marital status, wife's first name, and number of children, be sent immediately to AFA national headquarters in Washington.

The new AAS Alumni Council has held one meeting and is scheduling its next meeting for New Orleans, La., in conjunction with the annual AAS Conclave, March 30-April 2.

Members of the Council, pictured here, are: Thomas E. Cindric, Chairman; Maj. Lawrence R. Cotter; Capt. Terry Miller; Gilbert E. Petrina; Maj. William Sparks; Lt. James D. Simmons; Lt. Richard H. Wainscott; and Cadet Donald F. Johann, National Commander of AAS, who serves the Council as consultant.—END



T. E. Cindric
Laurel, Md.



D. F. Johann
Jamaica, N.Y.



L. R. Cotter
Arlington, Va.



T. Miller
Eglin AFB, Fla.



G. E. Petrina
Harrisburg, Pa.



W. Sparks
San Antonio, Tex.



J. D. Simmons
Montgomery, Ala.



R. H. Wainscott
Rancho Cordova, Cal.



By Jackson V. Rambeau

AFA DIRECTOR OF MILITARY RELATIONS

Off at a Crawling Pace

As this was written, on February 6, the Nixon Administration was moving as quickly as cold molasses in naming the new political appointees at the Undersecretary and Assistant Secretary levels in OSD and the services. Dr. Robert C. Seamans, Jr., had been appointed Air Force Secretary, but no other officials yet had been selected nor had any of the incumbents publicly been asked to remain. The result is that much planning and many actions have been delayed or stopped in the Air Force Secretariat, and, of course, this affects Air Staff actions.

In one move, Secretary of Defense Melvin R. Laird announced the appointment of Roger T. Kelley to be Assistant Secretary of Defense for Manpower and Reserve Affairs. This key office handles all personnel legislation. In making the announcement, Mr. Laird indicated that Mr. Kelley's two main tasks would be to expedite the Hubbell compensation proposals and to search for a way to end the draft. Mr. Kelley will come to the Pentagon from the Caterpillar Tractor Co., where he was Vice President for Personnel.

With the show of interest in Hubbell by Secretary Laird, a possibility still remains that Rep. Mendel Rivers, Chairman of the House Armed Services Committee, can be persuaded to hold hearings on the Hubbell package before July 1. On that date the automatic 12.6 percent military pay raise becomes effective unless Congress acts to change it.

This writer recommends that those with an interest in the changes the Hubbell plan would make in military compensation read the comprehensive piece on this subject by Louis R. Stockstill in this issue, starting on page 50.



In ceremonies that took place at the Pentagon on January 15, the Honorable Harold Brown, outgoing Secretary of the Air Force, presents the Exceptional Civilian Award to Paul H. Nitze, then Deputy Secretary of Defense, for Mr. Nitze's service both to the nation and to the US Air Force.

Project Referral Gets Under Way

As one of his last moves while Secretary of Defense, Clark M. Clifford announced a strengthened program to assist the more than 51,000 enlisted military personnel and approximately 13,000 officer personnel who retire from active duty each year. "Project Referral," as the new plan is called, will establish contact between industry and those leaving the service regarding employment. The system will be computerized and conducted on a DoD-controlled computer in Dayton, Ohio. DoD now is actively engaged in encouraging industry to use the system. Mr. Clifford, before leaving the Defense Department, stated, "These trained men and women who have completed at least twenty years of active military service represent a rich reservoir of talent for continued service to our nation."

"We have a deep obligation to the men and women who have served a full career in uniform to assist them to the appropriate extent possible as they move on to new opportunities for useful employment. In many instances, the particular skills and leadership qualities which these men and women have acquired during their military service will be of continued importance in civilian pursuits, both in private and public sectors. I am pleased that after some months of careful study, it is now possible to initiate immediate action."

For some years, the Department of Defense, in cooperation with other government agencies, notably the Department of Labor, has been conducting a program to counsel retiring military personnel on potential employment opportunities. These programs, while helpful, have not proved too successful.



In another of his last official acts, Secretary Brown presented Exceptional Service Awards to three of his key staff members: from left, Philip F. Hilbert, AF Deputy Undersecretary; John A. Lang, Jr., Administrative Assistant to the Secretary; and Bert Z. Goodwin, Assistant General Counsel.

We hope the new Administration will strongly support this new venture on the part of DoD to ensure meaningful second careers for retiring military personnel. AFA's Military Manpower Council endorsed "Project Referral" at its last meeting.

A Moving Outfit

The US Air Force Helicopter Pilot School will observe its twenty-fifth anniversary at Sheppard AFB, Tex., on June 7, 1969. The Silver Helicopter celebration will feature an open house at the Sheppard school, which will include static displays of rotary-wing aircraft, helicopter equipment and components, and a number of aerial demonstrations. All graduates and instructors of the Helicopter School and others associated with rotary-wing aircraft are invited to attend the program and reunion banquet.

The school was originally founded at Freeman Field, Ind., in 1944 and received its first helicopter, a Sikorsky R-4, in May of that year. Since that time it has moved nine different times to seven different locations, returning to Sheppard AFB in 1966.



Robert E. Hampton, a native of Tennessee and an AF veteran, has been named by President Nixon as US Civil Service Commission Chairman. Hampton's distinguished career in government includes eight years of White House staff service and seven years as a Republican CSC member.

Currently, the school trains approximately 400 helicopter pilots each year in eight classes. It flies HH-43B, CH-3C, and TH-1F helicopters in its operations.

Graduates of the school can make reservations for the reunion banquet now. Hotel or motel reservations and requests for limited transient quarters can be made at the same time. Requests for reservations and further information should be addressed to: Helicopter Reunion, CMR #2, Box B-85, Sheppard AFB, Tex. 76311.

Reserve Firepower

The first Air Force Reserve unit since the Korean conflict has begun flying armed combat missions in Vietnam. A mobilized squadron from Indiana began providing close combat support in the AC-119G gunship aircraft in early January, it was announced at Headquarters, Seventh Air Force.

In May 1968 four elements of the 930th Tactical Airlift Group at Bakalar AFB, Ind., were ordered to active duty with 335 personnel and redesignated the 71st Special Operations Squadron. The unit had been trained in the twin-engine C-119 to airlift troops and cargo, as well as to drop paratroops. After mobilization, the squadron was given a new mission—close air support—and trained in modified C-119 aircraft at Lockbourne AFB, Ohio, near Columbus.

The AC-119G is converted from a transport to a combat ship by the addition of four 7.62-mm Miniguns. These guns, firing together from the side of the aircraft at a rate of 24,000 rounds per minute, provide firepower in support of ground troops. These are the first AC-119s to be sent to



At Andrews AFB, Md., January 29, members of Prince George's Co.-Andrews AFB Red Cross were honored for their volunteer attendance of wounded from Vietnam. Special guest Lt. Gen. K. E. Pletcher, AF Surgeon General, with Girl Scout Sheryl Cottrell and Mrs. Virginia McGovern.

Vietnam. They will augment the mission now being performed by the AC-47 gunships, nicknamed "Dragonships."

This Reserve unit has been mobilized twice before—once for twenty-one months, in June 1959, for the Korean conflict, and in October 1962 during the Cuban missile crisis.

While not directly involved in combat, other elements of the Air Force Reserve have been flying in support of the Vietnamese action. The 349th Military Airlift Wing from Hamilton AFB, Calif., near San Francisco, and the 445th Military Airlift Wing from Dobbins AFB, Ga., near Atlanta, were mobilized in January 1968. From mobilization through the end of December, they flew 1,148 missions, 328 of them to Southeast Asia, airlifted more than 29,000 tons of cargo (7,500 tons of this total to SEA),

(Continued on following page)



Air Force Chief of Staff Gen. John P. McConnell with Lt. Col. William A. Anders and his wife Valerie during ceremonies at Pentagon on January 30 during which Anders received Senior Pilot astronaut wings for his contribution to the success of the Apollo-8 mission flown in December.

carried 13,381 passengers a total of 9,042,856 passenger-miles, and amassed a total of 44,643,658 ton-miles of cargo carried. This accomplishment required a total of more than 33,000 flying hours.

The 305th Aerospace Rescue and Recovery Squadron mobilized from Selfridge AFB, Mich., near Detroit, in January 1968, flew 752 missions for a total of more than 4,000 flying hours by the end of December. This unit's mission is to provide search and rescue support to aircraft, mainly in overwater flights.

All other Air Force Reserve flying units, although not ordered to active duty, have been providing support to the Air Force in cargo transport and in training paratroops for the Army.

Takes Over Armistice Commission

Maj. Gen. James B. Knapp, USAF, has been appointed Senior Member of the Military Armistice Commission, United Nations Command. He will replace Maj. Gen. Gilbert H. Woodward, USA, who is completing an extended assignment in this position. General Woodward, acting on orders, signed the "confession," which he immediately repudiated that the *Pueblo* had violated the territorial waters of North Korea before its seizure by the North Koreans.

General Knapp's last assignment was Chief of Staff, Strategic Air Command, Offutt AFB, Neb.

As Senior Member, General Knapp will head the five-man Commission that oversees the keeping of the terms of the armistice.

In addition to the United Nations Senior Member, the Commission is comprised of two members from the Republic of Korea, one member from the British Commonwealth, and one member selected from the other nations of the advisory group. This group has representatives from the United States, the Republic of Korea, the United Kingdom, Thailand, Turkey, New Zealand, Ethiopia, Australia, Canada, and the Republic of the Philippines.

Parting Shots

★ A memorial honoring the late Gen. William S. Stone is to be established at the United States Air Force Academy. Anyone wishing to contribute to the memorial fund may do so by sending a check or money order to the US Air Force Academy, Colorado 80840, payable to the Air Academy Alumni Foundation, Inc. When all voluntary contributions are received, the Memorialization Board at the Academy will then determine the form of the memorial.

★ Do you know how the National Guard got its name? It all started in 1824 in New York on the occasion of the last visit to the United States of the French general Marquis de Lafayette. During his visit a discussion was held regarding the French *Garde Nationale*, an outstanding or-

Col. Labre R. Garcia, USAF (Ret.), gets this month's mention for engaging in an exciting second career. He has joined the Senate Armed Services Committee staff to specialize in defense procurement and defense investigation matters.



Air Force Chief of Staff Gen. John P. McConnell awards posthumous Air Force Cross to the widow of CMSgt. Richard L. Etchberger, cited for extraordinary heroism in military operations against an opposing armed force on March 11, 1968. She accepts the award on behalf of her husband.

ganization composed of civilian soldiers in Paris. Members of the militia present decided to rename the New York City Militia units "National Guards." During the Civil War in 1862, the New York Legislature adopted the title National Guard for all militia units in the state. By the turn of the century nearly all states had followed suit. In 1903, with passage of the Dick Act, Congress set the stage for modernizing the Guard and officially established the title for all elements of the whole organized militia.

★ More than 4,250,000 World War I and II veterans will receive \$236 million in dividends on their GI insurance policies during 1969.

★ Participation in the education and training program of the third-generation post-Korean GI Bill has passed the one million mark, the Veterans Administration reports. From the beginning of the post-Korean GI Bill on June 1, 1966, to date more than 985,000 veterans with service after January 31, 1955, have entered training. Better than sixty percent entered institutions of higher learning. This compares with fifty-one percent under the Korean conflict GI Bill and less than thirty percent under the World War II program. Flight training is being taken by 25,334 veterans.

★ Two Air Force Reserve tactical airlift groups, the 931st at Bakalar AFB, Ind., and the 927th at Selfridge AFB, Mich., will convert to a forward air controller mission in July. The units will give up their C-119s and temporarily use U-3s until the O-1 Bird Dog and O-2 becomes available. AF forward air controllers are used extensively in Southeast Asia to search out and identify the enemy, mark targets, and control close air support strikes.

★ The Air Force is offering Reservists a rewarding way to log retirement points. Efforts are now under way to recruit Reservists to supervise and instruct members of the Air Explorer Program on a nationwide basis. Especially needed are instructors in air navigation, mechanical training, citizenship, and character development. Those interested in this challenging work should contact USAF-BSA Liaison, P. O. Box 200, Robins AFB, Ga. 31093.

(Continued on page 133)

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A Page From The History of Surveillance



Vikings located enemy shores and fortifications on the fog-shrouded European coast by shouts or horn-blasts from their raiding long-ships, judging distance and size by echo return.

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★ In January, the Guard's 149th Fighter Group, Kelly AFB, Tex., was awarded the Air Force Outstanding Unit Award for exceptionally meritorious service and exceptionally outstanding achievement, which clearly sets the unit above and apart from similar units. The F-102 fighter-interceptor unit earned the award for its high degree of perfection while performing its ADC mission. The Air Guardsmen maintained round-the-clock alert to provide air defense for the Southwest.

★ It should be no surprise to many why the veterans programs within the Congress fare so well each year. In the recently convened 91st Congress, 389 of its 535 members are veterans.

★ How much is it worth to be Deputy Secretary of Defense? Apparently the new holder of this job thinks it must be worth a great deal. Based on the income which Secretary David Packard will give up in order to hold this high position, one Washington columnist calculated that it would cost him \$1,270 a day. He will give up an income of more than \$1 million a year, and, in place of this, the government will pay him \$30,000 annually.

★ At midterm, 450 new second lieutenants were graduated from AFROTC programs in US colleges. More than 200 of these new Air Force officers will enter flight training as their first active-duty assignment. Many of the remainder will be granted educational delays in order to complete their graduate work for master's or doctor's degrees.

★ The Air Force has announced a new program to get aircrew position volunteers for service in SEA. The new program is nicknamed "Palace Dragon," and is a follow-on to the successful volunteer program called "Palace Gun." Those interested should contact their Consolidated Base Personnel Officer for further information.

★ The next annual meeting of the American Fighter Pilots Association will be held in conjunction with the AFA Convention in Houston, Tex. The main event of this meeting on March 21 will be an awards banquet, with Sen. Barry M. Goldwater of Arizona as guest speaker and Bob Hope as Master of Ceremonies.

★ The Air Force recently bestowed the largest cash award ever granted to a military member of the Air Force since the inception of the military suggestion program in September 1965. Capt. Chesley S. Pieroway, Project Officer



Gen. Joseph R. Holzapple (center) has been assigned as Commander in Chief, United States Air Forces Europe, and Commander, Fourth Allied Tactical AF, replacing Gen. Horace M. Wade (left), named Chief of Staff, Supreme Headquarters Allied Powers Europe. Lt. Gen. Marvin L. McNickle (right) will fill General Holzapple's previous post as Deputy Chief of Staff for R&D, Headquarters US Air Force.

for Minuteman Power Structures, Ballistics Systems Division, AFSC, was the recipient of \$5,465. His suggestion on design of SAC Minuteman launch control centers saved some \$4.4 million in FY '67. This huge sum was validated by the auditor and concurred in by responsible management personnel at all echelons. Our congratulations to Captain Pieroway!

SENIOR STAFF CHANGES

L/G John W. Carpenter, III, DCS/P, Hq. USAF, assigned add'l duty as Senior AF Member, Military Staff Committee, UN, replacing L/G Joseph R. Holzapple . . . M/G Richard A. Grussendorf, from retirement to Chief, Office of AF History, Washington, . . . L/G Joseph R. Holzapple, from DCS/R&D, Hq. USAF, to CinC, USAFE, and Cmdr., 4th ATAF, and promoted to General, replacing Gen. Horace M. Wade . . . B/G Jimmy J. Jumper, from Asst. DCS/O, to Cmd. IG, ADC, Ent AFB, Colo. . . M/G James B. Knapp, from C/S, SAC, Offutt AFB, Neb., to Senior Member, UN Cmd. Military Armistice Commission, Seoul, Korea.

L/G Marvin L. McNickle, from Dep. Dir. for Admin. & Management, ODDR&E, OSD, to DCS/R&D, Hq. USAF, replacing Gen. Joseph R. Holzapple . . . M/G John S. Patton, from retirement to Military Adviser to Chairman and Exec. Officer of Reserve Forces Policy Board, OSD, Washington, D. C. . . M/G William H. Reddell, from DCS/M, MAC, Scott AFB, Ill., to Vice Cmdr., San Antonio AMA, AFLC, Kelly AFB, Tex. . . B/G Dale S. Sweat, from Asst. DCS/Plans & Ops, to DCS/Plans, Hq. USAFE, Wiesbaden, Germany, and promoted to M/G . . . Gen. Horace M. Wade, from CinC, USAFE, and Cmdr., 4th ATAF, to C/S, SHAPE.

PROMOTIONS: To General: Joseph R. Holzapple.

To Major General: Albert J. Bowley, Thomas H. Crouch, Timothy J. Dacey, Jr., Rene G. DuPont, George J. Eade, Robert J. Gibbons, William S. Harrell, Augustus M. Hendry, Jr., George J. Keegan, Jr., James F. Kirkendall, John W. Kline, Clifford J. Kronauer, Jr., David I. Lieberman, William P. McBride, William V. McBride, Franklin A. Nichols, Francis W. Nye, Robert L. Petit, William F. Pitts, Russell K. Pierce, Jr., Felix M. Rogers, Joe T. Scepanisky, Kenneth W. Schultz, Anthony T. Shtogren, Donavon F. Smith, William W. Snavely, Carl W. Stapleton, Paul R. Stoney, Dale S. Sweat, Carlos M. Talbott, Rockly Triantafellu, George V. Williams.

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SMSgt. William N. Starnes sworn in by Lt. Gen. James V. Edmundson, PACAF Vice Commander in Chief, on final enlistment that will carry Starnes into thirty years' active military service. Sergeant Starnes is serving as Chairman of PACAF's Noncommissioned Officers' Advisory Board.

What happens when an old-timer, mature in years and wise in the ways of the Air Force, finds himself back in flight school in company with a clutch of brand-new lieutenants? Retraining in the Gooney Bird, no less. Here's how it was for one man, who never doubted for a minute that he was the world's best C-47 pilot . . .

Grandpa Goes to War

By Lt. Col. C. Gordon Furbish, USAF

CARTOONS BY BOB STEVENS

WHEN you've seen forty-five summers and haven't flown in seven years, but still get selected by the Air Force to be an "Air Commando" pilot, your ego leaps right through the overhead. "Air Commando" has a sound about it that makes you think you're Steve Canyon.

And when three-quarters of your Gooney Bird flying school consists of new second lieutenants, with the other one-fourth being majors and lieutenant colonels (and with several of us already grandfathers), it has the makings of a delightful and sometimes hilarious experience.

The scene at England Air Force Base, La., the Air Force's C-47 school for Vietnam operations, could be 1943 all over again. Some two dozen old C-47s, scarcely showing their age, sit fat and sassy on the England tarmac, daring the new lieutenants to master their idiosyncrasies but taking years off the lives of us retread staff officers.

Man, you're an Aviation Cadet again! Without harassment. No other responsibility, no staff work, no papers to be coordinated, no budget problems. Major Air Commands and the Pentagon seem light-years away, manned by poor souls who have long forgotten the real old Air Force.

"Palace Cobra" is the name of the personnel plan that got us old-timers into this wonderful scene. "Palace Cobra," simply, is the project to sweep back into the cockpit all pilots who haven't yet had a Southeast Asia flying tour. It hopes to avoid, as long as possible, sending pilots back for second tours before others have had their first. Fair enough.

This includes bringing back hundreds of Code Three pilots—men who have been excused from flying since the early 1960s because of their ground specialties. My class includes Civil Engineers, Comptrollers, former ROTC instructors, and myself, an erstwhile Information Officer.

England AFB, five miles northwest of Alexandria in central Louisiana, could well be the ZI training base



remembered by any of you other aging veterans of the Big War, except the facilities are better. Beside our ancient Gooney Birds there sit a few C-123s, a herd of A-26 bombers, and various liaison planes used in units of the 1st Special Operations Wing, also headquartered here. (Special Operations is the drab term that replaces "Air Commando." Will the Air Force ever learn?)

The soothing sound of propellers is heard throughout the land. The tranquillity of this fair base is spoiled only by a squadron of Cessna A-37s that are training Vietnamese pilots. The A-37s belch their evil-smelling kerosene fumes and seem naked without propellers.

Hold tight, you jet jocks. We prop guys are coming to save your tails!

The management, as Command is now called, runs

a good base at England. Mostly, they leave you alone and let the instructors do their job. And the instructors let you progress as your competence permits. To some degree there is the usual "block filling," i.e., completing mandatory but unrealistic training laid on by obscure staffs at higher headquarters. Lo, it hath ever been so. For example, airplane indoctrination lesson No. 1: Ground evacuation of the C-47. "You get up and run back out through that side door." Time allowed: seven seconds.

After efficient in-processing and assignment of very adequate quarters, students—officers, NCOs, and airmen (since crew chiefs, loadmasters, gunners, and navigators also train here)—begin several days of thorough ground schooling. Sergeants from an Air Training Command detachment, some of whom crewed the Goon in the Normandy invasion or battled it over the Hump, run expertly over the engines, propellers, and all the various subsystems of the Douglas Racer. Old-timers always learn something from these sessions. Each lesson ends with the standard phrase, "Are there any questions, gentlemen?"

You're damned right there are questions! Our dozen second lieutenants, fresh out of supersonic T-38 school, are loaded with questions. "What is the cowl flap for?" asks one. "Explain again, please, what feathering an engine means," another asks.

Don't laugh, old-timers. These poor devils have never seen an air-cooled, internal-combustion, reciprocating aeroplane engine in all their past flight experience. In today's Air Force they have only seen that jet engine with one little lever—push to go, retard to slow. The lieutenants are briefly mystified by prop controls, mixture controls, throttles, 1930-style hydraulic systems, and all the other pipes, valves, lines, venturi tubes, push-pull rods, cables, tanks, gauges, cylinders, and other devices which, when assembled in sequence, become a real by-God C-47.

We old heads nod sagely as the sergeants patiently explain the systems. The lieutenants scribble notes. Obviously they can't grasp this new science quickly.

At the end of ground school an official ATC-devised test is given to authenticate the excellence of the instruction. I whip through the fifty questions in a dozen minutes, smug about my vast knowledge accumulated over a quarter century on the Air Force rolls.

After the coffee break the sergeant congratulates the class on its performance. "Lieutenant Lund, you had one wrong. Lieutenants Vance, Hale, and Amundsen each had only two wrong. The most anyone had wrong was eight." I think he looked at me as he spoke. You'll find smart-tailed lieutenants are always showing off.

Yes, there is no question about it. This new generation of pilots is smarter, taller, healthier, and handsomer than the World War II crop. But can they fly? Can they master a monster with twirling props, a sneaky bird whose tail wheel wants to reach out ahead of the main wheels, a flying machine whose ailerons will move the wing when they're good and ready, not just when you lightly touch a stick? We'll see . . .

Each instructor pilot is assigned two student pilots, preferably two with approximately equal experience. Fortunately, I was left over and was teamed with 2d Lt. Paul Amundsen from Burlington, Mass. As I grew



up in Framingham, Mass., we spoke a similar language and had no communication problems. Although Amundsen didn't appear too interested in the wallet photo of my granddaughter, he was otherwise a delightful chap. Called me "Sir" a bit excessively, though.

Maj. Warren Tomsett, a Connecticut Yankee, was our patient, good-humored, hard-working, and helpful instructor who led us both through the thirty-odd flying hours it takes to make a man ready for EC-47, AC-47, or PsyWar C-47 operations in Vietnam. It's difficult to describe what makes a good instructor. Whatever it is, Tomsett has it.

An example: "Did they show you the landing gear mock-up in school?" he asked. Of course they hadn't. No money is spent on training aids for a twenty-five-year-old airplane. Whatever existed in 1945 has long been scrapped. "OK. Here's one," says Tomsett. He points at the office door. "When you unlock the landing gear, it's like turning this door knob. The next position on the gear lock is like releasing this latch," he explains. "Then hydraulic pressure through lines raises the wheels just like the door on its hinges." He pushes with his shoulder against the door to open it. "Lowering the gear is the same in reverse."

It was the simplest, most effective illustration possible. A real mock-up would cost thousands and do no better.

On the first day of flying it was obvious Amundsen needed a basic lesson: how to taxi the airplane. Remember, these new pilots have seen only steerable nose-wheel airplanes. Eight-year-olds can operate a sled; taxiing a C-47 is an art since you balance the thrust from two engines, the wind loads against the huge vertical stabilizer, the free-swiveling tail wheel, and the sail effect of the rudder. In fact, knowing how to sail a boat helps in taxiing a C-47.

Then Major Tomsett let us both make landings from the right seat. Twenty landings in a three-hour period

(Continued on following page)



plus some instrument and air work is a typical lesson plan. My landings were excellent. Amundsen tended to bounce quite a bit.

After a few days of landings—short-field landings, full-flap landings, power-on landings, power-off landings, single-engine landings, assault landings, and cross-wind landings—Lieutenant Amundsen showed a lot of improvement. I was still excellent.

We turned to instrument practice, GCA approaches, ILS approaches, radio-beacon approaches, and TACAN approaches. Amundsen didn't know a thing about radio-beacon approaches, a 1940-ish system; I didn't know a thing about TACAN approaches, a 1960-ish system. We explained them to each other.

In night flights we flew navigators across the dark damp flatlands of Louisiana while they peered for obscure landmarks, illuminated only by moonlight or starlight, and then computed instant time, distance, direction calculations to equally dark "targets"—practical training for future nights of doing the same thing in Vietnam.

In other night flights we dropped flares to illuminate targets for the A-26 bombers as they made low-level attacks on Camp Polk's vast range; simulated attacks but with real napalm, .50-caliber guns, and bombs. You get a tremendous grandstand view from a C-47 orbiting at 3,000 feet.

As the hours of training increased, I noticed two things. You don't lose much skill after several years of not flying. Only a few procedures change. Secondly, Lieutenant Amundsen was pressing me real hard for the title of the world's best C-47 pilot.

On the final check ride, he stole it clean away from me. His every landing of every type was one of those "squeak-squeak" types as the tires gently kiss the con-

crete. Mine tended more toward the "thunk-skip-thunk" kind—safe and with no damage to the airplane, but the crew chief grips the stanchions tighter with each one.

On instruments, Amundsen's altimeter and airspeed indicators looked like they had been glued onto the numbers; mine zig-zagged as if they were sending semaphore signals.

That's the way it goes at England AFB. Lieutenants don't know a damn thing about old-fashioned propeller airplanes. But lieutenants learn awfully fast. Old-timers enjoy every moment of it as they relive their youthful days.

And what do the lieutenants think of the venerable old Gooney Bird, manufactured before most of them were born? How does it compare with supersonic jet flying they had previously experienced at altitudes of 30,000 feet rather than 500 to 3,000 feet at 135 knots in an ancient transport? I talked with several of them. Said one, "I enjoy this C-47 a thousand times better than jets. I like the beauty of flying close to the ground."

Another added, "You can sense flying this airplane. You can feel when you lose airspeed and feel when you lose altitude."

Some of the other contrasts in transitioning from jets to the slow C-47: "The control pressures are enormous. It's hard to get used to the gross movements of the controls needed to make the plane respond. Also, the slow speed makes you a little nervous at first. The T-38 approaches at 155 knots plus added speed for fuel weight. The C-47 approaches at ninety knots or less. That's scary."

Perhaps the most encouraging response was to my question as to why a man chooses C-47 school above the dozens of other schools available to newly graduated pilots. "Simple," said this man. "It's the shortest course and will get me to Vietnam the quickest."

With men like that and with a plane like the Goon, want to bet their kids may be going through the Air Force's C-47 school in 1990?—END



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MASSACHUSETTS: Andrew W. Trushaw, Jr., 204 North Maple Street, Florence, phone (413) 594-5327. **BOSTON, FLORENCE, LEXINGTON, NORTHAMPTON, PLYMOUTH, RANDOLPH, SAUGUS, TAUNTON, WORCESTER.**

MICHIGAN: Norman L. Scott, 6011 Northfield, Birmingham, phone 626-9754. **BATTLE CREEK, DETROIT, FARMINGTON, GRAND RAPIDS, HUNTINGTON WOODS, KALAMAZOO, LANSING, MOUNT CLEMENS, OAK PARK.**

MINNESOTA: Victor Vacanti, 8941 10th Avenue South, Minneapolis, phone TU. 8-4240. **DULUTH, MINNEAPOLIS, ST. PAUL.**

MISSISSIPPI: M. E. Castelman, 5207 Washington Avenue, Gulfport, phone 863-6526. **BILOXI.**

MISSOURI: O. Earl Wilson, 10651 Roanna Court, St. Louis, phone VI. 3-1277. **KANSAS CITY, ST. ANN, ST. LOUIS.**

NEBRASKA: Lloyd Grimm, 5103 Hamilton Street, Omaha, phone 553-1812. **LINCOLN, OMAHA.**

NEVADA: Barney Rawlings, 2617 Mason Avenue, Las Vegas, phone 735-5111. **LAS VEGAS.**

NEW HAMPSHIRE: Stuart N. Shaines, Northfield—Beech Road, Dover. **PEASE AFB.**

NEW JERSEY: James P. Grazioso, 208 63d Street, West New York, phone Union 4-4275. **ATLANTIC CITY, BELLEVILLE, CHATHAM, FORT MONMOUTH, JERSEY CITY, MCGUIRE AFB, NEWARK, PATERSON, TRENTON, WALLINGTON.**

NEW MEXICO: William C. Bacon, Rt. 2, Box 162A, Roswell, phone 623-5488. **ALAMOGORDO, ALBUQUERQUE, ROSWELL.**

NEW YORK: William C. Rapp, 886 Edgewater Avenue, Tonawanda, phone 857-6971. **BINGHAMTON, BUFFALO, ELMIRA, FOREST HILLS, FREEPORT, ITHACA, KEW GARDENS, LAKE WOOD, NEWBURGH, NEW YORK CITY, PATCHOGUE, PLATTSBURGH, ROCHESTER, ROME, STATEN ISLAND, SUNNYSIDE SYRACUSE, WHITE PLAINS.**

NORTH CAROLINA: Eldon P. Allen, Rt. 1, Box 277, Knightdale, phone 829-3834. **RALEIGH.**

OHIO: George A. Gardner, 620 Rockhill Avenue, Dayton, phone AX 9-3956. **AKRON, CANTON, CINCINNATI, CLEVELAND, COLUMBUS, DAYTON, YOUNGSTOWN.**

OKLAHOMA: William S. Jones, 136 W. Silver Meadow Drive, Midwest City, phone 732-7830. **ALTUS, ENID, OKLAHOMA CITY, TULSA.**

OREGON: Clayton Gross, 804 Portland Medical Center, Portland, phone 233-0875. **CORVALLIS, PORTLAND.**

PENNSYLVANIA: Edmund J. Gagliardi, 2737 Amman Street, Pittsburgh, phone 342-6427. **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.**

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TEXAS: Ben Griffith, CMR 41594, Kelly AFB, phone 925-6917. **ABILENE, AMARILLO, AUSTIN, BIG SPRING, CORPUS CHRISTI, DALLAS, DEL RIO, EL PASO, FORT WORTH, HOUSTON, LUBBOCK, SAN ANGELO, SAN ANTONIO, SHERMAN, WACO, WICHITA FALLS.**

UTAH: Jack Price, P. O. Box 774, Hill AFB, phone 825-3690, Ext. 3750. **BOUNTIFUL, BRIGHAM CITY, CLEARFIELD, HILL AFB, OGDEN, SALT LAKE CITY, SPRINGVILLE.**

VERMONT: Dana Haskin, Waitsfield. **BURLINGTON.**

VIRGINIA: A. A. West, P. O. Box 1038, Newport News, phone 596-6333. **ARLINGTON, DANVILLE, HAMPTON, LYNCHBURG, NORFOLK, ROANOKE, STAUNTON.**

WASHINGTON: Peter A. Tuohy, P. O. Box 6100, Seattle, phone SK 2-0821 (H) or CH 4-8650 (O). **SEATTLE, SPOKANE, TACOMA.**

WEST VIRGINIA: Nelson Matthews, 248 East Main Street, Clarkshurg, phone 624-1490. **CLARKSBURG.**

WISCONSIN: Harold C. Bates, 1035 Alfred Street, Brookfield, phone 782-5599. **MADISON, MILWAUKEE.**

WYOMING: Merle W. Allen, Veterans Administration Center, Cheyenne, phone 634-1581, Ext. 232. **CHEYENNE.**



THE MIDDLE GEORGIA CHAPTER . . .

cited for effective programming in support of the missions of the Air Force Association and the Aerospace Education Foundation.



Maj. Gen. A. J. Beck, center, Commander of the Warner Robins Air Materiel Area, welcomes area college representatives to the AFA Education Day activities recently sponsored at Warner Robins AFB by AFA's Middle Georgia Chapter. From left to right are Dr. Earl Strickland, Wesleyan College president; J. O. Paine, Mercer University director of news services; Mrs. Walter Brown, teacher at Macon Jr. College; William Johnson, instructor at Fort Valley State College; Robert A. Wys, chairman of the Chapter's education committee; and Chapter President Paul Fain (see accompanying story for details).

Some fifty educators representing five Middle Georgia colleges were guests of AFA's Middle Georgia Chapter recently for AFA Education Day activities at Robins AFB.

In his remarks at the luncheon held at the Officers' Open Mess, Maj. Gen. A. J. Beck, Commander of Warner Robins Air Materiel Area (WRAMA), stated, "The better educated we are here at Robins, the better we can accomplish our mission." He pointed out it would be mutually beneficial to the Air Force and to the community if the base and the educators in the area would work together toward the common goal of making education easily accessible to base employees and informing graduates about job and promotional opportunities at Robins.

The program included briefings on the AMA's mission and education program, and a tour of its facilities. Participants included Brig. Gen. James A. Bailey, Vice Commander of WRAMA; Col. J. E. Cahill, Chief of WRAMA plans and programs; Spencer Roads,



Air Force Association National Director Joseph E. Assaf, right, turns over the Massachusetts State AFA's charter to newly installed President Andrew Trushaw, Jr., second from left, at the recent Installation Party held for the newly elected officers of the State AFA, and the Boston and L. G. Hanscom Chapters. Looking on during the ceremonies are, from left, outgoing State President Hugh Simms, Doris Stone, AFA Board Chairman Jess Larson, and Betty Topjian. Mr. Larson was the guest speaker at the function, and Mrs. Stone and Miss Topjian were installed as Massachusetts State Treasurer and Executive Secretary, respectively.



Mrs. Fran M. Sigmund, President of the Mothers' Chapter of Pittsburgh, Pa., presents to National Director Judge J. G. Brosky a check for \$100 as the Chapter's donation to the Aerospace Education Foundation. Also participating are, from left to right, Elizabeth Murphy, Treasurer; Eileen Stevenson, Corresponding Secretary; Gail Chosey, Secretary; and Mary Coyne, Vice President.

WRAMA education project officer; and AFA Chapter President Paul Fain.

* * *

AFA's fifth annual State President's Orientation Meeting was held in Washington, D.C., January 9-10, in conjunction with the meetings of the Board of Directors and Nominating Committee.

Twenty-three State Presidents attended the two-day meeting, which convened at AFA's Headquarters offices for a briefing on AFA—its mission and internal operation.

AFA President Robert W. Smart opened the meeting, after which the State Presidents were briefed on the responsibilities and operation of each of the departments within AFA Headquarters.

The second day's sessions were conducted at the Washington Hilton Hotel and included a presentation on "The Air Force Mission" by Col. Leo Beinhorn, Chief of the Internal Information Division, Office of Information, Office of the Secretary of the Air Force; an Air Force film on the drug-

addiction problem, entitled "The Hang-up"; and a film on the Utah AFA's outstanding program entitled "Project Navajo."

Maj. Gen. William C. Garland, Director, Office of Information, Office of the Secretary of the Air Force, was

guest speaker at a luncheon held for the State Presidents, and an evening reception honored AFA's Board of Directors and State Presidents. Distinguished Air Force guests at the reception included John Lang, Administrative Assistant to the Secretary of the Air Force; Dr. Theodore C. Marrs, Deputy for Reserve Affairs; Maj. Gen. William C. Garland; Maj. Gen. Winston P. Wilson, Chief, National Guard Bureau; Maj. Gen. Nils O. Ohman, Commander, Headquarters Command; Brig. Gen. Richard A. Knobloch, Commander, 1001st Air Base Wing, Andrews AFB; Brig. Gen. John C. Giraudo, Deputy Director, Legislative Liaison, Office of the Secretary of the Air Force; and Brig. Gen. H. L. Hogan, Deputy Director, Office of Information, Office of the Secretary of the Air Force.

The following State Presidents attended the meeting: Dr. Boyd Macrory, Alabama; Hugh W. Stewart, Arizona; Robert Lawson, California; Parks Deming, Colorado; Herbert West, (Continued on following page)



Shown at the Alamo Chapter's recent dinner meeting are, from left, Texas AFA President Ben Griffith; Maj. Gen. Frank E. Rouse, Commander, San Antonio Air Materiel Area; Mrs. Richard Lee; Congressman O. C. Fisher, 21st District of Texas; Chapter President B. L. Cockrell. More than 350 attended the dinner, which was held in the Randolph AFB Officers' Open Mess and featured presentations by Maj. Vernon L. Frye and AF Academy Cadet Lt. Col. J. L. Arnold.



The Colorado Air Force Association recently hosted a dinner at the Lowry Technical Training Center Officers' Club as the kickoff function of the newly formed Colorado AFA Executive Advisory Council. Present at the event were, from left to right, Lt. Gen. T. S. Moorman, AF Academy Superintendent; Front Range Chapter President R. A. Haug; AFA National Director G. M. Douglas; Lt. Gen. A. C. Agan, Jr., Aerospace Defense Command Commander; Maj. Gen. J. C. Moffitt, Colo. Adjutant General; Brig. Gen. E. Wittbrodt, AFAFC Commander; Colo. AFA President S. P. Deming; Colo. AFA Past President Gen. R. M. Lee, USAF (Ret.); Colo. Springs Chapter President T. W. Shoop; Col. J. W. Lancaster, Ent AFB Commander; Col. J. O. Gross, AFAFC Deputy Commander; R. T. Person, Public Service Co. of Colo. president; R. E. Stanley, Colo. AFA Treasurer; W. F. Nicholson, Colo. State Senator; Maj. Gen. D. O. Monteith, Lowry Technical Training Center Commander; and R. J. Pringle, Mountain States Telephone Co. vice president and general manager for the state of Colorado.



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AFA NEWS

Florida; William Kelly, Georgia; Harry LeMoyné, Idaho; Ludwig Fahrenwald, III, Illinois; John McGaffigan, Louisiana; Andrew Trushaw, Jr., Massachusetts; Norman Scott, Michigan; Victor Vacanti, Minnesota; O. Earl Wilson, Missouri; and Lloyd Grimm, Nebraska.

Also, James Grazioso, New Jersey; William Rapp, New York; George Gardner, Ohio; Dr. Clayton Gross, Oregon; Edmund Gagliardi, Pennsylvania; Ben Griffith, Texas; Jack Price,

Utah; Peter Touhy, Washington; and Harold Bates, Wisconsin. Richard Emrich, Virginia AFA Vice President, represented State President A. A. West.

In his address at the 14th Annual Banquet of AFA's Altus Chapter, Brig. Gen. Frank Madsen, Jr., Chief of Staff of the Air Training Command, described the Air Force training program for pilots and called today's airmen the smartest students ever. He explained that the Air Force uses pro-



Lt. Gen. John W. Carpenter, III, shown second from right, Deputy Chief of Staff/Personnel, and guest speaker at a recent meeting of Air Force Association's Central Florida Chapter, chats with, from left, Chapter member Forrest Easson; Chapter President Taylor Drysdale; and Maj. Gen. Delmar W. Spivey, USAF (Ret.). More than 200 persons attended the meeting and enjoyed General Carpenter's presentation, which covered "The History of the Air Force Association."

Mr. Capriglione
receives the N. J.
AFA's Thomas
P. McGuire, Jr.,
Memorial Award
at the 1968 N. J.
AFA Convention.



Salvatore Capriglione, Immediate Past President of AFA's New Jersey State Organization, died suddenly on January 13, 1969. A dedicated AFAer, Sal, as he was known to members throughout AFA, served several terms as Chapter President and four terms as New Jersey President. AFA extends its deepest sympathy to Sal's widow and his children.



Head table guests at the Middle Tennessee Chapter's Annual Meeting and Awards Banquet pose for a photograph following the affair. From left to right are shown: Col. Wayne Matson, Commander of the 839th Air Division, Tactical Air Command, Sewart AFB, Tenn.; South Central Regional Vice President Jack Gilstrap; Chapter Past President Samuel Altman; Lt. Col. Stephen Harrison, Air Force Technical Applications Center, Directorate of Operations, Office of the Deputy Chief of Staff (Plans & Operations), who was guest speaker at the banquet; Chapter President King C. Matthews; and State President Enoch B. Stephenson.

grammed learning, a tutor-pupil relationship, "something that disappeared in this country when it was decided to put twenty-five students in one classroom." The "programmed learning" is the best pattern of training yet available, he said.

Wayne Stice, President-elect of the

Altus Chamber of Commerce, served as Toastmaster, and Chapter President Stansell Whiteside spoke briefly. Head-table guests included Col. David Davis, Commander of the Base Hospital, Altus AFB; and Col. Charles Hill, Commander of the 4th Mobile Communications Group, also at Altus.

CROSS COUNTRY . . . Arlington Chapter, Va., recently sponsored a reception honoring Brig. Gen. and Mrs. Richard A. Knobloch. General Knobloch commands the 1001st Air Base Wing at Andrews AFB. National Director A. Paul Fonda and Mrs. Fonda were special guests at the reception . . . The first Virginia State Air Show, recently held at Byrd Field in Richmond, was sponsored in cooperation with AFA's Virginia State Organization. The show featured an aerial demonstration by the Navy's Blue Angels and drew more than 65,000 spectators . . . AFA National Secretary Glenn D. Mishler recently served on the Freedoms Foundation Awards Jury. The Jury selected recipients of the 1968 National and School Awards presented by the Freedoms Foundation, Valley Forge, Pa.

COMING EVENTS . . . AFA National Convention, Houston, Tex., March 18-21 . . . Arnold Air Society National Conclave, New Orleans, La., March 30-April 2 . . . Air Force Academy Program, Colorado Springs, Colo., May 30-31 . . . Texas State AFA Convention, San Antonio, June 13-15.

—DON STEELE



The Ancient And Honorable Order Of GOONEYBIRDS® wants you!

Join this unique group dedicated to keeping alive the spirit of that "Grand Old Lady" of the skies, the fabulous DC-3.

Pilots . . . navigators . . . radio operators . . . flight engineers — active or retired — if you were flight qualified, you're eligible to join the growing list of aviation greats who are Gooneybirds.

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Get your copy of "The Plane That Changed the World," the biography of the DC-3, 296 pages, more than 200 illustrations, at a saving of \$4.75!

Get-togethers! Funfests! Fly-ins! There'll be Gooneybirds' "nests" wherever airmen meet!

Hurry!

LIMITED NUMBER OF CHARTER MEMBERSHIPS AVAILABLE

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P. O. Box 3213, San Diego, Calif. 92103

I am a qualified applicant for membership as an active or retired flight crew member in the DC-3.

Name

Address

Zip

☐ Please send me my membership card, pin, certificate, and special book discount catalog. I enclose \$ 5.00.

☐ In addition to the above, please include a copy of the book "The Plane That Changed the World." I enclose \$10.00.

Signed

Calif. residents add 5%; foreign orders add 10%

AIR FORCE ASSOCIATION MILITARY For Worldwide Protection.

**NO HAZARDOUS DUTY
RESTRICTION
NO WAR CLAUSE**

MORE THAN:

18,500 POLICYHOLDERS

MORE THAN:

**\$300,000,000.00
INSURANCE IN FORCE**

BIG BENEFITS! LOW PREMIUMS

Professionally Administered by AFA!

BIG BENEFIT SCHEDULE		
Age	Basic Coverage*	Extra Accidental Death Benefit
20-24	\$20,000	 \$12,500
25-29	20,000	
30-34	20,000	
35-39	20,000	
40-44	17,500	
45-49	13,500	
50-54	10,000	
55-59	10,000	
60-64	7,500	

*A flat sum of \$15,000 is paid for all deaths which are caused by an aviation accident in which the insured is serving as pilot or crew member of the aircraft involved. In this case, the accidental death benefit does not apply.

LOW PREMIUM SCHEDULE

\$10 per month gross premium (reduced by dividends each year since 1962) provides COMPLETE coverage.

Policyholders Have Shared in
Dividends for Six Consecutive
Years—Plus Increased Benefits

1961



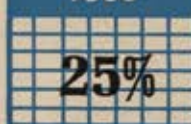
Policy changed to permit policyholders to keep insurance at the low, group rate when leaving military service.

1962



20% dividend paid to all policyholders.

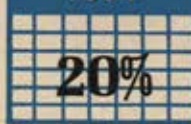
1963



25% dividend paid to all policyholders.

Coverage extended to include AF Ready Reserve and Air National Guard.

1964



20% dividend paid to all policyholders.

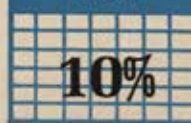
Accidental death benefit increased to \$12,500. Coverage increased for flying personnel at no increase in premium.

1965



9% dividend paid to all policyholders, a decrease reflecting AFA's decision not to limit coverage in combat zones.

1966



10% dividend paid to all policyholders. Coverage continues to insure policyholders in combat zones with no restrictions.

1967



8% dividend paid to all policyholders. Coverage continues to insure policyholders in combat zones with no restrictions.

YEARS
WAR
VIETNAM

GROUP LIFE INSURANCE...

..Everywhere, All The Time

NO WAR CLAUSE! NO HAZARDOUS DUTY RESTRICTION!

There is no war clause, combat-zone waiting period, other hazardous duty restriction or geographical limitation on AFA Military Group Life Insurance coverage. It is AFA's policy to continue to provide the broadest possible protection to all of our member-policyholders, including those in combat zones. We believe we can best fulfill our mission of service to the Air Force and to members in this way.

\$12,500 ACCIDENTAL DEATH BENEFIT

An additional benefit of \$12,500 is paid for accidental deaths—even those caused by aviation accidents—except when the insured is serving as pilot or crew member of the aircraft involved.

EXCLUSIONS — FOR YOUR PROTECTION

In order to provide maximum coverage at minimum cost for all participants, there are a few exclusions which apply to your coverage. They are:

Death benefits for suicide or death from injuries intentionally self-inflicted while sane or insane shall not be effective until your policy has been in force for twelve months.

The Accidental Death Benefit shall not be effective if death results: (1) From injuries intentionally self-inflicted while sane or insane, or (2) From injuries sustained while committing a felony, or (3) Either directly or indirectly from bodily or mental infirmity or poisoning or asphyxiation from carbon monoxide, or (4) During any period while the policy is in force under the waiver of premium provision of the master policy, or (5) From an aviation accident, military or civilian, in which the insured was acting as pilot or crew member of the aircraft involved.

EQUAL COVERAGE — AT THE SAME LOW PREMIUM — FOR FLYING AND NON-FLYING PERSONNEL

All policyholders are insured for the same basic amounts, at the same low premium, whether or not they are on flying status. This eliminates the penalty of lower coverage for the man on flying status whose death is caused (as most are) by illness or ordinary accident. There is one exception* to this provision which is clearly stated below the benefit table on the opposite page.

PROFESSIONALLY ADMINISTERED

Military Group Life Insurance is administered by professionally trained insurance personnel within the Air Force Association. This provides efficient, thorough service at the lowest possible cost.

OTHER BENEFITS

**COVERAGE MAY BE
RETAINED AFTER
LEAVING ACTIVE
DUTY TO AGE 65.**

**GUARANTEED CON-
VERSION TO PERM-
ANENT INSURANCE**

**WAIVER OF PREMIUM
FOR DISABILITY**

**FULL CHOICE OF
SETTLEMENT
OPTIONS**

ELIGIBILITY

All active duty personnel of the United States Air Force (under Age 60) and all members of the Air Force Ready Reserve and Air National Guard (under age 50) are eligible for this insurance provided they are now, or become, members of the Air Force Association.

PAYMENT OF PREMIUMS

Premiums may be paid direct to AFA in quarterly (\$30), semiannual (\$60), or annual (\$120) installments. AFA will send statements 30 days before each premium due date. Active-duty personnel may also pay monthly by government allotment (\$10), thereby having their premiums paid automatically and preventing any possible lapse in coverage.

AF Active Duty, Ready Reserve & National Guard Personnel Are Eligible

MAIL YOUR APPLICATION TODAY!

OTHER FACTS ABOUT YOUR POLICY

All certificates are dated and take effect on the last day of the month in which your application for coverage is postmarked. Coverage runs concurrently with AFA membership. AFA Military Group Life Insurance is written in conformity with the Insurance Regulations of the District of Columbia.

The insurance will be provided under the group insurance policy issued by United Benefit Life Insurance Company to the Air Force Association. However, National Guard and Reserve members who are permanent residents of Ohio, Texas, Wisconsin, and New Jersey, will not be covered under the group policy, but will be eligible for individual policies providing somewhat similar benefits.

AFA MILITARY GROUP LIFE INSURANCE (UNDERWRITTEN BY UNITED OF OMAHA)

Rank (please print) _____ Name _____ Service Number _____
Mailing Address _____
City _____ State _____ Zip Code _____
Date of Birth _____
Beneficiary _____ Relationship _____

This insurance is available only to AFA members:

- ☐ I enclose \$7 for annual AFA membership dues (includes subscription (\$6) to AIR FORCE/SPACE DIGEST).
- ☐ I am an AFA member.

I understand the conditions governing AFA's Group Life Insurance Plan. I certify that I am eligible for this insurance under the category indicated, that I am currently in good health, and that I have successfully passed, within the past two year period, the last physical examination required by my branch of service. (Reserve and Guard personnel not on extended active duty must include with this application a copy of their most recently completed SF88.)

Signature of Applicant _____

Date _____

Application must be accompanied by check or money order. Send remittance to:

INSURANCE DIVISION, AFA, 1750 PENNSYLVANIA AVE., N.W., WASHINGTON, D. C. 20006

Please indicate below the form of payment you elect:

- ☐ Monthly government allotment (I enclose \$20 to cover the period necessary for my allotment to be processed.)
- ☐ Quarterly (I enclose \$30)
- ☐ Semi-annually (I enclose \$60)
- ☐ Annually (I enclose \$120)

Category of eligibility (please check appropriate box)

- ☐ Active Duty, Air Force
- ☐ Ready Reserve, Air Force
- ☐ Air National Guard

Bob Stevens' "There I Was..."

Bob Stevens tips his hard hat to that splendid team at NASA's Manned Spacecraft Center, and to the men they help keep aloft. Consider the GI of tomorrow. Will his lot be much different in space? Probably not . . .

HERE'S TO THOSE UNSUNG HEROES OF THE SPACE PROGRAM WHO MAN THE CONSOLES -ON THE DECK.



ONE THING WORSE THAN THE 'NIGHT WATCH' IS MONITORING SPACE CHOW TIME ON THE BOOB TUBE...



IMAGINE! A THREE-DAY PASS FROM A SPACE STATION! ... QUO VADIS?

SOME THINGS, LIKE MORNING REPORTS, WILL ALWAYS BE WITH US



An altimeter is just one of hundreds of components on every U.S. Air Force plane. Each is a potential trouble spot. The Air Force has skilled mechanics to detect faulty parts on the ground, and it has given them access to a UNIVAC® real-time computer system to locate replacement parts from inventory in a matter of seconds. And, the parts can be delivered to the flight line in about twelve minutes.

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

When the mechanic orders a

replacement altimeter, the computer notifies issue clerks and indicates where it's stored. The computer checks its memory again. This time to see how many altimeters should be on hand. If inventory is now too low to meet expected demand, it initiates a re-order and updates accounting records for Base Level Supply.

Multiply that altimeter order by a few hundred an hour and you have a rough idea how much work the Air Force gets out of this UNIVAC inventory system. A total system with forecasting, control and cost-cutting functions built in.

There's a UNIVAC system at virtually every Air Force base. 166 systems to be more precise. All equipment and procedures are the same. Personnel have to be trained only once to use any of them.

UNIVAC computer systems are also being used by people in business, government and science. And you don't have to own an air force to have one working for you.

UNIVAC

Univac is saving a lot of people a lot of time.

 SPERRY RAND

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.





**"Experience...
daring design...
and the courage
to break old rules."**

With new high performance air superiority fighter designs now on the drawing boards, McDonnell Douglas' Engineering VP at McDonnell Aircraft Company, G. S. Graff, talks candidly about the men he's assigned to the job and the tools with which they work.

Q. Mr. Graff, you were on the design team that created the Phantom. What changes have occurred since that time which affect the design problem on a new fighter?

A. We've got a wider variety of better structural materials, but more restrictions and less tolerance in their application. Jet engines are more powerful and more efficient, but considerably more sensitive. Our customers are more sophisticated in their ability to define requirements. They are also better equipped to analyze the solutions to those requirements. Finally, there have been significant advances in computer technology. Computers now help us study design problems to a degree that we couldn't have visualized ten years ago.

Q. Just how do you fit computers into your design effort?

A. By making them a tool of the creative design engineer, not a replacement for him. It is entirely possible with today's computers to design an airplane using computers alone. Several programs have been written and operated which do just that. A sort of "dial-an-airplane" where you put in the requirements and take out a design. We at McDonnell Douglas, however, believe that there is no replacement for the creative design engineer when it comes to laying out new aircraft designs. We have designed our computer programs around him and as a design aid to him. They assist him in the orderly optimization of his design studies but are never a substitute for the designer's ingenuity and creativeness.

Q. How do you find this kind of designer? What is the key prerequisite you look for when picking your design team?

A. Good judgment. Not only about design, but about all aspects of product development, production, and application. Many of the leaders on our new designs have been together for years. They have grown in design judgment and they've stayed up with the state-of-the-art. They give us leadership, based on experience, that has the courage to break old rules. We've added a select group of "new blood" engineers to back them up. They're current on technology, experienced enough to be practical, and willing to suggest some daring designs.

Q. What is the most critical design area in a new fighter?

A. The propulsion system; engine, inlet, duct and exit. As the jet engine's efficiency improved it has become more and more sensitive to the environment provided by the engine airframe interface. Then, too, the trend toward higher thrust-to-weight ratios evidenced in new fighter designs increases the relative size and importance of the propulsion system to the rest of the aircraft. As a result, the greatest potential for improved aerodynamic performance for fighters lies in the area of the inlet and the exit. We have invested heavily in facilities, test time, and creative manpower in this area and as a result we are realizing substantial performance improvements in our new fighter designs.

MCDONNELL DOUGLAS

