FEBRUARY 1969 / 60c

AIR FORCE

and SPACE DIGEST

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

IN THE BEGINNING . . .

Man's first view of the rising earth, as seen by the Apollo-8 astronauts as they came from behind the moon after their lunar orbit insertion burn during the December mission. On the earth, 240,000 miles away, the sunset terminator bisects Africa.

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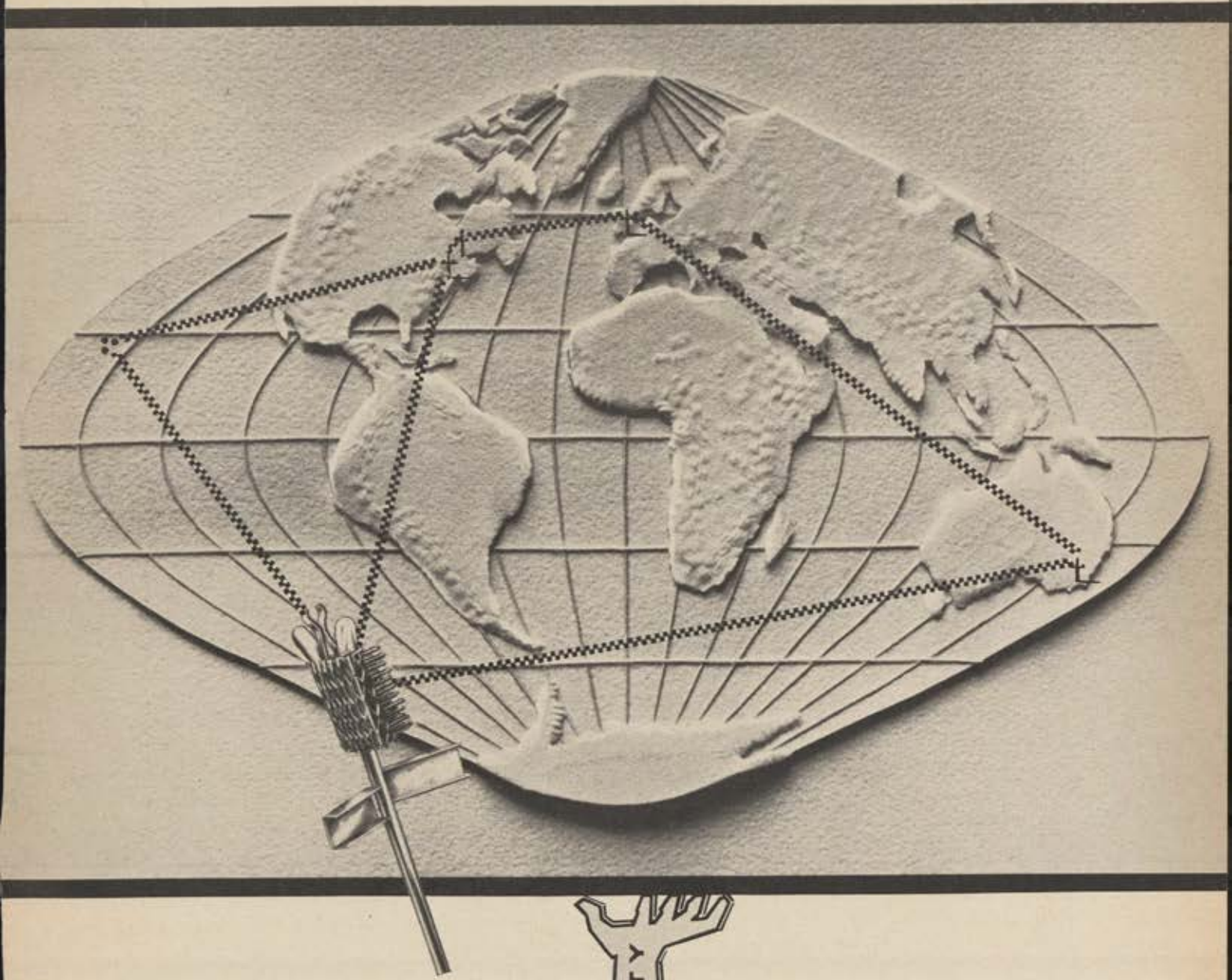

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EDITORIAL STAFF
1750 Pennsylvania Ave., N. W.
Washington, D. C. 20006

Richard M. Skinner, Managing Editor

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Irving Stone, West Coast Editor, 10000 Santa Monica Blvd., Los Angeles, Calif. 90067 (213-878-1530). **Stefan Geisenheyner,** Editor for Europe, 6200 Wiesbaden, Germany, Wilhelmstr. 52a, Apt. 123.

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ADVERTISING DEPARTMENT

John W. Robinson, Director of Sales, 880 Third Ave., New York, N. Y. 10022 (212-752-0235).
Laurence W. Zoeller, Director of Promotion; **Judy L. Markey,** Promotion Assistant, Suite 400, 1750 Pennsylvania Ave., NW, Washington, D.C. 20006 (202-298-9123).
Carole K. Zoeller, Production Manager, Suite 400, 1750 Pennsylvania Ave., NW, Washington, D. C. 20006 (202-298-9123).

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SPACE DIGEST

DEPARTMENTS

An Editorial

The New Administration

By John F. Loosbrock

EDITOR, AIR FORCE/SPACE DIGEST

WASHINGTON, D. C., JANUARY 16

AS THIS is written, only a block and a half from our typewriter the last licks of paint and the last bits of bunting are being applied to the imposing reviewing stand in front of 1600 Pennsylvania Avenue, N. W. The building contractor's sign proclaims, "Sorry for the inconvenience of construction—We are making way for another great man." Shop windows echo the sentiment, sometimes even giving the incoming President equal billing with the post-Christmas sales posters. The *maitre d's* at the flossy restaurants are busy putting new faces together with new names and rearranging the pecking order for their best tables.

The world's biggest business and Washington's biggest industry—the government of the United States—is about to experience a change of management. Like any company town undergoing a topside shakeup, Washington is a mixture of hopes and fears, of cocky newcomers and cynical outgoers, of loyalists, rebels, neutralists, and downright turncoats who preface every conversation with the murmured, "Of course, I've *always* been a registered Republican."

To one who has been in, but not of, the governmental scene for more than two decades comes an overpowering sense of *déjà vu*, of inconvenience rather than inspiration, of new numbers in one's telephone book rather than new hands on the reins of government. One feels a bit put upon.

But when the big day comes even we veterans shed our battle-stained armor of cynicism and join in the festivity with good heart and open mind. The pageantry is infectious, and through the vulgarity of the floats, the bands, and the prancing drum majorettes comes a feeling of history, a pervading notion of continuity and strength and idealism that makes the most hardened of arteries pulse with a tingle of renewal. It is at once a beginning and a carrying forward, and one cannot help but be touched thereby.

On Tuesday morning, of course, the workmen will return to the Avenue to attack the stands with their wrecking bars. The flags and the bunting will come down. There will be new pictures on the walls of the President's oval office and new nameplates on the back of the chairs in the adjoining Cabinet Room.

At that point our interest must be directed at the impact of the new Administration on those problems in which we have a deep involvement—the maintenance and enhancement of national strength, with special reference to the military, technological, and social attitudes and programs that form its core. It is here that the campaign oratory comes face to face with such harsh realities as the budget, Vietnam, the Middle East, NATO, the need for new and more advanced weapons for the force structure of tomorrow, the need for replenishing and refurbishing the force structure of today, the draft, the post-Apollo space program, the clogged national transportation system, the unrest in our cities and on our campuses, inflation, and, most important of all, the blurring and diffusion of our national purpose. If one looks at the weaknesses and the problems, one wonders why any man in his right mind would want to be President.

But one must also look, as assuredly Mr. Nixon has, at the great strengths of our nation—the burgeoning economy, the great technological leaps forward, the professional competence of our armed forces, our enormous natural resources, still vast after decades of abuse, and above all the talents and the energies of a population that has demonstrated time and again that it can rise nobly to high challenges nobly placed before it.

On balance, in our judgment, the pluses outweigh the minuses, the capabilities surpass the requirements, the strengths are greater than the weaknesses. John Kennedy felt this, we think, and articulated it beautifully, but his rhetoric was of higher quality than his deeds. Lyndon Johnson felt it, too, but the worth of his programs suffered from his inability to explain them with inspiration and credibility. Thus, he became the tragic victim of bad advice on and bumbling implementation of a war in Southeast Asia which the policies of his predecessor had made all but inevitable. History will be kind to Lyndon Johnson, we think, and if it is not cruel to John Kennedy, the reason will lie largely in the calamitous circumstances of his death.

Now Richard Nixon comes front and center. He inherits much that is good, much that is bad. The mistakes of his immediate predecessors can become a great asset to him, particularly in the area of national defense. With the exception of Vietnam, they are solvable and reversible. And Mr. Nixon, in his long and painful climb back up the political ladder, has demonstrated a toughness of mind and a pragmatism that will lead to close study of these mistakes. Even the Vietnam War can yield profit if the right lesson is derived from it, namely, "Let's not again" instead of "Let's do it better next time."

In his public pronouncements on defense Mr. Nixon has said mostly the right things. He believes in superiority, not parity, vis-à-vis Russia. He understands the role of technology in maintaining such superiority. He sees Communist weaponry as a greater threat to the world than US weaponry. This could be his greatest contribution of all to national security.

Any bureaucracy, of course, public or private, civil or military, has a great built-in inertia. It is easier to pronounce a new policy than it is to implement it. We can expect no rapid overnight improvements. But if the new Administration is willing to put its money where its mouth is in national defense, some welcome changes are in the offing.—END

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TRW's background in space is second to none. We were the first company to build a spacecraft—Pioneer I in 1958. Our record since then includes Explorer VI, nine more Pioneer spacecraft, six Orbiting Geophysical Observatories, ten Vela nuclear detection satellites, thirty-one Environmental Research Satellites, and many military satellites.

For more information about TRW, contact Public Relations, TRW Systems Group, One Space Park, Redondo Beach, California 90278.

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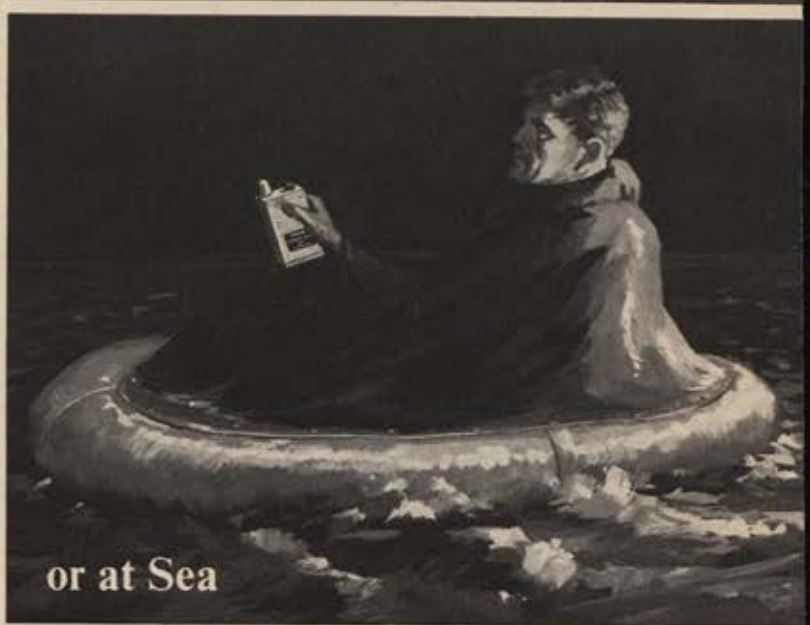

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Fact-Finding Subcommittee

Gentlemen: A quick note to express my appreciation for [Claude Witze's] excellent piece, "The Senate's Watchdog for Defense" [December '68 issue].

This is the only thing I have seen that really explains the work this largely unsung subcommittee has done through the years. It should be required reading by everyone interested in our national defense posture and in where his tax dollars go.

GORDON S. WILLIAMS
Public Relations Manager
The Boeing Company
Commercial Airplane Division
Renton, Wash.

NATO in Trouble

Gentlemen: It is rare that I feel compelled to write to an editor, but editorials occasionally demand that a person speak. This is especially true when the editorial is by a theoretically knowledgeable person like your Mr. Claude Witze, *i.e.*, his editorial on NATO in your December '68 issue.

I suppose it should take tremendous credentials to write an editorial for your magazine, and, therefore, should take equally tremendous credentials to write a critical letter. As I lack such equally tremendous credentials, I suppose I should accept somewhat the views expressed. . . . I am not a senior editor, or even a retired general. But I believe I am knowledgeable regarding both Europe and Asia. And I do not blindly accept what Mr. Witze has written.

In a sense, Mr. Witze has attempted to bring God to our side by suggesting that at Christmas time we can achieve peace only by strengthening NATO.

Mr. Witze dreamily requests a "force in being" in Europe to support NATO. I presume he means literally a force in being composed entirely of US forces and material. He must mean this because our so-called allies have never furnished much more to NATO than shadow forces and theoretically we should occupy France and force The General to furnish us with supply and communication facilities, not to mention room to maneuver.

If NATO serves as a deterrent at all, it is only because we beg for a Pearl Harbor of Europe to force our unwilling people to go to war against the Warsaw Pact nations.

Most of the senior military men I have talked to in Europe privately agree that if the Warsaw Pact nations attack the West they would be on the Atlantic wall in that time necessary to organize transportation. In an aside, Mr. Witze dreamily mentions the "rape of Czechoslovakia." Why doesn't he, or someone, tell the truth? Doesn't anyone, except the English, know that Czechoslovakia has two large uranium areas in Příbram in southern Bohemia and near Jáchymov bordering East Germany? Also, the Jeseník mountain range and Písek mines produce ilmenite and ilmenorutile, from which is obtained thorium, a trigger for H-bombs, and titanium, a space-age metal. I said the English tell the truth. See the Tuesday, November 12, 1968, issue of the London *Daily Telegraph*. [*"Uranium: Russia's Motive in Czechoslovakia?", an editorial by E. Hinteroff, suggests fear of loss of access to rich uranium deposits as real reason behind invasion.*—THE EDITORS.]

Back to the serious business of NATO. How long does any thinking person believe West Berlin could hold out? We know now that the Russian ground forces could move rapidly and are logistically sound. We also know NATO is in a complete state of disarray. But question—if Russia did move, would we use missiles for a first strike, knowing that Russia would retaliate? The obvious answer is no. We have a missile mania. We are almost psychotic regarding nuclear warfare. Many Americans honestly believe it is better to be red than dead.

What a give-away program we have indulged in. When the Marshall Plan came into existence to help rebuild Europe, the people then, as well as now, hated us. NATO simply defends our investment.

Well, we have sown the wind, and now we are reaping the whirlwind.

If NATO is to continue, we should demand equal participation from all of the countries, including France and Spain, build hard missile sites in Europe, and announce to the world we would use them to defend Europe, or get out and come home.

To paraphrase Mr. Witze, peace on earth will never come cheap, but war is equally expensive. What do we want?

CLANCY D. TULL
Kansas City, Mo.

MAC Acceptance

Gentlemen: As I approach the end of my second term as an AFA Chapter President and prepare to turn the position over to the new electee, Robert Loewy, I would like to write you about my recent experiences.

On May 13, 1968, my AFRes unit, the 88th Aerial Port Squadron, was activated by the President and gained by the 438th Military Airlift Wing (MAC), McGuire AFB, N. J. We served seven months and were demobilized on December 12, 1968. Forty of the enlisted men served in Korea and the remainder at McGuire.

The Military Airlift Command worked us as if they needed us. Reports from Korea indicate that our men assigned there also had long, hard hours. During the seven months, MAC treated us as if we were long-lost and very valuable persons. We were accepted as qualified traffic specialists and immediately placed in positions of authority befitting our grades and Air Force Specialty Code. We had from the first day the full confidence and respect of the gaining Aerial Port officials at McGuire AFB.

None of the minor administrative or personnel problems that occurred could diminish the fact that MAC treated us just great. I hope that [when] you come in contact with any of your high-placed Air Force friends you will tell them that MAC has more than amply demonstrated its regard for the Air Reserve Forces.

CAPT. WILLIAM G. BIRNBACH, AFRes
Empire Chapter #250
Bethpage, N. Y.

"Kingfisher" Search

Gentlemen: Several years ago, the battleship *North Carolina* was saved by the citizens of North Carolina from being scrapped. Through the efforts of our local American Legion, a campaign was started to raise funds to purchase the battleship and to berth her permanently in Wilmington. Since that time, the battleship has been re-

(Continued on page 11)

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stored and preserved as a memorial to those who served aboard her and to the men and women who have served our nation in the armed forces.

There is one important item we lack to complete this restoration. This item is of major importance. It is a Chance-Vought "Kingfisher" float plane that served as the far-ranging eyes of our fleet. Members of the North Carolina Battleship Commission have searched for several years and exhausted all leads in an effort to acquire a "Kingfisher" for the catapult. Without it, the ship is incomplete.

I believe your organization can assist in finding this vintage aircraft. I am a private pilot and have always been a supporter of airpower in the defense of our nation. Therefore, I am requesting assistance in locating this item . . . in the hope that those who see [this letter] and know of the location of such an aircraft, or parts thereof, may so advise me. We have volunteers standing by to restore the aircraft to its original condition.

I will appreciate information concerning a fuselage, wing, float, or any part of this aircraft. With your help, we will eventually "pipe" this aircraft aboard to take its rightful place to remind future generations of the role airpower plays in preserving our nation.

W. F. Summers, Jr.
5025 College Dr.
Wilmington, N. C. 28401
Phone: (919) 791-4087

Unit History Project

Gentlemen: The Wooten Squadron of the Arnold Air Society, here at The Citadel, is currently planning a project in which we would like to give a brief history of the many different Air Forces, Divisions, Wings, Squadrons, and so on, in the US and overseas. We are interested in obtaining information on *all* units, but would like to give particular interest to our units fighting in Vietnam.

We would greatly appreciate it if readers could send us a brief history of their unit and an insignia patch.

Cadet Sgt. George H. Kneen, III
P. O. Box 1483
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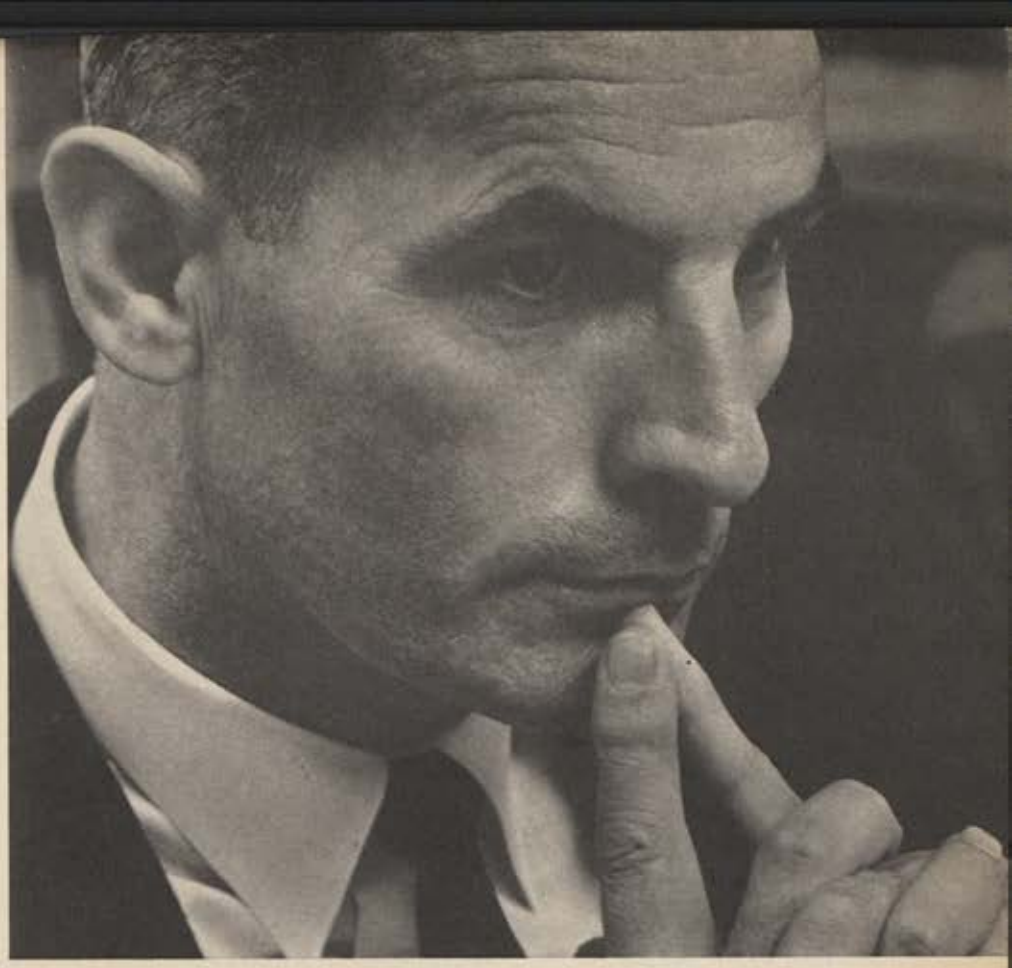

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AEROSPACE WORLD

News, Views & Comments

By William P. Schlitz

NEWS EDITOR, AIR FORCE/SPACE DIGEST

WASHINGTON, D.C., JAN. 17

The crew most likely to fly what is expected to be the climactic moon-landing mission, Apollo-11, perhaps as early as July, is deep in training for the monumental task. Their names were announced even as the triumphant Apollo-8 trio basked in the praise that followed their Christmas-tide flight around the moon.

Chosen to fly Apollo-11 are three space veterans, NASA civilian test pilot Neil Armstrong, Air Force Lt. Col. Edwin "Buzz" Aldrin, and Air Force Lt. Col. Michael Collins. The USAF members, Aldrin and Collins, are both veterans of the extravehicular "walks" in space that highlighted the later NASA Gemini flights. Commander of Apollo-11 will be Neil Armstrong. He will descend with Aldrin to the lunar surface aboard the Lunar Excursion Module (LEM). Collins will remain aboard the Apollo "mother ship" orbiting the moon.

But before anyone can be sure about the Apollo-11, the Apollo-9 and -10 missions have to be successful. Apollo-9, expected in late February, is the earth-orbital flight in which, for the first time, the LEM will be flight-tested for its ability to rendezvous precisely with the mother ship. During the actual moon-landing mission, the LEM, the most crucially important piece of hardware of all, must not only carry the landing astronauts safely to the surface but, after their hours of exploration are over, return them to a lunar-orbit rendezvous with the mother ship to be boarded for the flight home.

Apollo-10, next in the series, as currently described by NASA, is essentially a repeat of Apollo-8 except that two astronauts will descend aboard the LEM almost to the moon's surface without landing. The mission will be a final check on the operation of LEM. It is possible, but at the moment considered unlikely by NASA, that Apollo-10 could be converted into a landing mission.

Meanwhile, as the wait begins for the new missions to unfold, one touching moment after Apollo-8 should be recorded, before it's forgotten. It happened at the Washington press conference at which Astronauts Borman, Lovell, and Anders appeared. Colonel Borman's appointment as deputy chief astronaut for NASA, an administrative post at the NASA Houston Manned Spacecraft Center, had been announced, a job that took him out of the running for a seat on the moon-landing mission. A little later, he was asked why he had wanted to fly to the moon. He replied, quite movingly, that one of the most important reasons was his desire to prove the spaceworthiness of the Apollo system after the changes made in the wake of the Apollo fire tragedy of 1967. In a way, Colonel Borman seemed to be saying, his part in the flight was a kind of memorial to those who had died.

☆

The first in a series of projected annual US military exercises in Europe got under way last month and will continue into February. The exercises, Reforger I/Crested Cap I, involve 12,000 Army and 3,500 Air Force personnel transported from the States by C-141s from six Military Airlift Command wings.

The exercises, originally planned for later in 1969, were moved up in reaction to the Russians' invasion of Czechoslovakia. The earlier date was announced in Brussels in November by Secretary of Defense Clark Clif-

NASA astronaut Neil Armstrong, a former civilian test pilot, will be Apollo-11 command pilot, and with fellow astronaut, USAF Lt. Col. Edwin Aldrin, will be aboard the Lunar Excursion Module for the first moon landing.

USAF Lt. Col. Edwin Aldrin will be the Lunar Excursion Module pilot on the Apollo-11 mission and will descend with Armstrong to the surface. The landing duo may spend up to three hours exploring the lunar surface.

Astronaut Michael Collins, also an Air Force lieutenant colonel, will be command module pilot and will remain aboard "mother ship" in lunar orbit while Armstrong and Aldrin explore the lunar surface during the mission.

ford, who billed the exercises as part of the US contribution to increased NATO readiness. Over-all, the exercises are to help evaluate and develop techniques for deploying US NATO forces in Europe, with emphasis of the current exercise on orderly disposition of forces, rather than speed. The Russians, typically, charged provocation, since the maneuvers are taking place thirty miles from the Czech border.

Most of the units involved were redeployed to the US last summer but retained under operational command of USCINCEUR. Other units in Germany also are participating. Among them, a brigade of the 24th Infantry Division, which is not to rotate stateside as previously announced but will stay in Germany upon conclusion of the exercises. An earlier concept to have the brigades of the division succeed each other on duty in Germany has been revised in order to strengthen the 24th's combat readiness by decreasing personnel shifts.

The Army units airlifted to Europe by MAC are to return to the US upon completion of Reforger I. However, the Air Force's four squadrons of F-4s participating in Crested Cap I will remain in Europe temporarily for additional training.

Air Force units participating in Crested Cap I include the 7th, 8th, and 9th Tactical Fighter Squadrons, Holloman AFB, N.M., of the 49th Tactical Fighter Wing; and the 417th Fighter Squadron, Mountain Home AFB, Idaho, of the 50th Tactical Fighter Wing.

Military Airlift Wings participating in Reforger I: the 60th, Travis AFB, Calif.; the 62d, McChord AFB, Wash.; 63d, Norton AFB, Calif.; 436th, Dover AFB, Del.; 437th, Charleston AFB, S. C.; and 438th, McGuire AFB, N.J.

Troops of the 24th Infantry Division, Ft. Riley, Kan., settle down aboard a USAF Military Airlift Command C-141 StarLifter that helped airlift some 12,000 US Army personnel to Europe in January to participate in Reforger I, a training exercise held thirty miles from the Czech border in Germany. The Air Force supplied four squadrons of F-4s for its part of the operation, called Crested Cap I.

☆

In January another exercise, Bold Shot/Brim Fire 2-69, was conducted in Puerto Rico by the US Strike Command. The exercise involved nearly 2,500 Army and Air Force personnel and seventy-eight aircraft.

Focal point was a live-fire airborne assault by 82d Airborne Division paratroopers on Vieques Island, with transports supplied by the Military Airlift Command.

Close air support was provided by F-4s from Seymour Johnson AFB, N. C., augmented by F-104s of the Puerto Rico Air National Guard and RF-84E recon aircraft from the Michigan Air Guard. Tankers of the Strategic Air Command and 136th Air Refueling Wing, Texas Air Guard, carried out in-flight refueling operations.

☆

Special ceremonies were conducted at Northrop Corp.'s Palmdale, Calif., facility January 7 as the one-thousandth Northrop T-38 Talon supersonic trainer built for the USAF was delivered to the Air Training Command.

The T-38, noted by the Air Force for its reliability and safety record, has been used to train more than 11,000 student pilots and has racked up nearly two million hours in flight time. It currently is flown more than 40,000 hours a month.

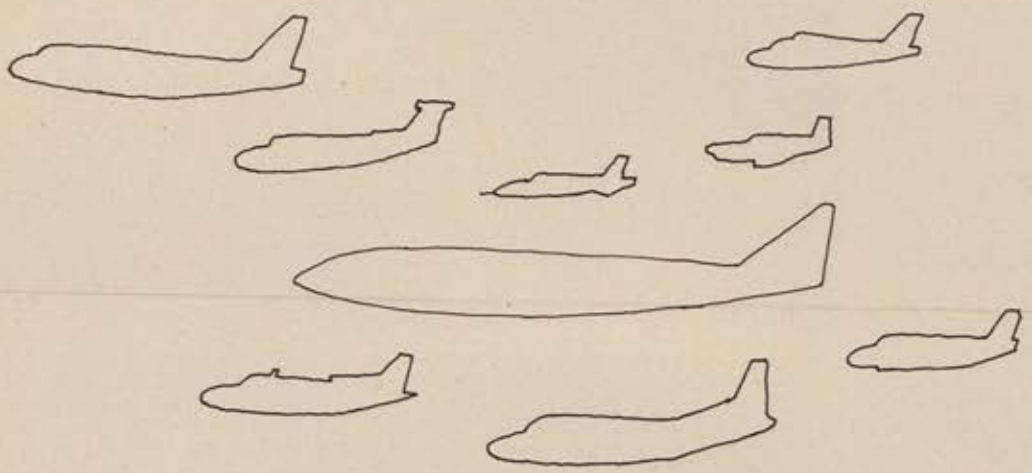
Northrop, working with Air Force assistance, designed into the trainer such safety features as dual engines, independent electrical and hydraulic systems for each engine, special placement of student pilot and instructor seats for unobstructed forward vision, visual access for preflight check, and identical ground and emergency air engine start procedures.

The T-38 holds several world time-to-climb speed records, and its two GE J85-5 turbojet engines give it a sea-level rate of climb of 30,000 feet per minute. The trainer can attain speeds of 850 mph.

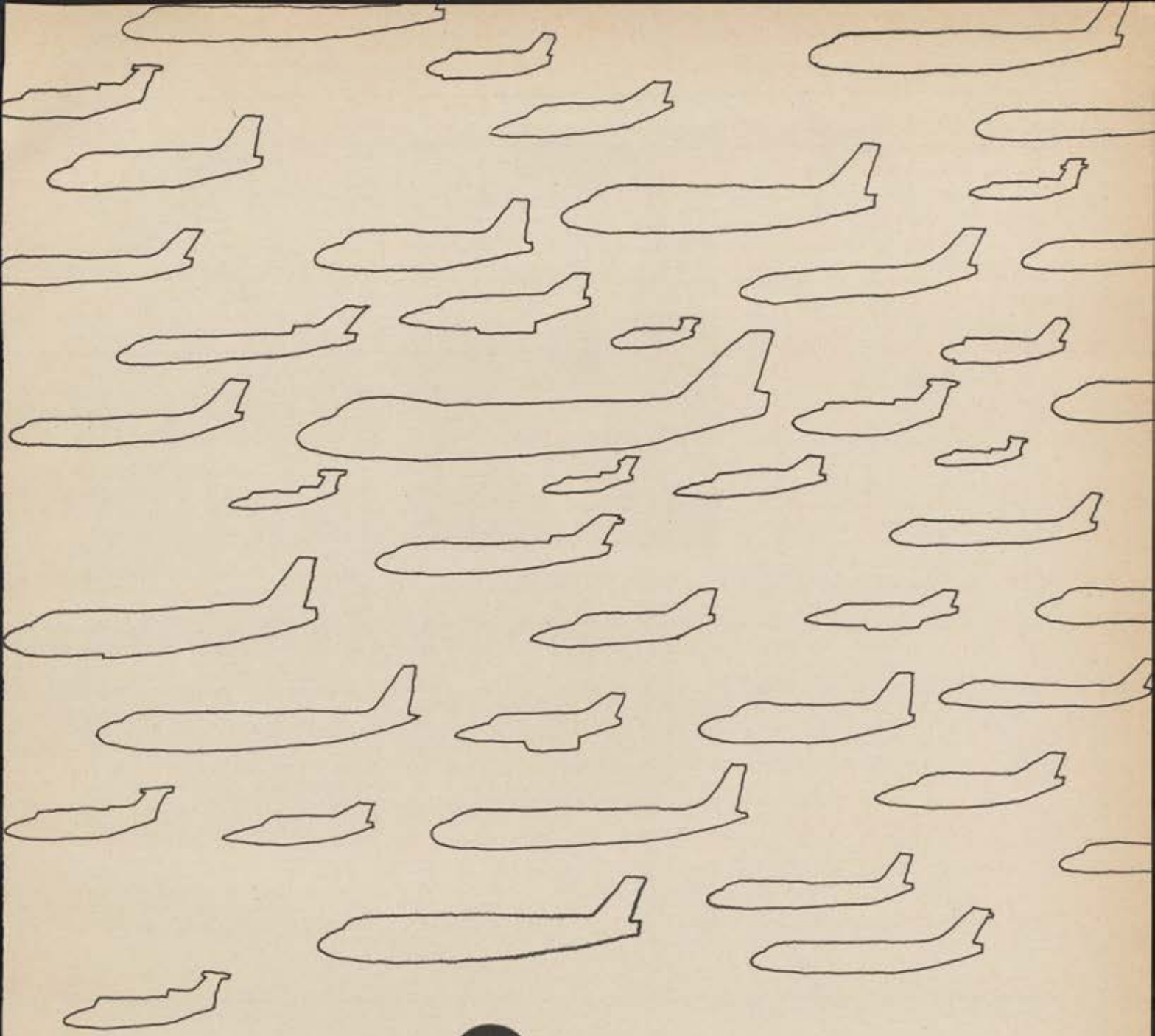
T-38s are used at all nine undergraduate pilot training bases and are to go into service at Columbus AFB, Miss., when that base converts to pilot training this summer. The air-

(Continued on page 16)

A milestone last month was delivery to the Air Training Command of the 1,000th Northrop T-38 Talon supersonic trainer built for the Air Force. The T-38 is noted for its proved reliability and a safety record that USAF says is the best of any supersonic aircraft in the inventory. In nearly two million hours of flight time the GE-powered T-38 has been used to train more than 11,000 student pilots.



Theirs.



Ours.

There are two major manufacturers of anti-skid braking Systems. *Them*. And Us. On the right are the number of plane models equipped with Our system. (We couldn't show the ratio on the total number of airplanes now in operation. It would be about 500 to 1.)

Four of the plane models on this page originally chose *Their* system. Now they have *Ours*.

Sometimes people get these facts a little confused. That's because *They* make wheels and brakes and tires. We just build anti-skid braking systems.

Thousands and thousands of anti-skid braking systems.

craft also is used by NASA to maintain astronaut flight readiness. Forty-three of the supersonic trainers are being used to instruct German Air Force student pilots at Sheppard AFB, Tex.

☆

A new self-contained jet engine starter that may eventually eliminate to a major extent the use of expensive starting cartridges and pneumatic power carts is under procurement by the Air Force.

Developed by the Air Force Systems Command's Aeronautical Systems Division, Wright-Patterson AFB, Ohio, the Jet Fuel Starter is a small gas turbine that requires only one and a half pints of standard aircraft jet fuel to start an engine. It weighs about seventy-five pounds, is nineteen inches long by eleven inches in diameter, and can generate ninety horsepower.

The Air Force has hopes that the starter may be adaptable to many DoD aircraft and sees it opening a whole new family of starters leading eventually to a continuously running device that will provide both auxiliary power and main engine starting power at reduced cost and greater reliability.

The new starter already holds the promise of eliminating the worldwide logistics problem resulting from use of starting cartridges and pneumatic power carts. No ground equipment at all is required.

The initial $9.5 million production contract, with Garrett Corp.'s AiResearch Division, Phoenix, Ariz., is in support of the new A-7D aircraft. Later, the devices could be installed on the Navy's A-7A aircraft, if an option for additional units is picked up.

The starter can start a variety of aircraft: the F-4, F-101, F-111, F-106, A-7, KC-135, and B-52 main engines, and retrofit on several of these aircraft is being considered. Studies are under way for use of the device on future aircraft, and its developers predict it also will find uses in general aviation.

Air Force Col. James D. Hughes has been appointed by President Nixon as his senior military aide. Colonel Hughes served as a military staff assistant to Vice President Nixon during President Eisenhower's second term.

☆

Air Force Col. James D. Hughes, 46, appointed senior military aide to the incoming President, is an old hand at working with Mr. Nixon, having served as a military staff assistant in the Vice President's office during President Eisenhower's second term. The Colonel is a West Point graduate and has an M.S. in International Affairs from George Washington University.

Until the presidential appointment, Colonel Hughes had been serving as Director of Safety, Headquarters, USAFE, Wiesbaden, Germany. During a tour in Vietnam, the Colonel was assigned to several posts at Hq., 2d Air Division, Tan Son Nhut Air Base. Among his decorations Colonel Hughes holds the Air Medal with nine Oakleaf Clusters, the Distinguished Flying Cross with one Oakleaf Cluster, the Bronze Star, and the Purple Heart.

Colonel Hughes hails from Balmville, N.Y. He and his wife Mary have four children: Donna, 22; Michael, 16; Karen, 14; and Robert, 4.

☆

Fog, that gentle but potentially deadly weather phenomenon, is receiving growing attention from both the civilian and military air sectors.

NEW BOOKS IN BRIEF

Handbook of Soviet Space-Science Research, ed. by George E. Wukelic. A detailed reference work for students, engineers, and scientists summarizing results of Soviet research with rockets, satellites, and space probes. Gordon and Breach, N. Y. 526 pages. $24.50.

Loud & Clear, by Robert J. Serling. The author examines the problem of airline safety through craft design, crew training, weather problems, ground control, and legal requirements. Though he does not resort to cheap scare tactics, his book is crammed with analyses of accidents that may persuade you to take the train next time. Doubleday, N. Y. 327 pages. $5.95.

1976: Agenda for Tomorrow, by Stewart Udall. Former Secretary of the Interior Udall reminds readers of the goals outlined in 1776, which he feels have been obscured and distorted since 1945. He discusses ways of achieving such priorities as livable cities, elimination of racism, control of population, and resource conservation. Harcourt, Brace & World, N. Y. 173 pages. $3.75.

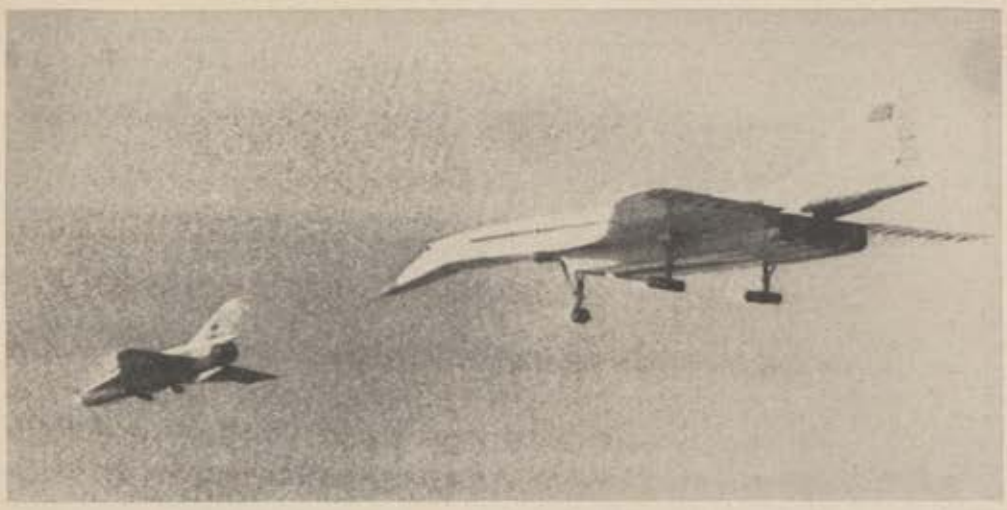
Soviet Space Exploration: The First Decade, by William Shelton. Along with comparisons of Soviet and American programs, information from interviews in Russia, and a review of early rocket research there, the author offers interesting personality sketches of Soviet cosmonauts and a chronology of Soviet spaceflights. Washington Square Press, N. Y. 340 pages. $6.95.

Towards a Global Federalism, by William O. Douglas. Supreme Court Justice Douglas here argues for world federalism as the means to solve conflicts and equalize resources among nations, and to defend the rights of individuals who are victims of race prejudice or technological innovation. With index. New York University Press, N. Y. 177 pages. $7.95.

Unless Peace Comes, ed. by Nigel Calder. The imaginations of these scientists from six countries will scare the daylights out of any unwary reader. Their projections of possible future weapons—from atomic robots to bacterial warfare and atmosphere pollutants—support one author's claim that "we must either eliminate science or eliminate war." Viking, N. Y. 243 pages. $5.75.

The Weapons Culture, by Ralph E. Lapp. A long-time critic reiterates his contention that the military-industrial complex has come to dominate our economy and to be detrimentally influential in our society. Contractor appendices and glossary included. Norton, N. Y. 230 pages. $4.95.

—Maria T. Estevez



The Russian supersonic transport, the TU-144, being guided to a landing after its maiden flight from a Moscow airport December 31. The aircraft has its nose down for maximum visibility. The plane will have a cruising speed of 1,500 mph and range of 4,000 miles. It can seat 120 passengers.

—United Press International Photo

It is estimated that domestic US airlines alone lose up to $75 million annually due to fog-canceled flights, a figure that is expected to mount as air traffic increases in the future. And in Southeast Asia, fog is interfering with the whole range of military air activities from support strikes to pilot rescue missions.

Several techniques under development to contend with the vexing mist have had encouraging results. The Air Transport Association followed up its Sacramento, Calif., area experiments that used planes and ground equipment in fog-seeding operations with a second series in the Cape Cod area. Experiencing considerable success, ATA will continue to develop a ground unit known as Fog-Sweep, a trailer-mounted large-diameter plastic tube that can extend 100 feet and dispense liquid or dry chemicals 200 feet in the air. FMC's John Bean Div. produces Fog-Sweep.

And Cornell Aeronautical Laboratory, conducting experiments for NASA's Office of Advanced Research and Technology, undertook a salt-seeding operation by air over Chemung County Airport near Elmira, N.Y. Swaths cut in the 300- to 400-foot-deep fog bank remained open for as long as twenty minutes. The seeding salt was mixed with fumed silica to assure even flow from the aircraft, but future experiments probably will use noncorrosive salt mixed with urea to achieve better results.

Another technique employs helicopter rotors to force the dry air that rests above a fog or cloud layer down into it. Scientists from the Air Force Cambridge Research Laboratories created nonreforming clearings of almost a mile in diameter in about ten minutes at Smith Mt. Airport, Roanoke, Va. Early tests had been conducted over the Gulf of Mexico, near Eglin AFB, Fla.

The most successful procedure requires the helicopter to hover 500 feet above the fog. The rotor downwash marks the fog area to be opened, and the helicopter then descends to one hundred feet above the fog and, at about thirty miles per hour, flies an expanding spiral pattern. Warm, dry air is forced down, to evaporate the moisture.

AFCRL says that at least one downed pilot obscured by fog has been rescued thus far in Southeast Asia using the instructions on the method passed on to area commanders.

For a report on fog-dispersal experiments by the USAF in Europe, see "Letter from Europe," page 33.

☆

The Soviet Union made good its boast to become the first nation to fly a supersonic transport, and in 1968, with very little time to spare.

The Russian TU-144 SST's maiden flight from the Zhukovsky facility near Moscow took place December 31, 1968, several months later than expected by Western experts. According to Soviet reports, the thirty-eight-minute flight went smoothly. Edward V. Elian, chief pilot of the TU-144, said that the aircraft was "much easier to pilot than subsonic airliners."

The TU-144 was accompanied by

(Continued on following page)

Flying just a few feet off the ground, this Lockheed C-130 Hercules delivers 36,000 pounds of cargo during test of the new "1528" Low Altitude Parachute Extraction System (LAPES). Low, accurate delivery system is expected to add a big plus to the effectiveness of aerial resupply.

First AC-119, gunship version of the Flying Boxcar, arrives for duty in South Vietnam. Recalled from AF Reserve status, the vintage aircraft have been outfitted with four 7.62-mm Miniguns. Plans call for the gunships to augment the mission performed up to now by the AC-47 Spookies.

a MIG chase plane that had been converted to check out various design features and performance characteristics of the big transport.

The 1,550-mph, 120-passenger aircraft is quite similar in appearance to both the British-French Concorde, slated to make its first flight in the immediate future, and the US SST, the Boeing 2707-300, the design of which currently is under evaluation by the US government.

One notable feature of the Soviet SST is its lack of tail plane. The aircraft is constructed of light alloys and has titanium on leading edges and other areas that will experience high temperatures.

☆

Pratt & Whitney Aircraft Division of United Aircraft Corp. has announced that it has successfully operated a JT8D turbofan engine utilizing a first-stage fan equipped entirely with boron/aluminum composite blades. The experimental blades weigh forty percent less than the standard engine's titanium blades.

With a diameter of forty inches, the fan stage is the largest rotating engine component made of metal-matrix composite materials ever run, according to Pratt & Whitney.

Each of the thirty blades weighs 15½ ounces, compared to twenty-six ounces for comparable titanium blades.

The test run of two hours included full power levels, and the blades remained in excellent condition throughout. The test was part of P&W's program of demonstrating feasibility of metal-matrix composites for applications in advanced military and commercial aircraft.

Pratt & Whitney Aircraft's JT8D turbofan in final stages of preparation for testing first-stage fan using boron/aluminum composite blades. Following installation of inlet case and guide vanes, the engine was run in a two-hour test in East Hartford, Conn., to JT8D takeoff rating thrust levels without damage. Fan is largest metal-matrix composite rotating component that has ever run.

Principal difference in appearance between the new fan and its conventional counterpart is the absence of part-span shrouds, needed in conventional titanium JT8D fans to stiffen the blades to prevent vibration. The composite blades, even though forty percent lighter, are stiff enough so that shrouds are unnecessary.

Considerable weight savings throughout an engine can be realized from use of lighter blades because centrifugal forces on the rotor are reduced.

Over-all engine weight reductions on the order of twelve percent for supersonic turbofans may be possible, once the benefits of the lighter materials are applied to other components, such as discs, stators, and cases. For lift turbofans, weight reductions of around thirty percent are indicated, and for subsonic turbofans about twenty-five percent. Although technical and economic problems preclude immediate use of composites in aircraft engines, Pratt & Whitney is confident that these advanced materials will play an important part in future engine designs.

In this space in the September 1968 issue of AF/SD it was indicated that USAF had "let it be known" that it would buy no more than the eleven Handley Page C-10A Jetstreams initially ordered. This information was incorrect. Delivery of the first eleven Jetstream mission-support aircraft, the prototype shown above during its maiden flight in November, will begin early this year. The option on the additional seventy aircraft is definitely still open and can be exercised by the Air Force on a yearly incremental basis. A twin-turboprop light transport, the C-10A is capable of carrying up to fourteen occupants or about 4,000 pounds of cargo, and is powered by Garrett AiResearch TPE 331-301W turboprops instead of the Rolls-Royce engines in the civil version.—L.W.Z.

☆

The Federal Aviation Administration announced that the first industry/government National Aviation System Planning Review Conference will be held February 18-20 in Washington, D.C.

FAA said that the conference's purpose is to give those who use the aviation system a forum to shape future plans and policies and also allow the FAA fuller utilization of resources and ideas contributed by

the industry. The National Aviation System comprises the navigation, communications, and all other factors involved in US air traffic control.

In January, FAA issued its two-volume National Aviation System Plan, Book I of which details FAA policy, criteria, and standards, and includes a bibliography. The document is intended as a permanent one to be amended as necessary. Book II outlines FAA's long-range plans for the system and will be updated annually to include data from industry and to reflect changes in planning, technology, and other factors.

During the conference, seminars will cover such National Aviation System subjects as: Aviation Demand Forecasting, Aviation Technology Forecasting, En Route Air Traffic Control, Terminal Air Traffic Control, Long-Range Radar Systems, Short-Range Radar Systems, Flight Service Stations, Terminal Air Navigation, En Route Air Navigation, Air/Ground Communications, Future Communications, National System of Airports, National Airport Standards, Airport Capacity, Aviation Weather, Airmen Information Service, and Airway Cost Allocation Study.

On the conference's last day, meeting results will be summarized and conferees will receive procedures for submitting proposals and conducting research in the six months following the conference.

The FAA intends to consider the conference's discussions and whatever proposals are submitted by industry in developing a new National Aviation System Plan to be published in January 1970. The FAA envisions a continuing review and analysis of policies and proposals culminating annually in the publication of a new plan, followed by the yearly conference.

Full-scale mockup of the world's largest inlet duct for an aircraft engine takes shape at Lockheed-California's Burbank facility. The "S-duct" will channel air to the No. 2 engine of Lockheed's L-1011 advanced trijet aircraft. This duct is to go into a full-scale mockup of the L-1011.

Invitations to the conference are to go to the aviation industry, state and local government officials, and to other federal government agencies.

In another matter, the FAA said it is extending for one year its near midair collision reporting program, which grants immunity and anonymity to those filing such reports. The program was initiated in January 1968, originally for a year's duration.

A report on the program is to be available sometime after the first quarter of 1969. James F. Rudolph, FAA's Director of the Flight Standards Service, said: "Before we initiated the reporting program last January, we were getting reports, but they were not as detailed or as frequent as we knew they could be. Once the program was under way, apparently, the airspace users welcomed an opportunity to tell us what factors, in their opinion, were contributing to near midair collisions. We've had outstanding cooperation from all segments of the flying public." Pilots and controllers are to use the same form—FAA 8020-1—used in the 1968 program.—END

AIRPOWER IN THE NEWS

By Claude Witze
SENIOR EDITOR, AIR FORCE/SPACE DIGEST

The New Team Signs Up

WASHINGTON, D. C., JANUARY 16

The task of assembling an Administration for President Nixon is proceeding so slowly that the veterans in this town are getting fidgety. With the inauguration less than a week away, a number of important jobs have not yet been filled. There are rumors that the Republicans are having a difficult time finding fit people, which is to say job hunters of proper competence, loyalty, and availability, who can be located after their names have been fed into a computer. This reporter personally knows one man—an industry type who has been commanding a salary of $25,000 a year—who has had no less than seven letters. All of this correspondence has been clearly fed to him by machines that have digested some information about his interest in employment, and all are signed by Harry S. Flemming, a special assistant to the new President, who will provide liaison between the White House and the Civil Service Commission. The letters all say, in effect, stand by, you are under consideration.

Melvin R. Laird, long a critic, now will run the Pentagon. He says his primary responsibility as Secretary of Defense will be to give policy direction, not administer the details.

David Packard, who has been earning nearly a million dollars a year, took a cut to $30,000 when confirmed by the Senate for post as Deputy to Defense Secretary Laird.

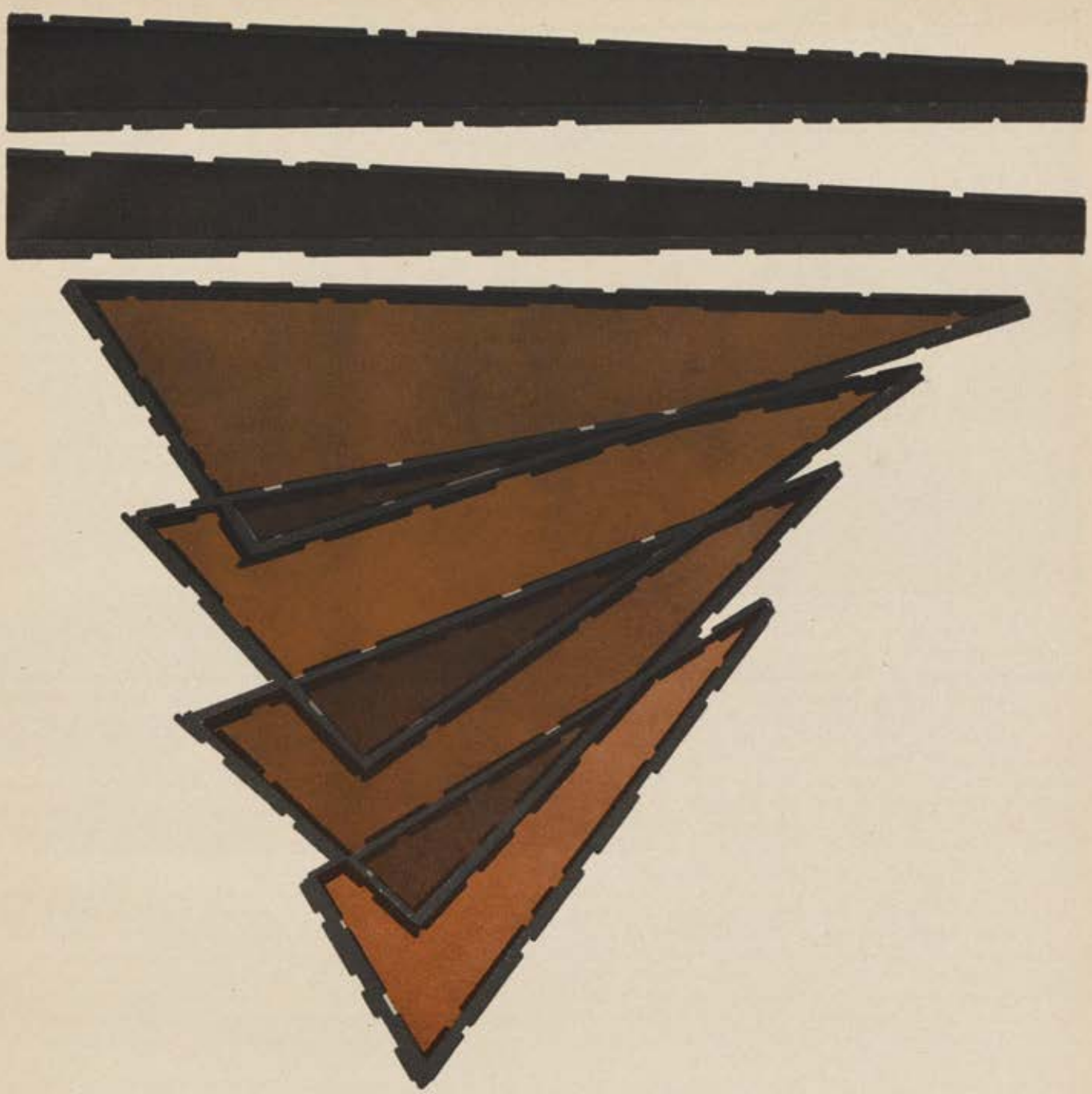
Nobody in Washington knows how many letters the computers have sent out, but it is known that the potential patronage available to the Nixon camp amounts to 6,500 federal jobs worth, in total, about $106.4 million a year. All of these posts are exempt from Civil Service, but many of them are held by persons who have achieved permanent civil service status. This protects them from curt removal, but the political regime still is left with all the power it needs. The President has a lot of posts to fill, from $35,000-a-year Cabinet seats to lesser openings that pay $6,000 and $7,000 a year.

The Cabinet has been selected, and Congressman Melvin R. Laird, a Wisconsin Republican and veteran competent critic of the Defense Department, will take over in the Pentagon next week. Mr. Laird has been in Congress since 1952. With his seniority on the Defense Appropriations Subcommittee, he is considered one of the GOP experts on Pentagon finances. During the past eight years he has shared with Senator John Stennis the pleasure of harping on weaknesses in the McNamara management of money. His estimates on how much we would spend in Vietnam and how big the request would be for supplemental funds have been accurate, year after year. The McNamara figures were wrong. The new Secretary has said, however, that "I was in agreement with him [McNamara] more often than I was in disagreement with him . . . only the disagreements seem to make the news, and I did disagree with him on his estimates of the cost of the war."

At his confirmation hearing, which started today before the Senate Armed Services Committee, Mr. Laird indicated the Nixon Administration is in no hurry to start talking to Russia about a nuclear arms agreement. Further, he feels strongly that his job as Secretary of Defense is to make sure we never fall "into the position where we negotiate from weakness." This means he favors military superiority, not parity with the Russians.

Approval of Mr. Laird was expected to come easily, but the Senators had been reported ready to raise some sticky issues about his selection of David Packard to be Deputy Secretary of Defense. Mr. Packard is a rich man, the kind who attracts attention because he is a living testimonial to the idea that the so-called American Way is worth defending. Without going into the details of his conflict of interest—Mr. Packard himself said it was near impossible of solution—the news today is that the Armed Services Committee is prepared to relax its earlier stringent rules. Already, there are some press reports that sound a bit disappointed, because harmony between the inquisitors and the appointees makes few headlines. It was the new committee chairman, Senator John Stennis, who finally said Mr. Packard's problem, which had appeared complicated, had "been cleared up now." It also is true that this committee, in the past, has forced Pentagon appointees to divest themselves of all stock in defense industries. In Mr. Packard's case, he will do this with

(Continued on page 22)



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SUNDSTRAND

The new Secretary of Defense poses with his chosen Service Secretaries. From left, are Stanley Resor, reappointed as Secretary of the Army; Secretary Laird; Robert Seamans, Jr., new Secretary of the Air Force and former NASA executive; and John Chafee, nominated to be Secretary of the Navy. Mr. Chafee is a former governor of Rhode Island.

—Wide World Photos

about $2 million of securities. Stock in his own company —Hewlett-Packard—will be placed in trust, where he cannot benefit from it. He has assured the Senate he will not worry about its value, fixed right now at $300 million.

In the selections made for the armed forces, the Air Force has been awarded a distinguished aeronautical engineer, Dr. Robert C. Seamans, Jr., as its Secretary. Active in missiles and aeronautics since before World War II, he has most recently been Deputy Administrator of the National Aeronautics and Space Administration. In that shop, he has existed for a number of years as an avowed Republican working in an atmosphere dominated, for sure, by NASA's boss, James Webb, who was a Democratic political force as well as an administrator. Dr. Seamans was educated at Harvard and the Massachusetts Institute of Technology, where he also has been a member of the faculty. Early in his career, he worked with C. Stark Draper on airplane control problems and won recognition for his work on guidance equipment. He is no stranger to the Defense Department or to USAF, where he has served on the Scientific Advisory Board.

Because he has been associated with the NASA program, the selection of Dr. Seamans as Secretary of the Air Force has been widely interpreted as a sign that USAF space activity will get new emphasis. Questioned about this, he said USAF "does have and should have a major space activity," with emphasis on the Manned Orbiting Laboratory. "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 as well as for aeronautics." Dr. Seamans also was a NASA principal in the civilian agency's interface with USAF in the past few critical years. He is well known to top Air Force executives, in uniform and out.

Former Governor John H. Chafee, of Rhode Island, has been named Secretary of the Navy, to replace Paul R. Ignatius. Mr. Chafee comes from a state where the Navy has basic roots—mainly at Newport and Quonset Naval Air Station—and brings the distinction of having served as a Republican governor in a solidly Democratic community. He was defeated in the 1968 election, with his downfall attributed to the issue of a state income tax. He was for it.

The Army Secretary, Stanley R. Resor, says he had planned to leave the office, and was surprised to be asked

Dr. John S. Foster, Jr., will be retained in his office as Director of Defense Research and Engineering.

Robert C. Moot, Comptroller of the Pentagon, also has been granted an extension to serve in the Republican regime.

to stay on. A Republican, Mr. Resor is credited by Mr. Laird with having done an "outstanding job." He is retained, the Nixon Administration says, to help in the transition from one Administration to another. The fact that he is of the GOP faith was not mentioned in the formal announcement.

So far as the transition is concerned, two more important nominations for the new defense team are those of Dr. John S. Foster, Jr., as Director of Defense Research and Engineering, and Robert C. Moot, to be Assistant Secretary of Defense, Comptroller. Both of these men have been serving in the McNamara–Clifford regimes and obviously have won the approval of Mr. Laird in their appearances on Capitol Hill. In the area of research and development, the new Defense Secretary said, "We need the best talent available in America if we are going to insure continued strength. . . . If we are leaving the period of confrontation and moving into an era of negotiation, we must insure through research and development efforts that we will always be in a position to negotiate from strength and never from weakness."

Mr. Laird was, of course, challenged for selecting Dr. Foster to continue after the Nixon campaign had featured some criticism of the research effort under the Democrats. Mr. Laird pointed out that the basic philosophy comes out of his office, not Dr. Foster's, and implied that the Director of Research and Engineering will be working in a new and more congenial atmosphere from now on. Dr. Foster seemed to have this understanding, too. The program for the next four years, he said, will depend on the nature of the threat and what the Nixon–Laird team decides to do about it. He appeared confident that at least some of his recent frustrations would end. Dr. Foster is known to have many friends in Congress, more, for example, than Dr. Alain Enthoven, the Assistant Secretary for Systems Analysis and chief of the "Whiz Kid" team.

Mr. Laird was asked whether he intends to have an Assistant Secretary for Systems Analysis. He said the decision had not been made, as of January 13, but that the function of the office is important. He clarified this by pointing out that systems analysis should be just that and not a policy-making job. The review function could, of course, be returned to the Office of the Comptroller, where most critics think it belongs. If weapons are to be evaluated, the Pentagon has a Weapons System Evaluation Group, somewhat neglected in the past eight years.

USAF Secretary Seamans is fifty years old, a native of Massachusetts. He has been a professor at MIT, has worked on aeronautical research, and, in industry, was employed by RCA as an airborne systems expert before his appointment to NASA.

Mr. Laird has made it clear he will not retain Philip Goulding, the Assistant Secretary of Defense for Public Affairs. The House of Representatives, where Mr. Laird prepared for this job, is critical of the Pentagon's publicity effort and indications are it will be curtailed. Daniel Z. Henkin, a Deputy Assistant Secretary under Goulding, will fill the job as "Acting" Assistant Secretary and is an acknowledged candidate for the top slot. Henkin's former post will be taken by Richard G. Capen, Jr., a thirty-five-year-old former chief of public affairs for the Copley newspapers in California, Nixon campaign worker, and friend of Mr. Laird. Another Laird choice is an old school and college chum, Robert F. Froehlke, who was named Assistant Secretary of Defense for Administration. Native of Wisconsin, Mr. Froehlke has been vice president of the Sentry Insurance Co. in Boston. An attorney, he is described by Mr. Laird as a man with wide experience in workman's compensation, health, and casualty insurance.—END

Dr. Seamans, coming from MIT, is briefed by Dr. Harold Brown, his USAF predecessor, who is going to CalTech. Dr. Brown will be President of the West Coast institution.

LETTER FROM EUROPE

By Stefan Geisenheyner

AIR FORCE/SPACE DIGEST EDITOR FOR EUROPE

Germany Developing Short-Haul Aircraft

Extensive market analyses and interviews with potential customers around the world recently confirmed good sales prospects for the first German postwar jet transport design, the VFW 614. This modern short-haul aircraft presently is under development at Vereinigte Flugtechnische Werke, Bremen. The small jet is tailored to replace the DC-3s still in service with many operators. It is designed to match the dependability and sturdiness of the old Douglas-built aircraft.

The VFW 614 will have a maximum speed of 460 mph and, fully loaded, a range of 500 miles. Maximum takeoff weight is sixteen tons. The wings are mounted low on the fuselage, and the engines are located on pylons on top of the wings close to the fuselage. The aircraft is designed to carry forty-four passengers or four tons of freight. Its features include short takeoff and landing; the ability to operate from roughly prepared airstrips; fast turn-around; independence from ground power equipment; and a high utilization factor.

The designers promise that the aircraft will be an economic proposition at distances as short as sixty-five miles and that fourteen to twenty-one passengers, depending on distance flown, are enough to cover costs. Though no price details have yet been released, a customer's initial investment will be reasonable, according to the manufacturer.

The first prototype of the VFW 614 should be ready before the end of 1970. The next three are expected to fly by February 1971, and large-scale production is to begin by mid-1972. By then the research and development work will have cost somewhere in the region of $100 million, about half spent on developing a suitable jet engine.

Since the aircraft is expected to operate mainly in the short-haul environment, involving legs between fifty and 100 miles, it would be uneconomical to climb to higher altitudes where jet engines operate most efficiently. Rolls-Royce and SNECMA of France, therefore, were contracted to design jointly a bypass engine that shows maximum efficiency at lower altitudes and has the ability to absorb the high-performance demands put on it by frequent takeoffs and landings under the most severe circumstances. This engine, the M45H, ran successfully for the first time last year and should be available on schedule.

The VFW 614 actually will be a joint European aircraft. Sharing in the venture: Short Brothers of Britain, Fokker of Holland, and SABCA of Belgium, besides the parent firm and several other German subcontractors. VFW has a fifty-three percent stake in the project and is the design leader.

Development costs are covered by a West German government loan equivalent to sixty percent of the money invested by VFW, a proportion that may be increased to eighty percent, should the company run into trouble. If the aircraft turns out a failure, considered unlikely, the government's loan will be written off. The German government is footing fifty percent of the engine development bill as part of its commitments under the exchange offset agreement between Germany and Britain in connection with the stationing of Britain's Army of the Rhine.

VFW estimates a market for about 1,200 short-haul jets will exist in the 1970s and intends to corner at least a quarter of it. The company must sell 170 VFW 614s to break even.

Martel Production Is Set

Martel, the air-to-ground tactical strike missile that recently experienced a highly successful series of firing trials, is set for quantity production.

The Martel (Missile, antiradar and television) is actually two versions designed and developed as part of a group of projects undertaken jointly by the British and the French (*for a progress report on another of the cooperative efforts—the Jaguar trainer-fighter—see page 44*).

Hawker Siddeley Dynamics of the United Kingdom and Engins Matra of France cooperated in developing both Martel versions. The TV variant, primarily the responsibility of the UK, is designed to transmit to a launching aircraft a picture from a TV camera mounted in the missile's nose. This picture is monitored on a console by a weapons operator who guides the missile to its target with a joy stick. During trials, the TV version hit targets only

(Continued on page 33)

Scale model of West Germany's first postwar jet transport, the VFW 614, currently in development. Its features are to include STOL; fast turn-around; the ability to operate from roughly prepared airstrips; independence from ground power equipment; and a high utilization factor.

An Aerospace Capabilities Report on Beech Aircraft Corporation

BEECH SUBCONTRACT CAPABILITIES...

used by major manufacturers for aerospace since 1943

The complete airframe for the Bell Model 206 JetRanger helicopter is manufactured by Beech.

Winner of an Army competition for its new light observation helicopter OH-58A and selected by the Navy as its new primary training helicopter (TH-57A), this turbine-powered JetRanger depends heavily on Beech manufacturing capabilities. Under contract with Textron's Bell Helicopter Company, Fort Worth, Texas, Beech will provide complete airframes which will include the following components:

Pylon cowling – one piece fiberglass construction.

Engine cowling – honeycomb fiberglass construction, hinged for engine accessibility.

Aft fuselage – titanium engine pan, aluminum honeycomb bulkhead. Forward bulkhead forms rear wall of fuel-cell compartment.

Tail boom – monocoque sheet metal tube, rolled and riveted. Riveted brackets support drive shaft and internal push-pull control rod.

Seat – honeycomb, designed to 25G impact loads with energy absorbing yield beyond the design point.

Main fuselage – unique "bathtub" design made of a single piece of one-inch thick aluminum honeycomb sandwich. Bulkhead attach angles are bonded to pan.

Skid gear – aluminum tubes bolted to round extruded crosstubes. Crosstubes are streamlined with Kydex fairing.

Turnover structural bulkhead – riveted sheet metal structure with integral column. It provides primary structural continuity between honeycomb roof and floor.

Bulkhead – aluminum honeycomb structure.

Doors – formed polycarbonate and lightweight metal shapes.

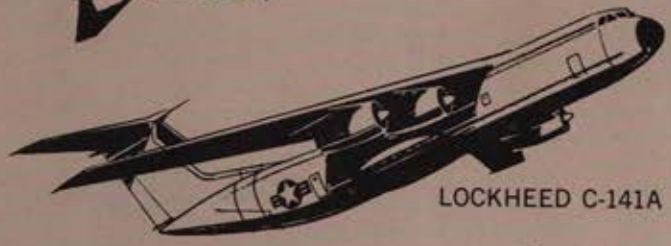
LTV A-7

BELL HU-1

BOEING 737

REPUBLIC F-105

McDONNELL
DOUGLAS F-4B/F-4C



LOCKHEED C-141A

CONVAIR F-106

LOCKHEED F-104

A brief history of Beech contributions to the United States Air Fleet . . .

Beech subcontract history started in 1943 with the production of 1,600 complete sets of wings for the Douglas A-26 Invader. Since then, nearly all major military aircraft manufacturers have used Beech capabilities for engineering, tooling and production. A partial list of the aircraft to which Beech contributed includes: F-94C, T2V, T-33, B-70, B-58, F-101, F-102 and F-84.

Current and recent production for both military and commercial aircraft is as follows:

LTV A-7—chemical milling.

Bell HU-1—honeycomb metal bonded panels (74 different types).

Boeing 737—metal-to-metal bonded honeycomb panels.

Republic F-105—ailerons and aft fuselage.

McDonnell Douglas F-4B/F-4C—ailerons, flaps, speed brake doors, spoilers and landing gear doors.

Lockheed C-141A—flaps, ailerons, nose landing gear doors, emergency exit doors and wing spoilers.

Convair F-106—aft fuselage, wing fences, radar compartment, windshield, canopy, missile bay doors, elevons, wing leading edges, wing tips, dorsal fairings and vertical fins.

Lockheed F-104—aft fuselage and fuel tanks.

Over 150,000 external stores have been produced for a wide variety of current military aircraft. Beech has furnished research, development and production on external stores ranging in tank capacity from 110 gallons to 1,700 gallons.

Beech Fields of Capability Cover the Spectrum of Aircraft and Flight Equipment...Research, Development and Engineering

From basic research through manufacture and testing, Beech Aircraft Corporation has the facilities and capabilities to accept complete systems management assignments.

A summary of Beech capabilities in Aircraft and Flight Equipment is shown in check-list form below. Complete information on specific facilities, related experience and personnel in any category is available upon request. This summary is similar in organization to the various R&D Source Information and Survey forms such as DD Form 558-2 issued by the Department of Defense, and AFSC Form 220.

AREA OF CAPABILITY	RESEARCH	EXPLORATORY & ADVANCED DEVELOPMENT	PRODUCT ENGINEERING
AIRCRAFT AND FLIGHT EQUIP			
AIRCRAFT INSTRUMENTS			
Flight Test		X	X
AIRCRAFT DESIGN			
Aerodynamics			
Aerodynamic heating at high Mach numbers	X	X	X
Transition from laminar to turbulent flow in boundary layers		X	X
Skin friction		X	X
Physical and chemical properties of air at high temperatures			X
Shock waves and their interaction with boundary layers		X	X
Supersonic pressure phenomena		X	X
Interference of aircraft components			
Inlet location			
Jet exit location			
Lift development			
Friction drag and aerodynamic heating	X	X	X
Maintenance of laminar flow			
Factors affecting boundary layer transition			
Gas Dynamics			
Hypersonic flow			
Temperature simulation			
Ballistic ranges			
Control Systems			
Mach number, angle of attack effects on static stability	X	X	X
Mach number, altitude effects on dynamic stability	X	X	X
Effective aircraft control through Mach number range	X	X	X
Stall improvements for high performance configurations	X	X	X
Stability augmenters			
Powered controls		X	X
Artificial stabilization and motion limiting		X	X
Human pilot control and tracking capabilities		X	X
Control through automatic pilots		X	X
Automatic tracking		X	X
Gyro		X	X
Special type aircraft (Aerodynamics)			
Lift augmentation		X	X
Research equipment and techniques		X	X
Targets			
AIRCRAFT STRUCTURES	X	X	X
Theory	X	X	X

AREA OF CAPABILITY	RESEARCH	EXPLORATORY & ADVANCED DEVELOPMENT	PRODUCT ENGINEERING
Design			
Aircraft loads	X	X	X
Vibrations and flutter	X	X	X
Structural materials applications	X	X	X
Structural techniques	X	X	X
Testing	X	X	X
Stress Analysis	X	X	X
Criteria	X	X	X
FLIGHT OPERATING PROBLEMS			
Special Techniques		X	X
Aircraft noise		X	X
Jet noise			
Boundary layer noise			
Propeller noise			
Effects of noise on structures			
Attenuation of noise			
Flight Safety		X	X
Meteorological aspects			X
Atmosphere turbulence			X
Icing problems			X
Environmental Protection			
Crew and equipment protection			X
FLIGHT SAFETY			
Approach visibility		X	X
Turbulence		X	X
Research equipment and technique			
Landing problems		X	X
Fire			X
Gust alleviation			X
Optimum flight paths		X	X
Airspeed measuring systems		X	X
Spin hazards and recovery		X	X
Engine performance and reliability			X
Thrust reversal			X
Foreign object damage to engines			X
Pilot escape	X	X	X
Ejection seats			
Capsules			
Escape systems components			
High altitude, high speed escape			

AREA OF CAPABILITY	RESEARCH	EXPLORATORY & ADVANCED DEVELOPMENT	PRODUCT ENGINEERING
Parachutes			
Crash survival		X	X
LIGHTER THAN AIR			
PROPELLERS AND ROTORS			
Application and performance studies			
Conventional, high subsonic	X	X	X
Vertical take off and landing			
Short take off, landing		X	X
Design and development			
Stability and control		X	X
Pitch change and control	X	X	X
Accessories			X
Test facilities			X
ROTATING – WING AIRCRAFT			
VULNERABILITY STUDIES		X	X
EXPANDABLE STRUCTURES			
Applications			
Re-entry		X	X
Ballistic		X	X
Landing Impact Devices			
Flotation Aids		X	X
Space Vehicles			
Atmospheric Vehicles			
Marine Structures			
SUPPORT TECHNOLOGY			
Erection and Stabilization			
Materials			
Structural		X	X
Non-Structural		X	X
Lubricants			X
Structural Analysis			
Basic Theory		X	X
Applied		X	X
MANUFACTURING PROCESSES			
Weaving			
Joining and Seaming	X	X	X
Coatings		X	X
Surface Finishes		X	X
Metalcraft		X	X

Extensive Beech Manufacturing Facilities . . .

The Beech machine shops occupying nearly 60,000 square feet, are equipped with standard and special machines oriented to the aerospace industry. These include milling machines with

Examples of honeycomb structures produced at Beech:

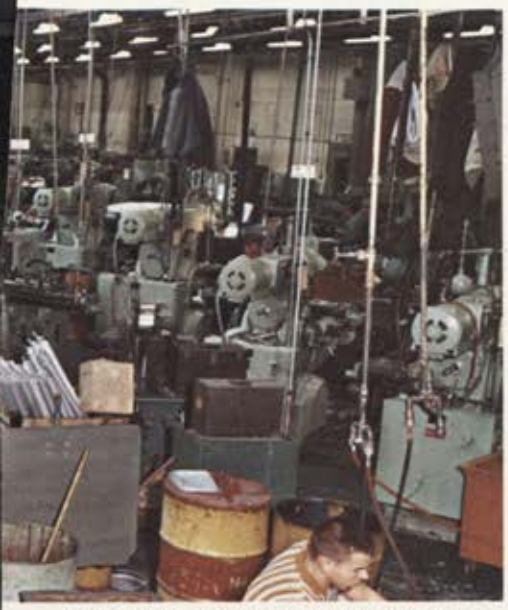
SANDWICH STRUCTURES

Type of Core	Face Sheet Material	Adhesive
Paper Honeycomb	Formica Plastic (Wood Grain Pattern)	Bonded
Paper Honeycomb	Fiberglass	Bonded
Fiberglass Honeycomb	Fiberglass	Bonded
End Grain Balsa	Aluminum Alloy	Bonded
Aluminum Alloy Honeycomb	Aluminum Alloy	Bonded
Aluminum Alloy Truss Grid	None	Bonded
Titanium Alloy Honeycomb	Titanium Alloy	Brazed
Steel Honeycomb	Steel	Welded

Chemical Milling for precision milling of aerospace metals (aluminum, magnesium, titanium, inconel, steel and stainless steel) to unconventional design specifications has developed to extensive capability at Beech. Among the largest in the U.S., 167,340 parts were produced here in 1967. Facilities include cleaning, rinsing and washing equipment. The tanks, in sizes up to 14 feet long and 14 feet deep, are equipped with automatically timed taper hoists.

The complete bonding facilities (metal-to-metal and metal-to-honeycomb) at Beech are capable of manufacturing assemblies of metal, reinforced fiber, plastic and paper. All layup of assemblies is accomplished under "clean-room" conditions. Techniques and tools have been developed for honeycomb core shaping by machining and crushing. More than 600,000 military and commercial metal bond assemblies have been produced here.

Complete X-ray facilities are available for internal examination of material. In addition, the best equipment available is used for inspection, including Fokker bond testers, tensile testers, peel testers, ultrasonic equipment, and various types of electronic and mechanical comparators, gage columns, gage blocks, angle computers, micrometers, etc.



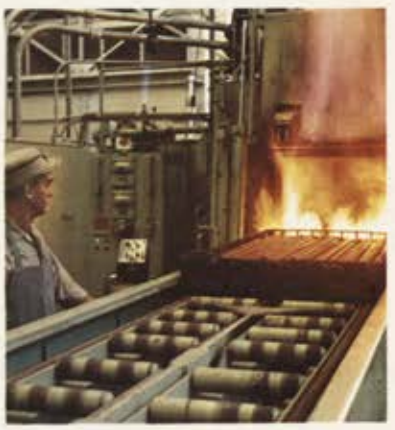
beds as long as 54 feet 8 inches, numerically controlled machines, profile milling, automatic lathes, drills, boring machines, broach machines, grinders, hones and planers.

Beech machining capability extends beyond that provided by "off-the-shelf" equipment. The center machine—flanked by a three-spindle Hydro-tel and a large single-spindle Hydro-tel—has been specially adapted by Beech: It is a 72" King Vertical Turret Lathe with retro-fitted 2-axis tracing equipment, and accessories for spherical milling, drilling, angular boring, trepanning, and automatic program control. These functions are all in use in current production of highly sophisticated aerospace hardware.

Numerically Controlled machines include the two Milwaukee Series "E" NC Mills shown on the right and the versatile Series II MilwaukeeMatic. These machines have full point-to-point positioning ability. Their special value is for turning out intricate and difficult parts, but their efficiency makes them competitive with conventional equipment on even the simplest parts. They are in daily production on commercial as well as military work.

This vacuum furnace, with automatic cycling controls and a molybdenum hearth for heat treating special space-age alloys up to 2800° F, will create vacuums up to 10^{-5} torr.

Beech electron beam welding equipment assures highly precise and dependable welding. It is especially valuable for welding the exotic materials used in the aerospace industry. This equipment is capable of welding material thicknesses from .0015" to over 2" with minimum distortion. Conventional and spot welding facilities are complete.



Complete brazing equipment comprises an important part of the weld shop facilities. Temperatures up to 2250° F can be obtained in batch-type brazing. The furnace equipment includes an endothermic generator, has provision for automatic cycling, and for either air or oil quenching.

. . . and capabilities that keep growing!

Large assembly areas are provided at each of the manufacturing plants. Overhead cranes having clearances up to 32 feet are available over a large portion of the assembly area. The Beech production riveting complement consists of approximately 67 riveting machines, including three photoeye-controlled high production General Drivmatic machines and three Chicago Pneumatic hot coin dimplers with throats up to 48 inches deep.

All types of surface treatments common to the aerospace industry are in use at Beech. Major processing facilities are available for iriditing, anodizing, alodine processing, nickel plating, chrome plating, cadmium plating, deoxidizing, hard coating, teflon coating, dry-film lubrication and dichromate processes. Vapor degrease, alkaline rinse, fresh water rinse and drying facilities are also available. In other areas specialized treatments, such as tumbling barrels, sand blast rooms, liquid honing, glass bead peening, etching, pickling, and passivating are provided.

Beech has complete tool design and fabrication facilities. The Tooling Division covers a total of 220,000 square feet. Equipment in the tool fabrication facility includes boring machines with table sizes ranging to 40 by 74 inches.

Two of these machines are in temperature-controlled areas. The tooling shop also has metal shapers, drill presses, grinders (surface, cylindrical and profile), lathes, milling machines, saws, including a traverse-type aluminum plate saw with a 4 by 12-foot capacity, and planers ranging in size up to 3 by 14-foot table.

Conversion of numerical data to master templates and forms is yet another in the broad spectrum of capabilities available at Beech. This spin-off from Beech's comprehensive Computer Section enables direct fabrication from numerical computer data.

Preparing for efficient production requires much more than merely building accurate tooling. To this end, Beech Aircraft Corporation maintains a highly skilled technical staff of Tool and Manufacturing Engineers, all of whom are a part of the Manufacturing Engineering Division.

Forming of sheet metal and extrusions is an important requirement of any aerospace facility. At Beech, forming capabilities have been developed to handle complex jobs in a wide range of materials.

Beech's aluminum sand foundry is used primarily for specialized designs and experimental castings.

Heat-treating facilities include six aluminum heat-treat furnaces with capabilities of drop quenching and handling parts up to 9½ feet high, 8½ feet wide, and 24½ feet long. The facilities are furnished with aging furnaces having inside dimensions up to 8 feet wide, 6 feet high and 40 feet long.

Their capabilities include:

1. Pre-production Planning.
2. Producibility.
3. Manufacturing and Tooling Estimating.
4. Manufacturing Research and Development.
5. Manufacturing Methods.
6. Tool and Manufacturing Planning.
7. Equipment Engineering.
8. Conservation and Manufacturing Supplies Cost Control.

The intensive application of these professional skills—stressing manufacture with the most modern materials, equipment and methods—plays a vital role in Beech's ability to deliver high quality, on time, and at minimum cost.

In addition to the "in-plant" facilities, Beech Aircraft Corporation has available numerous accredited subcontracting tool shops that are experienced in fabricating precision tooling for the airframe and missile industry.

This Riemco power spinning lathe provides controlled roller pressures from 0 to over 350,000 pounds to the piece being formed. Blanks have been spun at room temperature, cryogenic temperatures and at elevated temperatures. This machine is capable of spinning aluminum and magnesium alloys from ¼ inch to 2 inches thick, and plain carbon steels from ⅛ inch to 1 inch thick. Stainless steels and high temperature-high strength alloys, including Rene 41 and Inconel 718, can be spun from $^{3}/_{16}$ inch to ½ inch thickness.

A complete, experimental department is organized and equipped for the development and production of prototype articles. It is a complete entity in itself, staffed by highly qualified personnel.

Tooling quality is no accident—Here, the tool maker and a tool inspector work side-by-side in the final check-out of a large assembly fixture. Complete optical alignment equipment and extensive optical tooling experience are available for the most difficult tooling problems.

This is one portion of the large and well-equipped tool fabrication area. The large Lucas horizontal boring mill and King vertical turret lathe have capability for the largest as well as the smallest jobs, but capability is more than machinery—it is also experience. At Beech, on-the-job experience in tooling averages 11½ years per man, and **twenty-six** employees have served in tooling over twenty-five years!

Proven quality of production and on-time delivery mark Beech leadership

Many unusual and difficult assignments have been given to Beech—in Space programs, in military systems and in commercial projects. Accomplishment of these assignments—to specification and on time—has given Beech an enviable reputation for dependable performance. This reputation is zealously guarded by an alert, aggressive, forward-looking Beech management. No intangible image of greatness, this is a solid, substantial hook you can hang your profit on—as Beech does.

For full information about how you may take advantage of Beech's experience in systems management and proven capabilities in designing, developing, manufacturing and testing of components for aviation and aerospace projects, write, wire or phone Contract Administration, Beech Aircraft Corporation, Wichita, Kansas 67201, U.S.A.

The design and fabrication of pressure vessels and cryogenic storage systems are highly developed at Beech. This cryogenic storage system was designed and built by Beech under contract with North American. It was the **first** of 13 major subsystems aboard the Apollo spacecraft to be man-rated by NASA.

Ordinance facilities and capabilities of Beech have been amply proven by the production of thousands of these bomb dispensers and containers for the Army Ammunition Procurement and Supply Agency. These highly classified products are manufactured to ordinance standards in a complete, separate Beech facility.

The never-ending search for highest reliability from all Beech-built products led to the design of this General Purpose Automatic Tester. It is shown here being applied to all functional areas, both electrical and mechanical, of an MQM-37A supersonic target missile produced by Beech for the U. S. Navy. The taped read-out will become a permanent record of the test, eliminating the chance of human error in reading, evaluating and recording.

Sandpiper, the first maneuverable rocket-powered supersonic target missile has successfully completed first tests for the U. S. Air Force. The test vehicle was a modified Beech AQM-37A missile powered by the nation's first operationally-designed hybrid rocket engine. The engine, developed and produced by United Technology Center, uses both solid and liquid fuels and has sustained flight of Sandpiper during tests for an extraordinary full five minutes.

For subcontract work to specification and on time... Look to Beech Capabilities!

Beech Aerospace Division

Beech Aircraft Corporation, Wichita, Kansas 67201. U.S.A.

ten feet in diameter while controlled by an aircraft heading away from a target at high Mach numbers. The UK's Marconi Co. has received a contract to produce the missile's TV guidance system.

The antiradar version of Martel, for which France has prime responsibility, is an all-weather bird that can operate in the presence of multiple targets, homing on enemy radar transmissions. The antiradar version has scored many direct hits on test radar installations during the trial firings. France's Electronique Marcel Dassault is to provide the antiradar guidance system. Both missiles can operate in the face of electronic countermeasures.

Martel missiles initially will equip the British Navy's Buccaneer low-level strike aircraft, the RAF's Nimrod and French Atlantic maritime reconnaissance aircraft, the Mirage III strike fighter, and the jointly developed Jaguar.

USAFE Attempting Fog Dispersal

At this time of year fog is the worst enemy of USAF combat readiness in Europe. In the past it was considered essential that an entire airport, or at least the runways, be clear of fog during flight operations. With the introduction of much improved electronic takeoff and landing devices, it is sufficient that only the crucial points on runways be clear of fog.

In November experts of USAFE's 2d Weather Wing began testing methods of dissipating supercooled fog, which occurs at temperatures below zero degrees centigrade. A ground-based and an airborne fog-dispersal system are under test. The ground-based system has been installed at Wiesbaden Air Base but had to await the appearance of supercooled fog to be tested. The airborne system has been employed successfully at Hahn, Spangdahlem, and Bitburg Air Bases. Both systems work on the same principle: cooling stimulant is injected into the moisture-laden air, causing the water droplets that make up the fog mass to turn into ice crystals. These fall to the ground, leaving the air clear of fog.

The ground-based system uses propane gas as the cooling agent. Small amounts are injected into the air for periods ranging from one minute to thirty minutes at distances varying from 200 feet to nearly eight miles from the runway to be cleared. The airborne system, being tested for the first time in Europe, employs crushed dry ice as a cooling stimulant and is dispensed from a modified WC-130 weather aircraft. The aircraft flies at low altitude over the fog bank covering the runway and dispenses finely crushed dry ice.

In the photo on the right, notice the sun pillar caused by reflection of sunlight on ice crystals formed by dry ice dispensed from weather aircraft in fog-dispersal experiment.

This is the first released photograph showing a launch of Martel, the Anglo-French air-to-ground missile. The bird has two versions: one that is guided to target by TV and an antiradar weapon that homes on enemy radar transmissions. Firing trials of Martel were highly successful.

Primary consideration in determining where the cooling agent will be released is wind direction. The weathermen have to estimate wind movement accurately to ensure that the fog will be eliminated over the runway.

The 2d Weather Wing is operating the ground- and airborne systems on a standby basis until March 15, when it becomes unlikely that any supercooled fog will occur. (*See page 16 for a report on fog-dispersal experiments being conducted in the US.*)

Algerians, French Begin Talks

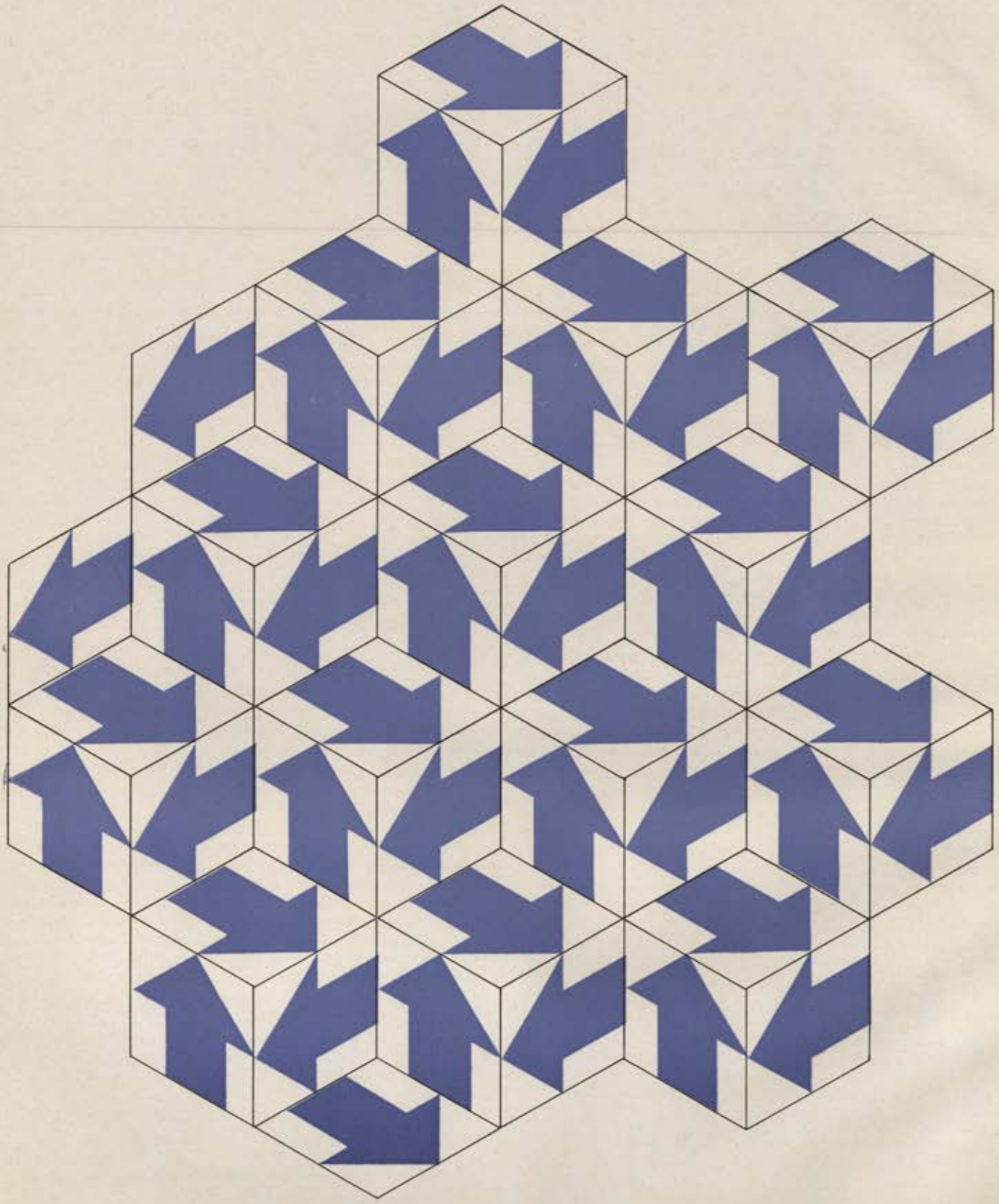
During a visit to France toward the end of 1968 the chief of the Algerian Navy, Major Ben Moussa, inspected French Navy training facilities in Brest and Toulon and discussed subjects of common interest in Paris with the Ministère des Armées. Well-informed circles in Paris suggest that this little-publicized visit was the prelude to closer cooperation between the navies of the two countries. French naval equipment, including ships, are sought by Algeria, and its cadets may receive training with the French Navy.

The talks are of utmost importance to the security of NATO's southern flank, since the important harbor of Mers-el-Kebir, one of the best in the Mediterranean, is located in Algeria.

The USSR is very interested in leasing the harbor as a naval base in the western Med. The French Navy had invested about $200 million in Mers-el-Kebir before turning it over to the Algerians in 1967, and, to protect this investment and stay on best terms with the Algerians, France may make many concessions during any negotiations for the acquisition of French ships.

The USSR already has supplied Algeria with several smaller fighting vessels, but, due to the lack of spare parts and proper training, the combat readiness of this fleet is very low.

If Algeria should turn to the USSR for help in building up its naval forces, France has one ace in the hole: a treaty between Algeria and France allows the latter to use the military airport of Bou-Sfer, which is near Mers-el-Kebir. This treaty expires in 1977, and unless forceful measures are taken to oust the French from this airfield, it is unlikely that Mers-el-Kebir will be of great tactical use to the Red fleet.—END



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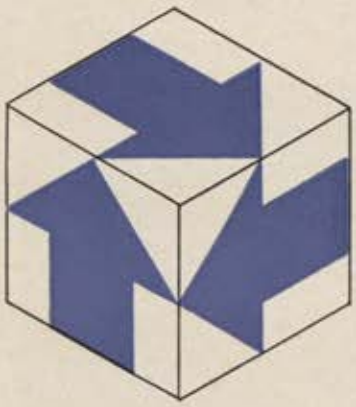
We can design and produce a complete system.



Or a single, critical component.

Our specialty is Task Vehicles. And their components. Our technology is far broader.

It encompasses diesel and turbine power. Hydraulic systems. Power drives. Suspensions, both wheel and track. Human engineering. Environmental technology. Materials research—from sophisticated metallic alloys to space-age ceramics.

Supporting these design and research activities is a manufacturing program that puts Caterpillar among the top ten steel consumers in the U.S. . . . that makes us the second largest buyer of steel plate and forging steel.

Currently we are building more than 150 different machines at 25 plants, here and overseas. Over the years these Caterpillar-designed, Caterpillar-built machines have earned a reputation for reliability and availability.

We'd like to put these capabilities to work for you. On the toughest programs you're facing.

Those are the kind of problems we like. The tough ones.

Write, wire or call: Defense Products Department, Caterpillar, Peoria, Illinois 61602.

CATERPILLAR

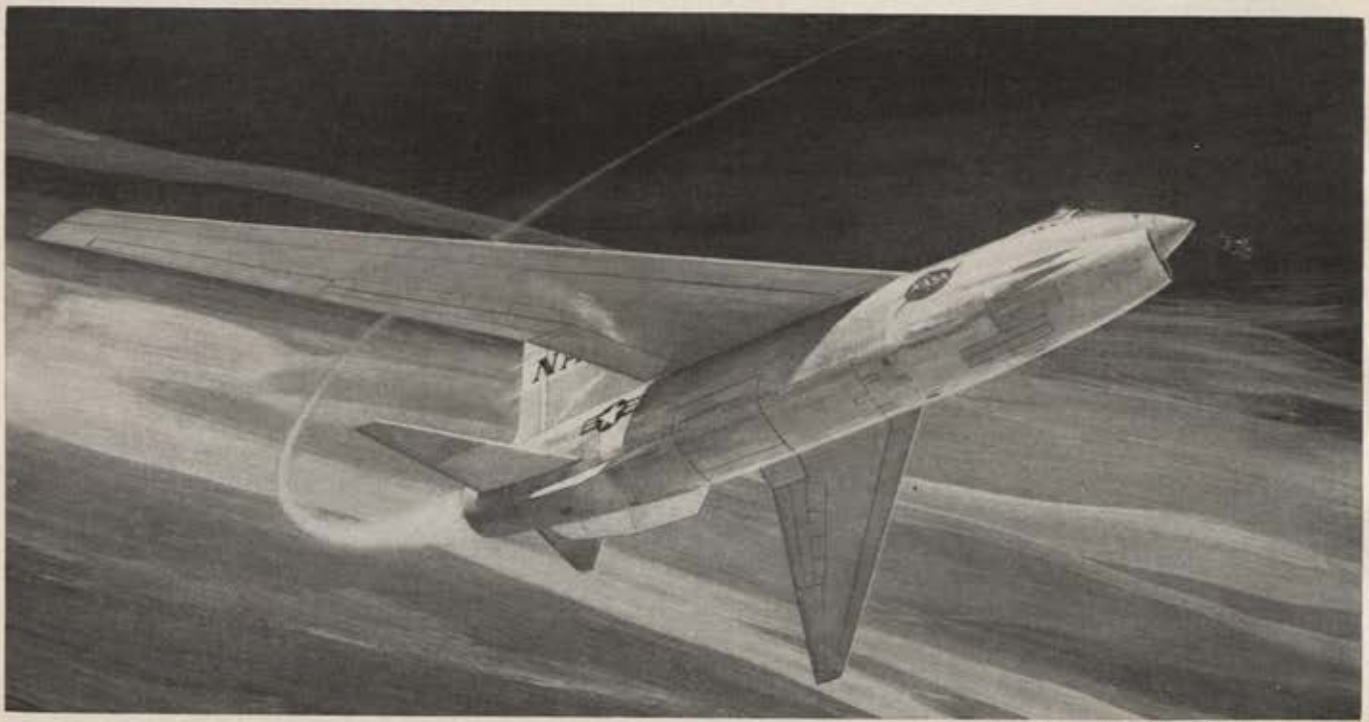
In Prospect: The 'Supercritical' Wing

AIR FORCE
FEBRUARY, 1969

Today, the aircraft industry is on the verge of taking another giant step in designing advanced aircraft, with the opportunity to incorporate a new type of wing that holds great promise to both military and civil aircraft. Particularly relevant, then, is the almost unanimous opinion in the aeronautical engineering community that the heavy dependence on analytical techniques in aircraft design must be backed up by a strong program of evaluation . . .

There's No Substitute for Flight-Testing

By J. S. Butz, Jr.
TECHNICAL EDITOR, AIR FORCE/SPACE DIGEST

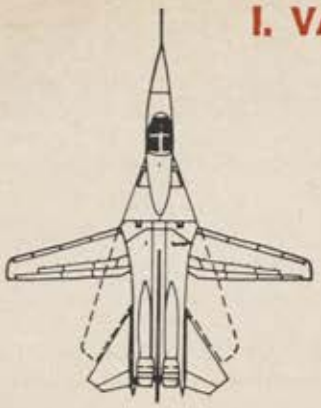


—ILLUSTRATION BY GORDON PHILLIPS

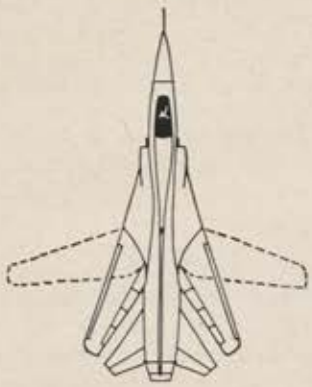
NASA is requesting funds, in its FY 1970 budget, for construction of a new experimental aircraft, shown here in artist's conception. It will have an F-8U fuselage and will test a version of the "supercritical" wing devised by NASA's Richard T. Whitcomb. Some experts predict the new airfoil will have a greater impact than did Whitcomb's area rule fifteen years ago.

I. VARIABLE-SWEEP AIRCRAFT

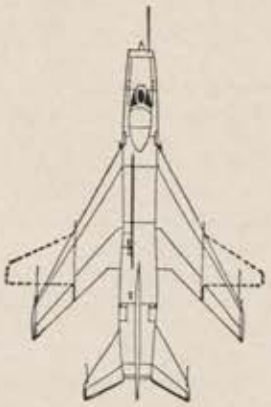
The variable-sweep wing has been involved in great controversy since it reached a usable state some ten years ago. Such a wing is on the F-111, and was selected winner on the Boeing SST entry the company later dropped. Reportedly, this wing will not be on USAF's new F-15 (FX), because a fixed wing can be superior for the single-design-point, high-altitude, air-superiority mission. A bright future is predicted for the concept, however, by most US designers who believe much progress can be made in the next decade. They want to step up flight-testing. France has the model low-cost program in the Mirage IIIG, which cost less than $25 million for design, modification of an existing fighter, and dozens of flights. The Sukhoi appears to be a similar project, but the Mikoyan is a completely new design with good operational potential. (PLANFORM DRAWINGS BY ROBERT L. FINES)



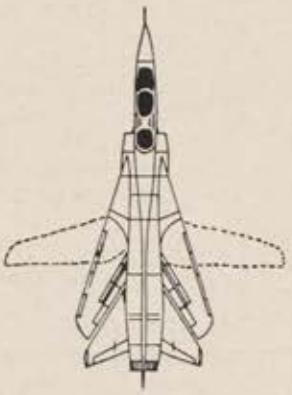
General Dynamics/Convair F-111A (U.S.)



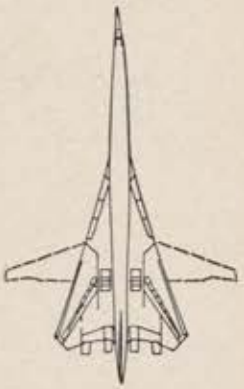
Dassault Mirage IIIG (France)



Sukhoi SU-7B (U.S.S.R.)



Mikoyan Variable-Sweep (U.S.S.R.)



Boeing Variable-Sweep SST Design (U.S.)

IF A supersonic airplane designer could get the ear of Richard M. Nixon today, there is little doubt about what he would tell the new President. Most important, he would report that there has been far too much analysis and not enough experimental flying in the past decade. The US is following a most unscientific procedure in an effort to save money—that is, relying primarily on theory to produce engineering data without checking it properly by experiment.

Mathematical techniques for conducting the most complex phases of aircraft design have become extremely sophisticated and will become far more powerful in the future, but it is impossible to escape the fact that they are essentially an improved tool of the theorist. Flight experiments still must be used to show where theory is in error, to give the designer some clue to his mistakes as he heads back to his computer.

Nearly all of the dozens of US jet aircraft projects over the postwar years attest to the validity of this view. The B-47, for example, pushed the technology of the late 1940s near the breaking point and had severe cost and schedule problems because there wasn't enough flight proof of the design before entering production. Such experience, painfully paid for in money and time, can be a good teacher: The Boeing Co.'s follow-on bomber, the B-52, had a very good record for staying within original price and schedule estimates, primarily because it rode in on a sturdy technical base of B-47 experience plus a major prototype flight-test program.

The most recent case in point is the F-111 multipurpose airplane. The heavy cost overruns on this program could have been reduced to a substantial degree if production had been delayed until a prototype airplane, or an experimental aircraft of similar layout, had been thoroughly tested. At least this is the majority opinion in the industry.

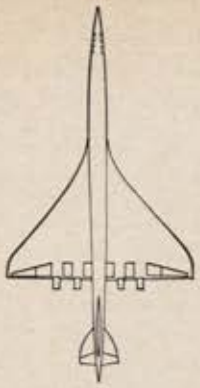
Designing the F-111 must be recognized as a difficult problem because the aircraft has completely new features, notably the variable-sweep wing. Its over-all mission requirements are also more severe than for any previous aircraft so that all components, including this wing, must operate at very high efficiencies. In spite of this unusually heavy load of design problems, the powers that were in the Department of Defense in the early 1960s believed that analytical techniques could be used to resolve them quickly without a strong backup of experimental flying. Consequently, their plan called for a rapid commitment of the F-111 to production. They were asking for trouble—and the military and General Dynamics got it.

Most observers experienced in aircraft development disapproved thoroughly. They contended that a large number of major changes were inevitable before such an advanced design could be ironed out, and that program costs inevitably would go well above the estimates if these changes had to be made along an entire production line rather than in a few prototype airplanes.

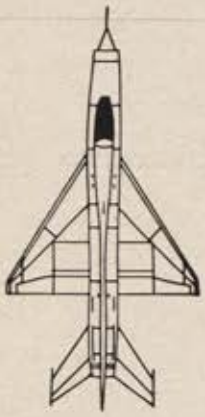
At any rate, the aeronautical engineering community

(Continued on page 39)

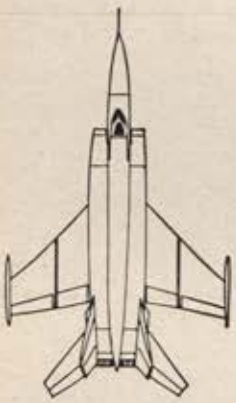
II. FIXED-WING, CONVENTIONAL-TAIL AIRCRAFT



Boeing Fixed-Wing
SST Design (U.S.)

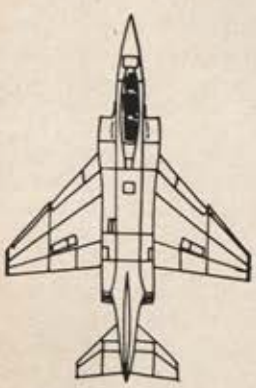


Mikoyan MIG-21
Fishbed (U.S.S.R.)

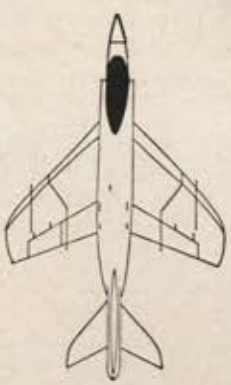


Mikoyan MIG-23
Flipper (U.S.S.R.)

Most supersonic airplanes built to date have had conventional tails. This group is far larger than the other major categories: tailless deltas, canards, and variable-sweep configurations. In most instances the aircraft with conventional tails are more maneuverable, and have more reserves of control power for landing and takeoff and for off-design situations such as engine failure at high speed. Boeing made a conservative decision when it chose to drop its variable-sweep SST and go ahead with the configuration at upper left. This wing is a compromise between subsonic and supersonic requirements that has respectable, but not top, performance in either speed range. Control problems with this design will be relatively minor. The major task will be design of an extremely light structure, which is needed on all SSTs. These airplanes have high fineness ratios and are about twice as long in comparison to their diameter as any transport or fighter now in service. In addition, they are designed for low allowable loads, only about 2.0 Gs as in ordinary transport practice (compared to about 8.0 Gs for fighters). This long, lightly loaded structure gives all SSTs the most severe bending problems of any high-speed airplanes. Every pound added to stiffen the structure and control the bending detracts from the over-all efficiency and eats into range and payload. Soviet supersonic research and design has paralleled that of the United States to a surprising extent. The modified arrow wings on Tupolev's Blinder and Fiddler (opposite page) are almost identical to a family of wings developed at the Langley Research Center in 1956. It isn't possible to say that the Russians copied us because the detailed information on these wings was not released until 1960, and the Blinder and Fiddler appeared in sizable numbers at a Moscow air show in 1961. The basic idea of the arrow wing hasn't ever been a secret, with aerodynamicists in Europe and the United States discussing its advantages for years. The disturbing aspect is that the Russians had the technical skill and worked hard enough during the mid-1950s to develop these two aircraft, which give every indication of being first class. In terms of range, they could outclass the B-58 substantially, for their type of arrow wing has about a thirty percent better aerodynamic efficiency at both subsonic and supersonic speeds than the delta shape on the B-58, which is about four years older. If the engines and the other aspects of the design are equal, the Russians could have a range edge. Yakovlev's Firebar is the latest model in a large family of aircraft that first appeared more than fifteen years ago with the subsonic YAK-25 Flashlight. NATO sources regard the Firebar as an excellent multipurpose supersonic aircraft. If this is true, then it provides evidence that the Soviets can combine every trick to boost performance, including the area rule, wing fences, leading-edge extensions, camber, twist, kinks, and cut-outs. Best evidence of such skill in the US is the F-4, which has most of these features plus a drooping tail. The F-3H and F-101, beside the F-4 at lower left, illustrate the tendency of most companies to improve on their old designs. Mikoyan's MIG-23 is more of a departure from the MIG-21 that preceded it. However, the MIG-23 is believed to be nearly 1,000 mph faster than the -21, with a top speed above Mach 3. The British Aircraft Corporation Lightning has a good record, but no other aircraft to date has used its unusual configuration. The North American Rockwell A-5 is an area-ruled airplane with no volume penalty due to the "Coke-bottle" shape.



McDonnell Douglas
F-4 Phantom (U.S.)



McDonnell Douglas
F-3H Demon (U.S.)

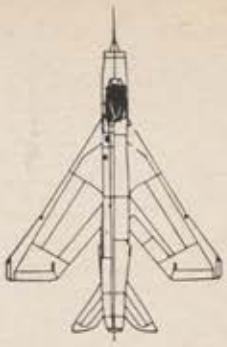
McDonnell Douglas
F-101 Voodoo (U.S.)

North American Rockwell
A-5 Vigilante (U.S.)

today is as near a unanimous view as it ever gets. If the new Administration wants to avoid the embarrassment of large cost overruns and badly slipping schedules in aircraft programs, it should revitalize flight-testing in the United States.

As the situation stands now, the Nixon Administration's position on high-speed aircraft development will become clear at an early date. No one will be kept in suspense very long, for the new government has inherited the longest list of question marks in supersonic aerodynamics since Capt. Charles E. Yeager first flew faster than Mach 1, on October 14, 1947.

The opportunity for performance improvement appears as bright as at any time in the past, and there is good reason to believe that the supersonic airplanes of the 1970s will completely outclass those operational today. But no one can establish just what the potential is without extensive experimental flying.



BAC Lightning (U.K.)

The Next Generation of Fighters

Most pressing high-speed problem for the military is a new generation of fighters—the Air Force's F-15 (called the FX until recently) and the Navy's F-14 (VFX). These aircraft aren't intended to set speed records, as they probably won't top Mach 3, but they are aimed at revolutionary performance improvements as important as supersonic flight itself. The chief goal is to achieve a completely new order of maneuverability at supersonic speeds, which will make all current fighters obsolete insofar as air-to-air combat is concerned.

Yakovlev YAK-28
Firebar (U.S.S.R.)

Outstanding new engines will be available for the F-14 and F-15 because government and industry have cooperated closely in a strong analytical program backed by extensive testing of experimental engines. These powerplants will have approximately twice the thrust-to-weight ratio of any engines now in service, and they alone are enough to guarantee an outstanding new fighter.

Improvements in aerodynamic design of the airframe are not as much a known quantity as the powerplant, but they could easily be a bigger factor. A steady stream of new ideas is being generated in government and industry theoretical studies and small-scale experiments. Flight verification is the missing link.

Tupolev
Fiddler (U.S.S.R.)

The aerodynamic tinkering even extends to the basic airfoil, which apparently has an almost unlimited potential for delivering less drag and more lift. Systematic development of airfoils was begun in the early 1930s by the National Advisory Committee for Aeronautics (predecessor organization of today's NASA), and the work still isn't finished.

Richard T. Whitcomb, originator of the area rule for reducing airplane drag at transonic and supersonic speeds, the so-called "Coke-bottle" configuration, is the latest NASA scientist to try his hand and the results appear somewhat staggering. Whitcomb has devised a family of "supercritical" airfoils that theoretically will allow a transport airplane to cruise very eco-

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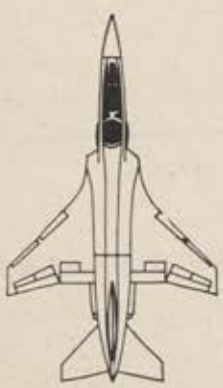
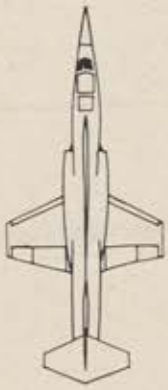


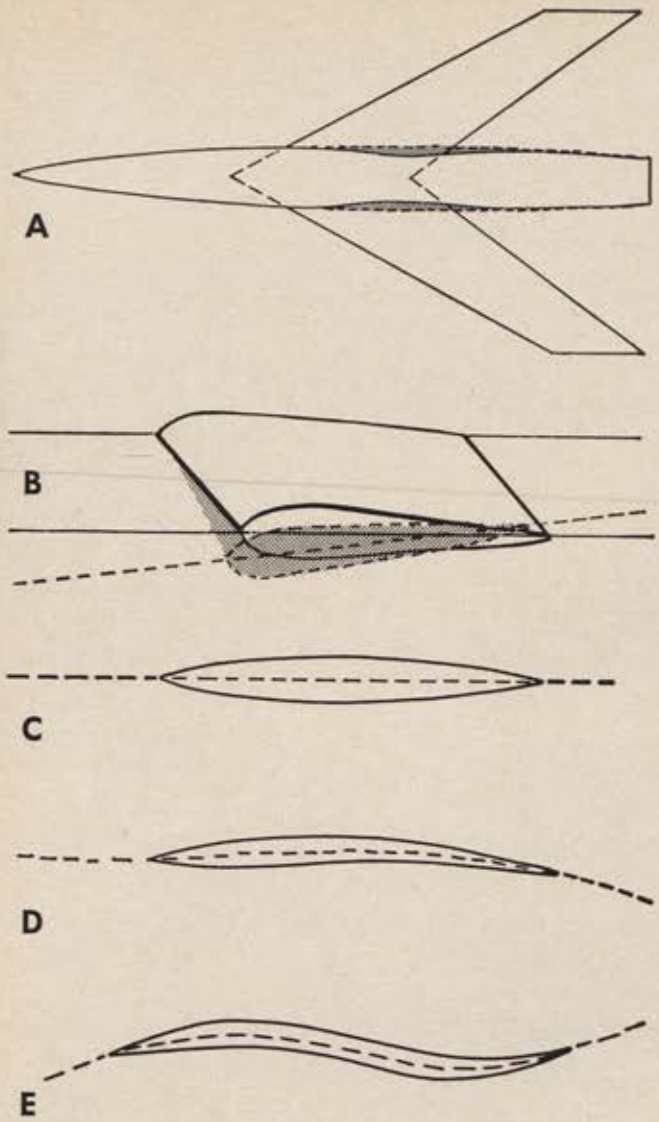
Breguet-BAC Jaguar
(Anglo-French)

Northrop F-5
Freedom Fighter (U.S.)



Lockheed F-104
Starfighter (U.S.)

Tupolev TU-22
Blinder (U.S.S.R.)



Some basic supersonic design techniques are illustrated above. "A" shows the area rule, used to reduce interference between flow on the wing and body. The shaded area cut out of the fuselage is equal to the wing volume. Good supersonic efficiency requires wing twisting (as in "B"), and cambering of its airfoil. Upper airfoil ("C") is a symmetrical supersonic shape. Cambering involves curving the center line (as shown in "D"). Lowest airfoil ("E") with drooped nose and reflexed trailing edge that curves upward is typical of unusual shapes being proposed, including "supercritical" airfoil being developed by NASA's Richard Whitcomb.

nomically at Mach 1. Mach 1 was previously thought to be the speed at which a very high drag would occur on any flying vehicle.

Ten years ago jet transports cruised at Mach .75 or so, and by constant refinements some have been pushed to Mach .8 or better, but few people ever expected Mach 1. Economically, Whitcomb's latest work is of extreme importance if it works out in practice, because an advantage of twenty to thirty mph in cruise speed has been enough to make a jet transport a big seller over its competitors. Cruising at Mach 1 would provide more than a 100-mph advantage over current models.

Military importance could be even greater, since such an airfoil should also substantially improve the lifting capability of a wing in supersonic turns and in flight at high altitudes. That is, a fighter with a "supercritical" wing should be able to make much tighter turns at supersonic speeds and high altitudes than any of today's aircraft. Apparently it has the potential to extend a fighter's buffet limit and maneuvering altitude to the point that such an aircraft would be unbeatable in the high-altitude air-superiority role. This is the mission of the F-15, which has been described by Air Force leaders as a single-design-point airplane with the capacity to sweep the skies clear of all enemy aircraft during the 1970s.

Technical details of Whitcomb's airfoils have not been made public, but they are a substantial departure from conventional shapes, and some aerodynamicists working with them call them "weird." In simplest terms, their shape produces a pressure field, which prevents the separation of airflow from the top of the wing that is induced by the shock wave that forms as an aircraft nears Mach 1. This separation of flow from the wing is the cause of high drag. It is also a cause of buffeting, which shakes a fighter aircraft fiercely when its wing nears the limit of its lifting capacity during maneuvers at high speed and high altitude.

NASA's regard for Whitcomb's work is evident in the space agency's new budget, which requests funds for construction of its first major research aircraft in several years (*see illustration on page 36*) to flight-test the supercritical wing. Industry's interest is displayed by the fact that most major companies are trying to improve on the basic idea and adapt it to practical configurations.

Configuration Integration

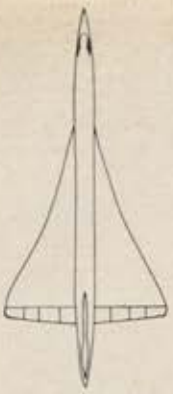
The other fertile avenues for aerodynamic design improvement can be lumped under the name of configuration integration. This isn't a serious problem on subsonic airplanes because the major parts, *i.e.*, the wing, fuselage, tail, engine inlet, and engine exhaust, don't affect each other unless one part is directly in the wake of another part.

During supersonic flight, however, a completely different situation exists since each part creates a strong pressure field that radiates outward. The interaction of the pressure fields from the various parts can seriously degrade, or substantially improve, the performance of a supersonic aircraft.

A widely publicized example of favorable interference between fields was the B-70's "riding" of its own shock wave. In this case the large engine nacelle was placed below the wing and shaped so that it would throw a positive pressure field of maximum intensity on the lower wing surface to increase lift and raise the aircraft's aerodynamic efficiency (lift/drag ratio) to the point that long-range flight at supersonic speeds was possible.

Since the B-70, configuration integration has become far more sophisticated. Designers have much better mathematical techniques for predicting the interaction of flow fields. Now it is recognized that the engine air inlet and exhaust exit can be the biggest source of supersonic drag. More satisfactory methods are available for reducing this drag at all speeds and altitudes, and in the most severe maneuvers.

III. TAILLESS DELTA AIRCRAFT



BAC-Sud Aviation
Concorde (Anglo-French SST)

If one looks at the highlights, supersonic design can be said to be entering its fourth phase. These phases overlap in time, but each has had quite distinct objectives.

Supersonic Design History

• **Phase 1—Extend Top Speed.** The initial step was to create operational airplanes that could make dashes to at least Mach 2. At this speed they would be completely bathed in supersonic flow and would be beyond the troublesome transonic region in which subsonic and supersonic flows were mixing over the aircraft's surfaces in unpredictable fashion, causing high drag and erratic piloting qualities.

An intensive effort was made on this problem in the aircraft industry's design offices through the late 1940s and until about 1953. The Bell X-1 led the way in flight experience and provided invaluable information, but it fell far short of clearing up all the questions. A major technical battle arose regarding the most efficient wing shape for supersonic flight, and at that time there were three main contenders—the delta, swept, and straight planforms.

As it turned out, all of these wings were used on successful operational airplanes. In terms of air-superiority-type performance, the straight-wing Lockheed F-104 was the premier design of the era. It was laid down in 1951 as a result of an urgent USAF request for a fighter that could clearly outclass the Soviet fighters in Korea and the ones certain to be on the

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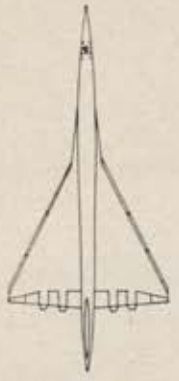
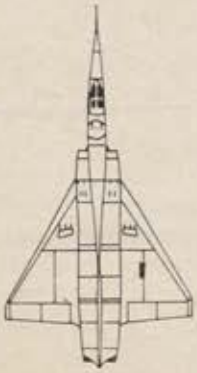


Lockheed L-2000
SST Design (U.S.)

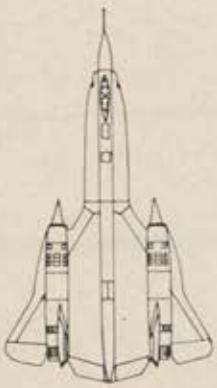
Tupolev TU-144
SST (U.S.S.R.)

The tailless-delta configuration has ardent supporters around the world. Its major advantages include good drag savings due to elimination of the horizontal tail, and the potential of building a very light wing that is very thin. On some SST designs the thickness ratio drops near 2% (*i.e.*, the depth of the wing at the fuselage is only 2% of the length of the wing along the fuselage). A big disadvantage is relatively poor control effectiveness during landing and with an engine out. Problems also arise because deflection of the control surfaces on the wing trailing edge makes an input to roll as well as pitch, and it is difficult to separate the motions. On most of these designs fuel has to be pumped to new tanks during flight to maintain proper balance. These problems reportedly have been solved satisfactorily on the Concorde and the TU-144. The Soviet SST flew December 31, and a rapid test program is planned with VIP passenger service scheduled to begin early in 1970.

General Dynamics/Convair
B-58 Hustler (U.S.)



Dassault
Mirage IV (France)



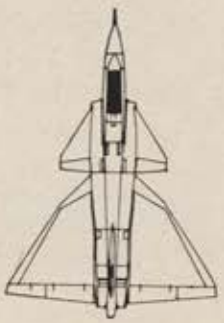
Lockheed YF-12A (U.S.)

SAAB-35
Draken (Sweden)

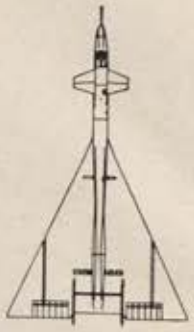
General Dynamics/Convair
F-106 Delta Dart (U.S.)

IV. CANARD AIRCRAFT

Canard control surfaces on the nose of airplanes have fascinated designers for decades. At one time the favored SST configurations of Lockheed, Boeing, and North American carried canards, and NASA spent much research effort on them. Despite their exceptional power as controls, they create other problems, such as disturbing airflow over the wing and aggravating the bending problems of long, flexible fuselages. The SAAB Viggen and the B-70 are the only supersonic aircraft to date in the West to carry canards. Wings on subsonic cruise airplanes (opposite page) have changed since the B-47 was designed in the late 1940s. The slender swept planform has been modified by lengthening the root chord to reduce wing thickness and allow cruise speed closer to Mach 1. The TU-154 is the first Soviet transport to use a full complement of leading and trailing edge flaps to lower landing speed. The Boeing 727 commercial transport aircraft is the third generation in this respect.



SAAB-37
Viggen (Sweden)



North American Rockwell
XB-70 Valkyrie (U.S.)

drawing boards. The F-104 set ten world records for speed and time to climb and still is regarded as a formidable fighter over short ranges.

All aircraft of this period, including the F-104, had their problems, however. During very tight turns, for example, aircraft with highly placed horizontal tails often "pitched-up," with the nose rising uncontrollably to throw the aircraft out of the maneuver. Some supersonic airplanes experienced uncontrollable "coupling" of the controls, *e.g.*, when the pilot would pull back on the stick to nose-up, the aircraft also would roll over. Such problems were handled primarily through electronic "black-box" automatic controls, but this sort of artificial stability usually restricts maneuverability unacceptably.

Many drag miscalculations occurred, the most serious of which involved the Convair F-102. Theory showed that the F-102 should have had respectable supersonic speed, but when the first one flew it could not even make Mach 1. NACA's Richard Whitcomb's area rule, which had previously been turned down for the design, was applied, and the aircraft met its specifications.

The area rule was immediately applied to the Convair B-58 bomber and since then has become a standard supersonic-design technique in all nations.

• **Phase 2—Two-Design-Point Wings.** About 1953 the military made urgent requests for supersonic aircraft with greater range, and the industry worked hard on this problem during the mid-1950s. The immediate effort was made toward improving the technique of Phase 1, cruising subsonically for long periods and dashing to supersonic speeds for brief periods of combat. This problem was formidable because it meant compromising between two widely different wing requirements. The most efficient subsonic wing has a long span (high aspect ratio) and is relatively thick, while the best supersonic wing has a short span and is very thin.

Successful wings from this period generally were modified deltas. The most efficient compromise was the so-called arrow wing, which is highly swept, has a long root section next to the fuselage, tapers down to a point at the tip, and looks like an arrowhead (*see illustrations, page 39*).

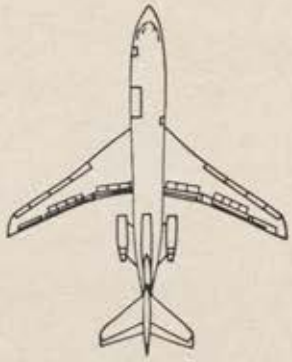
Most prominent US fighter of this period was (and still is) the McDonnell Douglas F-4 Phantom. In addition to excellent range and maneuverability, its stability and handling qualities are substantially better than those of the earlier series of supersonic airplanes. The F-4 set eight world records for climbing and for speed at both high and low altitudes, and its record for adaptability to many missions is unexcelled.

A more powerful means of satisfying the two-design-point requirement, the variable-sweep wing, was an

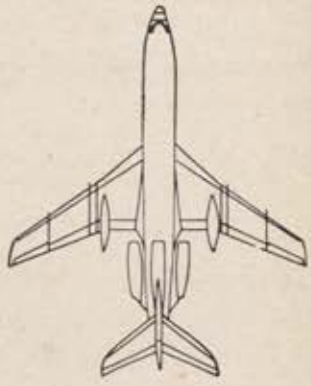
Engineers feel that the Lockheed YF-12A (the fighter version of the A-11, as it was originally called, or SR-71, as the strategic reconnaissance version is known) had ideal management. Only a handful of government or company officials were permitted to review the work of designer Clarence L. "Kelly" Johnson. Today, the SR-71 is the only aircraft in the world known to be cruising regularly at supersonic speeds over intercontinental ranges. Photo shows the YF-12A.

V. SUBSONIC CRUISE AIRCRAFT

Boeing B-47
Stratojet (U.S.)



Boeing 727 (U.S.)



Tupolev TU-154
(U.S.S.R.)

object of intensive research a decade ago. This wing can be moved through large sweep angles in flight to provide the proper span and good aerodynamic efficiency at both subsonic and supersonic speeds.

Many people contributed to the long effort to perfect this truly revolutionary wing, but today's successful version is based primarily on research conducted during the late 1950s at NASA's Langley Research Center by a group headed by John Stack.

• **Phase 3—Supersonic Cruise.** By the mid-1950s research was showing the way to very large improvements in wings that were designed primarily for supersonic speeds with little subsonic compromise. For example, the F-104 airplane had a supersonic aerodynamic efficiency, or lift-to-drag ratio, of about 4, while wind-tunnel tests were showing ways to push this over 8.

The gains came through design for favorable interference, as discussed above; the use of very large delta wings, which can be thinner than other shapes; and an improved understanding of the drag reductions possible by twisting and cambering supersonic wings.

The North American B-70 was the first supersonic cruise project to be announced. It did not enjoy the success of the Lockheed A-11, which was developed in secret as a follow-on to the U-2 reconnaissance airplane. Now designated the SR-71 (or YF-12A), this aircraft is the only one in the world known to be cruising regularly at supersonic speeds over intercontinental ranges.

The supersonic transport (SST) design competitions of the last five years in the United States are theoretical extensions of the practical experience gained from the SR-71 and to some extent from the B-70. The B-70 flew 1.8 hours at Mach 3. (Two B-70s were built. One crashed in June 1966; the other was recently retired to the Air Force Museum, Wright-Patterson AFB, Ohio.) The SST requires substantially better design efficiencies than those of the SR-71 or the B-70 if it is to meet the present specifications.

• **Phase 4—Supersonic Maneuvering.** A completely new order of supersonic efficiency is needed to meet the requirements of this phase, which is seeing maximum activity as McDonnell Douglas, North American Rockwell, and Fairchild compete for the F-15 contract. Last month Grumman was picked for the F-14.

To the untrained eye, the aircraft that are finally produced probably won't look much different from today's models, but they could represent one of the biggest steps yet in jet aviation. The potential appears that great.

The Situation Today

Today, a company's techniques for supersonic design, and the means by which it is trying to improve these techniques, are among the most closely held proprietary secrets. By all reports, there usually are significant differences in company techniques, and interesting new ideas appear regularly.

The situation in aerodynamic design appears as fluid as in the early 1950s when every company had its own distinct ideas about supersonic flight—and in those days this meant only a short dash at supersonic speeds. Lockheed, for example, favored the straight wing of the F-104, Convair argued for the delta of the F-106, and North American stayed with the F-100's swept wing.

Making a selection in those days wasn't a real problem for the military because the Administration gave the highest priority to supersonic development and hedged all bets by building more than a dozen supersonic aircraft. In addition, a sizable stable of research airplanes fed data into all of the projects.

Building as many separate designs in the 1970s would be as unnecessary technically as it would be impossible politically or financially. Understanding of supersonic aerodynamics certainly is advanced enough to eliminate the necessity of a scatter-shot approach in development.

On the other hand, there is little reason to expect that understanding of supersonic flight today is clear enough to allow even the most expert selection board to focus on the exact fighter design that will provide air superiority a decade ahead. A good deal of experimental flying must bolster the theory to have any hope of getting such a clear view.

"Fly before you buy" would still seem to make a lot of sense.—END

Development of the Anglo-French Jaguar trainer-fighter, directed by a superb binational management team, has gone smoothly, and the manufacturing program for the versatile aircraft is well along. Such has been the success of the joint project that it may well serve as a model for future international aviation and space ventures . . .

jaguar

A Cooperative Project Pays Off

By Stefan Geisenheyner

AIR FORCE/SPACE DIGEST EDITOR FOR EUROPE

ENCOURAGED by the smoothly running cooperative program to produce the Anglo-French Concorde supersonic airliner, the British and French governments decided late in 1964 to embark on another ambitious joint effort to develop several military aircraft and missiles for use by the two nations' armed forces.

The most famous offspring of this undertaking are the Hawker Siddeley/Engins Matra Martel air-ground guided missile, the W.G. 13 light observation helicopter, and joint production of Sud Aviation's medium transport helicopter S.A. 330.

Two heavier military aircraft also were to be co-developed and produced. The first, the so-called AFVG (Anglo French Variable Geometry) long-range fighter-bomber, was dropped while in the planning stage because the Royal Air Force and the French Air Force could not reach a compromise regarding their respective military requirements. France subsequently canceled its participation and developed a swing-wing aircraft tailored to its own tactical requirements. This aircraft, the Dassault Mirage G, has been flying since 1967.

While the cooperative effort on the AFVG was abandoned because of the divergent views on aircraft capability, an agreement on the second aircraft, an advanced trainer, was arrived at with relatively little trouble, since RAF and FAF requirements for this type aircraft turned out to be very similar.

Working separately, each air staff already had independently concluded in early 1964 that the introduction of a modern and advanced trainer was mandatory in the early 1970s to replace the obsolescent trainers—mainly converted combat aircraft—still in widespread use in both countries. It was understood that the advanced pilot-training aircraft must have capabilities over the whole spectrum of tactical air warfare techniques, with emphasis on low-altitude penetration, precise attack runs, high- and low-speed aerobatics, and supersonic high-altitude interception. Required was a two-seat trainer offering almost the same performance as a combat aircraft designed for frontline use.

The two air staffs also concluded that it was logical to go one step further and plan parallel development of *two* aircraft: a two-seat trainer with limited combat capability, and a single-seat combat version based on the same engines and airframe. And when this compromise aircraft project was studied, it was discovered that an advanced trainer design would serve excellently as a close-support fighter-bomber for low-level missions if appropriate equipment for tactical combat were provided.

Remarkable Airfield Performance

For instance, the high engine thrust desirable in the training version for supersonic high-altitude interception could be employed to full advantage in the low-level tactical aircraft to achieve a remarkable airfield performance in the form of short takeoffs and excellent combat load.

On the other hand, low-pressure tires and sturdy landing gear required for soft-field operations of tactical aircraft would provide a cushion of safety for students during their first landings with a high-performance trainer. Also, the high-lift devices mandatory

The Jaguar is not revolutionary in either performance or layout. It has been designed as simply a very up-to-date and sturdy military aircraft incorporating well-proved technologies. One strong feature is its short landing and takeoff capability.

for tactical STOL operations need not be employed if a student were being trained to fly supersonic interceptors exclusively in the future; he could utilize the capability to make the high-speed landings demanded by the British Lightning or French Mirage III.

Many more commonalities were discovered, and the studies of the two air forces pointed clearly toward a combined trainer-fighter design that would fill the tactical and training needs of the 1970s.

All these considerations took place in the spring of 1964 and when, that autumn, the French and British governments requested their air staffs to formulate joint military aircraft requirements, it proved uncomplicated to arrive at a binational agreement on the trainer-fighter.

After several continued joint studies, an operational requirement was decided upon which led to an Anglo-French "Memorandum of Understanding." Signed May 17, 1965, it defined the program for an advanced training and tactical support aircraft, dubbed Jaguar. France's Breguet Aviation and the British Aircraft Corp. (BAC) were chosen to design and produce the Jaguar. Rolls-Royce, Ltd., and Turbomeca, S.A., of France were contracted to jointly develop and produce the aircraft's engines.

The Memorandum of Understanding specifically required the formation of a joint industrial organization to coordinate the two nations' industry teams. A first and important step, therefore, was the establishment of this binational management team to handle the contracting and communications, to divide the workload, to deal with the two governments, and finally to negotiate sale of the Jaguar.

This company was called SEPECAT, an acronym for Société Européenne de Production de l'Avion Ecole de Combat et d'Appui Tactique. The firm is registered in France and opened its doors in May 1966. On the engine side, a complementary organization named Rolls-Royce/Turbomeca, Ltd., registered in England, administers the industrial design and manufacture of Jaguar's engine.

To create an impartial decision-making authority, the SEPECAT Board of Directors consists of eight executives, four from each of the parent companies. The post of chairman is filled each year alternatively by B. C. Vallieres, Chairman and President of Breguet, and by F. W. Page, Chairman and Managing Director of BAC's Preston Division. SEPECAT relies fully on the financial and administrative facilities of the two companies.

The board has appointed representatives from the technical, production, financial, and sales departments of each company who together form the SEPECAT management committee. To achieve the utmost simplification in the chain of command, a strict division between design and production affairs and finance and sales matters was introduced. The latter is handled by BAC, and the former is the responsibility of Breguet.

Much care has been taken by the parent companies to divide equally between the two nations the expenditures, workload, and accruing knowledge. Manufacture of the Jaguar airframe, for instance, is allocated evenly. Breguet constructs the nose and central fuselage parts while the rear fuselage and the wing assemblies are manufactured by BAC.

This division of effort applies to all prototypes and production models. Regardless of whether the aircraft's future user is the RAF or FAF or any other customer, assembly of the aircraft will take place simultaneously in Britain and France.

It was calculated that transporting the aircraft parts would be cheaper than duplication of rigs and tools in the two factories. Essentially the same system is used in the cooperative effort on the part of the two engine companies.

This has produced a problem, since finished wing and tail assemblies must be transported to France and front fuselages to Britain. But once production is fully under way, the transport media will receive optimum use in shuttling between the continent and the British Isles.

Government-Level Management Committee

SEPECAT and Rolls-Royce/Turbomeca, Ltd., are supervised also by a government-level Anglo-French management committee. Two members are from Britain's Ministry of Technology and the Ministry of Defense and two from the equivalent French government agencies. Four subcommittees report to the main

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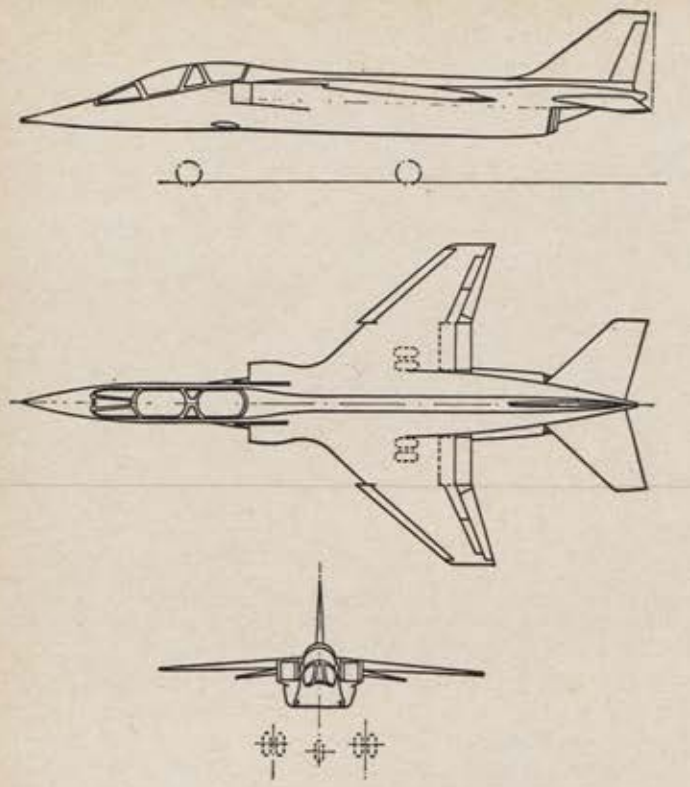


Line drawings show Jaguar side, top, and front views. The aircraft's wingspan measures 27.86 feet. Length of the tactical version is 50.91 feet and 53.87 for the trainer.

committee on progress and problems in the airframe, engine, administration, and production areas. Working groups of government specialists support these committees in the field.

All contracts for the Jaguar airframe and systems are awarded by a purely governmental organization, the French Direction Technique de Construction Aéronautique (DTCA). This group acts as executive authority for both the British and the French governments. The same powers are held on the engine side by the British Ministry of Technology.

This approach to development and manufacture has worked well and has eliminated the bulk of the problems encountered in similar previous ventures. For all management purposes, the two companies can be regarded as one unified body. Financial matters are handled easily and with a minimum of delay, customers and subcontractors deal with a single decision-making authority, and internal technical matters are brought to one office staffed by executives from both companies.

If the past two and a half years give any indication, the SEPECAT management system works smoothly and efficiently. It may well serve as a model for future international aviation or space projects. A similar approach has been taken to organize the three-nation European Airbus venture, and that effort by France, Germany, and Britain in its present rudimentary form is functioning satisfactorily. In this case it is the prospective customers who are having trouble agreeing on basic aircraft design.

From its inception, no such problem confronted the Jaguar project; the designers were told precisely what the military wanted and, therefore, could proceed rapidly with development and production. The design was frozen early, to apply the French philosophy of not weakening the basic design through too many alterations. Once the aircraft is flying, changes still can be incorporated. This approach is somewhat unusual since it is empirical, seemingly a throwback to outmoded methods. But France has been very successful using this system in military aircraft development.

The Jaguar trainer-fighter is definitely not revolutionary either in performance or layout. It is simply a very up-to-date, sturdy, and honest military aircraft incorporating well-proved technologies. Externally it is an all-metal shoulder wing aircraft fitted with high-lift devices for short takeoff and landing. Control is through use of wing spoilers and all-movable tailplane and rudder.

After much deliberation, the planners decided to equip the Jaguar with two engines. The higher initial cost of this was disregarded in favor of better survival chances. Worldwide statistics covering several million flight hours for aircraft with similar characteristics and wing loadings indicated that the accident rate of single-engine aircraft has been two and a half times that of twin-engine aircraft. This resulted in the conclusion that the number of single-engine aircraft to be replaced due to normal attrition would have been thirty percent more than two-engine ones.

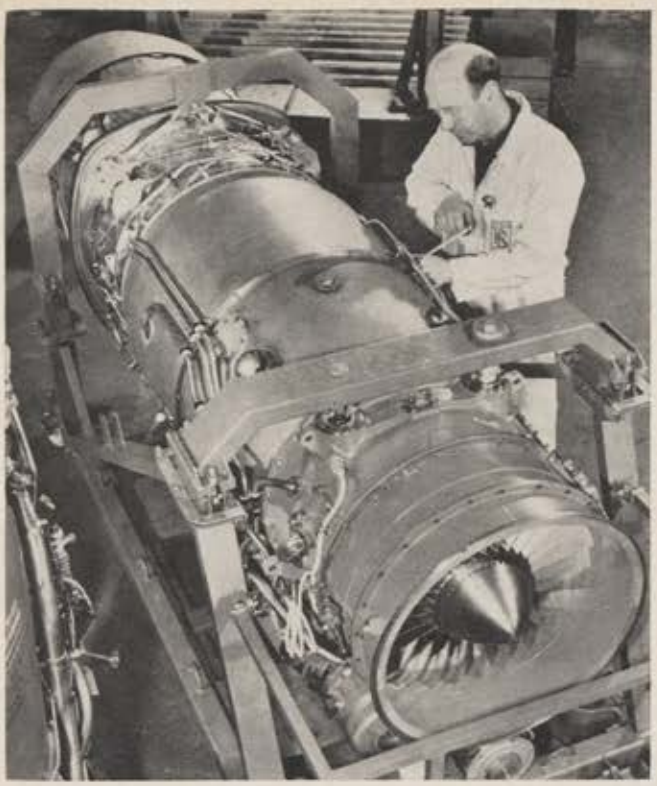
Advanced Turbofan Bypass Engine

Two Rolls-Royce/Turbomeca afterburning turbofans of 4,400 pounds of thrust each (6,600 pounds with afterburner) power the Jaguar. This engine is an offshoot of the RB 172-T260, an advanced turbofan bypass engine specifically designed for simplicity, economy, and high resistance to foreign-object ingestion. It features a fully variable-afterburner system and self-contained starting capability. The manufacturers are attempting to establish a time between overhauls of up to 1,000 flight-hours. The engine was named "Adour," for a river in the Pyrenees close to Turbomeca headquarters.

The aircraft is relatively small as such and is in the weight and size class of the North American Rockwell F-86 or Hawker Siddeley's Hunter. Takeoff weight varies according to mission to between 22,000 and 30,000 pounds. The span measures 27.86 feet. Over-all length for the tactical version is 50.91 feet and 53.87 feet for the trainer.

A rugged, long-stroke landing gear is used; main legs are equipped with twin wheels. With a tire pressure of only fifty pounds per square inch and a gear designed to take a vertical velocity of 11.8 feet per second, the Jaguar can fly from such unpaved airfield surfaces as grass or hard-packed sand.

The Jaguar has been designed to accept a wide range of avionics equipment. For tactical support, its navigation and attack systems vary from an uncomplicated system based on standard TACAN procedures to more sophisticated equipment employing inertial elements and computers. Similarly, there is a wide choice of weapon-aiming devices from simple gyro gunsights to fully instrumented head-up displays. In the training version, representative opera-



Two Rolls-Royce/Turbomeca afterburning turbofan engines, each of 4,400 pounds of thrust, power the Jaguar. The engine is an offshoot of another engine, the RB 172-T260.

tional equipment can be fitted so that the student pilot can train with controls and displays found aboard operational aircraft.

To meet the diverse demands of future users, five Jaguar variants are presently under development (retaining basic airframe and engine equipment):

A-French tactical aircraft.
B-British trainer.
E-French trainer.
M-French naval tactical fighter.
S-British tactical strike fighter.

All trainers are two-seaters while fighters are single seat. The M-type Jaguar for French naval use incorporates a strengthened airframe and undercarriage to provide for the rigors of carrier takeoffs and landings. More advanced Jaguar versions are under study, notably a two-seat reconnaissance aircraft carrying the latest battlefield surveillance equipment.

Since the Adour engine has a good growth potential, most developmental studies center around higher-powered versions for tactical use.

On September 8, 1968, a Jaguar E model prototype undertook its maiden flight at Istres, France, only three years after the start of the program. The flight generally was successful but several stability problems were encountered that were remedied by adding aerodynamic stabilizers on nose and tail. Since then, the first prototype has been flown whenever weather permitted. Reportedly up to three flights per day were being made late last fall, a remarkable achievement for a basically experimental aircraft having a new and unproved engine. In October 1968 the Jaguar went supersonic for the first time and has since flown its entire speed spectrum.

Maximum speed at low-level is Mach 1.1 and Mach 1.7 at altitude. The ferry range using external fuel is given as 2,430 nautical miles. A hi-lo-hi radius of action of 675 nautical miles on internal fuel while carrying a combat load of about 10,000 pounds is anticipated. Lo-lo-lo missions with a full weapons load can be flown over a radius of 351 nautical miles on internal fuel. Fitting external tanks increases range to 459 nautical miles but reduces weapons load at least one-third.

STOL-Type Takeoff and Landing

The high thrust of the Jaguar's twin turbofan engines is matched with high-lift devices to give STOL-type takeoff and landing performances. To take off toting a typical weapons load and clear an obstacle fifty feet high requires 2,400 feet. For training operations the field length need not be more than 6,560 feet. If an engine fails during takeoff, this distance will permit the aircraft to be stopped or continue the run and take off on one engine. Landings can require a ground roll of only 1,550 feet.

Armament possibilities are up to modern standards. Two integrally mounted 30-mm machine cannon are fitted in all the Jaguar variants. On four wing-mounted pylons and one centerline pylon all types of napalm, rockets, and bombs can be carried. The maximum weapons load is given as 10,000 pounds.

Three Hawker Siddeley/Matra Martel antiradar missiles or two TV-guided Martels can be carried. The TV version has a special guidance pod that occupies the third missile's space. The pod houses a backward-fac-

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In September 1968, the first Jaguar prototype made its maiden flight at Istres, France, three years after the program's start. In October the aircraft went supersonic and since has flown its entire speed spectrum.

The Jaguar has been designed for easy maintenance under field conditions. Where possible, plug-in modules have been provided for replacement of electronic equipment.

ing TV receiving unit to monitor a missile's flight as the aircraft heads away from a target. An externally carried reconnaissance pod presently is under development for special missions to amplify the capability of the fuselage-mounted camera, standard equipment on all tactical models. Armed with infrared guided missiles of the Sidewinder type, the Jaguar also offers a limited interception capability.

Safety and maintenance have received considerable attention. The Jaguars can be equipped with zero-altitude and zero-speed ejection seats. The tactical variants employ armor extensively to protect the cockpit and the whole underside. Self-sealing fuel tanks are standard, and fuel lines are armored.

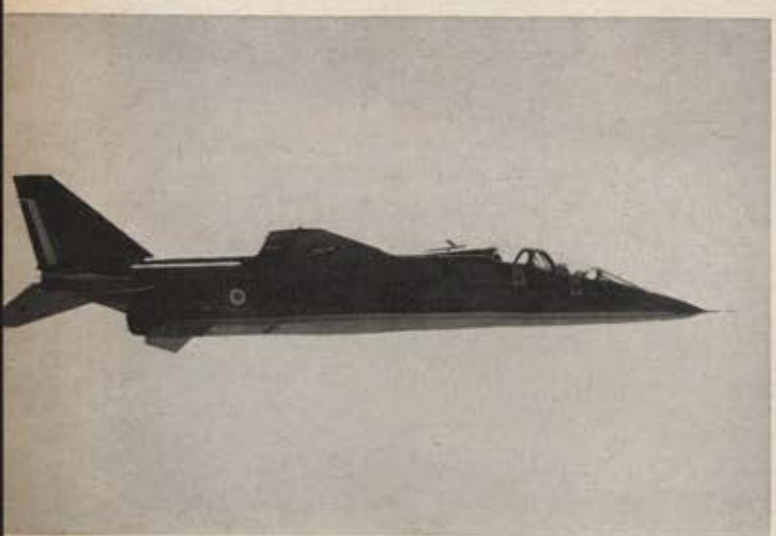
The Jaguars have been designed for easy maintainability under field conditions. Where possible, plug-in modules have been provided for the electronic equipment, and the various servicing points are accessible without use of ladders or scaffolding. The goal was a turn-around time—including rearming—of fifteen minutes' maximum under rough field conditions. A complete engine change can be accomplished in about thirty minutes.

The manufacturing program of the Jaguar is well under way. Two prototypes of the French trainer version will fly this spring, and two French tactical Jaguars are on the assembly line. The first flight of the naval Jaguar will follow later this year, and possibly two prototypes of the British tactical variant will also be ready for flight testing during 1969. The first FAF Jaguars are to become operational early in 1971 with the RAF receiving its first aircraft in 1972. This time schedule was established by the British and French governments when in January 1968 they ordered a total of 400 Jaguars. The order itself was unprecedented since at the signing of the production agreement by the two countries, the aircraft had not yet made its first flight.

Impetus to Sales Program

The Jaguar's excellent initial performance and the large firm order gave strong impetus to SEPECAT's sales program, under way since the Jaguar project's inception. Several foreign governments already have shown strong interest in the aircraft. SEPECAT hopes that eventually more than 1,000 Jaguars can be sold worldwide.

Whatever success the Jaguar program experiences certainly can be attributed to the efficient management system combined with the technological know-how of the two nations. And at the conclusion of the Jaguar program it doesn't seem likely that SEPECAT will be dissolved. Many close ties between the French and British aviation industries will have been established, creating the potential for the hard core of a joint European aviation industry. The Jaguar program has amply demonstrated the feasibility of this kind of large-scale international cooperation.—END



The tactical version of the Jaguar employs armor extensively for protection of the cockpit and underside. Self-sealing fuel tanks and armored fuel lines are other features.

For field maintenance, the turn-around time—including rearming—is fifteen minutes maximum under rough conditions. A complete engine change requires thirty minutes.

A Proposal

To help meet the requirements of responsible leadership in the midst of a sweeping social revolution, the Defense Department and military services could make a major contribution by inaugurating special orientation programs that would acquaint military personnel with the rich heritage of America's ethnic groups and the many contributions to the building and defense of our nation by black and other minority-group Americans . . .

Filling the Military's 'Heritage Gap'

By Maj. George M. Boyd, USAF

IN A period of rapid and sometimes violent change, as an active-duty Air Force officer I am sincerely concerned with those aspects of leadership that involve more than the "tunnel vision" usually ascribed to military thinking. I believe that there are many aspects of service life and responsibility related to the cultural revolution which we, as military men, must recognize and become constructively involved in without degrading our primary task of military preparedness.

Responsible leadership is more important today than it has ever been, especially in the armed forces. And the key to that kind of leadership is human understanding. We must understand our people individually and collectively. Of particular concern, in the face of national unrest, is the role the military must play in its relationships with our civilian population.

The author, Major Boyd, is a twenty-three-year Air Force veteran assigned to a manpower post in a Tactical Air Command unit at McConnell AFB, Kan. During his career he has served in Southeast Asia and on Greenland and Japan, and is a graduate of the Air Force Manpower and Management Engineering School. This article reflects the author's personal views and should not be construed as necessarily representing official Defense Department or US Air Force policy.

We are committed to the augmentation of local police forces for the purpose of maintaining law and order. Although the preservation of order is normally a function of civilian law-enforcement agencies, we recognize that civilian law-enforcement agencies cannot always cope with extraordinary situations. Thus, it is obvious that military leadership must be concerned with the current national crisis.

The days have long since passed when military officers could study basic military tactics in a private world of weaponry, protocol, and national security objectives, while completely ignoring the social and political trends across the nation. This means that the peripheral vision of military officers, at all levels of command, must be broadened to prepare them for meaningful contributions to society.

It is not easy to analyze the social aspects and trends in contemporary society. Our military forces are subordinate to our civilian government and rightfully so. This is their charter under the Constitution. But at the same time, military men, especially officers, must know our system of government, must understand the people and their problems. Without such understanding, military leadership, no matter how sincere, will not be adequate. Indeed, it will be sterile.

There is a moment of truth when American military men must face American citizens to quell disorder. In most cases, military personnel do not know why this situation has degenerated to a state of confrontation. Normally the military is called out in a crisis on short notice and instructed to secure certain objectives, as

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—Photo courtesy Ebony Magazine

Black Americans helped free the American colonies from England's grip during the American Revolution, a fact too often forgotten. Painting of Battle of Bunker Hill shows Peter Salem, right, in thick of the action in that encounter.

part of a mission directive. Under such circumstances, many a commander has been faced with the soul-searching problem of analyzing his own beliefs and convictions as they relate to his duty to enforce the law.

How do we improve our leadership so that we as military officers can meet our mission objectives using minimum force and completing the operation with a maximum of understanding and compassion for our fellow citizens? These are not questions of mere physical control. The problem is much deeper, and, to solve it, new and imaginative techniques are needed.

I have come to believe that all military officers should be exposed to a course of training that analyzes the citizens of the United States in terms of who and what they are, what their problems are, the basic causes for their grievances, and what reactions can be expected from them under varying circumstances. This information is generally available and can be made a part of the over-all continuous military training program.

Most of what I have said up to now has had to do with officer leadership. But I believe that enlisted personnel in the armed forces should eventually receive such training too. There is no reason to believe that this cannot be accomplished within our current military structure and resources.

There are many people in the United States who have occupations involved in the total defense effort. These individuals must maintain their objectivity in spite of changing social pressures and situations. The military officer is committed to the defense of the entire nation, as is every serviceman. To do this he has to know what his job is and that his job is bigger than his own aspirations and grievances. The first item in the Code of Conduct for Members of the Armed Forces says, "I am an American fighting man. I serve in the forces which guard my country and our way of life. I am prepared to give my life in their defense."

This means that a Negro serviceman who is discouraged from swimming on the beach of a southern state must be prepared to defend that same beach with his life, if necessary, without evasion of purpose or mental reservation. This thought can be hard to live with. But duty requires, too, that a white serviceman must be prepared to protect the right of a Negro student to attend a college or grade school that the white soldier may believe it is wrong for Negroes to attend. Leadership in such a climate is difficult. The country cannot afford to ignore the problem of training men to cope with such conflicting ideas. Military men who are charged with the preservation of the nation itself must be prepared for such complex responsibilities.

As a black American and as an Air Force officer with many years of service, I have thought long and

—Photo courtesy Ebony Magazine

In every war America has fought, black soldiers—and members of other minority groups—have made important contributions, as symbolized by this array of black GIs clad in US Army uniforms worn during various conflicts.

hard about some of the causes of the current social unrest in our country.

It appears to me that the main cause is what I call a heritage gap. It stems from the pattern of segregation instigated against the Negro after the Civil War as a result of economic pressures. I refer to the competition in the labor market between freed slaves and free labor already in the market. The hatred, suspicion, and misunderstanding of that time have survived to the present. When a Negro child looks at a school book, he sees no one who looks like himself in a position of authority or in a hero's role. He identifies himself with servants and menial workers. He knows that the Negroes were freed more than 100 years ago. Yet, he wonders, what have they accomplished except becoming a "problem"? He is not aware of his heritage. He does not know that members of his ethnic group have made major contributions in every walk of life.

The white child has a reverse problem. When he opens the book, he notes that the former masters and slave owners look like himself, and so do the "heroes," good or bad. He, too, is aware that the Negroes were freed over 100 years ago, and he does not know what they have accomplished to improve their position in society.

Thus, from two vantage points, we have what I call a heritage gap. A partial solution to this problem is to add more Negro culture to the school book at all levels. I note that in the past several years more and more Negro-oriented literature and advertising has become evident. This is an important step toward understanding and respect and recognition. But more can be done, especially in the military environment, to help close this heritage gap.

I recommend a Department of Defense agency that would have the mission of disseminating historical reference data about ethnic groups, in terms of their contributions as members of our armed forces, both past and present. Such an effort would by no means solve all the problems, but I do contend that such positive action within our present capability is a valid "mission requirement."

There are many sources of historical reference which could be compiled by the Department of Defense's research people. This information could be used in military writings of a public-information nature. I recognize that there are some scattered efforts in this direction. However, I believe we must sharply increase and focus such programs.

There is certainly precedent. In each military branch of the Department of Defense there are programs and briefings on the customs and characteristics of the people of other lands where we have military personnel stationed. Certainly, it is time American servicemen become educated about their fellow citizens. Such an effort, geared to study of minority groups of America and minority-group military contributions, is an essential endeavor in terms of promoting understanding among our servicemen and, indirectly, among all Americans.

Recognizing that the military services are dedicated to the common defense of the total United States population, it should be clearly understood that such a proposal encompasses the contributions of all ethnic groups to the American military heritage.

For all military basic training graduates, white and black, the author suggests, a knowledge of the contributions of America's ethnic groups to the nation would be beneficial.

The Department of Defense has been and continues to be a leader in advancing race relations. In these times of strife and turmoil, part of our contribution should concern itself with enhancing positive aspects of our history. Millions of Americans pass through the military services in a relatively short period of time. Obviously these men and women return to civilian life with experiences that they would not otherwise have had. This fact alone is justification for a vigorous in-service national heritage program, one that has the specific purpose of helping create a sense of identity and pride among the many peoples who together make up the American people.

To my way of thinking, the knowledge and understanding that will contribute to the personal dignity of those Americans who have been hitherto deprived of such advantages are not only worth working for, but are, in fact, aims we have a moral obligation to advance.

I also believe that military personnel should participate in our total national commitment without sacrificing the historical mission of defending the nation. I firmly believe, too, that, in addition to pursuing our role of national defense, the Department should conduct its business in ways to help solve pressing domestic problems. I hope that what I have written may contribute in some small way to our total national welfare.—END

Whatever course the Nixon Administration sets regarding formulation of national defense policy, now is an appropriate time for the military and civilian sectors of the defense establishment to reevaluate their respective roles. In this article, Herman Wolk, a long-time observer of the military-civilian defense combination, examines that crucial relationship and suggests approaches that might be taken to strengthen it . . .

The Military-Civilian Defense Team—

Time for Constructive Self-Analysis

By Herman S. Wolk

The problem of policy-making in our society confronts the difficulty that revolutionary changes have to be encompassed and dealt with by an increasingly rigid administrative structure.

The deepest cause of the inhumanity of our time is probably the pedantic application of administrative norms.

—Henry A. Kissinger

You can no more practice decision-making than you can practice dying.

—John Roche

ONE of the major benefits of the American political system is that every four years we have an opportunity to draw up a balance sheet and perhaps reflect upon where we seem to be heading. And when the "outs" win the presidency there is an even larger opportunity for fresh appraisals. As the Nixon Administration assumes power, perhaps nowhere is this more apparent than in the field of national security policy. It has, of course, become a truism that there is no longer such a thing as military policy independent of US foreign policy. The war in Vietnam provides the most recent reinforcement of the dictum that the strategy applied to support policy objectives must be appropriate and workable.

Already our military-political policies are undergoing a comprehensive reappraisal that will be of the greatest significance for the American military. And the tremendous cost of new weapon systems, the critical nature of forthcoming military-political decisions, and the complex intergovernmental relationships that contribute to the policy process will demand rigorous analysis by the military if the views of the American military are to have any substantial impact on future US policy.

Indeed, there are indications that the Nixon Administration is thinking in terms of changing significantly the way basic national security policy is developed. This departure from the recent past would feature a resuscitation of the National Security Council with emphasis on a more formal mechanism for making policy as opposed to the loose and sometimes diverse nature of policy-making that marked the Johnson Administration, and a return to techniques used in the Eisenhower years. There might even be a comprehensive statement of basic national security policy that would serve as a guide to the military. This kind of prospectus or abstract was a hallmark of the Eisenhower era.

Here it is pertinent to note that although some have pointed to new life for the NSC as an indication of a larger role for the military in policy-making, in practice it has been quite the opposite. The National Security Act of 1947 provided that the National Security Council—composed of high civilian officials—would advise the President on national security policy. This arrangement divested the Joint Chiefs of their very considerable power and policy roles, accumulated during World War II. Under the Act, the activities of the JCS were limited to military affairs as opposed to the formulation of over-all national security policy. It is true, of course, that the Chairman of the Joint Chiefs has traditionally attended NSC meetings. But it is equally relevant that the creation of the JCS Chairmanship in 1949—ostensibly to aid the unification process—further restricted the military role in policy-

making. And although the Chairman of the JCS informed the President on military matters, he also brought back to the JCS (as a body) specific Administration policies that were to be followed. Interestingly, while the Truman Administration sought military chiefs with substantial political weight and prestige with which to influence the Congress, the Eisenhower Administration wanted military leaders who were in agreement with Administration policy and who would leave the advocacy of these policies to Administration spokesmen. Thus, "massive retaliation," for example, was established by Secretary of State John Foster Dulles and defended from the attacks of the opposition party not by the military but by Secretary Dulles and Vice President Richard Nixon.

The Need for Communication

Effective government and successful policy-making have generally been marked by close and meaningful inter- and intraagency communication that—in the final analysis—produced policy based on clear reflection and rigorous analysis. McGeorge Bundy, Special Assistant for National Security Affairs to Presidents Kennedy and Johnson, has reflected on his governmental experience (*The Strength of Government,* Harvard University Press, 1968, 113 pages, $3.75) in that singular area where military and foreign policy coalesce and at the same time run smack into very difficult political considerations. Mr. Bundy confesses his concern with the problem of communication. The military, he says, has found it difficult to communicate with others in the government on matters of doctrine, force structure, and arms control. "I have spent many days in and out of government, wrestling with this difficulty," says Mr. Bundy, "and I do not pretend to understand it fully." But why the trouble? Why has it been so hard for responsible civilians and the military to communicate? Mr. Bundy's hedged reply is that military men are so involved in their own requirements processes, staff analyses, and internal decision-making that it becomes extremely difficult for them to open their minds to different points of view within the government. Thus, "it is much easier to fall into the we/they habit of mind in which these outsiders become adversaries to be overcome, not partners to be understood."

Surely, most military people would not argue with what Mr. Bundy says on this point. But beyond that, it is also true, military people often have difficulty communicating even with one another. Just recently, I heard a high-ranking officer, exasperated with the jargon of a staff study, exclaim that it was high time that we got back to communicating in the English language. And within the military, where the turnover rate in specific positions is high, many staff officers have difficulty adjusting to the jargon of a new office, directorate, or discipline. Isn't it possible to break the shackles of traditional military staff work and give it new breadth and fresh, meaningful language? As one who in his daily work must read a great number of military papers, I can testify to the urgency of the need for fresh insights and clear language. The military's jargon, verbal and written, is getting so bad that it threatens to uncrown sociology, until now the reigning king in the misty isles of confusion. Perhaps we could make a small beginning by doing away with *all* acronyms!

Clarity and precision of language are badly needed. Far too much military staff work is simply a reworking of older papers and briefings, resembling a layering-on of echelon upon echelon in the organizational framework. Too often, staff work looks like the filling out of a stereotyped report in which only the subject and date are changed, rather than a clear expression of new ideas and thought on the subject.

The Emphasis on Committees

Perhaps even more of a problem than the general paucity of clear language is the staff system itself with its emphasis on committees (*ad hoc* and otherwise), panels, and boards. Henry A. Kissinger, President Nixon's chief adviser on national security affairs, has devoted many years to the study of the mechanics of administration and the technique of governmental policy-making. The emphasis upon committees, staffs, and advisory groups, he notes, results in "a greater concern with the collection of facts than with an interpretation of their significance" (*The Necessity for Choice,* Harper, 1961, page 343). Mr. Kissinger is much concerned that the results of staffing and committee work too often reflect a common denominator devoid of reflective thinking and rigorous analysis. There is more emphasis on form than substance. In the process, creativity is stifled. Too, governmental staffing is well known for producing studies which, in the process of meeting "suspense dates," lack the kind of analytical depth so badly needed.

On the matter of committees, a word about outside expertise is very much in order. Over the years, the military has become a substantial customer for the so-called "think-tanks" or study institutes, some of which are private, nonprofit organizations while others are located within universities. Lately, much has been written of the alleged academic prostitution of these university-based institutes or offices because of their work for the US defense community. Academicians

(*Continued on following page*)

have raged over what many of them consider the impropriety and supposed immorality of the university's research for defense. Usually unmentioned is the fact that universities and institutes for many years have made a point of soliciting government defense contracts. John Roche, former White House adviser to President Johnson, has noted that, rather than seducing the academicians, the military are more often in the position of "a drunk in the process of being rolled."

This is a propitious moment to inquire into the origin, rationale, and competence of these think-tank studies. Much of the social science contract work for the government or the military is of the all-too-familiar "scenario" approach in which various contingencies are supposedly foreseen for years as far off as 1980. Many of these scenarios of the future have often proved to be less than useful at best and far off the mark at worst. Little or no documentation seems to be available from the 1950s or early 1960s in the area of what these people projected concerning Vietnam. It should be noted, however, that—in general—the range of subject matter and competence of the RAND Corporation studies are in marked contrast to the often irrelevant product of other institutes. This is not to say that outside advice cannot be helpful. It has been—and it is. The crucial points are that such counsel ought to strike at existing assumptions, reflect a genuine creativity, and be sufficiently grounded in history and practicality to be of some real use to policy-makers.

Military Role in Policy-Making

Whether the military assumes a heavier advisory role in the making of policy in the near future or not, it is vital that uniformed people accept the opportunity, in the early days of the new Administration, to rethink their product. For the hard truth is that a great deal of work and effort by the military has been wasted because it didn't reflect the kind of knowledge required in today's military-political milieu. This deficiency could well be crucial to the question of what role the military is to play in the making of policy in the Nixon Administration. It is not enough to be able to develop and submit weapons programs if these are in fact not relevant to the developing international situation. The ordering of military programs in the future—as never before in the past—will be based upon an extremely critical look at the political-economic realities. Hardware cannot be isolated from other important considerations any more than military matters can be divorced from foreign policy and diplomacy.

In the American military, this points to the need for the skilled generalist. Even more, it means we are going to need military statesmen of the highest order. We have technicians, specialists, and experts of all kinds who, perhaps inevitably, develop a certain parochialism. We need people with broader and more philosophical and imaginative outlooks. Mr. Bundy has said that we have become victims of the Age of Specialization: "Specialists are indispensable, but specialists who do not know how to talk to others outside their field are dangerous." Thus, it is not merely a matter of better and expanded educational and training programs, within or outside the military, as important

and necessary as these undoubtedly are. It is not a question of structuring a program to solve a problem. It is more a question of basic philosophy and communication. These are problems facing everyone. We think and talk about them. But we have usually found that most of our time is taken up with the struggle against "the system"—day in and day out. There is too little time left for broadening one's field of vision, for reading, thinking, and becoming knowledgeable about other disciplines that affect our own.

Having said this, one wonders whether our protestations aren't at least part rationalization? Isn't there *some* time available for thinking seriously about matters that deeply affect one's own work and one's own life? Don't we have time for what we want to have time for? Surely there is a need for a more liberal-minded military—liberal in the sense of having a larger world outlook.

All this does not mean a downgrading of formal military education and training. The broadening process is complementary. It is something that should continue and grow long after the rigors of formalized course work. The broadening should evolve and be nurtured in high staff positions because this is precisely where it becomes most valuable and is most needed. So far as education is concerned, for example, more emphasis on area studies is desperately required. The making of national security policy presupposes interdisciplinary knowledge. The politics, economics, history, and culture of regions have become the critical components of national strategy. They are indispensable to the generalist and to the making of a military statesman. This particular kind of knowledge will be demanded in sensitive, high-level military staff positions where we are going to need a whole new breed of American military who will be attuned to the post-Vietnam world. There will likely be greater stress on political, social, and economic factors as national policy becomes somewhat more introverted and much more selective in committing the nation's power and resources abroad. For this reason, a more responsible and distinguished military is required—more responsible to the ever-broadening dictates of policy and more distinguished in its grasp of the interdisciplinary approach. Although the cultivation of generalists in the services may run against the grain of traditional military training for specialization, it is now absolutely

essential that the military think deeply about the fundamental interactions of international politics.

The Civilians in Government

If the challenge facing the American military is at once difficult and exciting, it is certainly no less so for the civilian in government who is concerned with national security policy. If the military has found it hard to communicate, have the civilians found it any easier? I think not. The civilian hierarchy has been as guilty of the use of jargon, of obfuscation, and of a narrowness of outlook and thought as the military has —and, on reflection, perhaps even more so. And here, too, as Admiral Rickover has so forcefully pointed out, part of the problem is organizational. The Defense Department, he has said, has become so layered over that it is almost impossible to find the forest for the trees. And despite the many undeniable gifts possessed by Mr. McNamara, the DoD's civilian general staff has mushroomed to the point where it has almost gone beyond the control of the very people who are supposed to be its managers. There are too many layers, according to Rickover, between the Secretary of Defense and the services. The result has been a clear obstacle to effective and necessary communication and intercourse between civilians and the military.

Unfortunately, the recent past indicates that not all of the impediments have been of the organizational variety. An era of stifling specialization has spawned the need for generalists who can bring things back into perspective by integrating the knowledge and thought of the specialists.

It is obvious that the governmental obsession with quantification has become self-destructive. The quantification mania, the obsession with the preparation of literally tons of charts and statistics, has resulted in a stultifying dependence on this material. It has suffocated creativity and imagination. Nowhere did this drive run more plainly aground than in the attempt to "measure" the "progress" of what was primarily a political and psychological war in Vietnam. The graphs failed to "measure" the force of personality; the effectiveness of leadership; the character of nationalism; and the extent to which a country and a people had been sapped by twenty years of war. Or we can look at the shallowness of the numbers game another way: What does the number of college graduates, for example, tell us about the nature of their education and training? What is their world outlook? What is the philosophy that will guide them in the years ahead? What *kind* of education have they received?

Muzzle the Computers

Quantification gone wild has blocked the necessary dialogue between civilian and military. Now is the time to muzzle the computers while we strengthen human relationships. The Secretary of Defense and his civilian aides must set the example. They must encourage and demand clear, rational communication from the military. But loyalty and communication must flow both ways. For example, during the years 1961-1968, Secretary McNamara consistently failed to support and defend the US military and the defense community against outrageous charges by those who claimed that American democratic society was being "militarized." Those who attacked the military failed to understand that the *size* of the defense establishment was not the determining factor, but rather its *character*. The Office of the Secretary of Defense demands a man of compassion and understanding (and combativeness when required) as well as decisiveness and command of the job.

The new Defense chief will have a fine opportunity to strike the correct balance. For, as the President strikes the note as Chief Executive and as Commander in Chief, so too will the Secretary bring to the Pentagon a certain spirit, a particular style, specific and personal ways of wanting and getting things done. The echelons take their orders from—and follow the lead of—their chief.

The tenor of OSD has varied according to the personality, outlook, and experience of the men who have held the secretaryship. Aside from the necessities of being dedicated to his office and understanding its functions, the Secretary should ideally be both policy- and strategic-minded, for the top defense job is primarily a policy post rather than a managerial position. Breadth, wisdom, humility, and judgment are demanded more than administration and technique. And *successful command requires delegation of authority.*

McGeorge Bundy is undoubtedly correct when he observes that our conception of government must be reconstructed and our view of the public service enlarged and elevated. Throughout government, too much time is wasted on empire-building. There is a need to be more concerned with what can be done than with what can be blocked. A new *philosophy* of public service would emphasize better understanding and communication within the government *and between the government and the public.*

The nation deserves in its public servants loyalty, dedication, and competency. But it also deserves—indeed *requires*—a never-ending search for knowledge, truth, and the broadening of one's horizons. And once knowledge is gained—enlarged, tempered, and given perspective by experience—articulation becomes crucial. This is especially important to the military because it faces problems that most often must be dealt with in a short time span. Thus, high-level military advisers must have a sure knowledge of the complex issues of international conflict.

For the military, who have too long been ill-served by the inability to articulate in a global context, the task ahead is formidable. But the rewards of success are uniquely theirs and the nation's.—END

The author, Herman Wolk, holds an M.A. degree from American International College, Springfield, Mass., and was a historian for Headquarters, SAC, for eight years prior to joining the Hq. USAF Historical Division Liaison Office, Silver Spring, Md., in 1966. An expert on the military-political aspects of warfare and Far Eastern affairs, he has been a frequent contributor to this magazine (most recently "Strategic Superiority and Vietnam," January 1968 issue) as well as to Military Review *and* Air University Review, *among others.*

The skies were clear over the Alaskan wilds that day back in 1941 when the small Army Air Corps observation plane experienced an engine failure and mushed in. Its two-man crew, unharmed and undaunted, got their bearings and took a ten-day hike back to civilization. Over the next quarter century the tiny wreck lay there, ignored by the fast-paced world. Then its presence came to the attention of the Air Force Museum, which, with help from experts of the Alaskan Air Command, carried out . . .

Operation O-38

A SALVAGE ADVENTURE IN ALASKA'S 'DEEP FREEZE'

By Ed Mack Miller

In Alaska's desolate wilderness the wreck of an O-38 remained for a quarter century until the Air Force Museum brought it out with help from the Alaskan Air Command.

AS AN unmarried second lieutenant who liked to hunt, fish, and fly, Milton Herbert Ashkins wasn't exactly displeased in 1940 when he received a transfer from the US Army Air Corps's 8th Pursuit Group at Langley Field, Va., to the newly built Ladd Field at Fairbanks, Alaska, as chief of the fighter test section.

It was good duty for the young lieutenant. He especially liked the Northwest because it reminded him of his birthplace in British Columbia (he had become an American citizen at age eleven), and more hunting and fishing were available there than he could handle.

Although opportunities for flying were limited, Ladd Field did have an O-38 observation biplane, built by the Douglas Aircraft Co. circa 1933. The plane, believed to have been the first military aircraft assigned to Alaska, provided transportation and the means to maintain flying proficiency for the first two officers dispatched to Ladd—a Major Gaffney and a Lieutenant Walseth.

Milt Ashkins had doubts about the plane, though. Gaffney and Walseth had lived in Fairbanks while Ladd was being built, and the plane had been flown from the civilian airport there. Consequently, it probably had had scant maintenance. Particularly, the old engine wasn't the "tiger" it had been. Ashkins noticed that it wouldn't develop its rated rpm of about 2,300, but only cruise rpm of about 1,700 at full throttle on takeoff. A complete overhaul seemed called for.

Young Ashkins was watching the aircraft's performance carefully on the afternoon of June 16, 1941, when he wound up the engine for a routine navigation flight that also would allow him to drop mail and supplies to a prospector friend. With him was Sgt. Raymond

Sister ship 33-326 of the O-38 observation plane that is subject of article. Even in this age of supersonic aircraft, lines of antique craft give it neat, swift look.

A. Roberts, mechanic and observer. It was six months before Pearl Harbor. There were war clouds on the horizon, but none over Alaska that day.

The area east of Fairbanks and south of the Yukon is rolling, rugged wilderness, carpeted with fir trees, shallow-rooted in the permafrost. Mountains with names like "The Butte," "West Point," and "Twin" climb to nearly 6,000 feet; other mountains of the same height aren't even named on the map.

At 2:45 that afternoon, the old prospector working his diggings seventy miles east-northeast of Fairbanks watched as a single-engine military biplane circled low. That would be his friend Lieutenant Ashkins, his lone contact with civilization.

"After locating him," Ashkins noted later, "I came in on a low, slow pass at reduced throttle to satisfy myself that the old gent was indeed alive and active. Immediately after passing over him, I advanced the throttle, and therein was the moment of truth . . . the tired old engine just coughed and quit."

Said Roberts later, "I thought we were just diving at a moose or bear on the mountainside at first. I didn't know we were going to crash."

"We were very low—about fifty feet," Ashkins recalled. "No place to go but straight ahead." He slowed to a stall just above the treetops and coolly let the plane mush in so the bottom wing would take the impact. "Because of the permafrost," he said, "the trees weren't rooted deeply and, instead of breaking, they just toppled over, cushioning us to a very soft landing."

There really wasn't much in the way of crash sounds, and suddenly Ashkins and Roberts were sitting there, and everything was still.

Roberts had only a skinned nose and elbow; Ashkins wasn't even scratched. On the front of the Radio Facility Chart, the Lieutenant dutifully scrawled, "Cracked up June 16, 1941, 2:50 p.m. No injuries to self or mechanic," and signed it. Then they crawled out. It would prove to be a long walk home.

"We happened to have an experimental Lear radio with a trailing antenna aboard," Ashkins recalls. Roberts retrieved the set, and they strung the antenna in a tree "at max distance" and contacted the control tower at Fairbanks Civil. Fairbanks passed the message to Ladd (where the tower was still under construction), and a B-18 was dispatched.

"They dropped us a slab of bacon and some other provisions," Roberts recalls. Included in the paradrop were Lieutenant Ashkins' rifle and a two-man raft.

The prospector had arrived by the time the two had managed to remove several new instruments from the O-38. After resting up for several days with the prospector, when the weather looked right, the two flyers started off to hike to the Salcha River. It took six days toting cumbersome back packs to reach the river and several more days to reach the tiny emergency field at Caribou Creek. The going was slow on the river because while one man rode the raft shep-

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Lt. Milt Ashkins at outset of ten-day hike from downed plane to civilization. Unfazed by his experience, he later called it "the most enjoyable field trip I've ever been on."

Leaders of team that recovered the O-38. From left to right, Charles Gebhardt of the Air Force Museum, CMSgt. John Poirier, Maj. Robert Peterson, and TSgt. Robert Collins.

Sergeant Poirier and TSgt. Gary Prosser with crashed aircraft await the removal of a tree so that they can tilt the aircraft back and begin removing the ring cowling.

herding the salvaged instruments, the other had to hike laboriously alongside on the bank.

Tanned and healthy and sporting ten-day growths of beard, the men were flown from Caribou into Ladd Field. (Having gone into their adventure "tenderfeet," the two came out as "property-owning sourdoughs," because before leaving the crash site each had staked out a claim on adjacent plots of wilderness land. Ashkins called his claim "Forced Landing"; Roberts dubbed his "Lucky Shot." They still have the original papers drawn up at the land office on their return to civilization, but to date neither has yet gone back to homestead.)

Events moved rapidly after that. Suddenly the nation was in war and Ashkins and Roberts went their separate ways—Ashkins to command a fighter squadron in the Aleutians and Roberts to a succession of maintenance assignments. At the end of the war, Master Sergeant Roberts went to work as a civilian employee at Tinker Field, Oklahoma City. In the fall of '68, he noted thirty years of service with the government. Ashkins retired from the Air Force in 1965, having risen to the rank of brigadier general, and now lives in Santa Barbara, Calif. (Shortly after his Alaskan crash, he had married Jane Gordon of Fairbanks. Their daughters Peggy and Lorna were born in 1943 and 1947.)

So ended Chapter I of, as General Ashkins says, "the most enjoyable field trip I've ever been on." The Air Corps wrote off a fairly decrepit O-38 and called the incident closed.

And so it remained, although hundreds of military and civilians came upon the wreckage during the next quarter of a century, until finally someone mentioned the "deep-freeze" O-38 to personnel of the Air Force Museum at Wright-Patterson AFB, Ohio.

The Museum, of course, was interested—even though it was a king-size dream to hope to get the antique observation plane out of a wilderness so remote that it took the plane's downed crew ten days to hike out!

But the Museum's Charles Gebhardt wanted that O-38; the Museum didn't have one. And so he enlisted the help of the Alaskan Air Command, and in the fall of 1967 Capt. Robert L. Peterson flew an H-21 helicopter from Eielson AFB to the site, landed on a knoll about a half mile away, and then trudged through the brush to the wreckage.

He was astounded at how Alaska's "deep-freeze" weather had preserved the aircraft; he was equally amazed to see that, even in its remote location, the O-38 had had visitors over the years. The rest of the instruments, radios, seats, and even the tailwheel were missing. Animals had eaten the fabric, but, as Col. Louis W. Rohr (Commander of Alaskan Combat Sup-

Arctic survival instructor TSgt. Robert Collins helps Sergeants Prosser and Poirier rig an "A" frame of logs to support engine when lifted from the aircraft's fuselage.

The O-38 as it looked when first visited in November of 1967. Recovery team was amazed at the excellent condition of the plane after its long exposure to the Alaskan weather.

The initial task in recovery effort was removing aircraft's propeller. Sergeants Poirier, Prosser, and Marvin Mains here use bar to loosen it. The metal parts showed little rust.

port Group, charged with retrieving the O-38) said in a letter to General Ashkins, "The metal and the wood parts show very little aging and practically no rust."

By the time the authorization was received in 1967 to go in and get the "cold bird," it was too late in the year for an attempt. However, during the winter, planning went ahead. CMSgt. John L. Poirier, maintenance superintendent for the Chief of Materiel at Eielson, was picked to assist the project officer, now Maj. Robert Peterson.

In April of '68, Charles Gebhardt arrived from Ohio, and he and Major Peterson and Chief Master Sergeant Poirier flew to the site to get the project under way. "After a close look at the aircraft," Poirier said, "we were amazed at the condition—no corrosion or rust were evident. All the tools found were as issued from supply. The condition of dissimilar metal parts was unbelievably good. After looking over the plane I figured with three men we could have the aircraft ready for lift-out in about four or five days at the most. . . . We held a meeting after our return and established the first week of June as the target date.

"Mr. Gebhardt left me a copy of the technical order before he returned to Wright-Patterson. He advised me that he would bring the engine sling and make a sling for the aircraft fuselage. . . . With the few tools that would be necessary to disassemble the O-38, the only one we would have to fabricate would be a bar four feet long by seven-eighths of an inch to remove the propeller retaining nut."

Poirier selected two expert aircraft mechanics, TSgts. Gary Prosser and Marvin Mains, and together they reviewed the tech order to establish the required units for removal to make the weight requirements for lift. The H-21 would be working at 3,900 feet, and they figured it would take three flights—the first to get the engine to Eielson, the next for the wings and tail section, and the last for the fuselage.

Poirier also was given the aid of two experts from the Arctic Survival School, TSgt. Robert Collins and Sgt. David Webster. It would be their job to set up and maintain camp and also do the brush- and tree-cutting necessary to get the plane in position for a helicopter lift-out.

On June 3, they loaded two H-21s with the gear needed for a week's stay in the wilds (tents, stoves, rifles, chain saws, axes, and personal equipment), made the forty-five-minute flight, landed, offloaded, and spent the day setting up camp and staking out trail lines to the O-38. As the entire operation was being covered by two cameramen of the AF Motion Picture Service, things went slowly as cameras had to be positioned for each sequence of the recovery action. As the men from the Survival School cut brush for a trail, Poirier and his aides dug into the O-38, finding first that both upper and lower left wings were in bad shape. After brush removal, they began to dismantle the aircraft. At that time of year the night in Alaska is short, so they had long hours in which to work.

The next day the area around the plane was cleared and some trees big enough to make an "A" frame to remove the engine were found. Accessories were then stripped from the engine. The engine mount had been bent badly in the crash, and this impeded progress, but by late afternoon of June 4, the team man-

(Continued on following page)

After dismantling the aircraft, the recovery team moves the fuselage up the slope to clear tree fall. Short Arctic nights gave men long daylight hours to complete their job.

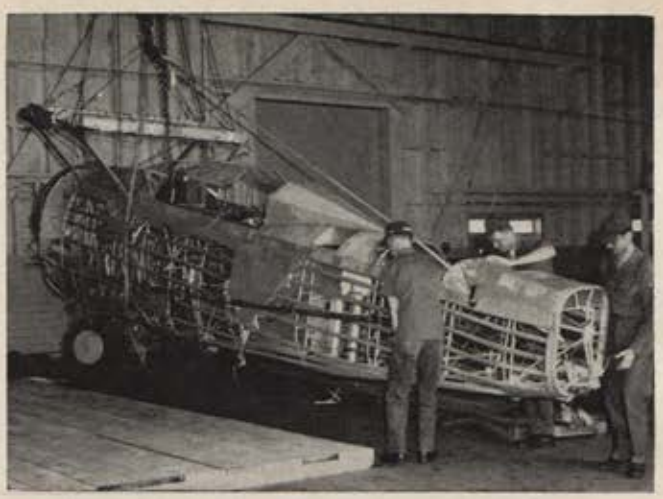
aged to remove the last engine bolt. After the 800-pound engine was removed, the men made skids from trees, secured a block and tackle to a tree stump about thirty feet ahead of the plane and, inch by inch, moved it forward to a better position.

The weather began to sour, and progress was hampered by rain the next day. They donned rain gear and heavy clothing, and, despite several unforeseen obstacles, it appeared they'd make schedule.

"We started to remove the wings from the right side, and Sergeant Mains worked on the hardware we were going to save from the left side," Poirier says. "We decided to leave the upper midwing, as this section was positioned with four cabane struts and had sling cables attached. These cables were three-sixteenth inches and, after close examination, were found to be in excellent condition. This prompted me to use these original cables to lift out the old plane. Although it would not fly out, at least it would be lifted out with the original equipment!"

Then came some good news. They were advised that a Chinook helicopter from Fort Greeley would be available on June 10, the following Monday. The Chinook's much greater lifting capability would allow them to leave the plane where it was rather than take it to higher ground, and also enable them to remove everything in two trips instead of three. Poirier decided not to separate the tail section, and this proved beneficial since it acted to stabilize the plane's drift on the trip home under the helicopter.

Chinook helicopter lifts out O-38 fuselage by a sling attached to the plane's original lifting cables at the four strut points. The O-38 begins its last flight, to a new home.



Sergeant Poirier and crew secure recovered fuselage to shipping pallet for delivery to Air Force Museum at Wright-Patterson AFB, Ohio, where restoration is now under way.

After finishing preparations they broke camp, leaving the tents. On the tenth they returned, loaded the engine on the Chinook, flew it to Eielson and returned for the fuselage.

When they arrived back at Eielson at 6:00 in the evening a large crowd was on hand to see Lieutenant Ashkins' "bird" as it flew "home."

It had been twenty-seven years between takeoff and landing, but, as Chief Master Sergeant Poirier noted, "This Alaska deep-freeze is sure good for preservation. . . . This state is the greatest air museum in the world. There are plenty of other planes out there—P-39s, B-17s . . . you name it."

By August, Sergeant Poirier and crew had secured the aircraft and palletized the engine for delivery to the Air Force Museum. On August 6, an Alaskan Air Command C-130, piloted by Capt. James McKenzie, returning to the "lower forty-eight" for modification, airlifted the O-38 from Eielson in Alaska to Wright-Patterson in Ohio.

Charles Gebhardt officially welcomed the crew and plane in a ceremony on August 7, noting that it was hoped that the O-38 would be rebuilt "in flying condition" and ready for the floor of the Air Force Museum by the end of 1969.

He's keeping in touch with Sergeant Poirier and the troops in "ice-box land."

Small wonder, since "we already have some more items for the museum," says Sergeant Poirier, "a complete drone . . . and the nose section from an Airacobra."

Alaska, called the "frontier of the future," also has become a touchstone with the past.—END

The author, Ed Mack Miller, is a prolific writer who has published three books and more than 1,200 articles and stories. A frequent contributor to AF/SD, Mr. Miller lives in Denver and is a veteran Air National Guardsman and pilot for United Air Lines. He most recently wrote for us "The Monster Is Well-Behaved" (October '68), a report on the handling qualities of the C-5.

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AFA NOMINEES—1969-1970

MEETING in Washington, D. C., on January 11, in conjunction with a meeting of the Air Force Association Board of Directors, the AFA Nominating Committee, made up of the Board of Directors and the State Presidents, chose a slate of three National Officers and twenty-two Directors (including a nominee for Chairman of the Board). This slate will be presented to the Delegates at the 1969 AFA National Convention to be held in Houston, Tex., March 18-21.

GEORGE D. HARDY, Hyattsville, Md., was nominated for the office of National President. Mr. Hardy is President of the Harry B. Cook Co., a food brokerage firm with offices in Washington, D. C.; Baltimore, Md.; and Richmond and Norfolk, Va.

During World War II, he served in a medium bomb group in the Twelfth Air Force in the Mediterranean theater. A dedicated AFAer, Mr. Hardy currently serves as a permanent National Director, as a member of the Executive and Finance Committees, and as a member of the Board of Trustees of the Aerospace Education Foundation. A charter member of the Air Force Association, Mr. Hardy has performed devoted service to AFA for more than twenty years. He has served as an AFA Wing Commander (two terms), Regional Vice President (five terms), an elected National Director (four terms), National Secretary (six terms), Chairman of the Board of Directors (one term), and as a National Committee member for many years. In 1957, Mr. Hardy received the President's Trophy as "AFA Man of the Year" after his highly successful chairmanship of that year's "Golden Anniversary" Convention in Washington, D. C. He has also received AFA's Gold Life Membership Card and a Special Citation.

In a surprise announcement, President Robert W. Smart withdrew his name from consideration as a candidate for nomination to the office of Chairman of the Board of Directors. Mr. Smart stated that the increased responsibilities and business commitments connected with his recent transfer to Washington as North American Rockwell's Washington Vice President, with full responsibility for the operation of their Washington office, would, at least for the present, preclude his devoting the time necessary to perform adequately the duties required of the Chairman of the Board.

Mr. Smart then nominated incumbent Board Chairman JESS LARSON for an unprecedented third term, and the Nominating Committee's vote for Mr. Larson was unanimous.

Now serving his second term as Chairman of AFA's Board of Directors, Mr. Larson is also a member of the Board of Trustees of the Aerospace Education Foundation and previously served for thirty months as AFA's National President, and as Chairman of AFA's Reserve Council. At the 1968 National Convention in Atlanta, Mr. Larson received the AFA Gold Life Membership Card.

A World War II field artillery officer, he later joined the Air Force Reserve from which he retired in 1966 with the rank of major general. In civilian life, Mr. Larson has served as Administrator, War Assets Administration; Administrator, General Services Administration; and, along with the latter post, was named Administrator of the Defense Materiel Procurement Agency. Mr. Larson is a partner in the Washington law firm of Alvord & Alvord.

GLENN D. MISHLER, Akron, Ohio, and JACK B. GROSS, Harrisburg, Pa., were nominated for reelection to their respective positions as Secretary and Treasurer.

Mr. Mishler, a Section Head in the Engineering Department of Goodyear Tire & Rubber Co., is a former Squadron and Wing Commander, Inspector of Elections Chairman at several AFA National Conventions, Regional Vice President, and Chairman of the Organizational Advisory Council. Currently, he is a National Committee member and a member of the Board of Trustees of the Aerospace Education Foundation.

Mr. Gross, a prominent Harrisburg, Pa., civic leader and businessman, is a former Chairman of AFA's Board of Directors and is now serving his eighth term as National Treasurer. In 1958, he received the President's Trophy, designating him AFA's "Man of the Year." He has also received AFA's Gold Life Membership Card and a Special Citation. Mr. Gross is a colonel in the Air Force Reserve with a mobilization assignment at Headquarters Command, Bolling AFB.

The following are permanent members of the AFA Board of Directors under the provisions of Article X of AFA's National Constitution:

JOHN R. ALISON, EDWARD P. CURTIS, JAMES H. DOOLITTLE, JOE FOSS, JACK B. GROSS, GEORGE D. HARDY, JOHN P. HENEBRY, ROBERT S. JOHNSON, ARTHUR F. KELLY, GEORGE C. KENNEY, THOMAS G. LANPHIER, JR., JESS LARSON, CURTIS E. LEMAY, CARL J. LONG, HOWARD T. MARKEY, JOHN B. MONTGOMERY, JULIAN B. ROSENTHAL, PETER J. SCHENK, ROBERT W. SMART, C. R. SMITH, CARL A. SPAATZ, THOS. F. STACK, ARTHUR C. STORZ, SR., HAROLD C. STUART, JAMES M. TRAIL, and NATHAN F. TWINING.

The twenty-one men listed below and shown in the accompanying photos are nominees for elected membership on the AFA Board of Directors for the coming year. (Names marked with an asterisk are incumbent National Directors.)

*JOSEPH E. ASSAF, Hyde Park, Mass.—chemical engineering technologist. Former Squadron, Wing Commander; Regional Vice President; National Committee member. Current member Board of Trustees, Aerospace Education Foundation.

(Continued on following page)

Hardy

Larson

Mishler

Gross

Assaf Berkeley Caniff Castellano Cordell Deming Fonda

Gaillard Harris Hodges Kriendler Kuter Lingle Miller

Murphy Ostrow Parker Shosid Spruance Vaughan Wright

*William R. Berkeley, Redlands, Calif.—AF civilian information officer. Former Squadron Commander; Regional Vice President; National Committee member.

*Milton Caniff, New York, N. Y.—syndicated cartoonist. Former Chapter President; National Committee member. Current member Board of Trustees, Aerospace Education Foundation. Arts and Letters Trophy (1953); AFA Citation of Honor (1961); AFA's "Man of the Year" (1965).

*Vito J. Castellano, Armonk, N. Y.—industry executive. Former Squadron, Wing Commander; Regional Vice President; National Committee member. Current member Board of Trustees, Aerospace Education Foundation.

M. Lee Cordell, Berwyn, Ill.—electrical engineer. Former Squadron, Wing Commander; National Director.

S. Parks Deming, Colorado Springs, Colo.—communications engineer. Former Chapter, State officer. Current State President.

*A. Paul Fonda, Washington, D. C.—industry executive. Former Squadron, Wing Commander; Regional Vice President; National Committee member. Current member Board of Trustees, Aerospace Education Foundation.

Paul W. Gaillard, Omaha, Neb.—telephone company executive. Former Chapter President. Current Regional Vice President; National Committee member.

Martin H. Harris, Winter Park, Fla.—research engineer. Former Chapter, State President. Current Regional Vice President; National Committee member.

*Joseph L. Hodges, South Boston, Va.—retail executive. Former National Secretary; Regional Vice President. Current National Committee member.

*Maxwell A. Kriendler, New York, N. Y.—food importer. Former Squadron Commander. Current member Board of Trustees, Aerospace Education Foundation; National Committee member. AFA's "Man of the Year" (1964).

*Laurence S. Kuter, New York, N. Y.—Gen., USAF (Ret.), airline executive. Former Commander in Chief, North American Air Defense Command; National Committee member; Chairman of the Board of Trustees, Aerospace Education Foundation. Current member Board of Trustees, Aerospace Education Foundation. AFA Citation of Honor.

*Joseph J. Lingle, Milwaukee, Wis.—Air Reserve technician. Former State President. Current National Committee member.

Troup Miller, Jr., Atlanta, Ga.—Lt. Gen., USAF (Ret.). Former Commander of Air University; State President.

Warren B. Murphy, Boise, Idaho—insurance and investment executive. Former Squadron, Wing Commander. Current Regional Vice President.

*Martin M. Ostrow, Beverly Hills, Calif.—attorney. Former Squadron, Wing Commander; Regional Vice President; National Committee Chairman. Current National Committee member.

*Earle N. Parker, Fort Worth, Tex.—industrialist. Former Wing Commander; member Board of Trustees, Aerospace Education Foundation. Current National Committee member; Treasurer, Aerospace Education Foundation.

*Joe L. Shosid, Fort Worth, Tex.—advertising executive. Former Regional Vice President; National Committee Chairman. Current National Committee member; member Board of Trustees, Aerospace Education Foundation. AFA's "Man of the Year" (1963).

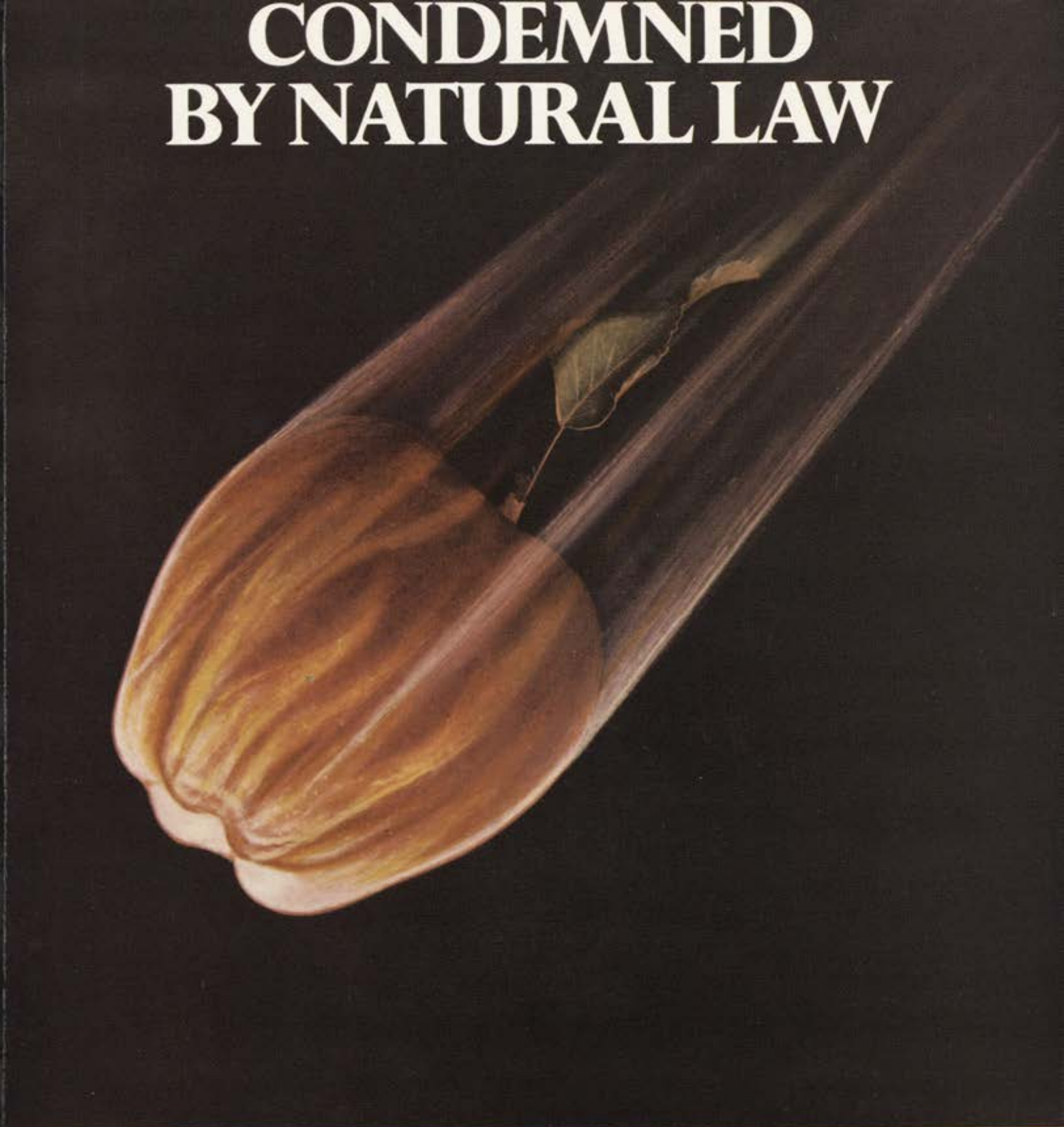
*William W. Spruance, Wilmington, Del.—federal, state aviation official. Former Regional Vice President; National Committee member. Current member Board of Trustees, Aerospace Education Foundation. AFA Citation of Honor; AFA's "Man of the Year" (1966).

*Robert C. Vaughan, San Carlos, Calif.—sales engineer. Former Squadron, Wing Commander. Current member Board of Trustees, Aerospace Education Foundation.

James W. Wright, Williamsville, N. Y.—chemical engineer. Former Chapter, State President. Current Regional Vice President; National Committee member.

—Don Steele

CONDEMNED BY NATURAL LAW



If Newton's apple had fallen from 100 miles up, it would have been doomed to disintegration. So would a vehicle entering Earth's abrasive atmosphere at tremendous velocity.

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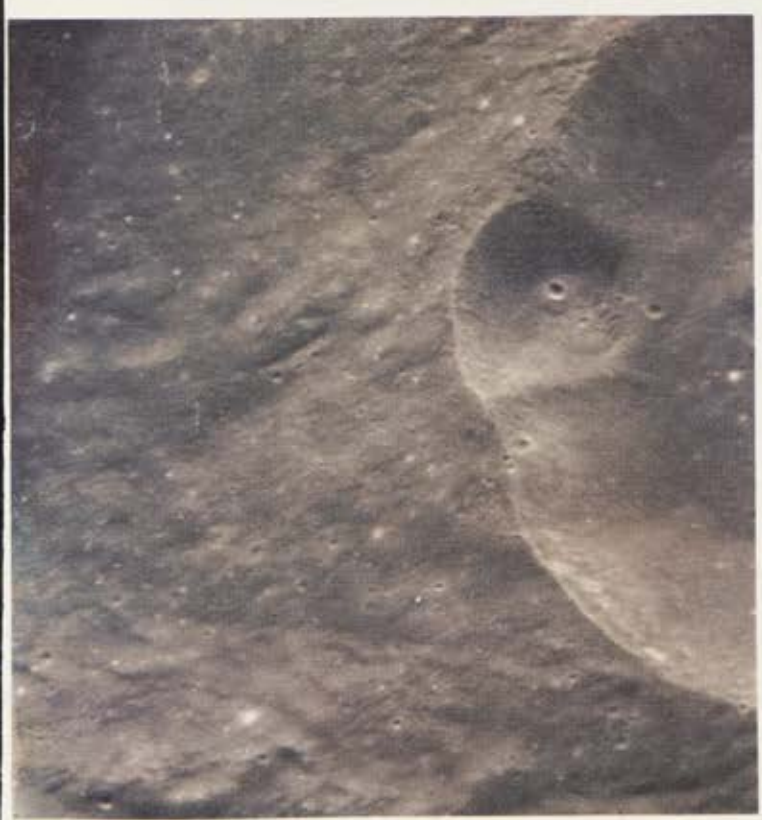
SPACE DIGEST

VOLUME 12, NUMBER 2 • FEBRUARY 1969

Apollo-8 and Beyond—A Special Report

A sight no human eye had ever seen before, the rising earth, greeted the Apollo-8 astronauts as they emerged from behind the moon after the crucial lunar orbit insertion burn. Frame of the spacecraft window is visible in the foreground. The lunar surface features in the foreground are near the eastern limb of the moon as it is seen from earth.

The earth from Apollo-8. Both sides of the Atlantic Ocean can be seen. The most prominent land mass is the bulge of West Africa. Parts of Africa near the equator are cloudy, but more northerly areas are clear, including the Cape at Dakar, the Senegal River, Cap Blanc, the Adrar plateau, the desert in Algeria and the Spanish Sahara, and mountains in Morocco. East coast of South America is clouded.



The far side of the moon. Apollo's telephoto camera caught this desolate 20-mile by 20-mile area inside a huge unnamed crater 100 miles in diameter on the lunar side hidden from earth.

This was the astronauts' view of the Saturn V's third stage, from which spacecraft had just separated after maneuver that transferred the ship into translunar path toward lunar orbit.

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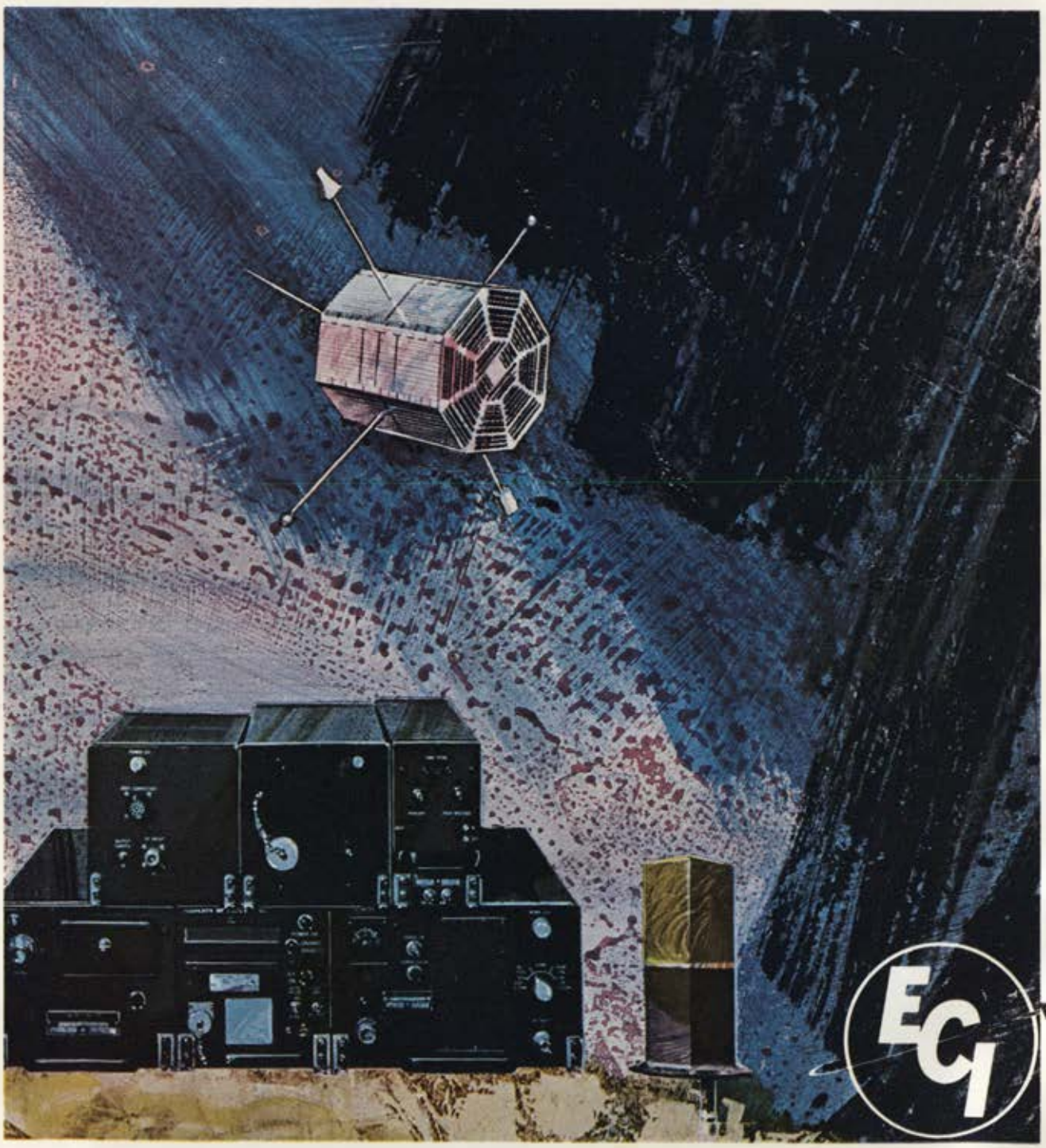


The incredible success of the Apollo circumlunar flight augurs well for the moon landing to come. But as we savor the triumph, the need to establish a balanced space program, geared to civil and military requirements of the 1970s, is a major challenge for the new Administration . . .

Apollo-8 and Beyond—
A Special Report

BY WILLIAM LEAVITT
Senior Editor / Science and Education

"I BELIEVE," John F. Kennedy declared in May 1961, "that this nation should commit itself to achieving the goal, before the decade is out, of landing a man on the moon and returning him safely to earth. No single space project in this period will be more impressive to mankind, or more important for the long-range exploration of space, and none will be so difficult or so expensive to accomplish."

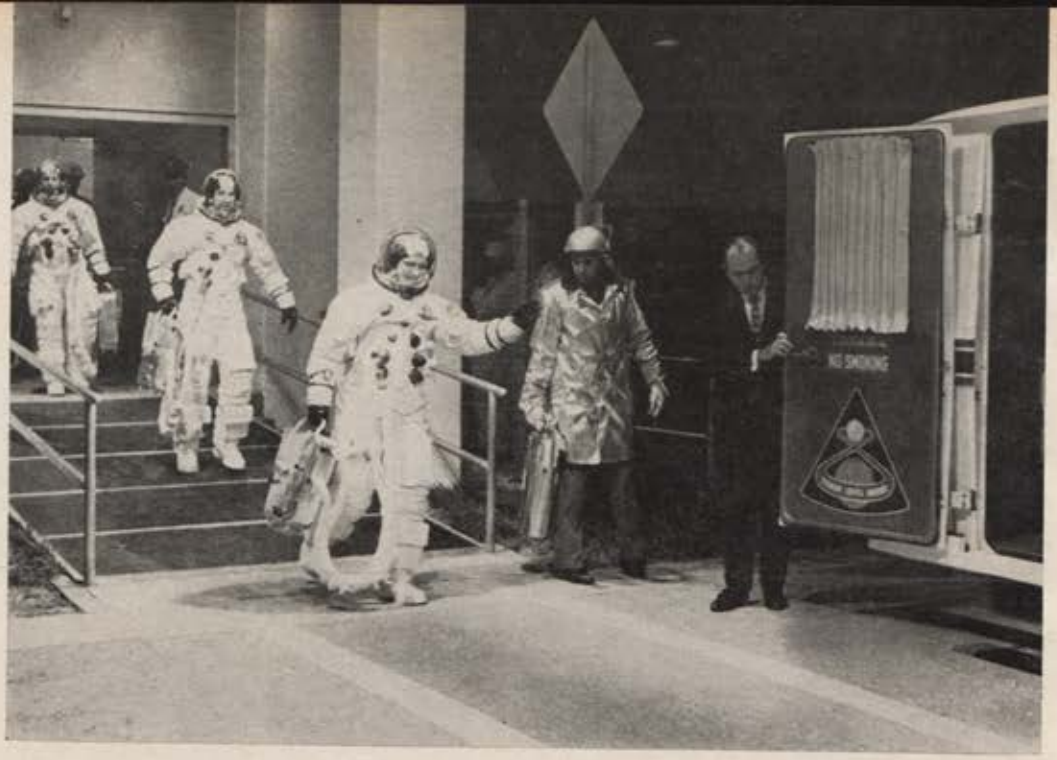
Now, eight years later, as the remarkable photos on these pages of the virtually flawless circumlunar Apollo-8 mission of Astronauts Frank Borman, James Lovell, and William Anders attest, the goal is nearly attained, and on schedule. This despite the terrible tragedy of January 1967 when three astronauts were killed in the Apollo capsule fire on the pad at Cape Kennedy, a catastrophe that caused the delay of the flight program by many months and added millions of dollars in hardware changes to the cost of the program and also shook the National Aeronautics and Space Administration to its very foundations.

Depending on one's viewpoint, the circumlunar flight of Apollo-8 can be viewed as a spectacular new beginning for mankind, the opening of a vast new era of limitless exploration, or as a giant act of technological escapism in the face of pressing problems on earth. There are earnest people who represent each of these views.

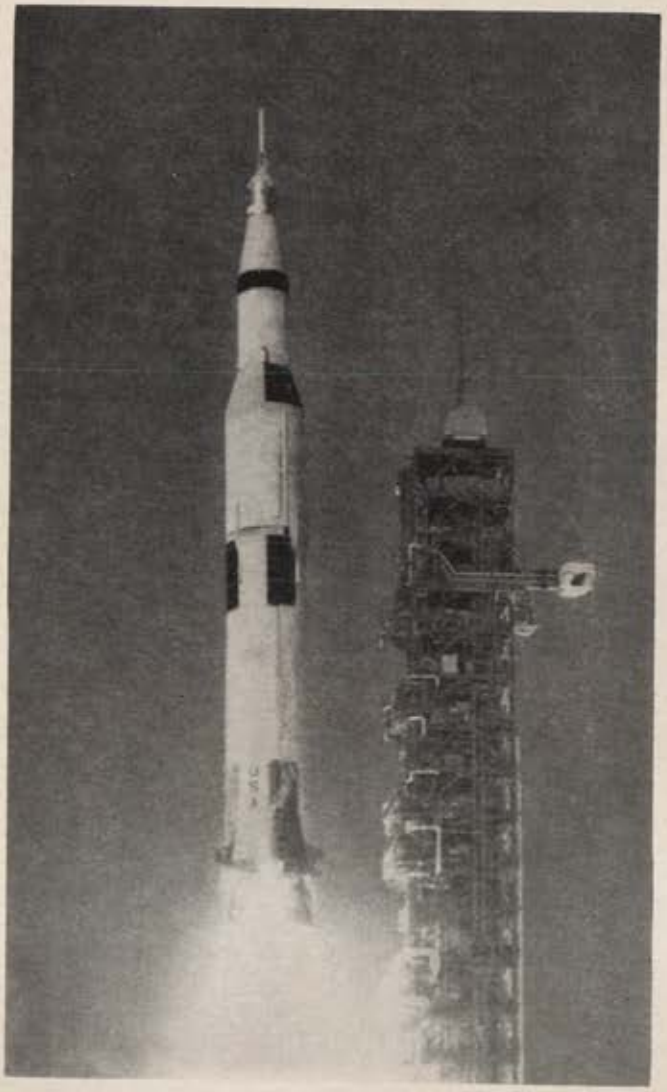
But whatever the verdict of history, what was achieved in late December has clearly proved the technical validity of the Apollo program. To be sure, the Apollo flights ahead—demonstration, within a few weeks, of the rendezvous capability of the lunar excursion module in earth orbit, followed by the test, without landing, of the same piece of hardware in lunar orbit—both in-

As preparations for the epochal flight to the moon proceed, Apollo-8 astronauts Frank Borman, James Lovell, and William Anders pose near the 363-foot-high Saturn V booster.

Steak and eggs, the traditional launch-morning meal for astronauts, are consumed with gusto by the Apollo-8 trio at Cape Kennedy before dawn on day they left for the moon.



With USAF Colonel Borman in the lead, Navy Captain Lovell in the middle, and Air Force Major Anders bringing up the rear, the three astronauts head for the van that will take them to the launch pad. Each carries a portable air-conditioning unit. For Anders, the moon flight was his first ride into space. He was promoted to lieutenant colonel after his safe return.



Cape Kennedy, Fla., Dec. 21, 1968, 7:51 a.m.—a sight seen by millions, the flawless launch of the giant Saturn V booster that would take men, for the first time, to the moon.

volve risks, as will the lunar-landing mission itself.

It now seems certain that, barring the unforeseeable, the late President Kennedy's original deadline of a moon landing before the end of the decade will be met, possibly as early as July of this year. The landing will truly be a midsummer night's dream come true, with the scenario not by Shakespeare but by Jules Verne, H. G. Wells, Arthur C. Clarke, and the rest of that tribe of restless science-fictioneers who believed in it long ago.

Even as we look forward to the epochal landing on the moon, there is considerable uncertainty about the future course of the national space effort. During the transition between the Johnson and Nixon Administrations, the President-elect named a task force headed by physicist Dr. Charles Townes of the University of California at Berkeley to assess what already has been achieved and to project future program possibilities. At this writing, the task force report has not been released, but even so, it is likely that more important to the formulation of the post-Apollo course of the space effort will be the views of Mr. Nixon's science adviser, Dr. Lee DuBridge, who before joining the government served twenty-two years as president of the California Institute of Technology. CalTech, through its Jet Propulsion Laboratory at Pasadena, Calif., has played a major role in the NASA unmanned space-probe effort.

Dr. DuBridge comes to the White House with weighty credentials. Not only a distinguished physicist, he is also a long-time and savvy veteran of the government-university partnership in research and development. He was a leading light of the World War II Massachusetts Institute of Technology Radiation Laboratory, which helped develop the wartime radar that contributed mightily to the Allied victory.

The new presidential science adviser's views on the space program are what in other contexts might be termed moderate. He has never been a vocal enthusiast of manned spaceflight and, during the early post-Sputnik period, he came down pretty hard on the side of un-

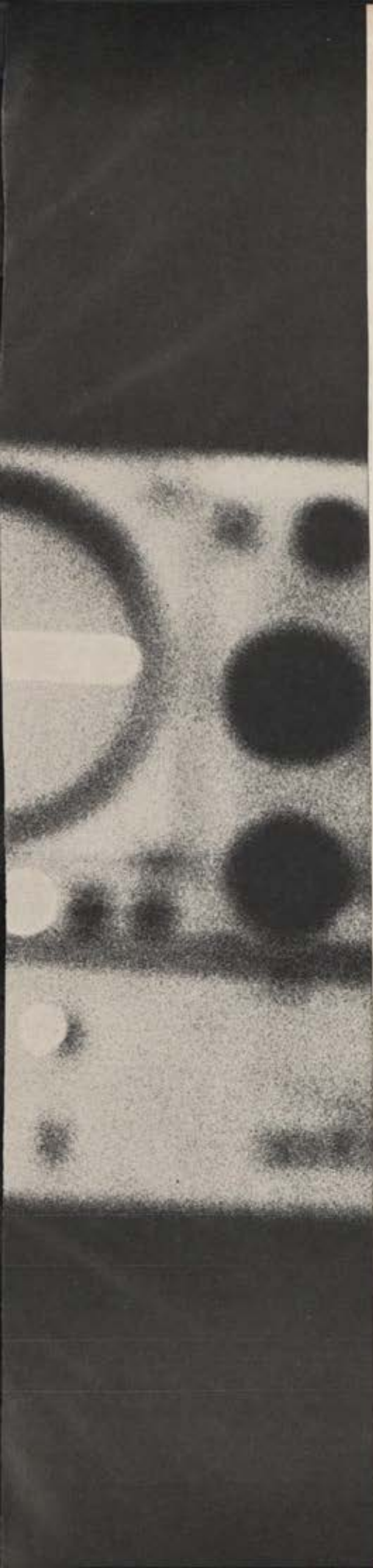
There were VIPs aplenty on hand for the launch. Among those present: Sen. Edward Kennedy, whose brother, the late President, proclaimed the Apollo program. With him in spectator stands were Mrs. Kennedy, and at right, T. Keith Glennan, the first Administrator of the National Aeronautics and Space Administration.

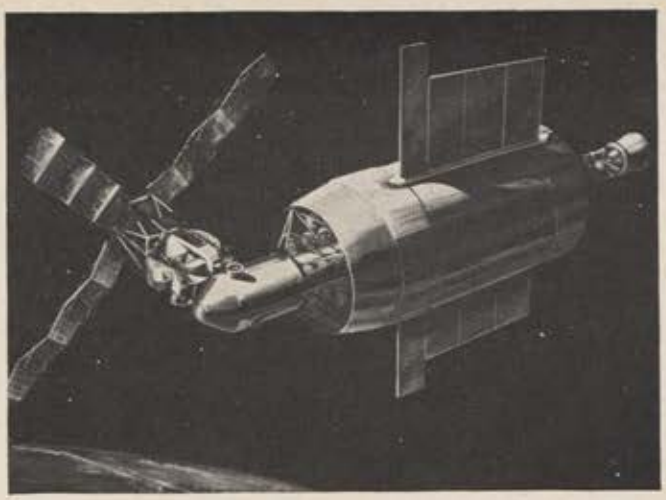
All manner of electronic observation and optical equipment was used to track the course of the man-carrying Saturn V as it roared skyward from the pad. Just one of the mechanical eyes on the heavens was this high-powered telescopic ground tracking camera, following the liftoff path.

manned space exploration and warned against over-enthusiastic projections of such items as the military value of the moon.

But it is also true that as the space program proceeded, Dr. DuBridge became more sympathetic to the investment of money and talent in the effort. His basic commitment, during his decades as a scientist-administrator who learned the academic/government ropes early in the game, is to an orderly and sustained program of government support of basic and applied scientific research. He is a strong advocate of basic research, and that should please the many academicians who lately have bemoaned the cuts in government funding of university programs, occasioned for the most part by the Vietnam War.

Precisely how Dr. DuBridge will manage as broker among the many interests in the scientific and research and development community, all demanding government





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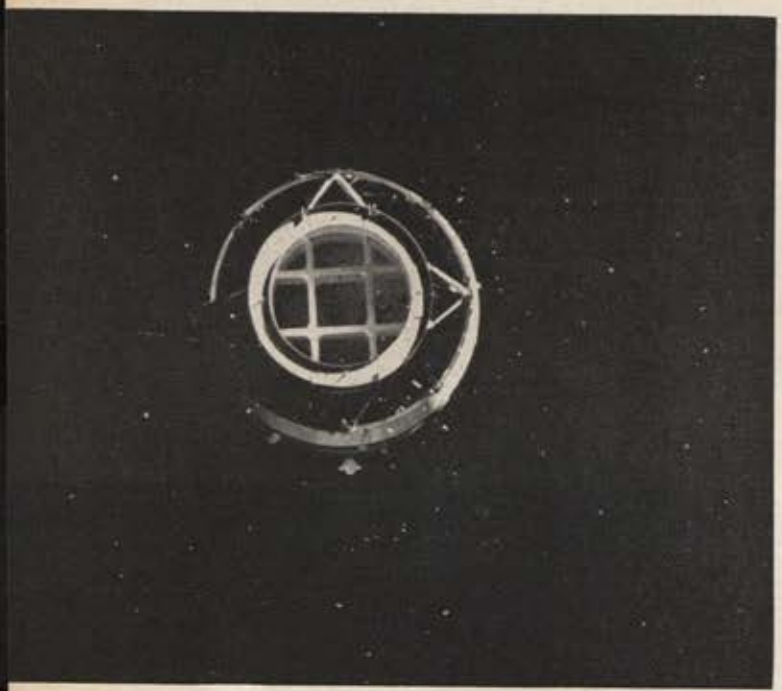
Camera aboard a C-135 flying at 35,000 feet got this dramatic shot of Saturn V hurtling into orbit minutes after launch. Booster shape, exhaust plume are clearly visible.

Astronaut Lovell took time out, more than 100,000 miles from earth, to wish his mother a happy birthday via television. Flight Commander Borman is visible behind him.



"Firefly" phenomenon, sunlight reflected from particles, first reported by John Glenn, is visible around Saturn V third stage, photographed from spacecraft, after separation.

support, remains to be seen. But if anything, Lee DuBridge is cool and has guts. And in his new role near the center of power, his problem—and President Nixon's—will be to balance society's domestic requirements, some of which lend themselves to costly technological solutions, against the need to expand the economy and enhance national security and prestige through continued technological superiority, the spearhead of which is aerospace technology.

Against this background, on the space front, it is easier to suggest what will *not* happen in the short term than what will take place. It is unlikely that the Nixon Administration will take on, Kennedy-style, another great adventure in space like the moon-landing program announced in 1961. Mars, the next natural celestial target for a manned landing, will have to wait, except for unmanned probes. Instead, we may expect a heavier concentration on manned earth-orbital programs with emphasis on commercial, scientific, and military payoffs plus a modest effort to set up scientific bases on the moon itself if, after the first landing, it is decided that conditions there do warrant such a program. There is no reason to believe that facilities roughly analogous to the scientific stations in the Antarctic would not be possible on the moon.

Perhaps the most interesting question is who will

Taken from lunar orbit with a long-focal-length lens, this photograph of the lunar crater Goclenius shows quite clearly the prominent rill that crosses the crater rim. Goclenius is some 40 miles in diameter. This is but one of the incredible array of close-up photos of the moon taken by Apollo-8 crew. Astronaut Anders was the "official photographer."

undertake what? For NASA, the Apollo-8 mission was a tremendous gamble with the full reputation of the agency at stake, a reputation shaken badly by the Apollo fire. And politics always enter into these matters. There is little doubt that beyond the announced and necessary objectives of proving out communications, navigation, and other Apollo equipment through circumlunar flight, NASA also understandably was attempting to persuade the incoming Administration to consider and to buy the post-Apollo programs advanced by the agency for several years.

It should be noted, incidentally, that despite the daring of the circumlunar flight and the fact that it was not originally a part of the Apollo program, the option of flying around the moon without a landing has for some time been an announced option at NASA. As far back as 1965, Dr. Robert C. Seamans, Jr., then Deputy Administrator of NASA and now Secretary-designate of the Air Force, told Congress "we have made a provision in our planning for [a manned circumlunar mission so that] we can do [it] if required."

Dr. Seamans was long gone from the space agency by last fall when Apollo's program director, USAF Lt. Gen. Samuel Phillips, and his colleagues became convinced that the flight around the moon made sense. Thus, much of the credit for pushing ahead with the flight goes to Acting NASA Administrator Dr. Thomas O. Paine and James E. Webb, then preparing for his exit from the top NASA post. The success of Apollo-7 helped a great deal to clear the way for the decision to carry out the Apollo-8 mission.

If there is a single manned space project NASA wants to work toward at this juncture, it is the large manned space station in earth orbit, the sort of spaceborne facility that eventually might support as many as fifty men, resupplied by orbital ferries, for periods of a year and more. The first step toward that objective would be NASA's Orbital Workshop, using Apollo-Saturn hardware to house a three-man crew, for a month or so, in earth orbit to test out environmental systems, equipment, and the general ability of crews to operate effectively for weeks at a time in an area considerably larger than the relatively cramped quarters of an Apollo.

But the Orbital Workshop idea, valid as it is, does collide with the Air Force's Manned Orbiting Laboratory (MOL) project. Despite differences in hardware (although the Air Force has borrowed and altered the Gemini capsule for MOL as the carrier to orbit for the crew and from which they will crawl into the MOL canister), the two projects continue to be competitive, and even duplicative, to many observers in and out of government.

Some have urged merging the two projects and establishing a joint NASA-USAF task force to develop the preliminary capability leading to the large space stations of the future. And depending on whom you talk to, both the Air Force and NASA have found reasons why such a merger, at least in the short term, cannot be effected. The reasons range from the classified nature of the MOL program to the alleged unwillingness of the two agencies to work together.

Chances are that both projects will survive and somehow the new Administration will find ways, as its predecessors have, to juggle the finances to keep both efforts going. On the military side, if anything, the appointment of Dr. Seamans, who did much during his long tenure at NASA to get that agency on an even keel, to the Air Force Secretariat, should augur well for the Air Force MOL. Dr. Seamans, whose familiarity with and participation in Air Force R&D programs goes back many years, came out strongly for manned military space capability in a statement shortly after his appointment.

"There are," he declared, "clearly requirements for a strong space program as part of the defense activities. One of my jobs will be to make sure that we are use all the technology that comes along."

Some observers, on the strength of this statement and also on the basis of Republican campaign declarations, are predicting a sharp cutback in NASA budgets and a

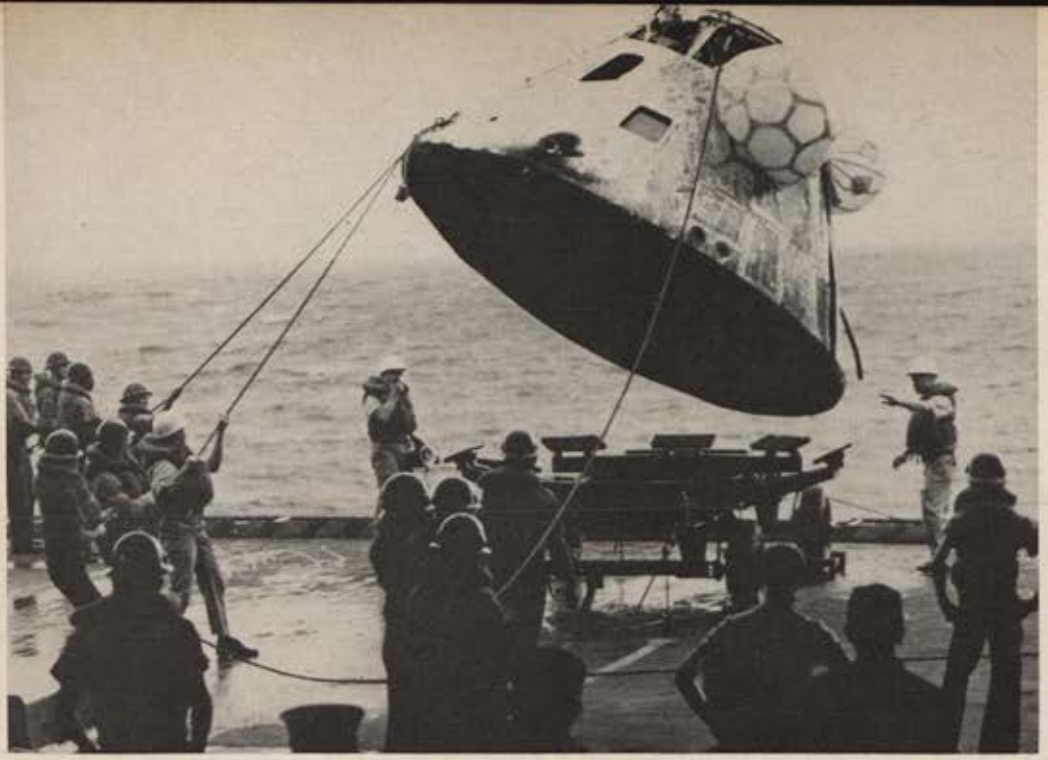
An unprecedented sight for human eyes. This oblique photo of the gray and desolate curve of the moon looks south on the lunar far side. The vista begins south of a large unnamed crater and extends to the moon's horizon, some 275 miles away.

Home from the moon and debarking from the chopper that took them to waiting recovery ship, Navy carrier Yorktown, *the Apollo-8 crew greets welcoming ship's company. Left to right, a freshly shaved Frank Borman, a bearded Jim Lovell, and a bearded Bill Anders. Borman said later he'd decided to trim six days' growth on board the helicopter.*

shift in emphasis from NASA to the Air Force and Defense Department on the space front. This may well be an exaggerated view. What seems far more likely is a kind of leveling off for NASA, with the civil agency being given every opportunity—and some of the money it wants—to advance its case for and to fund the development of extended, large-space-station capability and other programs with pragmatic payoff potential such as earth-resource observation satellite systems. Toward the latter end, NASA already has, and wisely, solicited the financial support of other US government agencies interested in the yield of data from space.

What should and may happen in the Nixon Administration is the development of some sense of balance between useful NASA programs and useful, and vitally necessary, military programs. Despite the excitement engendered by the Apollo-8 flight, and the fact that we did beat the Russians to the moon, there can be no blinking at Soviet concentration, with a seemingly endless launch program of so-called scientific satellites into earth orbit, on the space close to our planet. The Soviet fractional-orbit bombardment capability has nightmare potential, and there is a clear need to find ways to counter it. This should not be forgotten in the understandable euphoria following the successful circumlunar flight.

Apollo-8's navigation was so good that capsule landed in the backyard of the USS Yorktown *after successful reentry. The Pacific splashdown took place before dawn. The capsule was quickly sighted, and Navy frogmen were soon on the scene the morning of December 27 to get it ready for transit by chopper to the* Yorktown. *This was the scene as a frogman waved to the* Yorktown *crew just before the circumlunar spacecraft was hoisted aboard the carrier.*



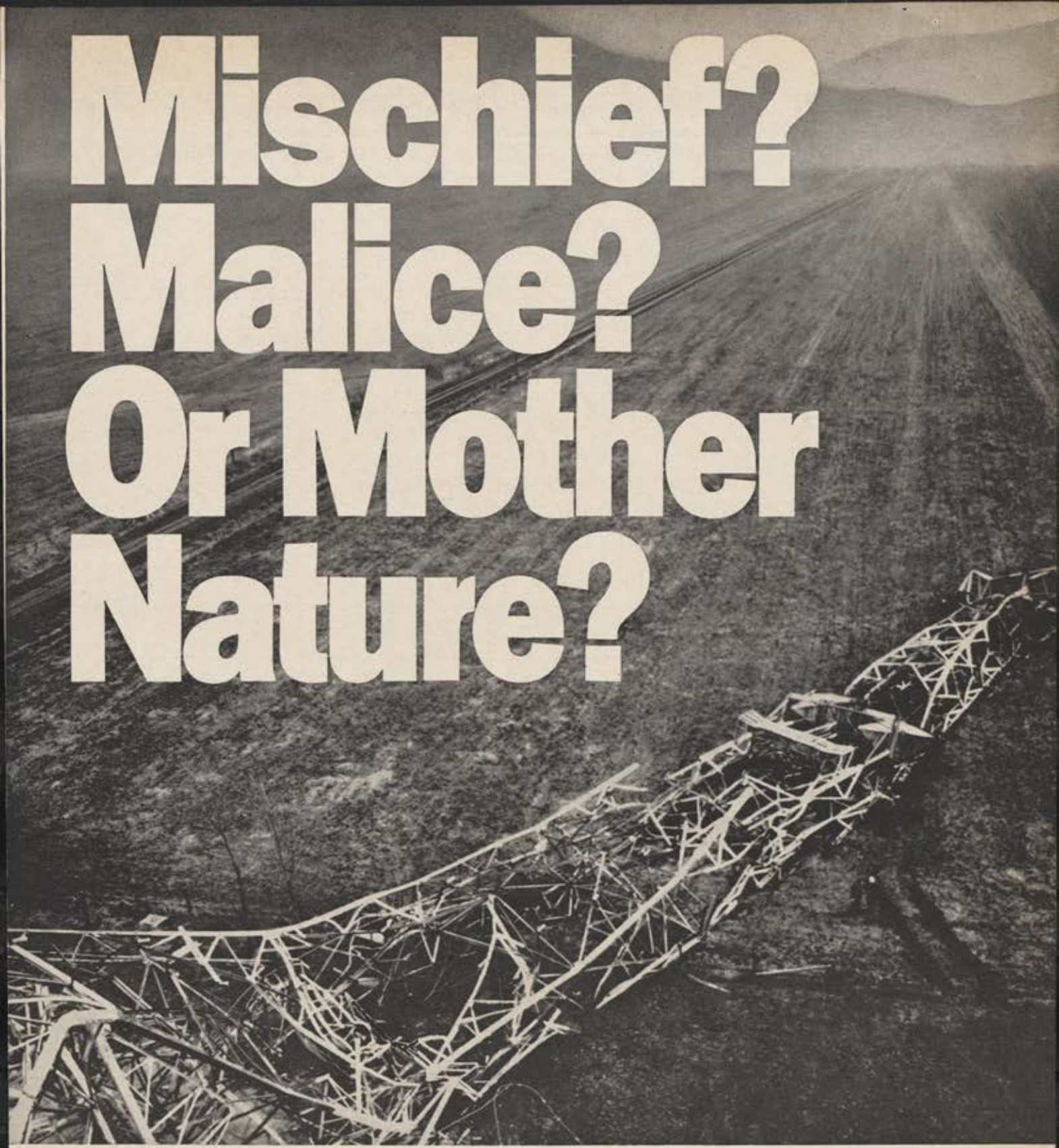
Dawn had come to the Pacific as the world's most famous piece of hardware was finally hoisted aboard the Yorktown, *looking in pretty good shape considering what it went through during its fiery reentry into the earth's atmosphere.*

The Nixon Administration has its work cut out. It has to find ways to continue the steady march of technological progress toward the extended space capability NASA has spearheaded in the remarkable eight years since John Kennedy announced the moon-landing program. At the same time, the new Administration must face the decision to advance military space capability significantly. That capability could be crucial to keeping the peace for the next several years.

The balance will be difficult to arrange in view of the continuing costs of the Vietnamese War and the press of domestic problems. Despite the hopes of a few months ago, the war seems no closer to settlement. And even if the war should be brought to a close, it does not necessarily mean that any huge flood of money will become immediately available for advanced R&D, in view of the restocking of the armed forces that will be necessary. How the new Administration handles this balancing act will be a good measure of its intelligence and courage. —END

The Apollo-8 astronauts, in pajamas and robes aboard the Yorktown, *receive congratulations from President Johnson. Soon to come was a succession of honors: appearance before joint session of Congress, medals from the President, a ticker-tape parade in New York.*

Mischief? Malice? Or Mother Nature?



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A Page From The History of Surveillance

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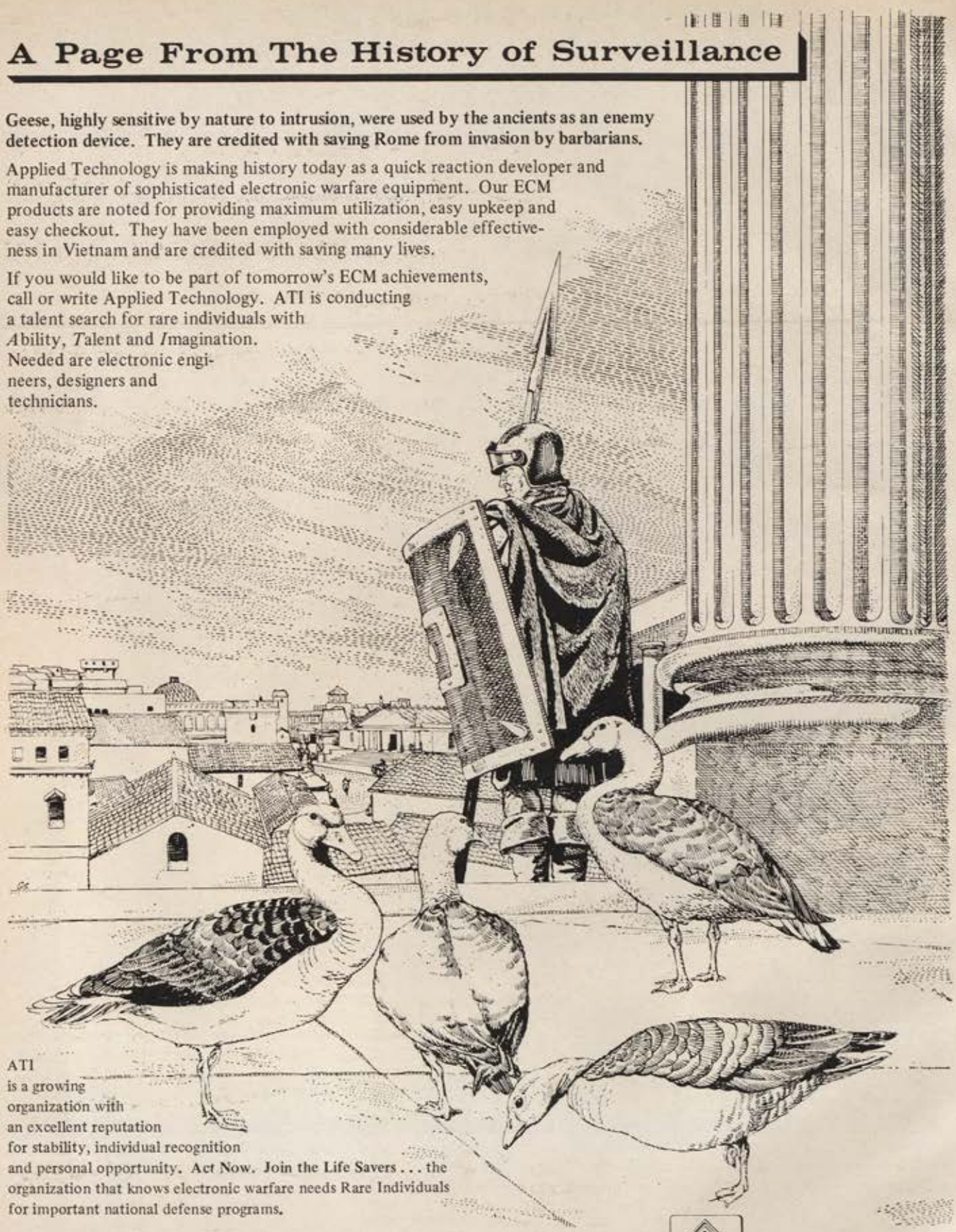

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News and Comment about Air Force People . . .

By Jackson V. Rambeau

AFA DIRECTOR OF MILITARY RELATIONS

The Air Force and Its People

AFA's 1969 National Convention will strongly emphasize Air Force people. The Convention will be held in Houston, Tex., from March 18 through 21.

The Convention will feature the first national meeting of base Junior Officer Council representatives. Fifty JOC chairmen are being invited to participate. The Junior Officers Advisory Council of AFA will act as host at this conference. Only major areas of concern to the junior officer community will be considered, and a number of important recommendations are expected to flow from this meeting. The Air Force will allocate the fifty spaces for attendance to the various commands.

A key feature of the Convention will be the first personnel symposium to be held at an AFA event. Distinguished participants will be Gen. J. P. McConnell, Air Force Chief of Staff; the new Assistant Secretary of the Air Force for Manpower (unnamed at this time); Lt. Gen. John W. Carpenter, III, DCS/Personnel; Maj. Gen. Robert J. Dixon, Commander of the USAF Military Personnel Center; John A. Watts, Director of Civilian Personnel, Hq. USAF; Col. Jeanne M. Holm, Director, Women in the Air Force; and Chief Master Sergeant of the Air Force Paul Airey. The title of this symposium will be "The Air Force and Its People."

The Air Force Military Personnel Center also will move a major part of its career counseling office from Randolph AFB to be on hand at the Convention to provide on-the-scene career counseling to active-duty personnel. Arrangements have been made to set up a remote computer tied into the master computer at Randolph. This will make it possible to provide worldwide locator service and personnel records review to those interested. These features should prove popular among those attending the Convention.

Interim Report on the Hubbell Pay Study

As we went to press the Hubbell proposals for a completely new military compensation and retirement system had not gotten out of the Pentagon or been cleared by the Bureau of the Budget for transmittal to the Congress. With time running out on the Johnson Administration, there seems little chance of favorable action during this session of Congress. With only bits and pieces of the very complicated proposals released or leaked to the press, personnel in the field have reacted quite negatively because of the lack of information, or misinformation and rumor. Reports from the House Armed Services Committee were that mail referring to the plan was running thirty to one against it. We hope to clear up a great deal of this confusion in the next issue of this magazine when Louis R. Stockstill will make a full and definitive report on the package and its components. Until recently, Mr. Stockstill was Editor of the *Journal of the Armed Forces,* where he had covered the Pentagon and Capitol Hill for the last twenty years. He is an expert on legislation and particularly that which affects military personnel.

We hope you'll watch for his report next month and then make up your own minds how you feel about this revolutionary proposal.

(Continued on following page)

Brig. Gen. John H. Buckner (right) receives the Order of Daedalians Muir S. Fairchild Award from Lt. Gen. A. P. Clark, Commander of Air University, in ceremonies at Maxwell AFB, Ala. General Buckner was honored for contributions to professional military education in the Air Force.

Two of the three Civil Service Commissioners join with AFA's Civilian Personnel Council at recent meeting in Washington to discuss AF civilian personnel problems. From left: Commissioner L. J. Andolsek; D. S. Dawson, Council Chmn.; Jess Larson, AFA Board Chmn.; Commissioner R. E. Hampton.

Civilian Personnel Council Meets

At its December meeting in Washington, the AFA Civilian Personnel Council met to hear many top officials discuss personnel problems affecting civilian employees of the government, and particularly the Air Force.

Of great interest to Council members was the meat-ax approach taken by Congress to reduce the number of Civil Service employees on the payroll to the July 1, 1966, level. This forced reduction, which will continue until the spring of 1970 unless Congress relents, has created extremely difficult problems in all government agencies. A Bureau of the Budget official, who discussed the problem with the Council, pointed out that the Administration opposed this method of economizing. The Council, after considering this problem, agreed to a resolution that urges Congress to take a more selective approach to reduction of civilian employees based on priorities and missions of the various agencies.

Another highlight of the meeting was a discussion led by Republican Commissioner Robert E. Hampton of the three-member Civil Service Commission concerning the effects the new Administration may have on the Civil Service employees. As of this writing, Mr. Hampton is expected to be appointed by Mr. Nixon as Chairman of the Commission. He indicated that he saw very few legislative proposals in the Civil Service area in the forthcoming Congress. He emphasized that efforts would be continued by the Commission in the areas of a more sound Civil Service retirement fund, increased per diem, enactment of the new executive pay scales, increase in the number of super grades, and improved fringe benefits.

Charles W. King, Director of Civilian Personnel of the Air Force Systems Command, reported on the trial retirement program now being undertaken by that Command. Unlike the military, the Civil Service employee can continue his government career until the mandatory retirement age of seventy, even though he can voluntarily retire as early as age fifty-five. An increasing problem among civilian employees is the aging of the force. AFSC is testing a program that allows any eligible civilian employee to elect retirement on a trial basis. Those who volunteer may retire for one year with the option of returning to government employment at the same grade if they find retirement not to their liking. Indications are that this program, if it proves successful, will be adopted throughout the Air Force and many other government agencies.

The Council went on record reaffirming its support of AFA resolutions that call for an increase in domestic per diem rates, tax exclusion for service by civilian employees and military personnel in Vietnam, and amendments to the dual-compensation act to rectify the inequities suffered by Regular officers in the forfeiture of pay as the price for civilian employment with the government. The Council also urged that Congress change the law to permit retirement credit for unused sick leave.

At a Pentagon ceremony, Gen. John D. Ryan, Air Force Vice Chief of Staff (left), presented the Distinguished Service Medal to Maj. Gen. Richard L. Meiling on the occasion of his retirement from the Air Force Reserve (Medical). This is only the third time this honor has been bestowed on an AF Reserve officer. General Meiling was cited for his "difficult and responsible assignments" participating in planning the operation of the Air Force Medical Service.

At Carswell AFB, Tex., Brig. Gen. John W. Hoff (right) admires the special Military Airlift Command plaque that was presented to the 512th Military Airlift Wing (Reserve) by Lt. Gen. James W. Wilson, MAC's Vice Commander, in recognition of the 100,000 hours of accident-free flying in C-124 Globemasters. The 512th is the first Air Force Reserve flying wing to achieve the hallmark in flying safety. General Hoff is Wing Commander. During flight-line ceremonies the Reserve unit also received the Air Force Outstanding Unit Award and various other commendations.

"Why Didn't I Get Promoted?"

For years the Air Force enlisted promotion system has never been able to answer the question of why an individual was not promoted. After extensive hearings before the House Armed Services Committee, the Air Force agreed to adopt a weighted criteria airman promotion system that had "visibility." The Airmen Council of the Air Force Association had urged the Air Force to do this. Planning to implement the new system has clearly indicated that operating it will be expensive both in personnel and money. We believe, however, that it will more than pay for itself in improved morale and increased retention. According to the latest report, the Air Force is still only retaining about eighteen percent of its first-term enlistees.

The Air Force is moving rapidly to redesign enlisted promotions to E-4 and above. The new program is based on weighted criteria and is known as the Weighted Airman Promotion System (WAPS).

Principal features of the WAPS are Air Force-wide com-

CONTINUED

petition within each career field and improved visibility. Each man will know the promotion factors and their relative weight and will be able to determine how he measures up against his contemporaries. In addition, he will be able to compare his point standing with the minimum score for promotion in his Air Force Specialty Code (AFSC).

Visibility is provided through a point system based on various weighted factors. These are board evaluations, Airman Performance Reports (APRs), decorations, time-in-grade, time-in-service, Skill Knowledge Test (SKT) and the new Promotion Fitness Examination (PFE), which are for E-4 through E-7 only, and the USAF Supervisory Examination (USAFSE), for E-8 and E-9. The PFE is a new test which measures a candidate's knowledge of military matters, including supervisory techniques, management, military justice, safety, and security.

Maximum possible points: board evaluation—100 for E-4 through E-7; 150 for E-8 and E-9; APRs—135; decorations—25; time-in-grade—60; time-in-service—40; SKT—95; PFE—95; and USAFSE—95. Possible points could total 505 for E-8 and E-9 and 550 for E-4 through E-7. Board evaluation will be based on education, favorable communication, remarks section of APRs, self-improvement efforts, and level of command experience.

An airman not selected for promotion will receive a "promotion notice card" listing his points for each weighted factor, his total score, and the minimum total score required for promotion within his AFSC during that specific cycle.

The minimum, or cutoff, score within each AFSC will vary from cycle to cycle, depending on the selection objectives (number of people who can be promoted) and the level of competition within each AFSC.

USAF Military Personnel Center officials say that bases will begin gathering data on each individual's APR and decorations this month. Other required information already is on record at Consolidated Base Personnel Offices.

Testing for the next E-8, E-9 cycle starts on September 1, 1969, and ends November 30, 1969. Some 38,000 masters and seniors are expected to take the USAFSE this cycle.

In August 1969, the first PFE and SKT will be administered to eligible candidates for grades E-4 through E-7. Tests are to be completed in February 1970.

Personnel eligible for promotion will be required to undergo annual testing. SKT scores can be used for promotions and skill upgrading if the test is taken within a promotion testing cycle. All three examinations will be changed periodically.

Airmen first class through technical sergeants have two more chances to be promoted under the system in existence today while masters and seniors will compete under the new system during their next cycle.

The necessity for boards was one item evaluated in the Alaskan Air Command's recent test of the weighted factors. If research indicates that selection by boards agrees with selections made by a weighted system without a board evaluation, boards might be discontinued for E-4 through E-7.

Parting Shots

• The Defense Department will again sponsor legislation to remove the dual-compensation restrictions on retired Regular officers. The proposed legislation now is being staffed in the services, and we're assured that all concur in it. The Bureau of the Budget, which refused to move the bill on to Congress last year, will, we predict, approve

(Continued on following page)

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Air Force Maj. Gen. Walter B. Putnam (left), Civil Air Patrol's National Commander, talks with (left to right) Air Force Col. Frank Borman, Navy Capt. James A. Lovell, and Air Force Maj. William A. Anders about their planned lunar voyage in the Apollo-8 spacecraft. The CAP Commander visited the Manned Spacecraft Center, Houston, Tex., early in December to present the astronauts with an organizational charter designating them the Apollo-8 CAP Squadron.

it under the new Administration. It is reported that Bryce Harlow, Chief of Legislation for the Nixon Administration, strongly favors the bill. Opposition in Congress, and among many government agencies, remains strong.

• Effective February 1, a four percent cost-of-living allowance increase will be paid to retirees whose date of retirement was prior to July 1, 1968. For retirees after July 1, 1968, the increase will be 2.1 percent. These increases will show up in the March paychecks.

• Congressman F. Edward Hébert of Louisiana has the distinction this year of submitting the first bill in Congress —H.R. 1. He proposes again to establish a Uniformed Services Medical Academy in the Washington area. Mr. Hébert has for years championed this cause. Up until very recently the Defense Department and the services strongly opposed the idea. While there has been some softening of position in the Defense Department, it still opposes it. The school, as envisioned by Mr. Hébert, would produce 100 career medical officers each year for the uniformed services. Hearings on the measure are now definitely planned, and the school could become a reality within the next two years. AFA's Medical Advisory Council has endorsed the proposal.

• The Air Force, considerably behind the Army and Navy in the matter of service history, is taking a giant step to rectify this situation. A team of sixteen professional historians is being set up in the Washington area on a continuing basis to take on this new task. Maj. Gen. Richard A. Grussendorf is being recalled from retirement to head up this effort, according to insiders.

• The third Air Force Cross awarded other than posthumously to an enlisted man was presented recently to Sgt. Thomas A. Newman, a pararescue specialist. The presentation itself was made by Gen. Howell M. Estes, Jr., Commander of the Military Airlift Command. Sergeant Newman distinguished himself by extraordinary heroism in connection with the rescue of an injured downed pilot under heavy enemy fire in Vietnam. The other two enlisted recipients of the Air Force Cross were also pararescue men.

• A Board of Officers will convene at the Air Reserve Personnel Center on March 17-28 to consider eligible lieutenant colonels in the Air Force Reserve, both on and off extended active duty, for promotion to the permanent grade of colonel. To be eligible for consideration, officers must have a promotion service date of July 30, 1965, or earlier. Eligible officers may submit letters under the provisions of paragraph 60-3, Air Force Manual 35-3. The Board is not authorized to consider letters of recommendation.

• An Air Force Reserve aeromedical evacuation group (associate) will be formed at Scott AFB, Ill., in July by the redesignation of the 932d Military Airlift Group (Reserve). The first of its kind, the group will utilize the new McDonnell Douglas C-9 Nightingale "flying hospital ward" (*see cover story, Jan. '69 AF/SD*) and other equipment of the Scott-based 375th Aeromedical Airlift Wing. The new group will have aeromedical airlift, materiel, and support squadrons. Reserve flying and medical crews will make the transition to the C-9 and join their active-duty counterparts in flying medical evacuation missions whether as all-Reserve crews or with active-duty personnel of the 375th Wing. This reorganization will permit Air Force Reservists to train with and fly the latest Air Force air evacuation aircraft.

• As mentioned above, the Air Force is having a tough time retaining its first-term enlistees. It was recently announced that there would be a speed-up in the early release program of first-term enlistees by eight to ten months. This action is being brought on by a DoD-imposed budget ceiling. This "hurry up and get 'em out" action slated for February can only further damage retention. Airmen presently assigned overseas will not have their tours curtailed as a result of this program, however.

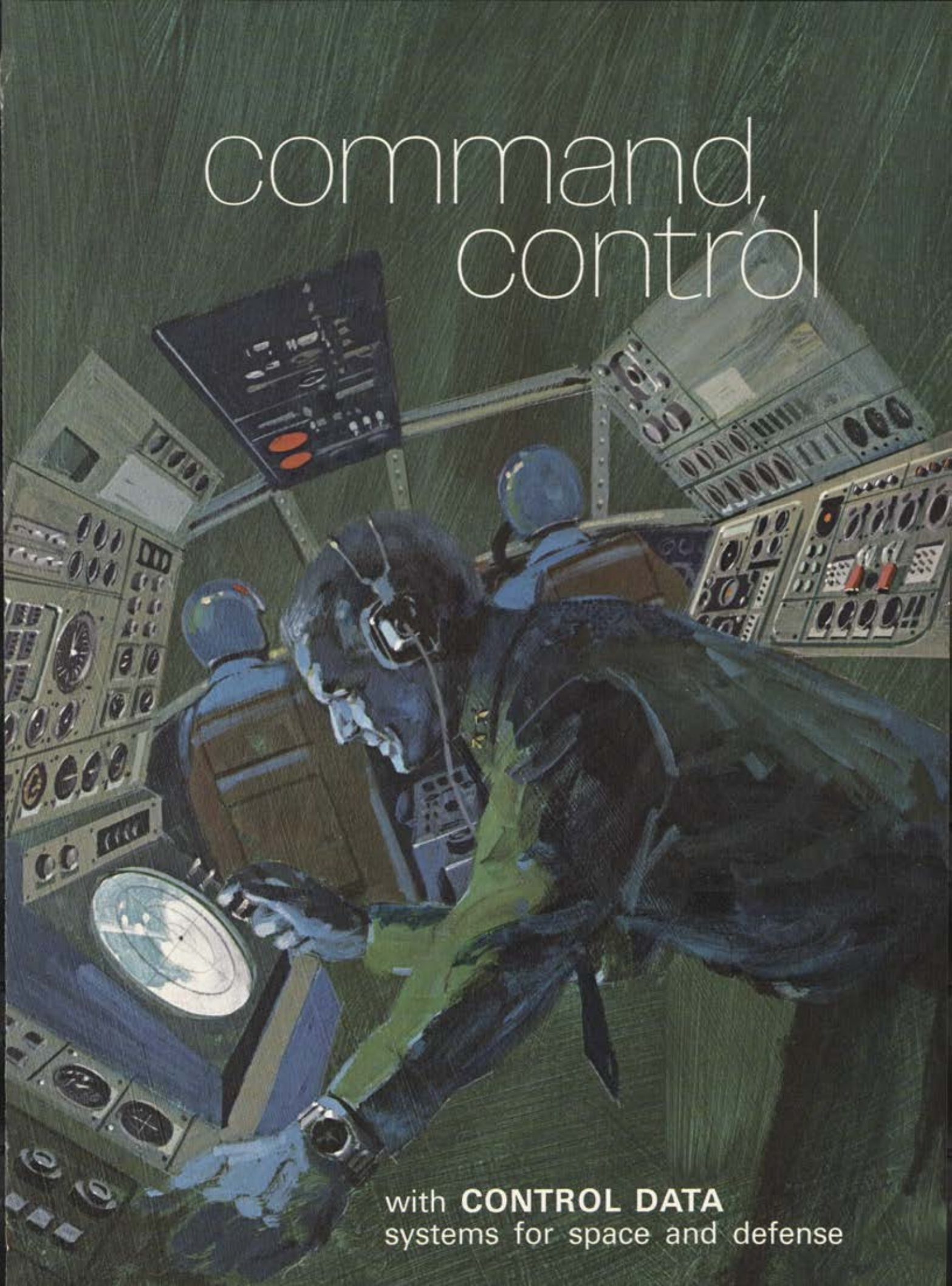
• The Civilian Personnel Council of AFA has recommended that a system be developed to allow credit toward retirement for unused sick leave. Congressman Dominick V. Daniels (N.J.), Chairman of the Retirement Subcommittee of the House Post Office & Civil Service Committee, agrees with our Council and has introduced legislation that would make this possible. His bill also would liberalize Civil Service retirement and at the same time raise the six and one-half percent retirement contribution to seven percent and thereby make the Civil Service Retirement Fund more financially sound.

SENIOR STAFF CHANGES

B/G John W. Baer, from Dep. Cmdr., MAC, Bangkok, Thailand, to Dir., Near East and South Asia Region, OSD (ISA), Washington, D. C. . . . **M/G Gordon F. Blood,** from DCS/Ops, 7th AF, PACAF, Vietnam, to DCS/Plans & Ops, USAFE, Wiesbaden, Germany, replacing M/G David C. Jones . . . **Dr. George A. Contos,** from Asst. for Spec. Studies, Office of Ops Analysis, Hq. USAF, to Scientific Adviser for Joint Continental Def. Systems Integration Planning Staff, JCS . . . **B/G Frank K. Everest, Jr.,** from Dir. of Aerospace Safety, Office of IG, Norton AFB, Calif., to Asst. Dir. (Operational Test & Evaluation), OSD/R&E.

M/G David C. Jones, from DCS/Plans & Ops, USAFE, Wiesbaden, Germany, to DCS/Ops, 7th AF, PACAF, Vietnam, replacing M/G Gordon F. Blood . . . **B/G Thomas B. Kennedy,** from Dep. ACS/Studies and Analysis, Hq. USAF, to Dep. Spec. Asst. for Strategic Mobility, Office of JCS, replacing B/G Fred W. Vetter, Jr. . . . **B/G Benjamin H. King,** from Cmd. IG, Hq. ADC, Ent AFB, Colo., to Dir. of Aerospace Safety, Office of IG, Norton AFB, Calif., replacing B/G Frank K. Everest, Jr. . . . **Dr. William L. Lehman,** from Asst. for Laboratories to Deputy for Laboratories, Office of Asst. Secy. (R&D), Hq. USAF . . . **Dr. Robert N. Schwartz,** from Dir. of Ops Analysis, 7th AF, PACAF, Vietnam, to Asst. for Spec. Studies, Office of Ops Analysis, Hq. USAF, replacing Dr. George A. Contos . . . **B/G Fred W. Vetter, Jr.,** from Dep. Spec. Asst. for Strategic Mobility, Office of JCS, to Cmdr., 436th Military Airlift Wing, MAC, Dover AFB, Del.

RETIREMENTS: B/G William H. **Lumpkin.**—END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LETTER FROM LOS ANGELES

By Irving Stone

WEST COAST EDITOR, AIR FORCE/SPACE DIGEST

Satellites to Gather Earth-Resources Data

A major effort to utilize orbiting spacecraft fitted with remote sensors to discover, map, and evaluate earth resources is expected to be initiated in the 1970s.

The project, the result of a natural scientific progression involving available and oncoming technology, will be motivated by the prospect of wide-scale economic and cultural benefits. The earth resources to be explored encompass such broad endeavors as agriculture and forestry, geology, hydrology, and oceanography, as well as geographic features. Each category offers numerous areas for investigation and development.

Such specially equipped satellites will not be used exclusively, since they can't contend with all the operational problems, but for tasks requiring observation they will considerably augment aircraft reconnaissance, which will continue as the primary tool. The satellites' greatest contribution will be to provide continuous, repetitive, change-noting observational data. Also, the satellites will be able to supply a synoptic (over-all) view of the earth, in contrast to the relatively limited mapping performed through use of aircraft.

Other factors favoring earth-resources surveillance via satellite is that access to remote areas is possible and the satellites provide vibration-free platforms for sensors. For long-term global applications, satellites may offer significant savings over aircraft in gathering the same data.

Possible MOL Use

The groundwork for a full-scale earth-resources effort already has been established by NASA through its Manned Spacecraft Center at Houston, Tex., using aircraft to carry remote sensors in a program that began in 1964. This has been largely a preliminary program to evaluate and develop airborne sensor systems.

The transition to an earth-resources spaceflight program for global coverage, expanded from limited-area aircraft coverage, might be given strong impetus through a joint NASA-USAF project. Such a cooperative effort could have many benefits. The Air Force might contribute use of its Manned Orbiting Laboratory (MOL), potentially a highly sophisticated vehicle, as a manned space platform to test an array of remote sensors and associated instrumentation. MOL also would possess an extended orbiting capability, using resupply ferries to shuttle equipment and data between space and the earth. Such a use of MOL in any earth-resources program could set the pattern for future advantageous cooperation between NASA and the Air Force, with benefits in terms of both data-exchange and economy.

Aerospace firms are gearing up for a role in NASA's future earth-resources spaceflight program. Many have committed their own funds, preparing to participate in areas related to the spacecraft, sensors, and data-handling equipment. Included are Boeing, General Electric, Hughes Aircraft Co., Lockheed Missiles & Space Co., McDonnell Douglas Astronautics, North American Rockwell, Radio Corporation of America, and TRW Systems.

Current Activities

NASA's current earth-resources program includes two major undertakings:

- The programs to develop sensor technology, conducted by the Manned Spacecraft Center, are expected to extend through 1975. The aircraft currently in use are a Convair 240 and a Lockheed Electra, both equipped with remote sensors. The Convair 240 will be phased out and NASA expects to add an Air Force Lockheed C-130 and a Martin RB-57. The C-130 is being outfitted at Ellington AFB, Tex., and is expected early this year. The RB-57 is scheduled to be available in July.
- Preparation for unmanned spaceflight in the early 1970s includes examination of spacecraft types, candidate sensors, ground equipment, data-management, and mission-planning techniques. Prime responsibility currently is assumed by NASA headquarters, but, as plans firm, control of specific efforts will probably be shifted to the various NASA centers.

For Fiscal 1969, NASA's budget for the earth-resources project is some $12 million. About $10 million of this is probably being allocated to the current aircraft effort, and $2 million to the preparational phase for unmanned spaceflight associated with an earth-resources effort.

In the early 1970s, when NASA begins its programs for earth-resources operational spacecraft, sensors, and associated equipment, the budget may reach $200 million per year.

The sensors NASA is testing aboard aircraft include radar, infrared, microwave, and ultraviolet sensors, and magnetometers. And while various sensors generally are selected for specific tasks, the intermix, or multisensing capability, will permit fairly complete analyses, with the aircraft flights establishing sensor validity for future space applications. NASA is not interested in sensor development for aircraft operation per se, but to evaluate data-capability for future space missions.

Participating Efforts

Other government agencies working with NASA in its earth-resources program, or who are keenly interested, include the Departments of Agriculture, Interior, Commerce, Housing and Urban Development, Health, Education and Welfare, the Navy Oceanographic Office, and the National Research Council. Aerospace-industry members also are involved, and several universities including Michigan, California at Berkeley, Stanford, Purdue, Kansas, Nevada, and Texas A&M.

The interest of these government agencies, industry and educational institutions, and the potential for scientific fallout that may ultimately benefit the public, certainly will strengthen NASA's intention to conduct a sophisticated program.

Conceivably, the Department of Defense might evince an interest in such a program as a means of acquiring an accurate picture of the natural resources of potential enemies. Such intelligence might involve raw materials,

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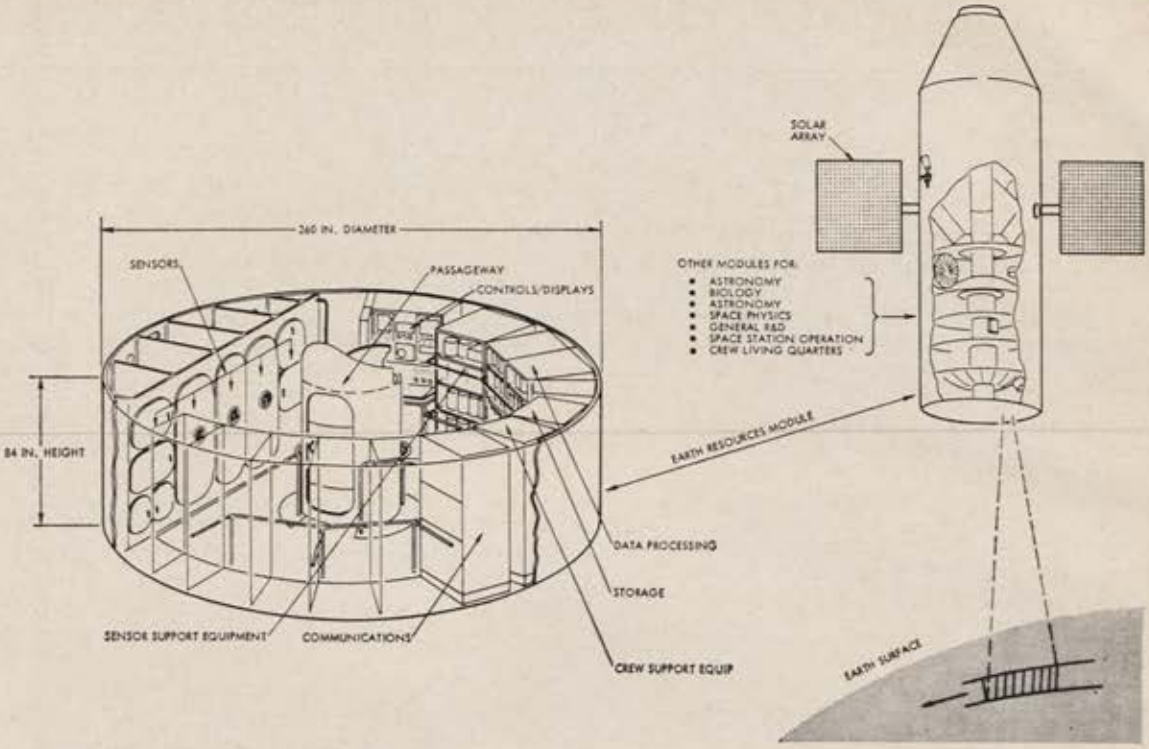

This concept of an advanced earth resources spacecraft configuration envisioned by TRW Systems engineers could be contained in the bottom portion of a space station. Viewing would be enhanced by orienting the lower surface toward earth. Sensors could include cameras, infrared radiometer, scanner, spectrometer, microwave radiometer, and radar altimeter.

nature of terrain, hydrology, perhaps even certain geographical and meteorological data, as well as potential locations for bases and transportation routes.

Probable Schedule

The initial NASA unmanned earth-resources technology satellite (ERTS) probably will be launched between 1971 and 1973. Transition to an operational system from exploratory flights would come later in the 1970s. The initial spacecraft likely will weigh around 1,000 pounds gross, including a payload of approximately 200 pounds of sensors and associated equipment. The spacecraft probably would be launched by a Thor-Delta booster.

The payload of this ERTS is expected to contain three return-beam RCA Vidicons to return pictures in the visible spectrum, with each of these TV cameras operating in a discrete portion of the spectrum. Another piece of equipment likely to be included is an optical-mechanical scanner —a camera-type system using photo multiplier techniques. It will sweep three areas in the visible spectrum and one area in the low infrared portion.

A data-collection system in the payload could interrogate ground- or sea-based sensors as the satellite passed over specific locations. The earth-based sensors would transmit data to the satellite for relay to ground receiver stations when it approached them. The interrogated earth-based sensors could be located anywhere in the world, but for the early missions they probably will be located in the Western Hemisphere.

NASA is studying an array of other sensors for advanced missions, including laser altimeters, side-looking radars, and various microwave devices.

The ERTS likely will be placed in a sun-synchronized orbit, permitting sensors to view at a constant sun angle with earth illumination staying approximately steady. The circular orbit may have an altitude of 500 nautical miles.

A request for proposals is expected to be issued to industry early in 1969 for a design study of the first generation ERTS incorporating the NASA-specified payload.

Alternate Scheme

Some industry members, specifically TRW Systems engineers, believe that the earth-resources spaceflight program might advantageously be kicked off with a small, low-cost satellite to perform a limited-objective mission before the full-blown ERTS program gets under way. This approach might envision a spacecraft with a gross weight of 150 to 250 pounds carrying a payload of approximately thirty pounds, including the return-beam Vidicon or some other optical device such as an imaging spectrophotometer.

It would be possible for the 150-pound version of this spacecraft to be carried piggyback by another satellite. The 250-pound satellite could be launched by a Scout booster, at an over-all cost of about $5 million.

The limited-objective mission would be a "crawl-before-you-walk" exercise to evaluate application of sensors and attitude-position devices, and analyze procedures to process and apply the data to user requirements. In contrast, a full-scale ERTS experiment might cost $20 to $25 million for the booster, spacecraft, payload, and some data-processing. It also may provide a saturation of data before capability exists to determine such data's usefulness.

While reconnaissance generally is concerned with relatively limited areas, the earth-resources satellite must be global in nature to be meaningful. However, despite the broadly parallel functions of the two observational modes, they also have major differences. For example, the pictures taken from such observational satellites as Tiros and Nimbus weather satellites and the Applications Technology Satellite strongly emphasize that the earth is surrounded by a very cloudy environment. Thus, with an earth-resources satellite much data to be obtained will have to be observed under cloud cover.

Clear Viewing

For earth-surface observation, conventional photography and TV cameras have reached a very high state of development. The utility of cameras has been demonstrated effec-

tively for reconnaissance and in the Mercury and Gemini spacecraft. Photographic film may be recovered and television data may be telemetered back to earth.

Infrared instrumentation for use in orbital altitudes up to 500 nautical miles is being refined for better spatial and spectral resolution. Results obtained from aircraft are being analyzed to assist in further refinement of IR instrumentation.

IR instruments may include the radiometer, the IR spectrometer, and a sensor known as the multispectral imaging system. The latter is an extension of color photography, but it is believed that more information can be extracted with a multispectral system than from conventional photography. This has been demonstrated recently in oceanographic observations in a NASA-funded project conducted by the Woods Hole Institute of Oceanography in conjunction with TRW Systems, which built the spectrometer and analyzed the results.

Fish-Breeding Areas

One highlight was the establishment of the existence of chlorophyll concentration as an indication of fish-breeding areas. This information would not be available from conventional photography. The exercise was conducted over the Gulf Stream and the eastern coast of the United States, using a Cessna aircraft.

The use of photography and television systems in space has wide application to agriculture, forestry, and in geographical determinations, relatively small-scale mapping, potential land utilization, and determination of surface water resources, including snowfields, and a broad band of oceanographic conditions.

The IR radiometer and spectrometer would be used for repetitive global observations, while the multispectral imagers, because of the large amount of data they would generate, probably would be used for observation of limited areas only. The IR radiometer obtains temperature readings of the source being viewed. The IR data, in conjunction with other sensors, can indicate temperature and moisture effects on agriculture, distribution of water sources, water quality (degree of pollution), and geophysical surface characteristics.

The spectrometer and multispectral imager operate in the IR band and also in the visible region. The distinction between the two is that the spectrometer scans the entire IR spectrum but isn't necessarily used to produce an image in the entire spectrum, whereas the multispectral imaging system observes discrete bands either in the visible or infrared region, producing the image in several parts of the spectrum, each of which produces discrete information. The multispectral imager appears promising for detecting such factors as marine life, sedimentation in rivers and estuaries, crop and forest vigor, wildlife distribution, and classification of geological resources.

Cloud Environment

For penetration of cloud cover, microwave sensors will be used. These are classified broadly into two groups—active and passive sensors. These types of microwave devices have been flown in aircraft for sensing from as high as 40,000 feet.

The active microwave sensors include the radar imager and such other radar devices as the radar altimeter and the radar scatterometer. The radar imager can be used for topographical mapping, including near-subsurface features, for detecting shoals and coastal features, and to provide mapping data for cloud cover. The radar imager also will have the capability of gathering information on sea surface conditions and ice features.

The radar scatterometer's main application, as currently envisioned, would be measurement of sea roughness. In a sense, the device uses what radar engineers call the noise in the signal, or backscatter, to gauge surface roughness. In conjunction with the radar altimeter and other devices, it also can be used to assess geological and geographical conditions.

The passive microwave technique has only recently been demonstrated as feasible. This mode detects the thermal radiation emitted by the topographical feature being observed. The sensor sees the "brightness" temperature of the observed earth feature, which is the product of the body emissivity and actual temperature.

Researchers still are learning to adapt the passive technique, but very successful results have been obtained in determining the extent of water content in snowfields, as well as in surface-temperature mapping.

In a nonimaging mode, the passive microwave radiometer would be used for point determination of surface temperature in cloud-covered areas. However, if the observer wants to scan and produce an image, the microwave sensor scans across the scene. A major application for passive microwave sensing will be to map ocean temperatures in high latitudes, where cloud cover is virtually continuous throughout the year. These data are required to improve knowledge of potential fishing grounds and provide better information on icebergs and icefield locations and extent.

A major limitation in passive microwave radiometry in spacecraft is the attainable resolution, a function of the antenna size. It is expected that this can be overcome through use of deployable phased-array antennas.

Other sensors envisioned for space use still have not come far enough down the development road to be ready for use in the early 1970s.—End

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Wednesday, March 19

8:00 AM 1st National Junior Officer Conference
9:00 AM 1st Business Session
12:00 N USAF Awards Luncheon
2:00 PM 2nd Business Session

Thursday, March 20

9:00 AM Aerospace Symposium: "Apollo-8"
12:00 N The Chief's Luncheon
2:30 PM Symposium: "The Air Force and Its People"

Friday, March 21

9:00 AM Aerospace Symposium: "Air Force Weapon Systems Requirements"
12:00 N The Secretary's Luncheon
2:30 PM Air Reserve Forces Seminar
7:00 PM American Fighter Pilots Association Banquet*

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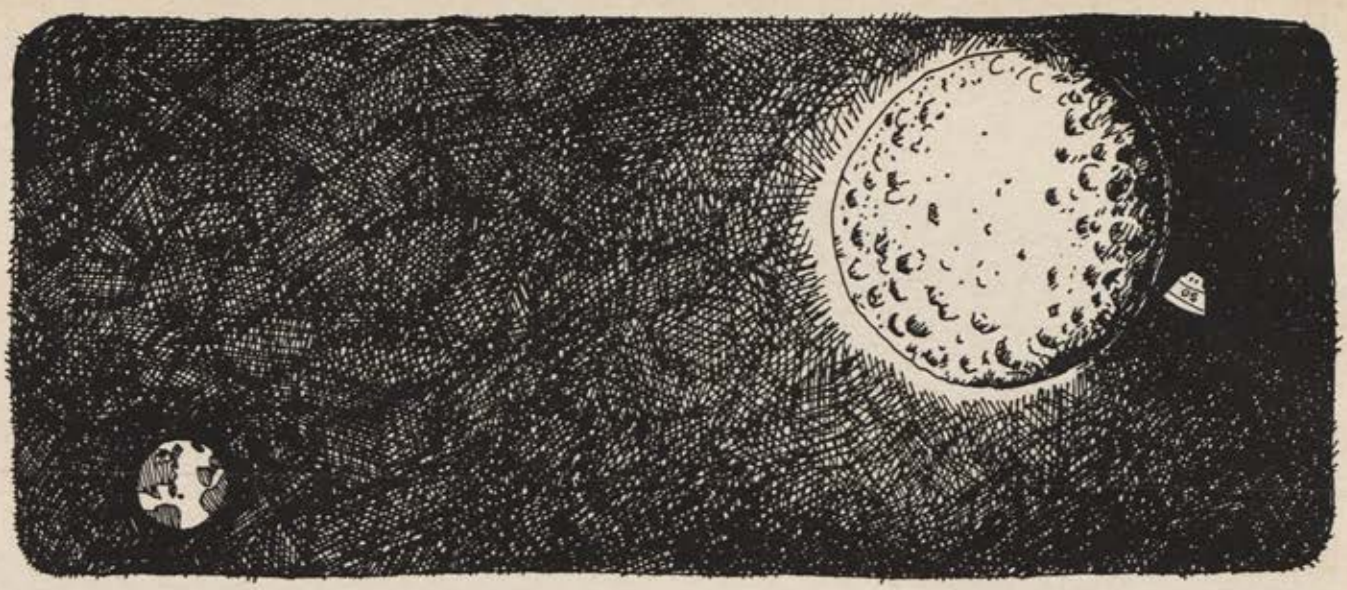

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THE IDAHO STATE ORGANIZATION

cited for very effective programming in support of the missions of the Air Force Association and the Aerospace Education Foundation.

The **Idaho State AFA,** the Aerospace Education Foundation, and leading Idaho educators recently cosponsored an **Educational Symposium** designed to bring together key citizens of Idaho to discuss the needs and demands for vocational and technical education in Idaho.

Held in the Boise State College's Student Union Building, the symposium, entitled "The Future Is Now," featured presentations by three of America's leading educators: **Dr. Robert F. Mager,** President, RFM Associates of Los Altos Hills, Calif.; **Dr. Leon Lessinger,** Associate Commissioner, Secondary and Elementary Education, US Office of Education, and immediate Past President of the Aerospace Education Foundation; and **Dr. Robert M. Morgan,** Professor and Head, Department of Educational Research and Testing, Florida State University.

After their presentations, Drs. Mager, Lessinger, and Morgan conducted informal discussion sessions, and participated in an evening reaction panel discussion to sum up conference objectives. Reaction panelists included **Eldon Smith,** President of the State Board of Education; **Dr. James L. Taylor,** President of the College of Southern Idaho; **Dr. Ernest W. Hartung,** President of the University of Idaho; **D. F. Engelking,** State Superintendent of Public Instruction; and **Wayne York,** Executive Secretary, Idaho Education Association.

Dr. Donald F. Kline, Director of Development and Institutional Research at Idaho State University, served as moderator; and **James M. Trail,** an Aerospace Education Foundation trustee and an AFA National Director, was the host.

Dr. James S. Garrison, Director of Personnel Development for Boise Cascade Corp., and **Dr. L. E. Wesche,** Head of the Department of Education at Northwest Nazarene College, shared the podium in delivering keynote addresses.

Other participants included **Dr. John E. Riley,** President of Northwest Nazarene College; Boise's Mayor **Jay Amyx; Dr. John B. Barnes,** President of Boise State College; **Dr. William E. Davis,** President of Idaho State College; **Dr. Warren B. Knox,** President of the College of Idaho; **Janet Latham,** Assistant Supervisor, Home Economics Education, State Vocational Education; **Wesley Steck,** Consultant for Title I, ESEA, State Department of Education; and **Dorsey S. Riggs,** Director, Teacher Education and Certification, State Department of Education.

The Symposium, which was attended by more than 250 educators from throughout the state, was one of the most effective education seminars sponsored by an AFA unit and could be used as a model for future seminars sponsored by AFA units at the community and state levels.

The Idaho AFA's Annual Convention was held in conjunction with the Symposium. **James H. Straubel,** AFA's Executive Director, was the guest speaker at the convention luncheon. During the business session, delegates elected **Harry LeMoyne** to serve as President of the State AFA for 1969, succeeding **Charles Barnes.** Guests included Northwest Regional Vice President **Warren Murphy;** National Directors **James Trail** and **Dale Hendry;** Washington AFA Secretary **Margaret A. Reed;** and **Clyde Stricker** of the Spokane, Wash., Chapter.

* * *

The Mount Clemens, Mich., Chapter's International Honors Night Banquet, held in the Selfridge AFB Officers' Club, observed the twenty-first anniversary of the US Air Force, and the fiftieth anniversaries of the Royal Air Force and the Polish Air Force.

The **Hon. Ronald Juchau,** British Consul in Detroit, introduced guest speaker Wing Commander **John Cooke, OBE,** Royal Air Force, who is now assigned with the USAF Logistics Command at Wright-Patterson AFB. **Col. Taras T. Popovich,** Commander, 1st Fighter Wing, Selfridge AFB, was the Military Host and served as Master of Ceremonies.

During the program, the Chapter presented two books to the Mount Clemens Public Library. Citations were presented to **Wing Commander Cooke,** the **1st Fighter Wing,** and to several **Chapter members** for their outstanding contributions to the Chapter's mission. Highlight of the

(Continued on following page)

At the Mount Clemens Chapter's International Honors Night, Chapter President Marjorie Hunt poses with Wing Commander John Cooke, left, guest speaker, and Col. Taras T. Popovich, Military Host and Master of Ceremonies (see story).

evening was presentation of an AFA Associate Membership to **Rudolph Senkowski**, President of the Detroit Wing of the Polish Air Force Veterans Association. Chapter President **Marjorie O. Hunt** made this presentation.

Distinguished guests included **Maj. Gen. Shelton Lollis**, Commander, Army Tank and Automotive Command; **Rear Adm. Leon J. Jacobi**, USN (Ret.); **Lt. Col. Joe F. Olshefski**, Commander of the 94th Fighter-Interceptor Squadron; and **Group Capt. Leonard N. Baldock, RCAF**, Senior Reserve Adviser and a Past President of the Royal Canadian Air Force Association.

• • •

Held in Savannah, the Annual Meeting of the **Georgia State AFA Organization** included a business session, an AFA Leaders' Workshop, and a dinner dance.

Brig. Gen. Augustus M. Hendry, Commander of the 836th Air Division, MacDill AFB, Fla., was the guest speaker at the dinner dance, and State President **Troup Miller, Jr.**, Lt. Gen., USAF (Ret.), served as the Toastmaster.

During the business session, delegates elected **William H. Kelly** to serve as State President for 1969. Colonel Kelly is base detachment commander of the 165th Military Airlift Group, Georgia Air National Guard, and served as Arrangements Chairman for the annual meeting. Other officers elected are: **Don Devlin, Ed Johnston**, and **J. D. Walker**, Vice Presidents; and **Homer Hockenberry**, Secretary-Treasurer. Southeast Regional Vice President **Martin H. Harris** attended the meeting and made appropriate remarks at the business session.

Brig. Gen. A. M. Hendry, left, Commander, 836th Air Division, MacDill AFB, Fla., chats with Georgia State AFA President-elect William H. Kelly at the State's Annual Meeting Reception. General Hendry was the guest speaker at the dinner, and Mr. Kelly served as Chairman.

• • •

Meeting in Ogden, delegates to the **Utah AFA's Annual Convention** elected **Jack Price** to succeed **Nolan Manfull** as State President for 1969. Other officers elected are: **Harry Cleveland, Charles Kelley**, and **Grant Sims**, Vice Presidents; **Tom Buller**, Secretary; **Edward Sparr**, Treasurer; and **Les Richardson**, Judge Advocate.

At the Convention Awards Banquet, **Mr. Price** was named the State AFA's "Man of the Year," and **Doris Edvalson**, who has served as the State AFA's Secretary for a number of years, was named "Woman of the Year." The "Outstanding Chapter" award went to the **Ute Chapter. Harry Cleveland**, then President of the Ute Chapter, received a citation.

"Serviceman of the Year" award went to **Maj. Gen. Robert H. McCutcheon**, Commander, Ogden Air Materiel Area. The **Ogden Chapter, Raymond Cassell**, President, received the exceptional achievement award, while the membership award went to the **Wasatch Chapter, Glenn L. Jensen**, President.

Others receiving awards included seven AFA leaders, nine industrial firms, three newspapers, three radio stations, five newspaper correspondents, and eight TV commentators.

• • •

The **Florida State AFA's** two-day convention, held at the Tides Hotel and Bath Club in Redington Beach, included an Aerospace Education Seminar with briefings on the US Air Force mission, Air Force Eastern Test Range, Military Airlift Command, Tactical Air Command, AF Special Operations Force, US Strike Command, and the Air Training Command. **Maj. Gen. Rollin B. Moore, Jr.**, Commander, Headquarters Air Force Reserve, was the guest speaker at the Seminar luncheon and spoke on "The New Look of the Air Reserve."

Other events on the Convention program included an aerial communications demonstration by the US Strike Command, an Aerospace Education Programming Seminar, a Chapter Programming Workshop, a skydiving demonstration by the MacDill

(Continued on page 101)

—Photo by Allan R. Scholin

At Florida State Convention, from left: West Coast Chapter President Joe Martin; former State President Les Curl; Maj. Gen. Rollin Moore, Commander, Hq. AF Reserve; Regional V-P Marty Harris; Florida State President H. M. "Bud" West.

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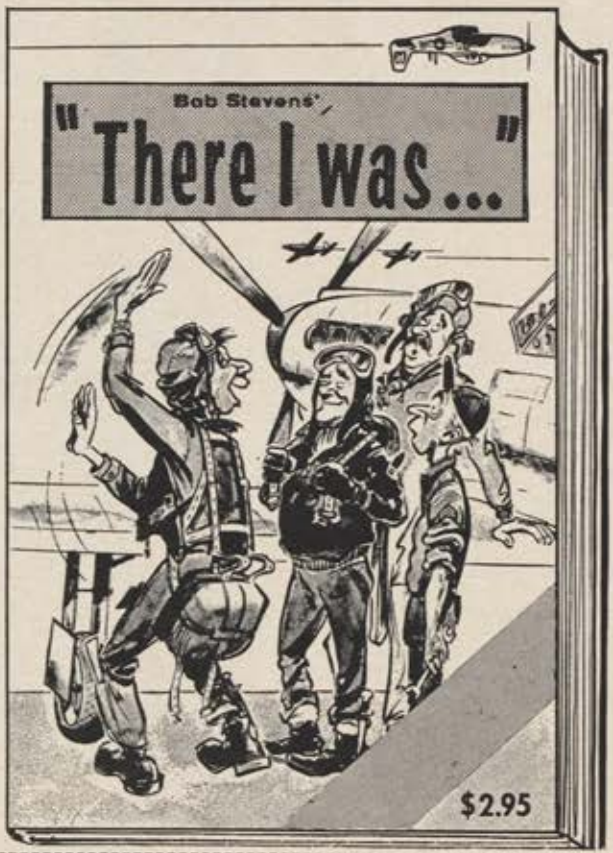

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AFB Sports Parachute Club, a luau, a Convention luncheon, an Awards Banquet and dance, an AFA Leaders' Breakfast, and a business session.

During the business session, delegates elected **Herbert M. West, Jr.,** President of the Eglin Chapter, to succeed **Lester Curl** as State President.

Dr. Stephen Speronis, Vice President of the University of Tampa, moderated the Aerospace Education Programming Seminar.

Maj. Gen. Dale O. Smith, USAF (Ret.), was the guest speaker at the Convention luncheon and spoke on the nuclear weapons proliferation issue.

Jess Larson, Chairman of AFA's Board of Directors, delivered the major address at the Awards Banquet, and **Joseph Martin,** President of AFA's Florida West Coast Chapter and General Chairman of the Convention, served as Toastmaster.

Col. Daniel "Chappie" James, Jr., Deputy Commander, 33d Tactical Fighter Wing, Eglin AFB, received the State AFA's "Jerome P. Waterman Award" for "the outstanding contribution to aerospace power by a Florida airman on active duty."

Joseph M. Verlander, Director of Cape Kennedy operations for Martin Marietta Corp., received the State AFA's "Gen. Lewis H. Brereton Award" for "the outstanding civilian contribution to aerospace power in Florida during 1968."

Herbert M. West, Jr., was named the "Florida AFA Man of the Year." The **Florida West Coast Chapter,** the Convention host, was named the State's "Chapter of the Year."

Distinguished guests included **Lt. Gen. Benjamin O. Davis, Jr.,** Deputy Commander in Chief, US Strike Command; **Brig. Gen. Augustus M. Hendry,** Commander, 836th Air Division (TAC); Southeast Regional Vice President **Martin H. Harris;** and **Jerome Waterman,** a former AFA National Director.

Mrs. Joanne Pinto, chairwoman, Department of Health, Education and Welfare for the Navajo Indian tribe, accepts Christmas package from Utah AFA President Nolan Manfull. Also participating in the presentation were Al Valdez, right, President of the Albuquerque Chamber of Commerce, and Hugh Whitfield, President of Whitfield Transportation Co., El Paso, Tex. (see accompanying story).

* * *

"Project Navajo," a project designed to provide the some 130,000 Navajo Indians throughout the Utah-New Mexico-Arizona reservation with Christmas gifts with a definite useful need (such as food, clothing, baby needs, and the things that will make children's eyes light up on Christmas morning), was sponsored by the **Utah State AFA** with the cooperation of the employees at Hill AFB, Defense Depot Ogden, Defense Contract Administration Office in Salt Lake City, the Intermountain School and other schools in the area, and the aerospace industry in northern Utah.

Tons of gifts were delivered to the reservation headquarters at Window Rock, Ariz., with the assistance of personnel of the 945th Military Airlift Group (Reserve) and the Whitfield Transportation Company, and distributed throughout the reservation under the direction of the Navajo Council.

David Whitesides served as chairman of the project, and Rocky Mountain Regional Vice President **Nathan Mazer,** Utah State AFA President **Nolan Manfull,** and State President-elect **Jack Price** supervised delivery of the gifts.

The Utah AFA is to be commended on its continuing and effective programming in support of the AFA mission. "Project Navajo" is another example of the kind of programming that won the Unit the "AFA Unit of the Year" award at the National Convention in Atlanta last year.

* * *

A most informative and comprehensive Space Symposium was recently sponsored by AFA's **Big Spring, Tex., Chapter.**

(Continued on following page)

Some of the participants in the Big Spring, Tex., Chapter's Space Symposium are shown at the Symposium Reception. They are, from left, Col. W. C. McClothlin, Jr.; Don Wade; Chapter President Jeff Brown; William H. Dana; and Texas State President Sam E. Keith, Jr. (see accompanying story for details).

Conducted at Webb AFB, for more than 300 civic leaders from throughout west Texas, the Symposium program included a tour of the base and demonstrations by units at the base; a reception and dinner at the Webb AFB Officers' Club; and an evening of aerospace lectures on such a variety of subjects as an X-15 flight, the Apollo-7 mission and the planned moon landing, schooling of AF test pilots, and the development of bioastronautics and the medical aspects of the space program.

Participants included **Col. W. C. McGlothlin, Jr.**, Commander, 3560th Pilot Training Wing, Webb AFB; Texas State AFA President **Sam E. Keith, Jr.**; **William H. Dana**, civilian research pilot-engineer for NASA's Flight Research Center and an X-15 pilot; **Don Wade**, chief of the Flight Loads Section, Structural and Mechanical Division at the Manned Spacecraft Center; **Maj. Don Kutyna**, instructor in the research test-pilot school at Edwards AFB, Calif.; and **Lt. Col. Calvin Chapman**, supervisor of the primary phase of aerospace medicine at the USAF School of Aerospace Medicine at Brooks AFB, Tex.

• • •

Held in the Officers' Club at L. G. Hanscom Field, the Massachusetts AFA's twenty-first annual State Convention dinner dance featured **Maj. Gen. Joseph J. Cody, Jr.**, Commander, Electronic Systems Division, AFSC, as guest speaker. General Cody spoke on "A Capsule Look at ESD Now, and In What Direction It Is Heading."

During the business session, **Andrew Trushaw** was elected to succeed **Hugh Simms** as President of the State AFA.

• • •

Meeting in Hampton, delegates to the **Virginia State AFA Convention** reelected incumbent State President **A. A. West.**

In conjunction with the Convention, the Langley Chapter sponsored its annual reception and dinner dance honoring the Commander of the Tactical Air Command and his staff. **Gen. William W. Momyer**, TAC Commander, addressed a capacity audience in the Langley AFB Officers' Club. AFA President **Robert W. Smart** spoke briefly. Central East Regional Vice President **Walter E. Barrick, Jr.**, was on hand for the event.

• • •

The **Louisiana AFA's** 1968 Convention was held recently in New Orleans. At the business session, delegates elected **John McGaffigan** to succeed **John Miller** as State President.

South Central Regional Vice President **Jack Gilstrap** made the principal address at the Convention banquet.

• • •

Lt. Col. Stephen Harrison was the guest speaker at the **Tennessee AFA's** Convention Dinner. Colonel Harrison served as a forward air controller in Vietnam and was a member of the Air War Symposium panel at AFA's 1968 National Convention in Atlanta.

Delegates elected **Enoch B. Stephenson, Jr.**, an Air Force Reserve brigadier general, to succeed **Howard F. Butler** as State President.

• • •

Paul F. Strittmatter, Navigational Guidance Systems Division of AC Electronics, was the guest speaker at the dinner dance held during the convention of the **Wisconsin AFA.** Mr. Strittmatter spoke on "The Apollo Space Program."

Harold Bates was elected to succeed **Kenneth Kuenn** as State President. Other officers elected are: **Lyle Ganz**, Vice President; **Tom Treat**, Secretary; and **Cecilia Stanton**, Treasurer. The newly elected officers were installed by AFA National Director **Joseph J. Lingle** during the program.

Great Lakes Regional Vice President **W. M. Whitney, Jr.**, was a special guest at the Convention.

—DON STEELE

Maj. Gen. Nils Ohman, right, Commander, Headquarters Command, and guest speaker at the luncheon observing the 65th Anniversary of Powered Flight at Kill Devil Hills, N. C., chats with Jacqueline Cochran, record-holding aviatrix, and Col. Charles Yeager, former X-1 pilot and the first man to break the sound barrier, both of whom were honored during the luncheon program by being picked for inclusion in the First Flight Shrine. The powered flight anniversary observance was jointly sponsored by the Air Force Association, the National Aeronautics Association, The First Flight Society, and the National Park Service.

Maj. Hugo E. Marek, USAF, a member of the Tactical Air Command staff and a dedicated AFAer, lost his life in the crash of a T-39 trainer at Langley AFB, Va., on December 31, 1968. Major Marek was a member of the Air War Symposium panel at the AFA National Convention in Atlanta, Ga., last year (*see "The Year Airpower Was Tested and Paid Off," by Claude Witze, AF/SD, June '68*), and, for his outstanding presentations to local, state, and regional AFA units, received a Special Citation during the Convention. AFA extends its deepest sympathy to Major Marek's widow and his ten children.

Major Marek speaking at last year's AFA Convention in Atlanta, Ga.

FIVE GREAT AFA INSURANCE PROGRAMS

complete information by return mail!

no cost! no obligation!

1

MILITARY GROUP LIFE INSURANCE

Offers equal coverage *at the same low cost* for flying and non-flying personnel. No geographical or hazardous duty restrictions or waiting period. Insurance up to $20,000 *plus* $12,500 accidental death benefit. Cost of insurance has been reduced by dividends for six consecutive years. All Air Force personnel, on active duty, in the National Guard and in the Ready Reserve are eligible to apply.

2

CIVILIAN GROUP LIFE INSURANCE

For non-military members of AFA. $10,000 of protection at exceptionally low cost. Double indemnity for accidental death except when the insured is acting as pilot or crew member of an aircraft. Waiver of premium for disability. Choice of settlement options.

3

FLIGHT PAY INSURANCE

Protects rated personnel on active duty against loss of flight pay through injury or illness. Guaranteed even against pre-existing illnesses after 12 consecutive months in force. Grounded policyholders receive monthly payments (tax free) equal to 80% of flight pay—the equivalent of full government flight pay, which is taxable.

4

ALL-ACCIDENT INSURANCE

(now includes pilots and crew members)

Offers *all* AFA members worldwide, full-time protection against *all* accidents—*now even including accidents to aircraft pilots and crew members.* Coverage up to $100,000. Two plans: complete, low-cost family protection under the popular Family Plan (including all children under 21), or individual coverage. Includes medical expense benefits, and automatic increases in face value at no extra cost.

5

EXTRA CASH INCOME HOSPITAL INSURANCE

Puts up to $40 a day *cash* in your pocket for every day you or an insured member of your family is hospitalized. *Cash* benefits for up to 365 days. No physical examination required. You use benefits any way you see fit. All AFA members, *active-duty and civilian,* up to Age 60 are eligible to apply.

RETURN THIS COUPON FOR COMPLETE INFORMATION ON ANY OR ALL AFA INSURANCE PLANS

AIR FORCE ASSOCIATION
Insurance Division

1750 Pennsylvania Ave., N.W.
Washington, D.C. 20006

Without obligation, please send me complete information about the AFA Insurance Program(s) checked at right.

Name .....

Rank or Title .....

Address .....

.....

City .....

State ..... Zip .....

- ☐ Military Group Life Insurance
- ☐ Civilian Group Life Insurance
- ☐ All-Accident Insurance
- ☐ Flight Pay Insurance
- ☐ Extra Cash Income Hospital Insurance

2-69

AFA'S BOLDEST, NEWEST

EXTRA INCOME

THREE PLANS TO CHOOSE FROM

☐ MEMBER ☐ MEMBER & SPOUSE ☐ ENTIRE FAMILY

WHAT IS AFA EXTRA INCOME HOSPITAL INSURANCE?

For every day you (or members of your family, if you have elected family coverage) are hospitalized AFA sends you money for up to 365 days . . . money you can use as you wish, without restrictions of any kind.

WHO IS ELIGIBLE?

Any United States citizen under the age of 60 who is or becomes a member of the Air Force Association is eligible to apply for AFA Extra Income Hospital Insurance for himself, his spouse, and unmarried children more than 14 days and less than 21 years of age.

HOW ARE BENEFITS PAID?

Once AFA receives verification that hospitalization has taken place, you will receive a benefit check within seven days with additional checks thereafter on a weekly basis upon AFA receiving certification of your continued hospitalization.

FIRST TIME OFFERED TO ACTIVE DUTY MILITARY PERSONNEL

HOW MUCH EXTRA INCOME DO YOU NEED? CHOOSE THE BENEFIT AMOUNT YOU REQUIRE FROM THIS FLEXIBLE GROUP PLAN!

1. You are the key to family finances. How much extra money would your family need if you were hospitalized? Check Plans A-1 and AA-1.

2. Does part of the family income depend on a working spouse? Would a cook, or maid or housekeeper be needed during a wife's hospitalization? How much would this, and other expenses cost? Check Plans A-2 and AA-2.

3. If you have a family, you should consider providing extra income for children's hospitalization. Accidents involving whole families *do* happen, especially with military families living around the world. Check Plans A-3 and AA-3.

And remember: Benefits are paid up to 365 days of hospital confinement for *each* accident or sickness for *each* insured person while the patient is under the care of a legally qualified Doctor of Medicine.

BENEFIT SCHEDULE

PLAN	INDIVIDUAL PLAN	LIMITED FAMILY PLAN	FULL FAMILY PLAN
	MEMBER	AND SPOUSE	AND CHILDREN
A	$20/DAY	$15/DAY	$10/DAY
AA	$40/DAY	$30/DAY	$20/DAY

COST SCHEDULE

INDIVIDUAL PLAN — PLAN A-1 (Member: $20 per day)

Member's Age	Annual	Semi-Annual
Under 40	$ 29.00	$15.50
40-49	$ 37.00	$19.50
50-59	$ 53.00	$27.50
60-64	$ 76.00	$39.00

LIMITED FAMILY PLAN — PLAN A-2 (Member: $20 per day; Spouse: $15 per day)

Annual	Semi-Annual
$ 59.00	$ 30.50
$ 72.00	$ 37.00
$103.00	$ 52.50
$147.00	$ 74.50

FULL FAMILY PLAN — PLAN A-3 (Member: $20 per day; Spouse: $15 per day; Children: $10 per day)

Annual	Semi-Annual
$ 74.00	$ 38.00
$ 86.00	$ 44.00
$118.00	$ 60.00
$162.00	$ 82.00

PLAN AA-1 (Member: $40 per day)

Member's Age	Annual	Semi-Annual
Under 40	$ 54.00	$28.00
40-49	$ 68.00	$35.00
50-59	$100.00	$51.00
60-64	$147.00	$74.50

PLAN AA-2 (Member: $40 per day; Spouse: $30 per day)

Annual	Semi-Annual
$107.00	$ 54.50
$132.00	$ 67.00
$195.00	$ 98.50
$284.00	$143.00

PLAN AA-3 (Member: $40 per day; Spouse: $30 per day; Children: $20 per day)

Annual	Semi-Annual
$134.00	$ 68.00
$159.00	$ 80.50
$222.00	$112.00
$312.00	$157.00

WHY DO YOU NEED EXTRA INCOME HOSPITAL INSURANCE?

Hospital costs for Non Military Families are climbing out of sight!

In 1966, according to the American Hospital Association, average *total cost* per hospital admission was $380.39 — *up 412%* in just 20 years.

Average 1966 cost per hospital day, over an average hospitalization of 7.9 days, was $48.15 — a figure which includes only basic costs.

And costs are going higher. Other authorities estimate that average cost per hospital day may reach $100 by 1980.

Would your present hospital benefits begin to cover this cost? Do they even cover today's costs?

Military Families Can Have Severe Money Losses Caused By Hospitalization

Military families as well as civilian families can be financially hurt by the indirect expenses of hospitalization and serious illness.

Even if every cent of direct hospital cost is covered by government benefits (or hospital insurance) there may be hundreds or thousands of dollars in indirect losses. For example:

Loss of income, especially when more than one member of the family works

Extra travel expense (sometimes for long distances) for other family members

Cost of housekeeper or "sitters"

Special diets, sometimes for long periods

Expense of special home care.

AFA EXTRA INCOME HOSPITAL INSURANCE PROVIDES THIS MONEY. BENEFITS ARE PAID DIRECTLY TO YOU — AND YOU USE THIS MONEY TO BEST SUIT YOUR NEEDS.

INSURANCE PROGRAM

HOSPITAL INSURANCE

Pays CASH benefits up to $40 per hospital day for each insured person!

All AFA members — military and civilian— and their families are eligible.

OTHER BENEFITS

Protected AFA members may continue their coverage at the low, group rate to Age 65, or until they become eligible for Medicare, whichever is earlier. Hospitalization for **all** sicknesses and accidents is covered, except for a few standard exceptions listed under "Exclusions."

LIMITATIONS

Hospital confinements separated by less than three months for the same or related conditions will be considered continuations of the same confinement.

Coverage will continue through the life of the master policy unless terminated for whichever of the following reasons occurs first for the protected person: (a) attains age 65; or (b) becomes eligible for Medicare; or (c) AFA membership dues are due and unpaid; or (d) a premium payment is due and unpaid. For dependents, coverage will continue through the life of the master policy unless terminated for whichever of the following reasons occurs first: (a) such dependent ceases to be an eligible dependent; or (b) the protected person's insurance terminates hereunder; or (c) the dependent spouse either attains age 65 or becomes eligible for Medicare; or (d) any required dependent premium payment is due and unpaid.

EXCLUSIONS

The plan does not cover losses resulting from (1) declared or undeclared war or act of war; (2) service in the armed forces of a country *other than the United States;* (3) acts of intentional self destruction or attempted suicide while sane or insane; (4) pregnancy (including childbirth or resulting complications); (5) confinement in any institution primarily operated as a home for the aged or engaged in the care of drug addicts or alcoholics; (6) illnesses for which the insured has received medical treatment or advice or has taken prescribed drugs or medicines within 12 months prior to the effective date of his insurance. Coverage for such pre-existing illnesses will begin after 12 consecutive months during which he is covered under the policy and receives no such medical treatment or advice and takes no such prescribed drugs or medicine; (7) hospital confinement commencing prior to the date the protected person or eligible dependent becomes insured under this policy.

HOW TO APPLY

Fill out the attached application and mail it to AFA with your first premium payment. You may elect to pay premiums either annually or semi-annually.

APPLICATION

AFA EXTRA INCOME HOSPITAL INSURANCE

Underwritten by ***Mutual of Omaha Insurance Co.*** *Omaha, Nebraska*

NAME

ADDRESS

CITY STATE ZIP

DATE OF BIRTH CURRENT AGE HEIGHT WEIGHT SEX

PLAN OF INSURANCE

MEMBER ONLY	MEMBER & SPOUSE	MEMBER SPOUSE & CHILDREN
☐ PLAN A-1	☐ PLAN A-2	☐ PLAN A-3
☐ PLAN AA-1	☐ PLAN AA-2	☐ PLAN AA-3

METHOD OF PAYMENT ☐ Annual ☐ Semi-Annual

This insurance coverage may only be issued to AFA members. Please check the appropriate box:

☐ I am currently an AFA member.

☐ I enclose $7 for annual AFA dues (includes subscription ($6) to to AIR FORCE/SPACE DIGEST).

I enclose my initial premium in the amount of $_____ (Refer to premium table to determine correct premium amount.)

Please complete this section only if you are requesting coverage for dependents (Limited Family or Family Plan) and list only those persons for whom you are requesting coverage.

FULL NAME	RELATIONSHIP TO AFA MEMBER	SEX	DATE OF BIRTH
	WIFE (HUSBAND)		
	child		
	child		
	child		
	child		
	child		
	child		

In applying for this insurance coverage, I understand and agree that:

1. coverage shall become effective on the last day of the calendar month during which my application together with the proper premium amount is mailed to AFA.
2. only hospital confinements commencing after the effective date of insurance are covered, and
3. any condition for which I or any of my eligible dependents received medical treatment or advice or have taken prescribed drugs or medicine within twelve months prior to effective date of the insurance coverage will not be covered until the expiration of twelve consecutive months of insurance coverage without medical treatment or advice or having taken prescribed drugs or medicine for such condition.

DATE SIGNATURE

Application must be accompanied by check or money order. Send remittance to:

INSURANCE DIVISION, AFA, 1750 PENNSYLVANIA AVE., N.W., WASHINGTON, D.C. 20006

Form 2332MGC App. 2-69

Bob Stevens'

"There I was..."

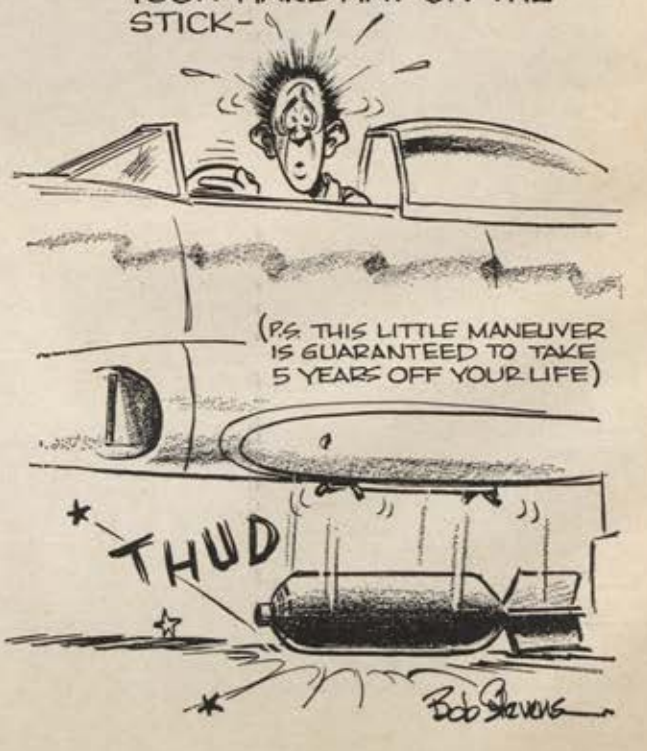
Everyone had his own heroic ideas on skill and daring, of course, but sometimes it was tempting to see how *safe* you could play it...

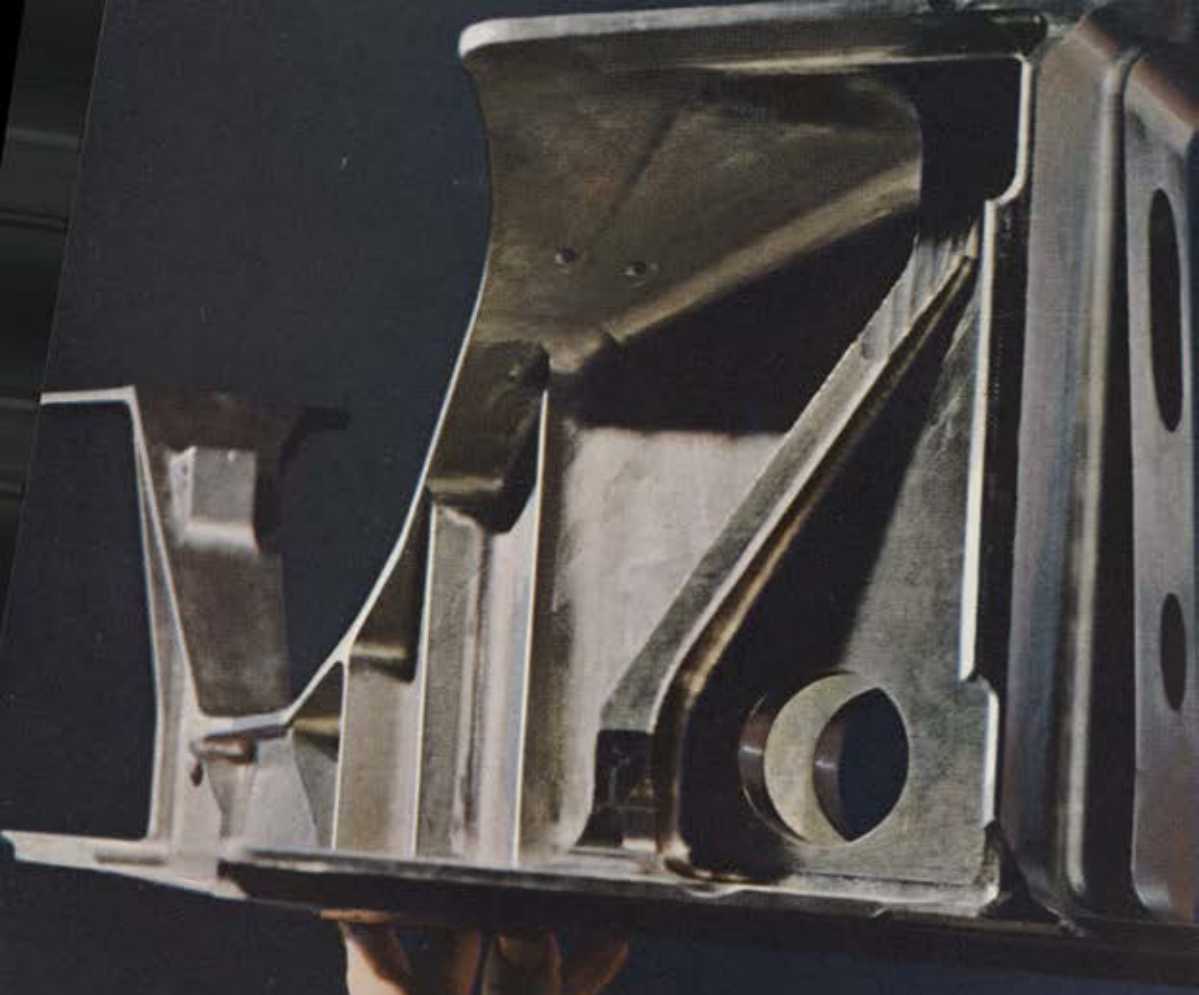
BRAGGING ABOUT "LOW ALTITUDE" BOMBING IN A RAF CLUB COULD BE PRETTY ENLIGHTENING--

THANKS TO CAPT. BOB HOWARD NORTON AFB, CALIF.

THEN THERE WERE THOSE "HIGH ALTITUDE" (ABOVE 10,000') NAVIGATION TRAINING MISSIONS-

THERE'S THE TIME YOU LEFT THE BOMB DROP BUTTON ARMED - AND HUNG YOUR HARD HAT ON THE STICK-





The fighting man's diet.

Titanium. It's the strong, lightweight alloy chosen by the foresighted engineers at our McDonnell Aircraft Company to keep the F-4 Phantom trim and combat ready.

McDonnell Douglas is the world's largest user of titanium. We're also imaginative users of beryllium, hypersonic honeycomb, and other exotic materials.

It's of such things that tomorrow's advanced military aircraft will be made.

MCDONNELL DOUGLAS

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

RYAN

When the chips are down...

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

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