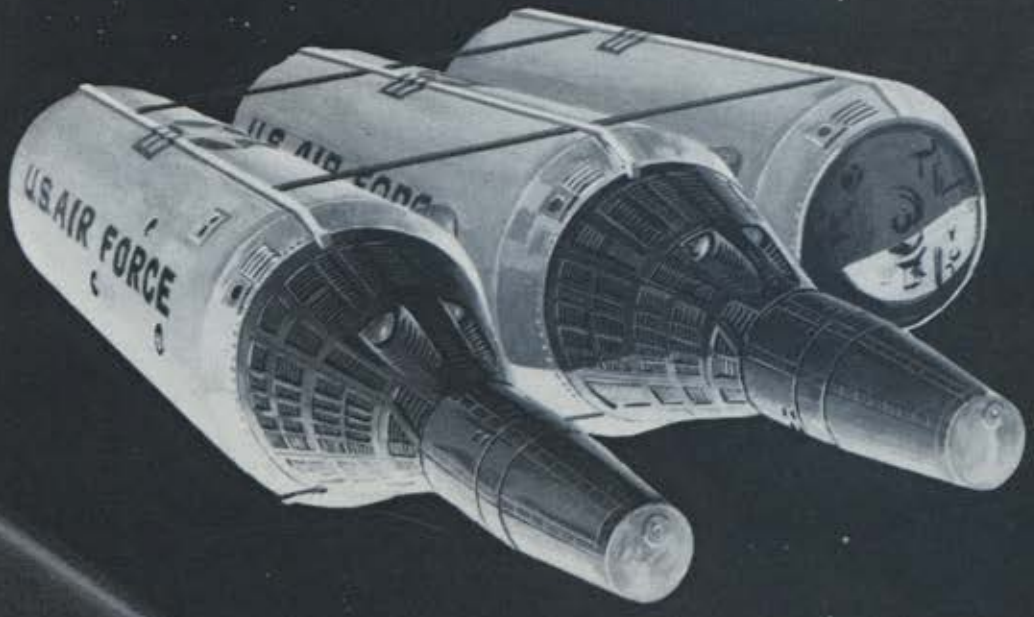
OCTOBER 1965 / 50c

AIR FORCE

and **SPACE DIGEST**

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



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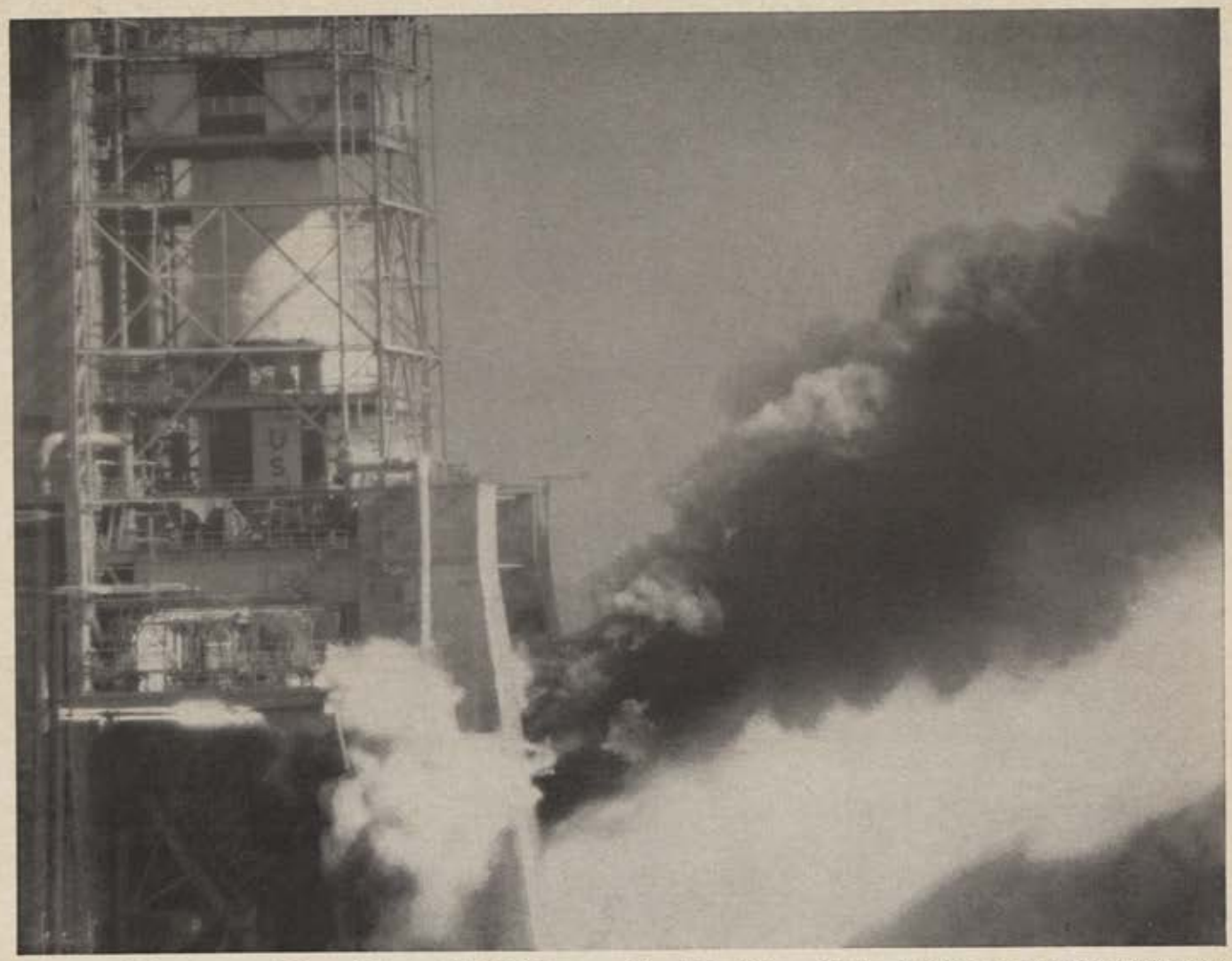

FIRST full-duration test firing of Saturn V's S-1C booster marked a major milestone on the way to America's first manned lunar landing. The test, conducted at NASA's Marshall Space Flight Center, generated the most force ever produced by a rocket—sufficient to create 160 million hp in flight. The Saturn V vehicle, tall as a 30-story building and weighing 3,000 tons, will launch American astronauts to the moon this decade. It will be able to put 100 tons into earth orbit, or propel several tons of instruments to Mars. Boeing holds a NASA contract to develop, build and test the S-1C booster.

Capability has many faces at Boeing

TWIN TURBINE Sea Knight, built by Boeing's Vertol Division, is U.S. Marine Corps assault transport helicopter. Tandem rotors fold in less than one minute for storage on carrier hangar decks.

SPACE BUBBLE, an inflatable balloon, suggested by U.S. Air Force and Boeing scientists, would protect astronauts while assembling platforms or repairing craft in space.

NEWEST jetliner, Boeing 737 Twinjet, will carry up to 115 passengers at 550 to 600 mph, over routes of 100 to 1100 miles. New 737 will offer more head room, more shoulder room than any other short-range jet. It has been ordered by Lufthansa, Pacific, United and Western.

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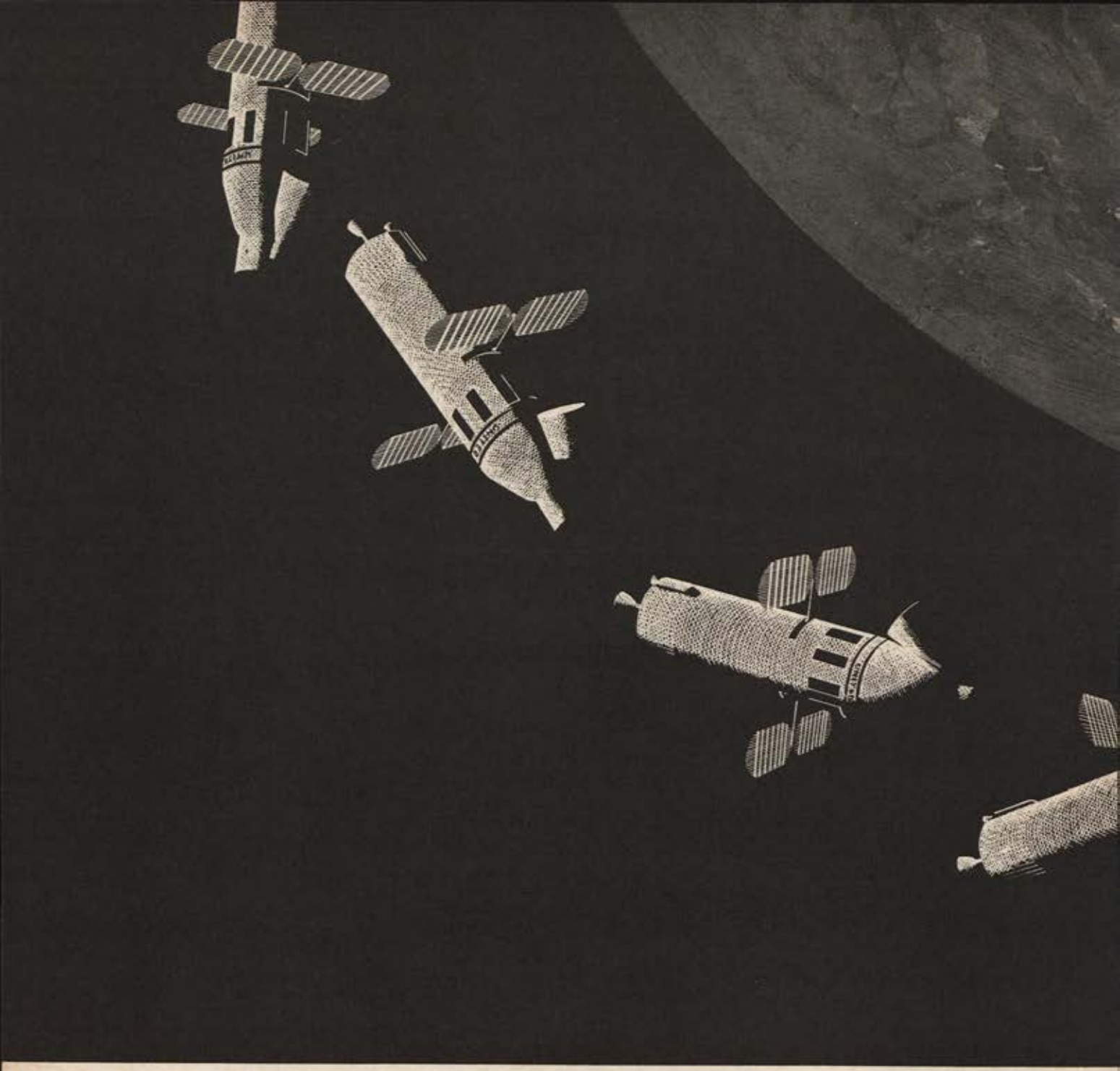

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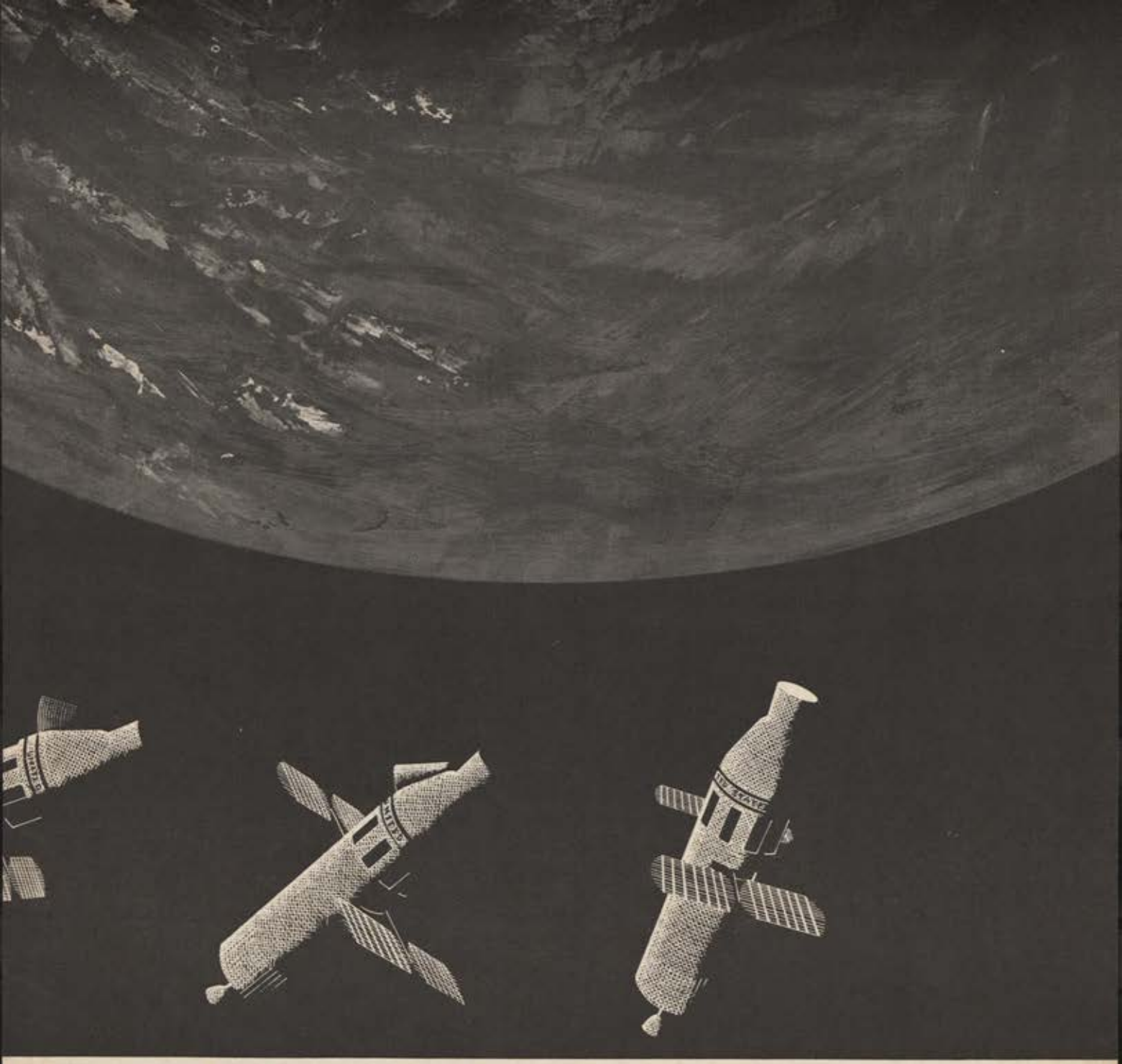
We are studying near-earth rendezvous and docking techniques.

And extending these studies into lunar and Mars orbit and fly-by missions.

We have a NASA/Douglas contract to study control and



on command and with precision?

stabilization systems for the Manned Orbiting Research Laboratory. And have extended this work for Manned Orbiting Laboratory application.

Our studies are in the areas of mission analysis and subsystem design and synthesis. Our hardware experience covers bi-propellant reaction controls, momentum storage devices, analog and digital electronic design, inertial guidance sensors, star trackers and sun sensing devices. If you're planning a manned space laboratory, we'd like

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Within the next two years, an American astronaut will leave his orbiting Gemini spacecraft and perform unprecedented maneuvers in space completely free and untethered.

That an astronaut will be able to accomplish such a feat is the direct result of space maneuvering programs launched by the Air Force and the Astronautics Division of LTV Aerospace Corporation in 1959.

The results of studies and experimentation has produced an AMU (Astronaut Maneuvering Unit) which literally converts an astronaut in a pressure suit into a one-man spacecraft for performing useful tasks in space. The first space-type AMU already has been delivered — 20 days ahead of schedule. At least six others will follow soon.

To be used initially as Air Force Gemini Experiment D-12, this AMU provides the Air Force with space maneuvering capabilities not only for Gemini, but also for future space programs.

At present, at least two flights are planned with the AMU during the Air Force's Experiment D-12. On the first mission, the astronaut will use a short tether. On the second, he will detach his tether and become the first astronaut in the nation — perhaps the world — to maneuver completely free and untethered.

These initial AMU flight excursions will be experiments in extra-vehicular maneuvering operations. The Air Force and LTV are now looking well beyond these initial research flights toward important space assignments for both manned and unmanned space maneuvering systems.

Experiment D-12 mission profile includes astronaut egressing from capsule on short tether, proceeding to adapter section, donning AMU and moving to nose of capsule where he performs checkout maneuvers, releases tether and begins flight sequence. Later returning to spacecraft, he fastens his back pack to adapter surface, re-enters Gemini. Mission complete.

untethered and free

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AIR FORCE and SPACE DIGEST

The Magazine of Aerospace Power
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VOLUME 48, NUMBER 10 — **OCTOBER 1965**

An Editorial

"Bless 'em All"

By Jess Larson

PRESIDENT, AIR FORCE ASSOCIATION

You'll get no promotion
This side of the ocean,
So cheer up, my lads,
Bless 'em all.

THE excerpt is from a bitter barracks-room ballad of the British Army. It became popular with our own troops during World War II. With a little editing it could be the theme song for the sidetracked Bolté legislation, which is designed to correct long-standing inequities in officer career management, inequities that go back eighteen long years.

When I started my term as President of the Air Force Association a little more than a year ago, I decided that our first priority should be matters that affect Air Force people—in their pocketbooks, in their career development, in every way they needed help. God knows there were many unsolved problems, and not all of them have been solved in the past year. Not by a long shot.

Only a year ago there was the famous, or infamous, "Standards of Conduct" directive, which cast, and still casts, a shadow on the integrity and morality of the career military man. AFA spoke out quickly and strongly on this matter and, we think, had some effect in the mitigating directives that were subsequently issued.

Then there was the matter of the badly needed changes in the dual-compensation laws, which prevented a government short of trained and dedicated manpower from utilizing to the fullest the services of retired military personnel. That, too, was a long, hard fight, and AFA was in the vanguard all the way. And, while the solution was not all that we could have wished for, the situation is a lot better under current legislation than it ever has been before.

Pay, of course, has always had a top priority in AFA. The battle to keep the military man abreast of his co-workers in civilian government and industry jobs is a never-ending one. But there is little question that the 1965 pay bill, so ably championed by Chairman L. Mendel Rivers of the House Armed Services Committee, is the best pay bill the services have had in many a year. And again, AFA was in the thick of the battle.

But we're not yet ready to "cheer up, my lads, bless 'em all." The pay scale is only half the problem. Equally important is where you stand on that pay scale in terms of rank. A captain who gets a pay raise is only halfway home if, in terms of length of service and comparison with his peers in the other services, he should really be a major. If a man lags in rank through no fault of his own, he is still being euchred at the pay table.

This is why a way has to be found to break the Bolté officer career management proposals out of the logjam. The excuses for delay in implementing a study completed in 1960 are legion. But none of them is good enough to satisfy me—or the Air Force Association. We have just gone through one more stopgap operation on Capitol Hill when USAF was authorized to exceed its statutory officer grade limitation for another year *(see "The Bulletin Board," page 90).* But this is one more in a long series of expedients. It is no real solution.

What is needed is a common standard of officer manning, promotion, and retirement in all services. The legislation arising from the Bolté study of 1960 is designed to provide just that. And it is particularly needed by the Air Force because of the great disparity in promotion opportunities between USAF and its sister services.

If the Bolté legislation is so important, and no one will say that it is not, just why is it yet to become law, after four years of fat-chewing? The House Armed Services Committee has indicated a willingness to take it up, providing the Senate will move also. But, it is said on the Hill, the Bolté bill is so complicated that overworked committee staffs have been hard put even to understand it, let alone revise it into passable, workable legislation.

It has been suggested that it be broken up into manageable pieces of separate legislation. But Bolté proponents say the problem must be considered as a package, that enacting some parts and failing to enact others would create more problems than would be solved.

Certainly the bits-and-pieces approach has not worked in the past. Nor can the relatively small congressional staffs be expected to massage the Bolté proposals into workable form without more help from the Pentagon.

It's a pretty sorry situation, in my view, when a piece of legislation so badly needed, and which is endorsed by so many and opposed by so few, lies moldering for want of an interpreter. Between the Pentagon and Capitol Hill, we have legal talent running out of our ears. There has to be a way to focus at least some of this legal expertise on the Bolté bill and get it out of the bottom drawer and into the hopper. The Air Force, with so much to gain, could take the leadership in this important matter. And let the midnight oil drip where it may.

Time is running out in this session of Congress. But early consideration next year is a must. The Congress will be receptive, I'm sure.

We have run out of excuses. How about a little action?—END

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Numerous lives have already been saved by versions of this proven ejection system. Over 1800 Douglas "Escapac" systems have been delivered to date.

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And how realistic they are! They duplicate the roar of airplane takeoffs and the approach of runway landing lights. A cockpit lifts, tilts and bounces in a rough airstream. Hot air is pumped into a space suit as the astronaut in his simulator plunges through the glowing atmosphere.

One extreme example solved by General Precision engineers for the U.S. Air Force is the approach of space vehicles in the Gemini rendezvous problem. The Agena is seen on a realistic visual display from distances 20 miles to 5 feet away. The entire approach is simulated over this distance—a range variation of 24,000 to 1.

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AIRMAIL

For a Better Showing

Gentlemen: John Loosbrock's editorial on American participation at the Paris Air Show in the August issue hit the mark squarely. Having attended the last five Air Shows and having had some professional concern with United States/European military industrial activity during the last twelve years, I want to underscore Mr. Loosbrock's analysis.

As a matter of economics and foreign policy, the United States has the capability and should make it its business to leave no ambiguities about who occupies first place in aerospace technology. The 1965 failure (which was happily saved in part by the Vice President and the astronauts) should not be repeated in 1967.

DONALD G. AGGER, President
American Nord-Aviation, Inc.
Washington, D. C.

A Matter of Rank

Gentlemen: In your September issue I notice an apparent discrepancy in the rank of SAC's Gen. Horace M. Wade, Commander of Eighth Air Force at Westover AFB, Mass. In one place you list him as a full general (in the "Photochart"), and in another place, with the SAC article, he is called "Major General." Which is the correct rank?

BENTLEY BYRD
Washington, D. C.

• *General Wade was promoted to three-star rank in January of this year. Our apologies to General Wade for not correcting in the one case and overcorrecting in the other.*—THE EDITORS

"Ruff's Riders"

Gentlemen: The article in the August '65 issue of AIR FORCE/SPACE DIGEST ["Tactical Air Support—Balancing the Scales in Vietnam," by Kenneth Sams] describing the meritorious flight of Capt. Richard Y. Costain and Capt. Doyle C. Ruff at Dong Xoai was of a great deal of interest to me.

I had the pleasure of being a student in Captain Ruff's flight at Moody AFB, Ga., in 1962. He always impressed me and every other student that was associated with him that he was the very best the Air Force had to offer. He always demanded nothing but excellence from his students and offered his students nothing but his best effort. His students called themselves "Ruff's Riders" and were very proud of that label indeed.

It was a great source of pride to me and to a great number of his other students to know that on the night of June 10, 1965, at Dong Xoai, "Ruff's Riders" rode again.

LT. CARL J. ARMANI
Kelly AFB, Tex.

Tribute to CAP

Gentlemen: In 1966 the Civil Air Patrol will be twenty-five years old. For the past few years I have been searching for pictures and written material on the CAP, eventually hoping to turn this material into a pictorial history.

I would like to hear from all former and current CAP members who can loan me additional material such as photos, negatives, newspaper clippings, magazine articles, logbooks, and general or human interest anecdotes. My need is particularly great for the early history of the CAP—1941 through the war years. All material will be returned to the senders.

The book will be a tribute to all Civil Air Patrol members and particularly to those who gave their lives in the performance of their duty.

W. J. VAN DE MARK
502 Linden Place
Cranford, N. J.

Hindsight

Gentlemen: Re Maj. Kenneth L. Moll's piece, "The Birth of the A-Bomb . . . and the Aftermath" [August '65 issue].

Admiral Leahy was merely up to standard when he called the A-bomb "the biggest fool thing," which "will never go off." Back in 1921 Leahy, then a captain, as Director of Naval Gunnery, was given the job of conducting tests of bombs against battleships before the Navy accepted the challenge of Billy Mitchell. It was only after Leahy had finished tests and reported that "the entire experi-

(*Continued on page 12*)

Smaller, more accurate, more flexible Univac digital computers adapt to a wide variety of aerospace applications.

Guidance has been a problem since the 13th century when the Chinese invented the first rockets.

On paper just about anyone can design a good guidance computer. The trick is not to build a guidance computer.

It's to design a compact digital computer that does everything a guidance computer can do, plus a variety of Command & Control functions and also gives the systems designer some elbow room.

And that's what we've been doing. Designing digital computers with such broad capabilities, they eliminate the need for approximation and pre-computation and can be used for things like re-targeting, in addition to guidance and navigation.

They're extremely fast, have a high-capacity internal memory, provide a large number of input/output channels, can be produced in quantity at low cost and surpass MTBF ratings and environmental parameters. Yet, because they use micro-electronic circuitry throughout, they're light and compact.

The 1824, for example, weighs less than 38 pounds and occupies about the same space as a portable typewriter. It's been adopted for several advanced Air Force Ballistic Missile Programs.

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Defense Systems Division
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ment points to the improbability of a battleship being sunk or even put out of action" by bombs, that Navy Secretary Daniels offered to stand on the bridge of a battleship while it was being bombed.

In view of the problem of AA missile sites in North Vietnam, is there not a parallel in the JFK-McNamara cancellation of our air-to-ground projectile and substitution of polygot A-ships? It would seem to me that such an air-to-ground weapon could knock out all missile sites with minimum risk, even using conventional warheads.

COL. SAMUEL TAYLOR MOORE,
USAF (Ret.)
Southport, Maine

Valley Forge Memorial

Gentlemen: Since 1777, Valley Forge has been a shrine to the heroism and sacrifice of the American fighting man. Now, as a permanent memorial to those who have followed in the footsteps of the early patriots of Valley Forge, Freedoms Foundation at Valley Forge is developing a Congressional Medal of Honor Grove. Encompassing fifty-two acres of this hallowed ground, the grove will provide individual recognition to the more than 3,000 men who have won the Medal of Honor since its authorization in 1861. The rustic woodland setting of the grove will provide an appropriate atmosphere for recalling the deeds of these men who loved liberty more than life itself.

Accompanying the grove will be an archives building which will house complete records of the deeds of all the Medal of Honor recipients. It will also house displays on the historical background of the Medal of Honor and on the significance and background of the other medals awarded in the armed forces for outstanding individual heroism and service.

One of the most interesting of these displays will be a collection of the various forms the Medal of Honor has taken in the little over 100 years of its existence. The Army and the Navy have always had distinctly different awards and since their origin, both medals have undergone three changes each. So there are eight historic designs in all. All of the designs retain the basic shape of an inverted star except for the Navy medal of the World War I period, which takes the shape of a cross bearing an anchor on each arm.

Because of the age and scarcity of some of the medals, they are not available through normal channels. For this reason, Freedoms Foundation is asking anyone having possession of a Medal of Honor to loan it to the archives building of the grove, where it will be placed under glass on public display with a suitable plaque recognizing the recipient and the donor.

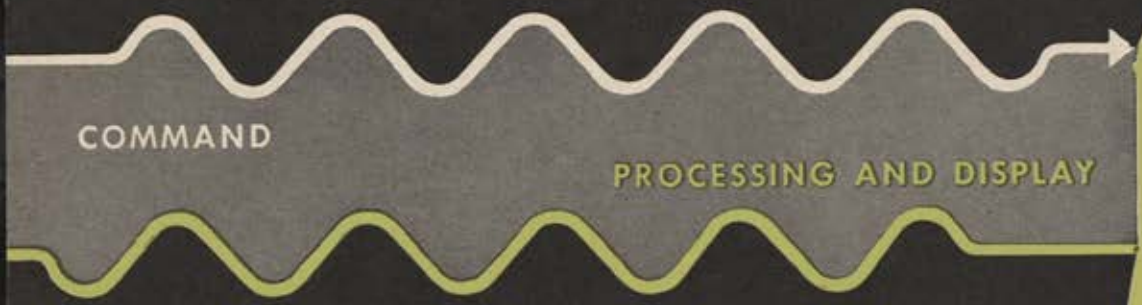
The Foundation will be most appreciative of any assistance that can be given in this worthwhile project.

GEN. BRUCE C. CLARKE,
Vice Chairman
Freedoms Foundation
Valley Forge, Pa. 19481

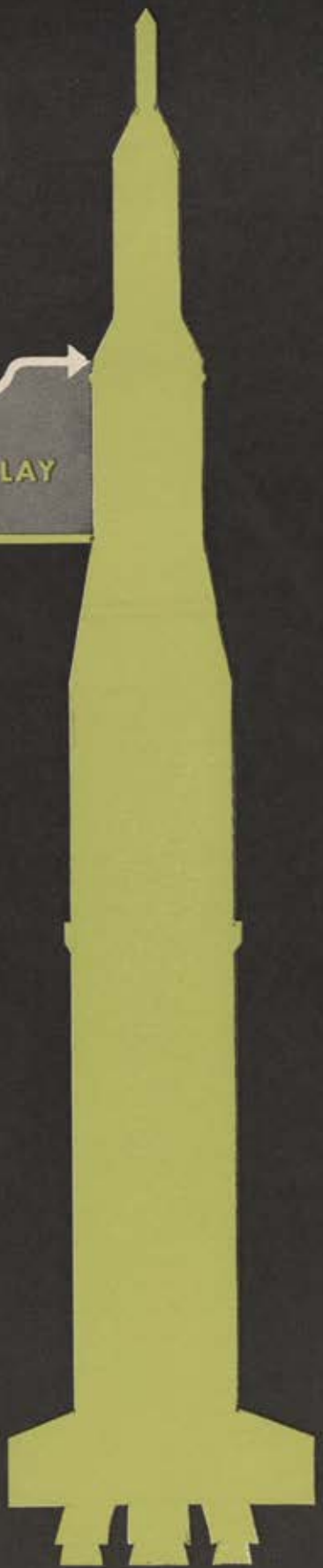
—By Joe Farris for AIR FORCE Magazine

"The way I figure it, I'm the 2,478th most powerful man in government."

On time/on cost



G-E Acceptance Checkout Equipment (ACE-S/C) delivered to NASA for Apollo Spacecraft and LEM analysis



MISSILE AND SPACE DIVISION GENERAL ELECTRIC

AIRPOWER in the news

By Claude Witze
SENIOR EDITOR, AIR FORCE/SPACE DIGEST

USAF in Britain

SOUTH RUISLIP AIR STATION, ENGLAND
SEPTEMBER 10

If France's General de Gaulle is right about anything, it is that change is inevitable. And there is no better place in Europe to scan the history of that change, so far as it relates to the role of airpower in defense of the western world, than right here in England.

South Ruislip is the home of the American Third Air Force, which traces its history back to 1948, when it was called the 3d Air Division, established here initially as a housekeeping operation for the Strategic Air Command. That was the time of the first Berlin crisis and probably the real beginning of the appreciation of the Communist postwar threat.

B-29 groups were sent to Britain, at the invitation of the British government. It was called operational training for the crews sent over on rotation. But the period was one of some strain with the Russians, and it was important for them to know the full truth, that the English-speaking allies had a big advantage in weaponry.

Well, the Third Air Force has been through everything since then. Its changing role, which will be reviewed here to illustrate the point, certainly stands as testimony to the fact that airpower is flexible and that it is the backbone of the NATO defense system.

Right now a major topic of conversation at South Ruislip is the continuing cooperation of USAF with the British Army in a joint training program. This had its genesis early last year when Wing Commander Thomas Stafford of the Royal Air Force was on duty as RAF liaison officer to the Third Air Force.

"We're probably going to have to fight together," he said. "Why in blazes don't we train together?"

The result is that the Third Air Force has a Close Air Support Program, and Wing Commander Stafford has been honored with the Order of the British Empire. The American pilots—from the 10th Tactical Reconnaissance Wing, the 81st Tactical Fighter Wing, the 48th Tactical Fighter Wing, and the 20th Tactical Fighter Wing—are flying an average of seventy to eighty sorties each month and getting more realistic training than most men in USAF cockpits.

The program was formalized in March of 1964, when the British Army invited USAF to join in exercises more or less as a guest, to handle close-support missions that the RAF and Royal Navy were unable to schedule. Soon there was a USAF Forward Air Controller attached to British ground units taking part in maneuvers at Practical Training Areas at Salisbury Plain, Stanford, and Otterburn. These are described as British Army training grounds similar to Fort Benning, Ga. In 1964 alone, USAF pilots flew 678 sorties over these maneuver areas.

As in war games at home, the pilots support alternate sides as they are assigned missions in the field and go after the targets named by their British allies on the ground. Some of these are ground attacks to clear the way for advancing soldiers. There is day and night photo reconnaissance and demonstration of strafing and rocketry with live, combat ammunition.

The latter is one of the unusual aspects of the effort. USAF tactical aircraft at British bases—the F-100, F-101, and soon the F-4C—are kept armed, for the most part, and ready for combat. The ammunition, however, has a limited shelf, or rack, life. Huge quantities of it must be disposed of, like old camera film, when it no longer is considered reliable enough for serious sorties, if they should be required.

In the past, these rockets, bombs, and bullets have been crated and hauled out of the country, at considerable expense, to be dumped in the North Sea. It was a form of unavoidable waste until the Close Air Support Program got under way. Now the stuff is used, giving these pilots more realistic experience than would be possible with training ammunition, which is less lethal. Some of the men, before coming to England, never had fired combat ammunition at tactical targets. And the cost of training ammunition is cut.

The British Army, of course, had no tactical targets on their practice ranges. USAF has provided these, moving old tank hulks, T-33 aircraft fuselages and convoys of discarded vehicles out to the maneuver areas. They are the kinds of wreckage shot at daily at Eglin and Nellis Air Forces Bases back home.

The USAF aircraft fly from five bases to the maneuver areas. From there on, the training is under the NATO team-concept program that works on the ground and in the air. The presence of the Forward Air Controller with the British troops lends a new flavor to the war gaming. What is more important is that the ground forces are learning more about USAF capability.

This is borne out in the complimentary letters that British Army commanders shower on Third Air Force headquarters.

"Air strikes by the 20th Tactical Fighter Wing," says a typical thank-you note, "were splendidly done and made us all realize what airpower and air superiority really mean."

This kind of missionary work may be one of the most important roles played by the Third Air Force.

The Third's strict mission is to stay combat-ready in case it has to fight. It is part of the United States Air Forces in Europe (USAFE) in peacetime, but if war broke out it would fall under operational control of the Fourth Allied Tactical Air Force. Other elements of the 4th ATAF would be the 1st Air Division of the Royal Canadian Air Force, the French First Tactical Air Force, the German Air Force's Tactical Air Division South, and the US Seventeenth Air Force.

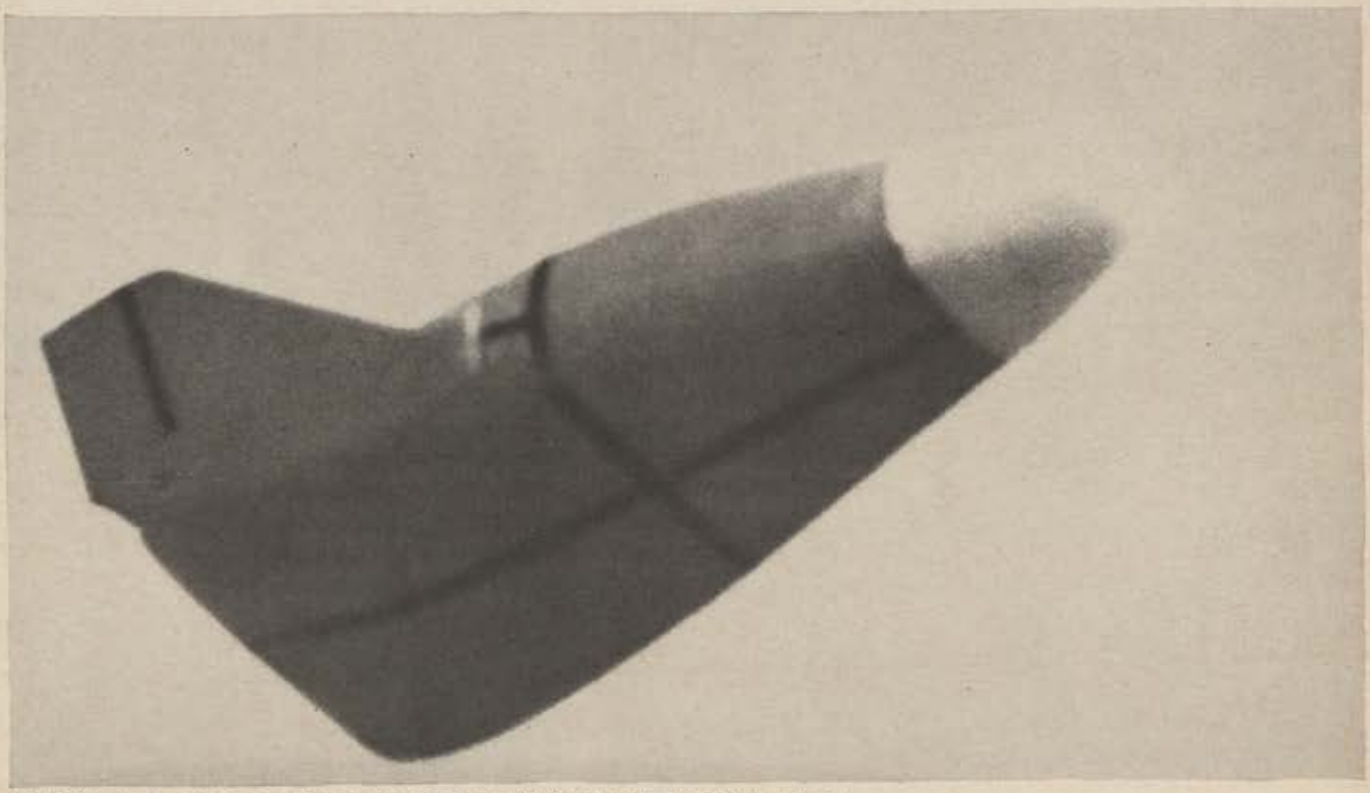
Being ready to fight in a tactical capacity is a long jump from the Third's first job in 1948, when it operated until 1951, under Headquarters USAF to control the SAC units that were rotating to Great Britain in those ancient times.

Since it started, there has been the Korean War, which

(*Continued on page 17*)

Continued progress in space requires a vehicle that maneuvers from orbit through hypersonic reentry to precision landing at any jet airport in the United States.

Creative engineering at Martin is making it happen.



PRIME lifting body, a step toward this goal, is scheduled for Air Force flight tests in space next year

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"He maketh the deep to boil like a pot..."

This was Anti-Submarine Warfare (ASW), Old Testament version (*Job* 41:31).

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followed closely behind the Berlin Airlift. Both situations gave the Third more work to do. The Airlift elevated the importance of England in the logistic system and resulted in the building up of strategic stockpiles. Then Korea led to further SAC activity and the establishment here of the 7th Air Division, which took over strategic operations and left the Third Air Force with the logistic and tactical responsibilities. These were the days when Gen. John P. McConnell, now USAF Chief of Staff, had the SAC command in Britain.

By 1951 Sir Winston Churchill, who had returned to head the government, said the USAF complex in England was a key force in keeping Russia from overrunning the continent. By mid-1952, the Third Air Force had an atomic capability and a military strength of 27,573. A program was launched to give the US forty-three major airfields, to house almost 2,000 aircraft. At the time, it was expected that in case of war there would be a monster SAC deployment to overseas bases.

But changes continued. The changes were in government, in the budgetary situation, the international atmosphere and, most important, in technology. The Third Air Force has felt all of them. Aerial refueling is an example. It worked, and by 1955 all but twenty-six of the planned forty-three bases had been eliminated. There were other changes in strategy and the temperature of the cold war.

Probably the most important one was the introduction of the Thor intermediate-range ballistic missile. This was a fast operation, as we look back on the dates. Construction was completed on the last Thor IRBM site in England in February of 1960. By April of 1963 we had started deactivation of the missile sites, and the job was to be finished by the end of that year. While it lasted, the Thor program brought new wrinkles. There was the Ballistic Missile Early Warning System (BMEWS) that went with the new weaponry, and in both cases it was the British who were to handle the operations. USAF was to provide equipment and help in the construction programs.

Back we go to international politics. President de Gaulle in late 1959 banned our atomic weapons from France. The Third Air Force got two new combat wings and moved to England where they were welcome. By 1961 the Third was cut back, with five wings transferred to the Seventeenth Air Force, on the continent, and plans were made to cut down on bases in the United Kingdom. This lasted only until 1963, when some NATO exercises showed deficiencies and the Third's operational mission was given back to it. Maneuvers of the past couple of years show that the Third is ready for combat.

USAF representative on the British, German, and American team evaluating the Hawker Siddeley P.1127 V/STOL aircraft at RAF West Raynham is Maj. J. K. Campbell, an experimental test pilot from Edwards AFB, Calif. With him is Hawker Siddeley's chief test pilot A. W. Bedford.

SAC is withdrawn, for all practical purposes, with no missile interest and declining need for bomber bases. And the Third Air Force, tactical in its combat capability, is training with the British Army. More changes will come.

The Hawker Siddeley P.1127 V/STOL fighter, shown in vertical flight above, is probably the most advanced V/STOL aircraft in the world. Scheduled for military unveiling October 1, it has been flying for about three years and is close to its 2,000th successful takeoff and landing.

P.1127

LONDON

The Hawker Siddeley P.1127, probably the most advanced V/STOL aircraft in the world—unless the Russians are prepared with more surprises—is scheduled to have its formal military unveiling on October 1.

Strictly speaking, there already is a fighter squadron of P.1127s. It has been in operation for evaluation of the plane for about three months at the Royal Air Force Station at West Raynham in Norfolk. And the squadron includes four Americans, as well as pilots and technicians from Great Britain and Germany.

USAF representative on the team is Maj. J. K. Campbell, an experimental test pilot from Edwards AFB, Calif. Campbell, who is forty-three and a native of Chattanooga, Tenn., started flying the P.1127 at the Hawker Siddeley testing ground at Dunsfold, Surrey, before he went to the RAF station.

Other Americans taking part in the evaluation are Lt. Col. L. K. Solt and Maj. J. A. Johnston, both of the US Army, and Lt. Cmdr. J. J. Tyson of the US Navy. An RAF Wing Commander, D. M. Scrimgeour, is commander of the squadron.

Later, both pilots and technicians from the US, Germany, and Great Britain will be assigned to study the performance and maintenance of the new fighters. The plane has been flying for about three years and is close to its 2,000th takeoff and landing. It has flown sideways at sixty knots, backward at twenty-five knots, and supersonically straight ahead.

The October 1 demonstration will be held for major military officers from the three nations involved in the program, as well as top NATO officers. Gen. Robert M. Lee, USAF, Air Deputy to Gen. Lyman L. Lemnitzer at SHAPE, will attend with other senior SHAPE officers.

The P.1127 is a single-engine aircraft designed for tactical strike and reconnaissance missions. It has a single seat. The engine can be vectored, or turned, to provide thrust straight down, straight back, or any position in between. Power is provided by the Bristol Siddeley Pegasus engine.—END

Letter from Europe

By Stefan Geisenheyner
AIR FORCE/SPACE DIGEST EDITOR FOR EUROPE

NATO—After 1969, What?

WIESBADEN, GERMANY

NATO is presently experiencing a crisis. It is certainly not the first one since the inception of the treaty organization in 1949, but it is definitely the worst disagreement so far, and, moreover, one that threatens to destroy the very roots of the NATO purpose—to serve as a deterrent. Where once stood a monolithic bloc of powers, endowed with a clear concept of cooperation, there is now a group of fifteen nations divided into four factions with diametrically opposed ideas as to what NATO's present and future policy should be. In 1969, the twenty-year period for which the treaty was signed in 1949 will have passed and as matters stand now, a renewal of the treaty in its original form and intent seems highly unlikely.

The text of the 1949 NATO treaty is so short and clear that it needs very little explanation. It will suffice, therefore, to give a rundown of the main points and policies to which the member nations subscribe:

- The peaceful settlement of disputes and abstinence from force or threat of force (Article 1).
- Economic collaboration among the signatory nations (Article 2).
- The strengthening of the means for resisting aggression both by individual national efforts and by mutual assistance (Article 3).
- Consultation in the event of any signatory being threatened (Article 4).
- Mutual assistance in case of aggression. (This major provision is contained in Article 5 and special reference is made to Article 51 of the Charter of the United Nations, which recognizes the right of individual or collective self-defense.)
- After the treaty has been in force for ten years, the members can request a review of the treaty to adjust it according to new developments (Article 12).
- After twenty years any party may cease to be a member (Article 13).

It has become common knowledge that this treaty has turned out to be a success. Behind the protective shield of the military alliance, Western Europe rebuilt its war-devastated economy, which, previous to this alliance, by its sheer poverty, had become a hotbed of communistic activity.

Joint scientific, economic, and military ventures brought the allied nations closer together than ever before. A steadily forward-moving, well-planned, and integrated rearmament program took place under the protection of the nuclear and conventional might of the US. Joint military programs came into being, such as a continental pipeline network, troposcatter installations, the G.91 close-support fighter, the F-104G multipurpose aircraft, and the Hawk and Sidewinder missile production efforts. Germany was rearmed and has become the strongest European partner in the alliance today. To the Eastern powers, NATO became the number-one enemy, since it formed a difficult-to-penetrate barrier against the expansionist policies directed westward. In fact, NATO had become a deterrent force which deflected the pressure from the East to other areas such as Vietnam or Africa.

Although almost everyone agrees that the treaty is, aside from the economic implications, a most useful political and military tool, one that should be kept handy and intact in case of need, the opinions differ as to what the task of the joint military forces should be, whether they should be conventionally equipped or armed with atomic weapons, and who should be in command of the nuclear forces. Furthermore, some member nations do not want to be drawn into the possible small wars of other NATO nations. A host of major and minor considerations involving political, military, and economic factors complicate the matter further, making it almost hopeless for the outsider to pinpoint the reasons for the ailments of NATO. At the risk of oversimplifying a very complex and fluid situation, but in order to better understand the problem of NATO's future, a breakdown of the nations' various basic demands

War-devastated Europe was able to rebuild its economy under the protection of the NATO alliance. Above, two F-102s of the US 32d Fighter Interceptor Squadron, Soesterberg, Netherlands, are part of the US commitments to NATO.

If British ideas for reorganization of NATO prevail, this British Gloster Javelin all-weather interceptor, as well as the USAFE F-105 behind it, would probably be withdrawn from NATO in line with the British plan for a gradual withdrawal of nuclear strike capability and a drastic reduction of NATO conventional forces.

—some still voiced only unofficially—will show the diversity of thought.

The US, originator and most powerful partner in the organization, seems to feel that the military situation in Europe is not too critical anymore and that a local nuclear conflict is unlikely. This does not preclude, however, the possibility of a controversy which might lead to a conventional war. Since the nuclear arsenal available in Europe at the present time is, in any event, sufficient to stop any local atomic attack, it is considered unnecessary to strengthen the nuclear strike force of the allies. Instead, a buildup of conventional forces is recommended. The major nuclear deterrent would be furnished by the US Strategic Air Command. This proposal would fit into the present frame of the NATO treaty and originates in the endeavor to stop, as much as possible, the proliferation of nuclear armament all over the globe.

This viewpoint contrasts considerably with British ideas, which favor a gradual withdrawal by the West of all nuclear strike capability from Europe under the assumption that the East would follow suit. In addition, a drastic reduction of conventional forces is proposed at the same time. This plan becomes feasible only if adequate American guarantees are given that its strategic nuclear strike forces would be used if Europe is attacked. This guarantee, in the British view, would prevent any outbreak of war in Europe. Small-scale conventional wars, however, would have to be fought alone by the nation attacked; if such a war were not terminated within a few days, the US would have to threaten to and possibly use its missile and bomber force. Since a small war of the type envisioned by the British would involve individual countries only, the extent of its defense buildup is left to the discretion of each and can be adjusted to the arms buildup of the opponent. Such a solution would favor Britain greatly, since she has no European borders to defend against the East. The whole load of the conventional defense system would be placed on the shoulders of the border nations—Germany, Italy, Greece, and Turkey—and on the US.

The decal on this Hawker Siddeley 1127 Kestrel V/STOL fighter-bomber symbolizes cooperation of NATO countries. Britain, US, and Germany jointly operate first VTOL squadron in the world, evaluating tactical potential of V/STOL.

As can be expected, the four border nations furiously protest the British plan, first, because the conventional arms buildup would place a terrific additional strain on their economies and, secondly, because they face the prospect of fighting a war alone. In fact, they claim that a treaty in this form would invite the outbreak of small-scale wars since the major deterrent of a combined NATO action is lacking. These four nations, which would have to bear the brunt of the first fighting, whether nuclear or conventional, propose strengthened conventional and nuclear forces. They adhere to the original NATO treaty condition that each member nation will come to the help of the other should an attack take place.

Lately it has become the custom to place all the blame for the NATO treaty troubles at the doorstep of Gen. Charles de Gaulle or France, since the French plan is the most radical solution proposed by any nation inside the NATO framework. France offers a plan basically very similar to the British proposal, in that every nation should fight its own small wars along its borders and that it should adjust the strength of its forces accordingly; no nation should be expected to participate in a faraway war, which is none of its doing. This philosophy comes from General de Gaulle's belief that the spheres of interest of Europe and the US are on such different levels that the latter just cannot be expected to fight Europe's battles on a nuclear scale. He therefore warns Europeans not to put too much trust in the use of the US nuclear force if the actual need arises. Why should the US risk being turned into a nuclear battlefield while fighting for some obscure city in Europe, which would mean nothing to the American public? This,

(Continued on following page)

Munitions experts from the Canadian, German, Belgian, and Netherlands Air Forces team up to load rockets on an F-84 during one of many NATO exercises. This one is in France.

indeed, seems to be a logical conclusion and is the basic reasoning behind the French endeavors to create an independent national nuclear strike force. A sizable French bomber force capable of delivering nuclear weapons is already in existence, and will be augmented in the not-too-distant future by ballistic missiles. Thus, in case of need, the French could strike with or without the consent of the US or NATO. Some sort of coordination with NATO is part of the French proposal, however, in that the treaty organization would provide target assignments and coordinate the use of the nuclear strike capability of France, the US, and Britain.

To sum up:

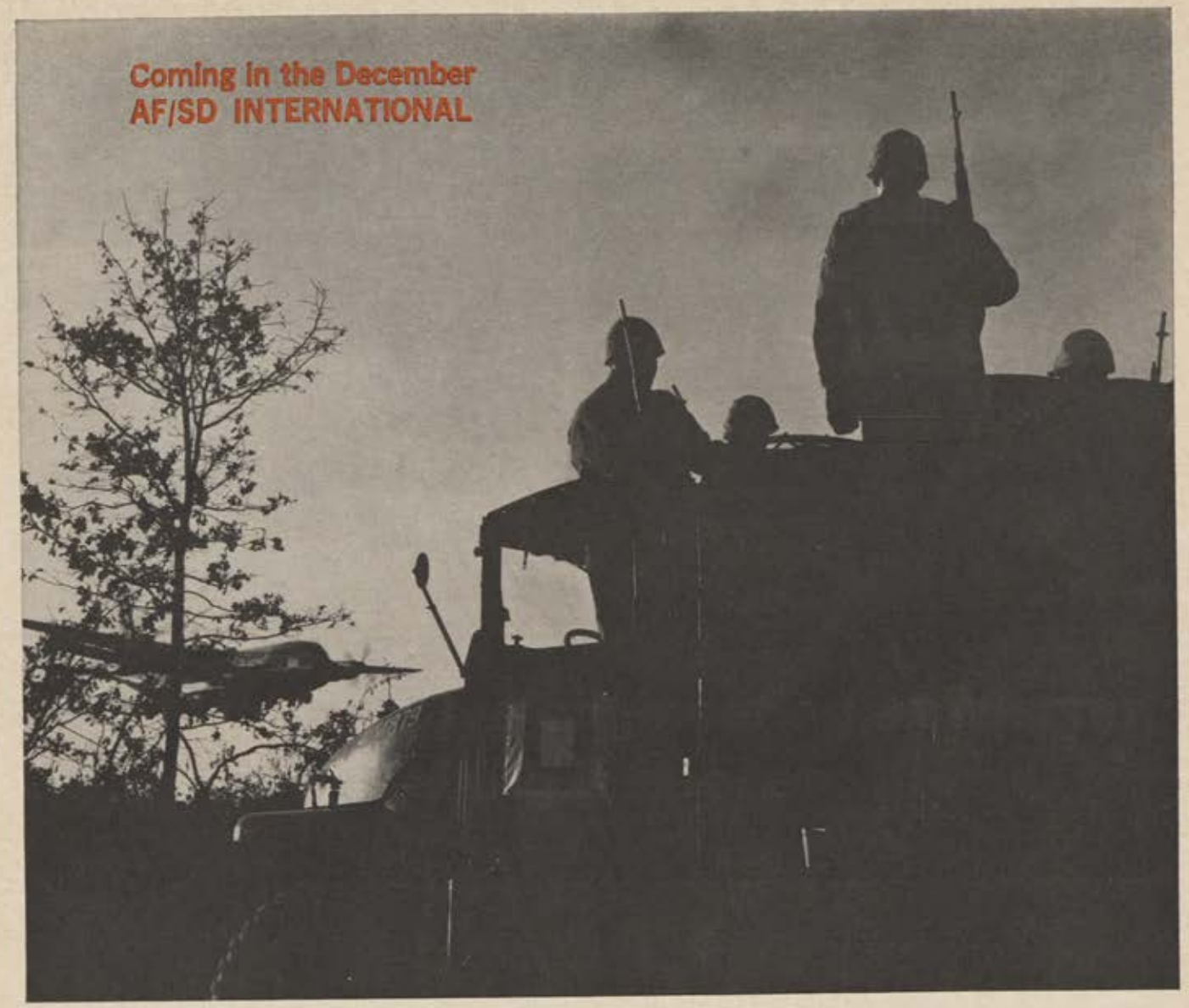
- The US wants strengthened conventional forces in Europe, with the framework of the NATO treaty remaining intact.
- Britain wants a reduction of nuclear and conventional forces, with small wars being the responsibility of the attacked nation; the nuclear deterrent to be furnished by the US.
- Germany and the other NATO nations bordering on the Iron Curtain want strengthened conventional and nuclear forces inside the present NATO framework.
- France proposes delegating the responsibility for fighting small wars to the nation attacked and, to prevent escalation into a bigger war, the use of independent European nuclear strike forces.

This bickering, which stems from nationalistic thinking and economic reasoning coupled with mutual distrust, seems to be wholly irrational in the face of the enormous inherent military and political powers behind the Iron Curtain, which are united behind a common cause—to bring the blessings of communism to the capitalist world. There is only one defense against this threat, and that is to arm at the same rate as the opponents. Every other solution—disarmament plans (as long as they cannot be effectively controlled), gradual withdrawals, or defense measures on a national level—amount to utter folly. The Soviet bloc has at its disposal in Central Europe 100 divisions, 21,000 tanks, 5,700 guns over 100 mm., 2,200 first-line aircraft, 400 medium-range rockets, and 355 ships including at least ninety submarines, sixty rocket-bearing units, and 100 landing vessels. Altogether, there are 2,000,000 men under arms. (This is a German defense ministry estimate. According to Mr. McNamara, 2,700,000 men are faced by 3,000,000 NATO soldiers. Conflicting statements like these add to the confusion.) The Soviet combat divisions, as well as those of their allies, are equipped with modern weapons, are fully mobile, and largely up to full strength. A decisive portion of these divisions can attack from their home bases. Moreover, the lines of communication and the rail- and roadnets through Poland to Russia have been strengthened considerably during the past years, so that fresh units can reach the western borders at high speed, possibly unnoticed by the West. For this reason, the withdrawal of the Soviet divisions behind the Bug River—as proposed by one disengagement plan—would serve political purposes only, since the units could be brought back to their staging areas overnight.

A common deterrent policy backed by 840,000 men, conventional and nuclear armed forces of the NATO nations, and, above all, by the missiles and bombers of SAC holds these forces in Central Europe at bay and has prevented an outbreak of war. On the whole, this policy has proved successful, and there is no substantial reason to deviate from it, in particular if one understands that a deterrent force is only as good as its credibility. As soon as this factor is lost, the whole defense effort becomes an empty shell, which a determined aggressor will try to crack if he has good reason to believe that the chances for all-out retaliation are slim. NATO's present difficulties are not insurmountable as such, as compromise among the divergent proposals can surely be found, but, in the meantime, the damage done to the credibility of the deterrent is serious.

The German philosopher Gen. Karl von Clausewitz said this, in his famous *Treatise on War* 150 years ago: "That nation is badly off which has to meet with half measures and restrained military forces an adversary who knows no other law than his inherent strength. Thus, every neglect of unity and activity will tip the scale in favor of the opponent, and only a small effort by him will suffice to conquer."—END

Seven aircraft from seven NATO nations line up on the apron of the Chaumont AB, France, runway, representing the cooperative spirit of NATO. Germany, Belgium, Canada, and the Netherlands fly the F-104G as a fighter-bomber; the French, the Mirage IIIC; the British, the Gloster Javelin; and USAF, the F-105, just one of the weapon systems in USAFE.



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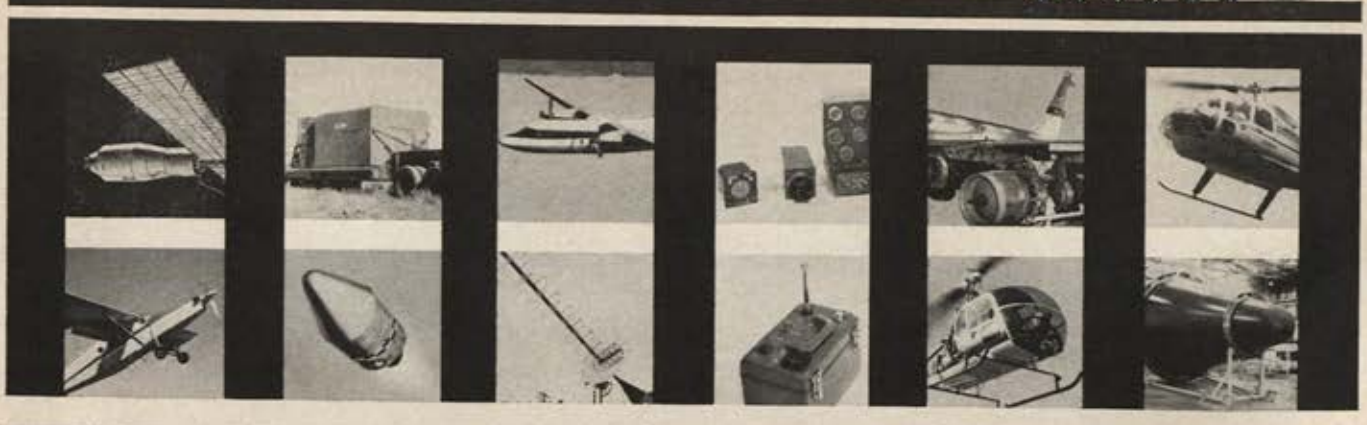

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News,
Views
& Comments

AEROSPACE WORLD

By Allan R. Scholin
ASSOCIATE EDITOR, AIR FORCE/SPACE DIGEST

WASHINGTON, D. C., SEPT. 14

A callup of some Reserve Forces by the end of the year seems definitely in the cards. This is strongly indicated by discussions in Congress on the Defense Department's $46 billion appropriations bill, still going on as this is written.

The point of contention is whether to give Defense Secretary Robert S. McNamara authority to transfer funds between the Reserve and National Guard, without prior approval of Congress. Mr. McNamara wants such authority specifically to build up four National Guard divisions to full strength between now and the time Congress reconvenes in January. Some members of Congress contend, however, that, given that authority, he will be able to carry out at least some part of the Guard-Reserve merger he failed to get by means of legislation.

Congress is in the middle on this one. The Armed Services Committees of both House and Senate have expressed opposition to Mr. McNamara's merger plans. Yet, if units are to be called, they should be brought to the highest possible state of readiness in the interim. And during that interim, Congress hopes to take a couple of months off before returning for the next session in January.

A compromise apparently designed by Rep. L. Mendel Rivers, Chairman of the House Armed Services Committee, and Sen. John C. Stennis of the Senate committee would allow the Defense Secretary to build up the four Army Guard divisions, if necessary, by shifting men, equipment, and funds from Reserve units.

Camouflage paint is being applied to USAF B-52 Stratoforts engaged in almost daily raids against the Viet Cong. So far, camouflage has been limited to tactical and theater support aircraft. Other Air Force planes may get it later.

Sen. Strom Thurmond of South Carolina, an Army Reserve major general, pointed out that if Mr. McNamara were given this authority he "would then be accomplishing in an indirect way, or through the back door, so to speak, what he has failed to accomplish through the front door. If funds and personnel are transferred, that is really all there is to it, in a way."

In reply, Senator Stennis noted that, "The matter could become more acute at any time, and could become greatly changed before Congress returns in January."

The dilemma will undoubtedly be solved before this reaches print, but it seems evident that neither Senator Stennis nor Congressman Rivers, both of whom had bucked Mr. McNamara on his merger plans, would now be willing to extend him this *de facto* authority unless a callup by January was practically certain.

There has been no mention in the congressional debates of the Air Guard and Reserve units linked with the four Army divisions for possible callup *(see "Aerospace World," September '65 issue)* primarily because no fund-transfer authority is required to bring them to full strength. Obviously, however, if the Army's strength is increased by mobilizing four Guard divisions, USAF will need the Guard-Reserve fighter and transport units to support them.

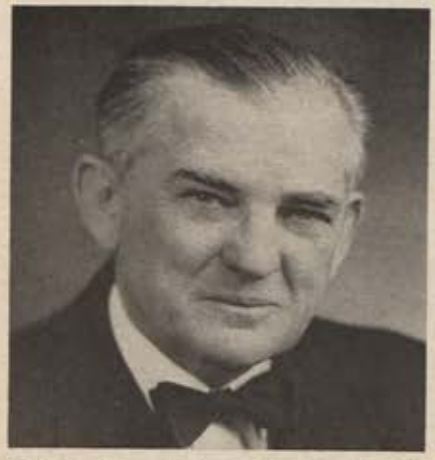
☆

When the football season gets under way in the US each year, spring is approaching in the Antarctic, and it's time for the Military Air Transport Service to launch another airlift task force in support of Operation Deep Freeze.

The Navy is in over-all charge of military participation in what is officially known as the US Antarctic Research Project, administered by the National Science Foundation. The

(Continued on following page)

With spring approaching in the Antarctic, MATS is moving its Deep Freeze task force force of C-130E transports into Christchurch, New Zealand, to work with Navy planes and ships in delivering personnel and supplies to the bottom of the world.



Senator Stennis has said that the US must make a decision in next session of the Congress on what to do about a replacement for the B-52 bomber.

Latest graduates of Aerospace Research Pilot School, Edwards AFB, are, kneeling, Capts. Floyd Stroup, Wendell Hull, Gerald Larson, Stuart Roosa, Henry Hartsfield, Jr., USN Lt. Gary Moore, and, rear, Capts. Barron Fredricks, III, Joseph Wuertz (USMC), Charles Duke, Jr., Spence Armstrong, Peter Hoag, Alfred Worden.

MATS contribution this season to what has been termed the greatest peacetime military logistics program in US history began in September when the 1501st Air Transport Wing at Travis AFB, Calif., made the first of sixteen C-135 Stratocruiser flights between the US and New Zealand.

At Christchurch, N. Z., a MATS task force of 115 men under Lt. Col. Robert D. Coffee, operating Lockheed C-130E Hercules transports, will make passenger and freight runs on alternate days beginning in November to McMurdo Station, Deep Freeze headquarters in Antarctica. They will be a welcome sight to the 290 Americans who spent the winter at McMurdo and other stations.

At the height of the Antarctic summer early next year, more than 4,000 US military and civilian personnel will be working on the subcontinent. Now entering its eleventh year, Deep Freeze still hasn't covered the entire region. Ten other nations, including the USSR, are also conducting research in Antarctica.

☆

Congress and the Defense Department are moving to a showdown next spring on whether or not to build the Advanced Manned Strategic Aircraft (AMSA) as an eventual replacement for the Boeing B-52 Stratofort.

As of now, considering the US involvement in Southeast Asia and the shooting war between Pakistan and India, it looks as though Secretary McNamara may be ready to concede that AMSA is needed.

"It is now clear that the Air Force will have to depend on something less than an aircraft developed specifically for the strategic bombing mission to replace the B-52s," Senator Stennis declared late last month in his presentation on the Defense Department's appropriation bill.

A bomber version of the General Dynamics F-111, tentatively designated the B-111, will probably be built, he said, but "this in no way lessens the requirement to proceed with the full development of an advanced manned strategic aircraft."

The Fiscal Year 1966 appropriations bill contains $22 million in new obligational authority for AMSA, which, added to funds available from prior year programs, gives DoD $46 million for development of ASMA components this year.

Senator Stennis pointed out that the Joint Chiefs of Staff had unanimously recommended that DoD proceed with the project definition phase during Fiscal Year 1966, but quoted Gen. J. P. McConnell, USAF Chief of Staff, as saying that "I think we can delay it until Fiscal Year 1967 at the latest."

"The record is clear," Senator Stennis concluded. "The Congress and the Executive Branch of the government must make a decision on this matter in the next session of the Congress."

Secretary McNamara, in directing stepped-up B-52 raids on Viet Cong concentrations, has acknowledged that heavy bombers can perform this role more effectively than even heavily armed fighters. As an interim replacement for B-52Cs through Fs, the B-111 would have capabilities beyond present fighter-bombers but well below the Stratofort in weapons payload.

Secretary McNamara has noted that it may take nine years to produce AMSA in operational quantities. If there will still be a bomber mission in the 1970s—and the possibility cannot be discounted, considering present events throughout South and Southeast Asia and the prospect that the NATO alliance will be substantially modified when that treaty comes up for renewal in 1969—development of AMSA cannot be delayed any longer.

☆

When the Air Force picks the crews for its Manned Orbiting Laboratory, they will come from among graduates of the Aerospace Research Pilot School, headed by Col. Charles E. (Chuck) Yeager, at Edwards AFB, Calif. The eighth class, made up of ten USAF pilots plus one Marine and a Navy officer, was graduated from the year-long course in September.

USAF graduates, all captains, are Spence M. Armstrong of Columbia, Tenn.; Charles M. Duke, Jr., Lancaster, S. C.; Barron Fredricks, III, Washington, D. C.; Henry W. Hartsfield, Jr., Birmingham, Ala.; Peter C. Hoag, Phoenix, Ariz., named top scholar and pilot; Wendell R. Hull, Tollesboro, Ky.; Gerald D. Larson, Jamestown, N. Y.; Floyd B. Stroup, Enid, Okla.; Stuart A. Roosa, Sessums, Miss.; and Alfred M. Worden, Jackson, Mich.

The Navy and Marine Corps graduates are Lt. Gary L. Moore, Eureka, Calif., and Capt. Joseph B. Wuertz, Washington, Ind., respectively.

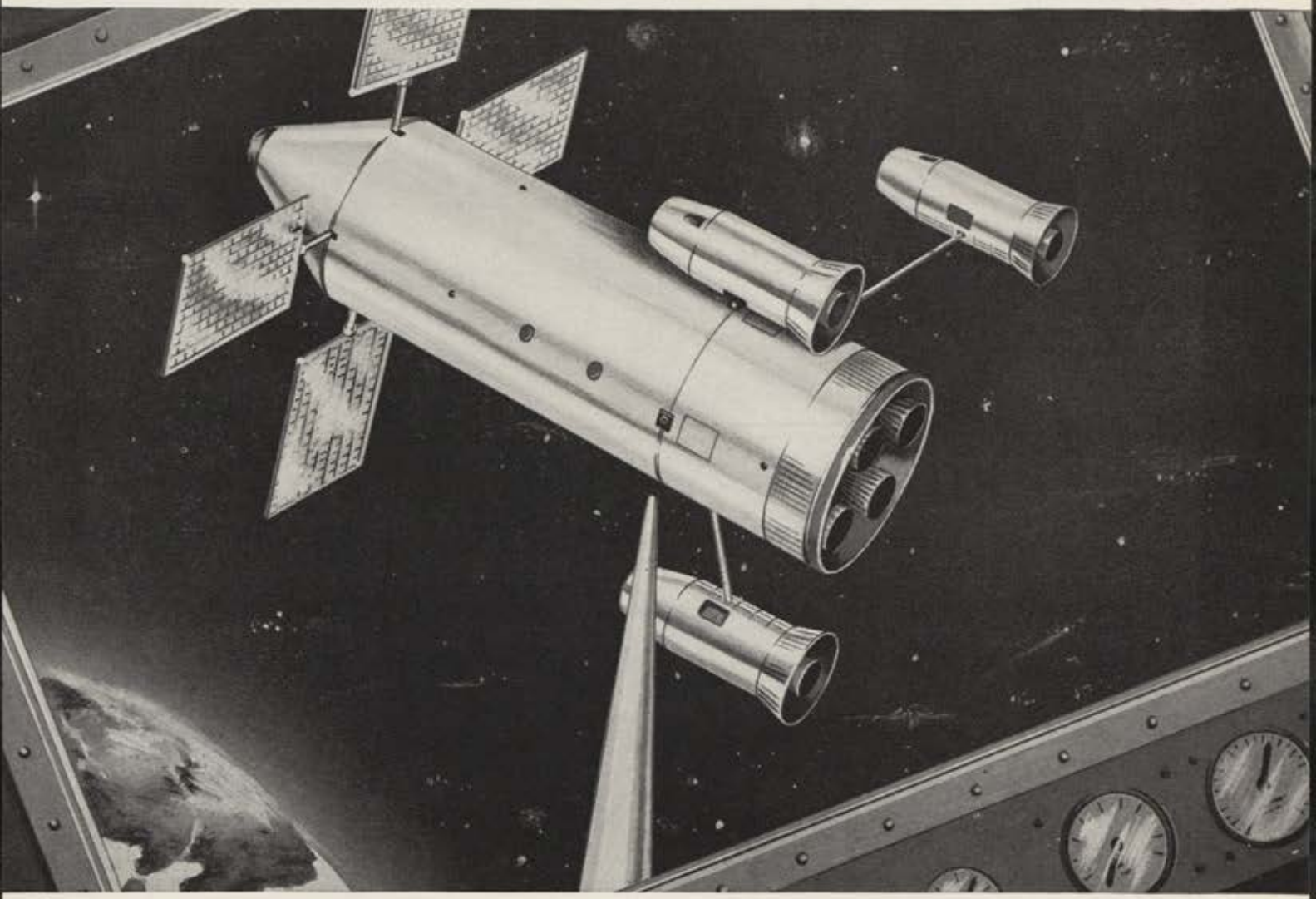
Three of the ten Air Force graduates—Duke, Hartsfield, and Worden—have been assigned as ARPS instructors. Four others — Fredricks, Hoag, Roosa, and Stroup—are remaining at Edwards as AF Flight Test Center research pilots. Armstrong goes to the Missile Development Center, Holloman AFB, N. M.; Hull to the Air Proving Ground Center, Eglin AFB, Fla.; and Larson to Nellis AFB, Nev.

Lieutenant Moore has been assigned

(*Continued on page 29*)

How to dock a spacecraft without rocking the boat

(Read how de Havilland's system using the STEM technique avoids dangerous impact)



First a word about STEM (Stored Tubular Extendible Member): Strip metal is heat-treated into a circular section so that the edges overlap by approximately 180°. This tube has a bending strength almost equal to a seamless tube of the same diameter and thickness. *But is just as light.*

Starting at one end, the tube is unbent and wound flat onto a drum. This means the tube is wound under strain. With a natural tendency to unwind and become a tube again. This stored energy can be used to extend the tube. (Or it can be extended and retracted by motor.)

The beauty of the STEM technique is that a long, rigid boom can be stored in a minimal amount of space. And can be extended and retracted quickly and simply.

How the STEM technique applies to docking spacecraft: In this application, the STEM technique is a boom system.

A 20 ft. motor-driven extendible boom attaches one spacecraft to another. When retracted, it pulls the two craft together.

The advantage of this system over conventional docking concepts is that the pilot can see the other craft up to and during attachment.

Catastrophic impact between the two craft is avoided. And final docking is carried out simply. Without the need for complex terminal guidance systems.

The STEM boom package weighs only 72 lbs. and measures only 24" long, 12" wide and 12" deep.

The STEM technique overcomes size, weight, packaging, density, and structural problems for other aerospace projects.

STEM developments for space programs include communication antennas, long gravity-gradient orientation booms, attitude control devices, despin and stabilization devices, lunar surface sensing probes and couplings for space structures.

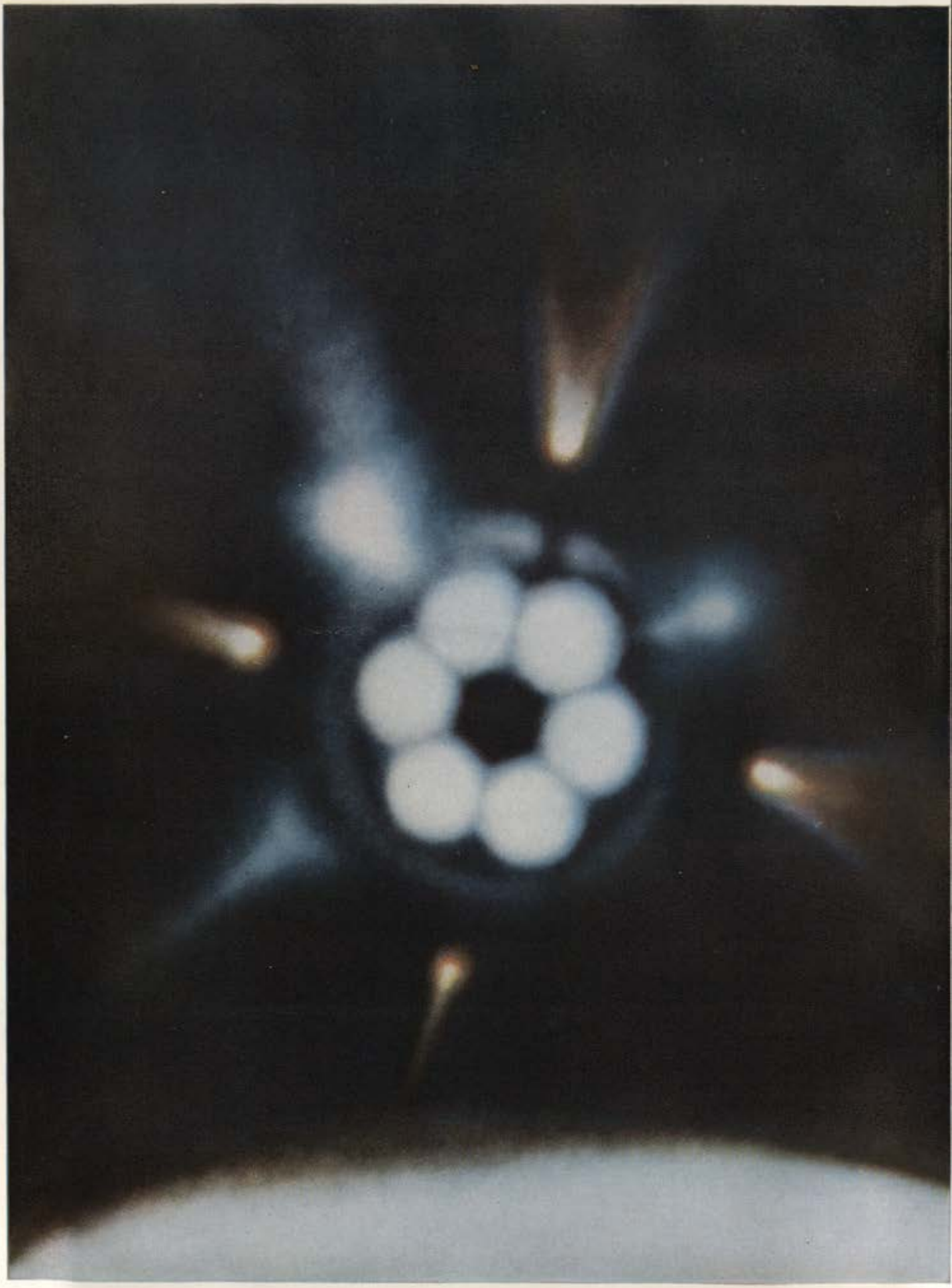
STEM devices have been used or are presently in use in Alouette, LOFTI, NASA Javelin, Scouts, TRAAC, Transit, POGO, Mercury, Gemini, Apollo and other space programs.

For more information on the versatility of the STEM technique, please write to the Sales Department.

THE DE HAVILLAND AIRCRAFT OF CANADA LIMITED

SPECIAL PRODUCTS & APPLIED RESEARCH DIVISION

MALTON ONTARIO



Photographed by a camera on the booster just after separation, NASA's Saturn S-IV stage, powered by six RL10 engines, accelerates 39,000 pounds into earth orbit.

SUCCESS 

Forty-four successful space firings prove the RL10's dependability for high-energy space missions.

Forty-four successful space firings have been accomplished by the Free World's highest-performance rocket engine, the Pratt & Whitney Aircraft liquid-hydrogen RL10. Performance has been flawless on every flight. This success stems from more than 936,000 seconds (260 hours) of cumulative operating time in over 6,650 full-scale firings at simulated altitude conditions. Individual engines have been fired more than 70 times without maintenance—equivalent to 10 round trips to the moon.

Versatility—Modified RL10s in full-scale engine tests have demonstrated variable thrust over a 25:1 thrust range, fluorine operation with a flight-weight engine, and 50 per cent increased thrust. This exceptional versatility, added to its demonstrated dependability, makes the RL10 engine the logical and economical choice for the next generation of high-performance, high-energy space vehicles.

Capability—The RL10 was engineered at the Florida Research and Development Center of Pratt & Whitney Aircraft. This Center, one of the nation's most advanced for research and development of high-energy liquid rocket engines, includes a full array of component and engine test facilities.

Pratt & Whitney Aircraft is ready today to meet tomorrow's propulsion requirements.

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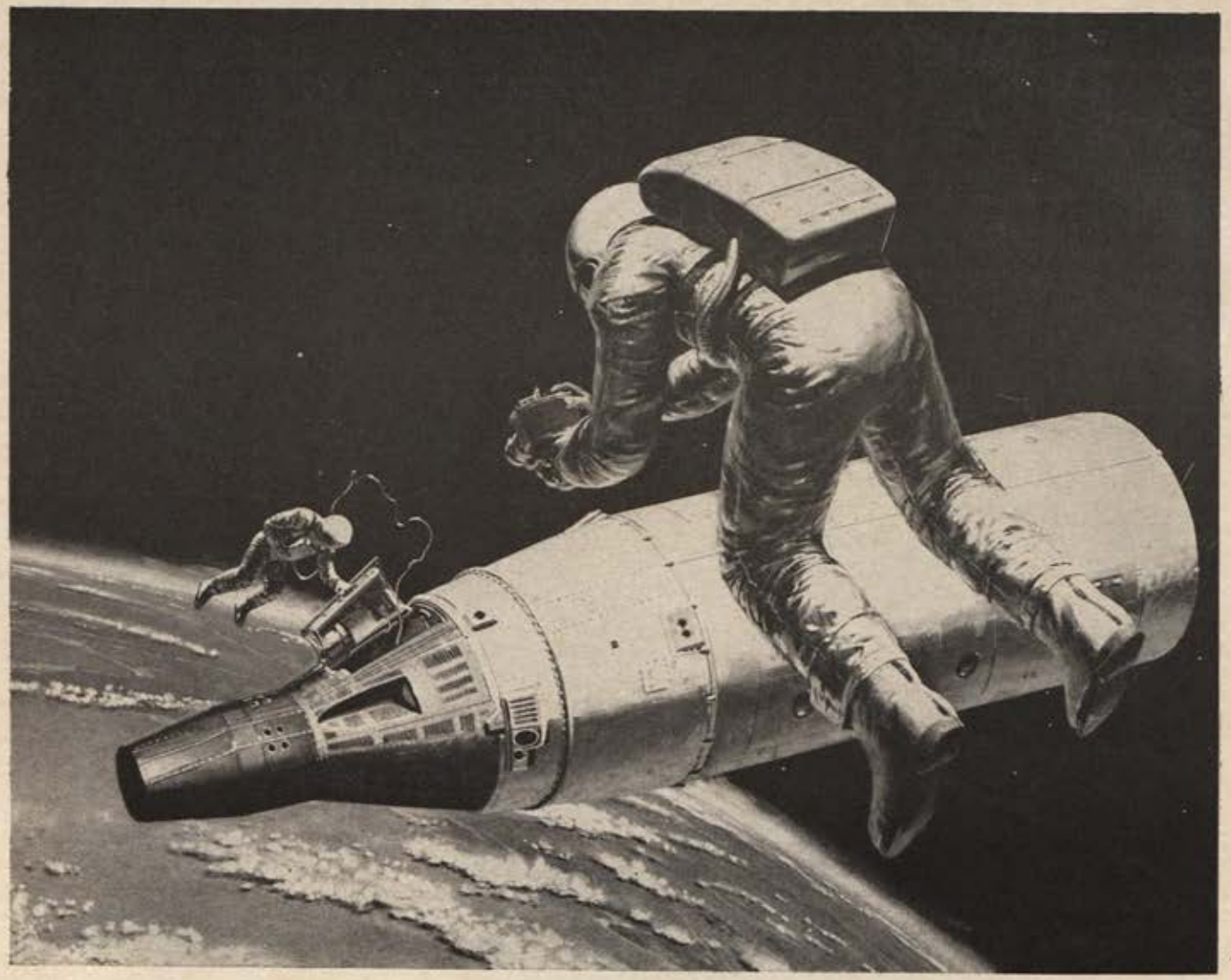


The AiResearch Integrated Maneuvering System combines life support, communications, propulsion, and stabilization for increased mission effectiveness.

Unique modular features are designed into Garrett's versatile AiResearch Integrated Maneuvering System (AIMS).

The basic module incorporates life support and communications. It provides atmosphere, heating, cooling and moisture control for up to four hours. The astronaut has a choice of self-contained or umbilical operation dependent upon mission requirements.

A stabilization module provides roll, pitch, and yaw control; off-center of gravity thruster capability, and stable navigation reference.

Hot or cold gas propulsion modules, incorporating wrist or pack mounted thrusters, can be integrated with the basic module to provide required impulse capability for the mission profile.

The Garrett-AiResearch modular concept offers maximum flexibility for both vehicle storage and mission planning.

The same reliability proved by Garrett's mission-tested environmental control systems on Mercury and Gemini is being designed into the AiResearch Integrated Maneuvering System.

Garrett *is* experience

GARRETT

AiResearch Manufacturing Divisions
Los Angeles • Phoenix

to the Naval Ordnance Test Station at China Lake, Calif., not far from Edwards AFB, and Captain Wuertz to the Marine Air Station at Cherry Point, N. C.

☆

A US Air Force Lockheed C-141 StarLifter has claimed the world weight-dropping title after successfully parachuting 70,195 pounds on a single pass over Southern California's Imperial Valley.

Seven huge pallets, each weighing slightly more than 10,000 pounds, were dropped from 5,000 feet above the desert floor. All seven pallets landed without damage within a half-mile area.

The National Aeronautics Association, with an official representative monitoring the thirty-five-ton drop, has requested the Fédération Aéronautique Internationale (sanctioning body of all official world aviation marks) to establish a new category for "heavy cargo paradrops," to bring official recognition to the record drop.

The Air Force's new four-engine fanjet cargo carrier had dropped 64,630 pounds in earlier tests, releasing two pallets on a single pass.

Logistically, the 70,195-pound record drop is equal to the combined weight of ten 105-mm howitzers—the type of equipment, along with rations, ammunition, and fuel, the C-141 will carry and drop on future missions.

In the record drop, all seven pallets —platforms measuring nine feet wide, eight feet long, and loaded five feet high with iron and steel bars simulating military equipment—were dropped from the C-141's gaping tail section within thirty seconds. Three 100-foot-diameter parachutes on each pallet lowered the weight to the ground.

☆

Private automobile accidents took more Air Force lives in the first half of 1965 than did aircraft accidents, Brig. Gen. Charles B. Stewart, Air Force Director of Aerospace Safety, has reported. A total of 170 USAF personnel were killed in automobile accidents, compared with 166 in air mishaps.

General Stewart said the Air Force is taking dramatic new steps to reduce automobile accidents. These include renewed emphasis on seat belts and other safety features and the use of investigating boards to determine underlying causes of accidents.

Three more direct approaches to safer driving were described by Maj. Gen. John B. Henry, Deputy USAF Inspector General, in a recent talk at

(Continued on following page)

WORLD

Stanford University, Palo Alto, Calif.

"Someone has estimated," he said, "that if all our roads were as good as our best roads, we would have ten percent fewer accidents. If all our vehicles were as good as our best vehicles, we would have another ten percent fewer accidents. But if all our drivers were as good as our best drivers, we would have *ninety* percent fewer accidents."

☆

Four US aircraft manufacturers have been selected to proceed with design studies for the advanced V/STOL tactical fighter which the US and West Germany plan to develop as a cooperative venture.

The firms, each of which was awarded a $1 million dollar contract for studies to be produced in six months, are Boeing, Lockheed, McDonnell, and Republic.

West Germany, in turn, has designated two firms to conduct parallel studies. They are Entwicklungsring Sud of Munich and Vereinigte Flugtechnische Werke of Bremen.

When both sets of studies are completed, a joint US-West German technical group now being formed at Wright-Patterson AFB, Ohio, will review the proposals. With approval by both governments, the winning US and German manufacturers would collaborate in producing aircraft for both countries.

☆

Two experimental V/STOL aircraft have crashed in the past month, one in the US and one in France, casting a blight on both projects.

In France, a USAF pilot, Maj. Philip E. Nease, Jr., of University Park, N. M., was killed when the Dassault Balzac VTOL fighter crashed near Paris on September 8. The Balzac had been converted from the original prototype of the Mirage III fighter to study problems of vertical flight and to test the control systems for Dassault's projected Mirage III-V V/STOL fighter. The Balzac, only one of its kind, had previously been damaged in a nonfatal crash in January 1964.

Major Nease's accident occurred only a few days after France and the US announced an exchange agreement under which USAF pilots were to fly the Balzac to gain experience in evaluating design proposals for a US-West German V/STOL fighter project (*see above*), while French pilots are to participate in test flights of the LTV/Hiller/Ryan XC-142 transport at Edwards AFB, Calif.

The US V/STOL crash involved the Curtiss-Wright X-19, a triservice

Curtiss-Wright X-19 experimental V/STOL aircraft crashed at Atlantic City, N. J., August 25. Both pilots ejected safely. Though airframe was apparently not at fault, triservice project, directed by USAF, is now being reevaluated.

experimental plane developed under Air Force supervision. After a number of hovering flights at Curtiss-Wright's plant at Caldwell, N. J., it had just been shifted to the FAA's National Aviation Facilities Experimental Center at Atlantic City to begin transitional tests and was on its first flight there when it crashed on August 25.

The plane was coming in to land when trouble of an undisclosed nature developed. The two-man crew—James V. Ryan, Curtiss-Wright's chief test pilot, and Bernard Hughes, on loan to Curtiss-Wright from FAA—succeeded in reaching a safe ejection altitude before the plane disintegrated. Neither pilot was seriously injured. Preliminary indications are that the airframe structure was not at fault. The accident has, however, cast some doubt on the X-19's future. A second prototype has been engaged in ground tests. Whether it will be reworked for a flight program depends in part on findings of the investigating board.

☆

News Notes—Increased airlift commitments in the Southeast Asia area have caused indefinite postponement of the 1965 MATS Aircrew Competition, which was scheduled for October. The annual competition evaluates MATS aircrew proficiency in aerial delivery procedures of paratroops and heavy equipment. The contest, which was to have taken place at Travis AFB, Calif., was canceled also because of a modification program involving the command's C-124 Globemasters.

Air National Guard commandos from Maryland and Rhode Island were to fly eight Grumman HU-16 Albatross amphibian aircraft to Europe and return in September on overwater navigational training flights in Exercise "Pink Slip." The Guardsmen, whose training is supervised by Tactical Air Command's Special Air Warfare Center, Fla., are members of Baltimore's 135th Air Commando Group and the 143d ACG, Warwick, R.I. Meanwhile, three New York Air National Guard elements of the 107th Tactical Fighter Group deployed to Hickam AFB, Hawaii, to fly close air support missions for an annual exercise with the US Army's 25th Infantry Division.

Tactical Air Command's 366th Tactical Fighter Wing from Holloman Air Force Base, N. M., has been selected to provide the first rotational squadron of McDonnell F-4C Phantom II multipurpose fighters to Alaska. The unit, the 389th Tactical Fighter Squadron, consisting of 372 men and eighteen aircraft, is now operating from Elmendorf AFB, Alaska, for a period of ninety days. Although air defense is their primary mission, the F-4Cs have an added responsibility for close air support and other tactical missions in providing training for units of the US Army located in Alaska.

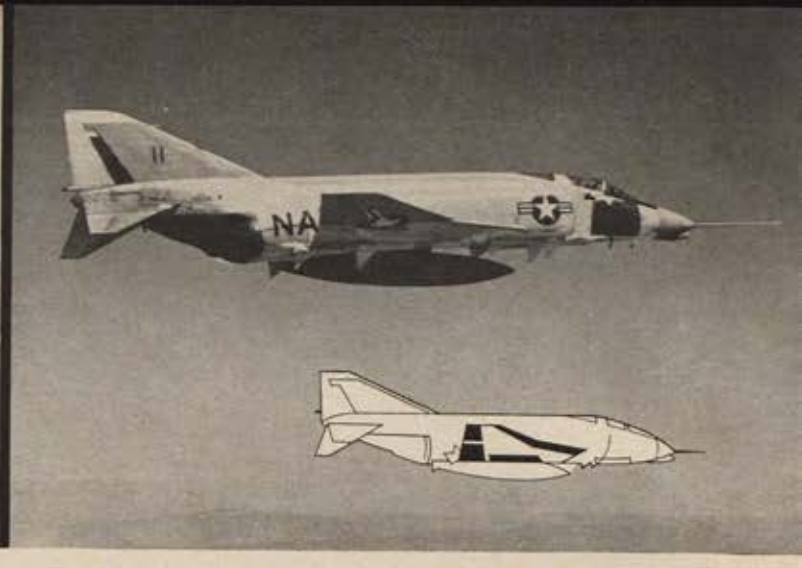
Winged air technological developments for the next decade will be the prime topic of discussion at the four-day International Congress on Air Technology scheduled for November 15-18 in Hot Springs National Park and Little Rock, Ark. About 1,000 of the world's foremost technical experts in every facet of winged air technology are expected to attend the first in a projected series of ten annual meetings. Sponsored by the Valley Education and Research Foundation of Arkansas and the Arkansas Industrial Development Commission, the event is intended to provide a continuing technical forum of top international experts in exchanging data on developments in air technology.

An Arabian prince is in pilot training with the US Air Force at Nellis AFB, Nev. Lt. Fahad Abdullah Mohammed Saud Al Kibar, nephew of King Faisal of Saudi Arabia, has been checked out in the T-33 and F-104. Saudi Arabia is reported to have selected the Starfighter as its new front-line tactical aircraft.—END

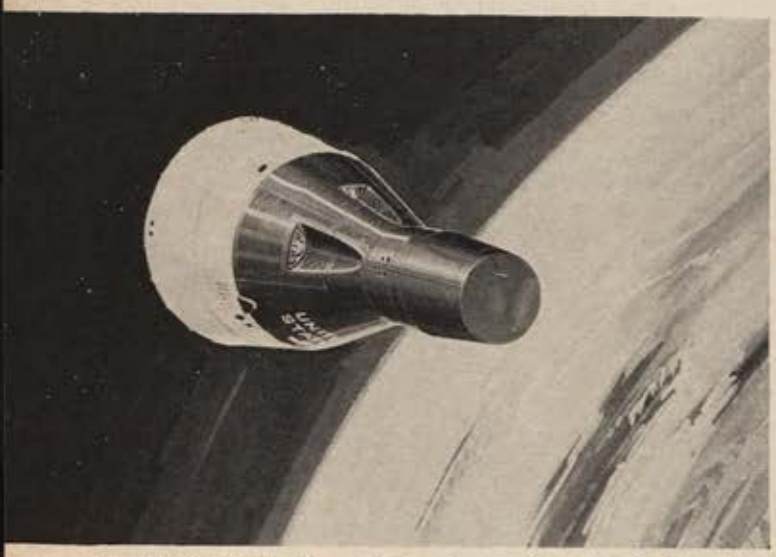
INDEX TO ADVERTISERS

BEECH "IMAGINUITY" AT WORK:

For Lockheed, Beech builds several wing sections, nose landing gear doors and emergency exit doors for the huge new U. S. Air Force C-141A "StarLifter" turbofan jet transport. This massive military cargo aircraft has speeds up to 550 mph.



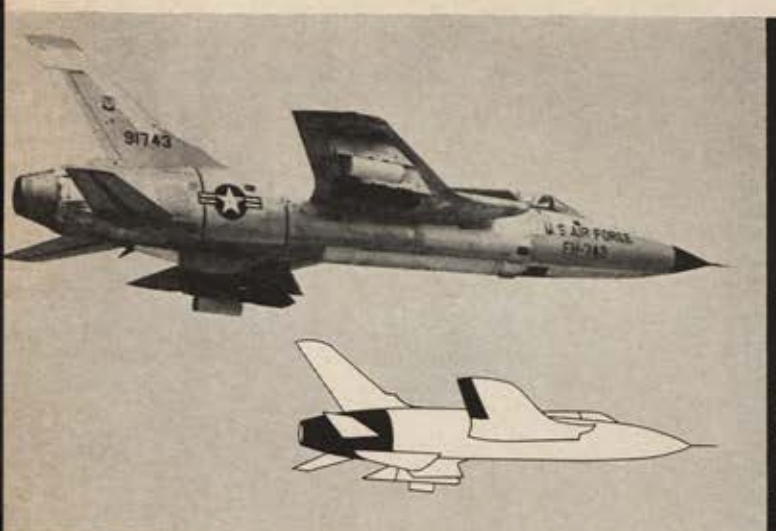
For McDonnell, Beech builds wing sections, flaps, ailerons, speed brakes, spoilers, landing gear doors and nose gear doors for the 1,500 mph Navy/USAF "Phantom II" jet fighter, considered one of the most versatile fighter-bomber-interceptors ever built.



For NASA's Project Gemini, Beech was chosen by McDonnell to design, develop and build the ground support equipment that supplies liquid hydrogen and liquid oxygen for the reactant supply system and the environmental control system aboard the Gemini spacecraft. Beech equipment is used at 11 vital points.

MAY WE BE YOUR "PARTNER", TOO?

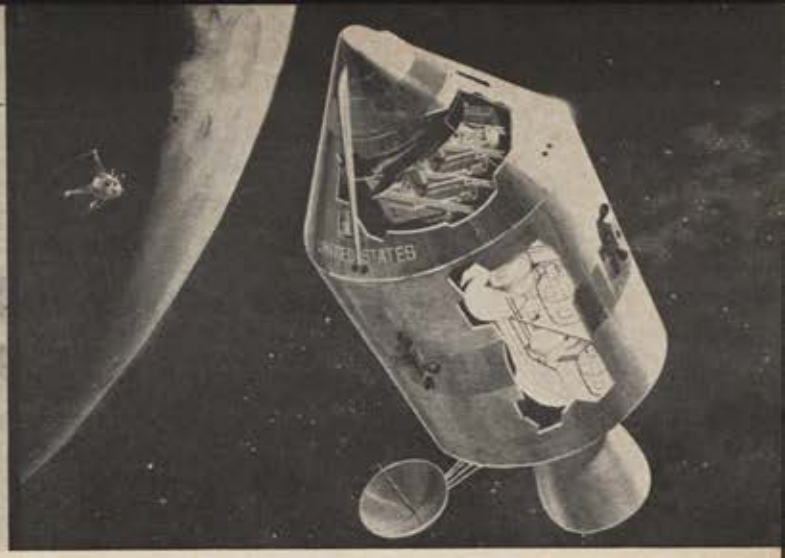
Beech's facilities, people and experience are ready now for you to use as your own on vital projects of any size.



The U. S. Air Force F-105 "Thunderchief" jet fighter-bomber, which can deliver weapons at twice the speed of sound, flies on Beech-built ailerons and aft fuselage assemblies. Beech has built major components for virtually every Century-series fighter.

For the LEM, Grumman selected Beech to assure complete systems responsibility for the design, development, fabrication, and testing of equipment required for storage, transfer, and loading of liquid helium – used aboard LEM to pressurize propellant tanks to assure proper flow in weightless environment.

For Bell, Beech builds metal bonded fuselage panels which contribute to the exceptional structural strength of the U. S. Air Army HU-1D "Iroquois" jet-powered helicopter. One of the fastest and most effective rotary-winged aircraft in our military services, the "Iroquois" also has Air Force and Marine use.



Chosen by North American to develop and build the Cryogenic Storage Subsystem to supply "shirtsleeves" atmosphere to the astronauts and generate electrical power for the Apollo command module. A cryogenics pioneer, Beech has made vital contributions in weight reduction and mission duration for space vehicles.

On these pages are just a few examples of how Beech's broad range of capabilities help many of America's leading prime contractors fulfill their responsibilities for vital military and aerospace projects.

Beech's extensive experience since the early days of World War II in meeting prime contractor's requirements ...Beech's reputation as a developer of new techniques ...and Beech's extensive facilities...have earned the respect of such outstanding industry leaders as Bell, Convair, Lockheed, McDonnell, North American, Republic, and others.

In addition, Beech has the ability to assume complete systems management responsibility for a wide range of space-age projects. An example is the U. S. Navy AQM-37A missile target system—the *first* missile target system to match the performance of the fastest enemy jets. A Beech project from concept to hardware, it is also the first supersonic target system ever to be designed, developed, tested and put into production by *one* company.

Among other special advantages that make Beech a preferred choice for any type of assignment are:

- **Unusually quick adaptability** to your processes and systems. No wasteful "break in" period while we learn. In fact, Beech so closely synchronizes with your own operation that it's almost like having another highly capable division of your own...overnight!
- **Immediate "go to work" capability.** Beech has pioneered in the development of new techniques of manufacture and is capable of applying them to your projects "right now." For example:

1. The forming and welding of titanium and other exotic metals—a relatively new field in which Beech is an "old hand."

2. Beech helped pioneer chemical milling methods for aluminum and stainless steel. This enables large and complex shapes to be milled more accurately and economically than by conventional methods.

3. Metal bonding facilities are outstanding at Beech—and experienced Beech craftsmen have exceptional capabilities in this field.

Beech "Imaginuity" in research, development and technical fabrication is already being utilized by leading prime contractors on many of today's military and aerospace projects.

Beech Aerospace Division projects include R & D on manned aircraft; missile target and reconnaissance systems; complete missile systems; space systems management; programs pertaining to liquid hydrogen propellants and cryogenic tankage systems; environmental testing of missile systems and components; and GSE.

The facilities, personnel and experience of Beech are at your disposal. A large staff of engineers, designers and technical specialists are ready for important assignments of any size.

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.

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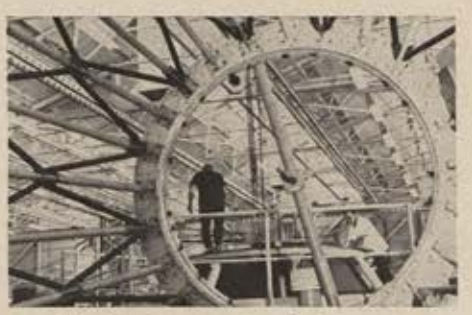
This is how North American Aviation is building the spacecraft that will take three Americans to the moon and return them to earth

The inner shell. At NAA/Space & Information Systems Division, the inner crew compartment of an Apollo command module takes shape. This leak-proof, pressure-tight shell is made of 2014 T6 alloy, 40% stronger and lighter than commonly welded aluminum alloys. To weld this structure, NAA made epic advances in tooling technology.



Precision jig. Shaping one Apollo crew compartment requires seventy giant tooling jigs similar to this one. Each jig is built to exact measurements, optically checked. This is why North American Aviation fabricators can hold to tolerances as minute as .010 inch on a space vehicle that stands 14 feet high, with a 13-foot base diameter.

Honeycomb structure. Strips of metallic honeycomb must be cut to exact dimensions and bonded to surface of crew compartment. Over the honeycomb go sheets of aluminum alloy to form a tough, lightweight sandwich panel. Honeycomb technology, using aluminum, was first developed by North American for the F-86.

The outer shell. The other main part of the command module is a heat-proof stainless steel honeycomb shield which fits over crew compartment. The two shells join early in the fabrication process for an exacting compatibility test. This remarkable stainless steel honeycomb technology was first developed by NAA for the XB-70.

Heat shield. Bolted to bottom of inner crew compartment, this shield must bear re-entry temperatures as high as 5,000°F. The outer shell then leaves NAA to be covered with the ablative heat shield. Ablative material is held in a fiberglass honeycomb matrix providing positive attachment method to assure high thermal-structure reliability.

Final assembly. Mating of the two Apollo shells takes place in Building 290 at NAA/S&ID. This is the world's largest clean room—1,500,000 cubic feet of meticulously controlled air space. Here subsystems are installed. And here the completed command module is tested with service module and launch escape system.

The Apollo command module is being built for NASA by North American/Space and Information Systems Division. S&ID is also building the Apollo service module and the S-II stage of the Saturn V moon rocket. North American Rocketdyne is building the rocket engines for all three stages of Saturn V.

North American Aviation

Atomics International, Autonetics, Columbus, Los Angeles, Rocketdyne, Science Center, Space & Information Systems

AIR FORCE
OCTOBER, 1965

The decision to proceed with the development of the Air Force Manned Orbiting Laboratory is one of the most significant of the space age—more important than the Apollo moon-landing declaration—because it expresses the determination of the US to explore military man's potential contribution to national security through enhancement of the performance of already highly productive unmanned instrumentation. In particular, MOL's manned surveillance from space promises an important new Air Force role in arms control. MOL and its successors may help lead the way to "controlled peace" on earth from space in a dangerous era. The assignment of MOL to the Air Force in no way threatens the present role of NASA. Indeed, it creates further areas of true cooperation between the Defense Department and the civilian agency. NASA, meanwhile, will continue to study new space exploratory missions for the country which will be judged on their merits . . .

MOL: Evolution of a Decision

By William Leavitt

ASSOCIATE EDITOR, AIR FORCE/SPACE DIGEST

PRESIDENT Johnson's order to proceed with development of the Air Force's Manned Orbiting Laboratory is one of the most significant political decisions of the space age that started in earnest with the launch of the first Soviet Sputnik, October 4, 1957.

- The decision ranks in importance with the May 25, 1961, announcement by President Kennedy of the Apollo moon-landing program. In terms of real significance, MOL is even more important than the Apollo decision.
- It signifies the commitment of the Administration and the Defense Department to an orderly "on-location" analysis of man's military usefulness in space.
- It marks the end of earlier policies which assumed that NASA efforts would provide the necessary base for manned military space systems.
- For the first time, it gives the US Air Force, operating as the space development agency of the Defense Department, a specific role in manned spaceflight operations. This new role transcends the considerable and growing support of the National Aeronautics and Space Administration that the Air Force has provided from the beginning.
- It serves notice to friend and foe that this country intends to use near-orbital space for national-security purposes, to crack the Communist secrecy curtain. At the same time, the world is assured that we will honor our pledge not to deploy weapons of mass destruction in orbit. MOL is not a weapons carrier.
- It assigns to the Air Force a significant potential arms-control mission using orbital crews. Should manned reconnaissance prove as fruitful as expected, the path will be cleared for the "controlled peace" envisioned in the March 1960 article on these pages by AIR FORCE/SPACE DIGEST Publisher James H. Straubel, in which he discussed the vast potential of orbital surveillance.
- It further cements the tie, which has grown year by year in the time since Sputnik, between the Air Force and NASA, with both agencies now engaged in the business of operational manned spaceflight. MOL may be expected, more than any other national program, to create a truly cooperative atmosphere in which both agencies can work together, and separately, for the scientific advance and national security of the United States.
- It offers the US Navy, increasingly concerned

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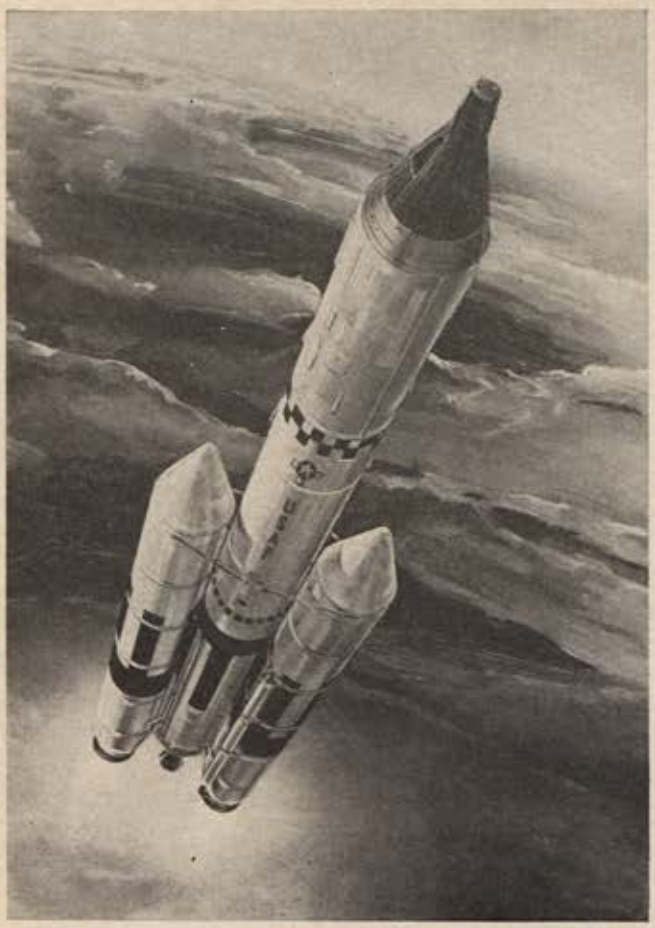

MOL at a Glance

Above, artist's conception of Titan IIIC launching MOL, with Gemini capsule atop it, into orbit.

Estimated Cost of MOL: $1.5 billion. **Program Director**—Gen. B. A. Schriever, USAF, Commander, Air Force Systems Command, reporting in MOL capacity to Air Force Secretary, Dr. Harold Brown. **MOL Vice Director**—Brig. Gen. Harry L. Evans, USAF, Office of the Secretary of the Air Force. **Deputy Director**—Brig. Gen. Russell A. Berg, Space Systems Division, AFSC, Los Angeles, Calif.

Major Contractors: MOL laboratory design and development—Douglas Aircraft Co. Experiment integration—General Electric Co. Major subsystem contractors—not yet announced.

Launch Vehicle: Major contractors for Titan IIIC: systems integrator—Martin/Denver; technical direction—Aerospace Corp.; propulsion systems—Aerojet-General, United Technology Center; guidance—AC Spark Plug Division of General Motors Corp.; facilities—Ralph M. Parsons Co.

Reentry Vehicle: Gemini-B capsule, which is approximately the same as the configuration used by NASA except for a hatch cut into the ablation-type reentry shield: prime contractor—McDonnell Aircraft Corp. Launch areas—Cape Kennedy, Fla., and Vandenberg AFB, Calif.; planned near-polar orbital launches from Vandenberg AFB.

Flight Test Program: Two unmanned MOL vehicles and five manned versions will be orbited. First launch of fully equipped unmanned MOL scheduled for 1968. First manned launch scheduled for late 1968.

Configuration: Forty-one feet long, ten feet wide, weighing 25,000 pounds, MOL will be divided into two compartments of approximately equal size, one pressurized to serve as crew quarters with some 400 cubic feet of unencumbered space for each crewman. A shirtsleeve environment, requiring no spacesuits during the thirty-day tours, is planned, and a two-gas environment—oxygen/helium or oxygen/nitrogen—at 5 to 7.5 psi. Rendezvous capability expected to be built in, but no definite plans have been announced. Using Titan III transtage, maneuvering capability is possible. Extravehicular capability will be available and may be bed for construction of large structures such as the antenna shown on pages 44 and 45.

with antisubmarine warfare tactics and world ocean surveillance, an important opportunity to enhance—from space—its abilities in these fields.

- It will probably eventually offer the US Army similar opportunities. Among the potential uses of the Manned Orbiting Laboratory and its successors is tactical observation. It is not too fantastic to envision close observation from space of enemy operations ranging from troop movements to riot-fomentation.
- It potentially enhances national command and control in crisis or war. MOL could lead to deployment, in the near future, of strategic command posts in near-earth orbit.
- It offers the potential (*see front cover*) of relatively simple linkups of a number of MOL canister laboratories to form more useful space stations.
- It will provide valuable answers to questions beyond those associated with manned military utility in space. It will also serve the Apollo moon-landing program by gathering data, before the moon landing, of human physiological and psychological response to month-long space missions. This data will be useful, not only to the moon-landing program, but also to expected NASA extended orbital operations and lunar-surface exploration.

Evolution of a Decision

The evolution of the MOL decision took a very long time—far longer than the so-often-cited twenty months since the original announcement of the program back in December 1963, shortly after the accession of Mr. Johnson to the Presidency and coinciding with the cancellation of the Air Force X-20 Dyna-Soar manned orbital glider program.

It goes back as far as the strong American reaction to Sputnik that resulted in the transformation of the old research-oriented National Advisory Committee for Aeronautics into the National Aeronautics and Space Administration, designated by the 1958 Space Act as the country's prime space-exploration agency. Since then, there has been a running argument, in and out of government and in the press, over the question of the military role in space. Indeed, the original drafts of the Space Act that created NASA were so fuzzy as to national-security aspects of astronautics that to read them now in the cold light of 1965 is somewhat unnerving. For instance, the Eisenhower Administration draft of the Space Act bill projected military space activity this way:

". . . The Congress further declares that such [air and space research] activities should be directed by a civilian agency exercising control over aeronautical and space research sponsored by the United States, except insofar as such activities may be peculiar to or primarily associated with weapon systems or military operations, in which case the agency may act in cooperation with, or on behalf of, the Department of Defense."

Defense Department objections to such vagueness were blunt. A later draft proposed to simplify the wording to: "[NASA] shall act in full cooperation with the Department of Defense insofar as such activities

are peculiar to or primarily associated with weapon systems"—a somewhat stronger assertion of DoD space prerogatives. That wasn't much of an improvement. And Dr. Herbert F. York, then Chief Scientist of the newly formed DoD Advanced Research Projects Agency, which had gathered in all existing military space programs in the months after Sputnik, commented sharply at the time to the House select committee on space:

"It sounds as though they [NASA] are in charge but . . . are supposed to cooperate with us. Space is a place and not a program. . . . In this country I do not think we consider that the ocean belongs to the Maritime Commission and the Navy has to get permission to operate there. The same way with space. If the DoD wants to put up reconnaissance satellites, I don't see why the civilian agency should have anything to say about it. The reconnaissance satellites are for military purposes. They are flying through space and operate in space, but it seems to me they are military from start to finish."

The objections of Dr. York and others prevailed, and under the prodding of the Senate's special space committee, then chaired by Sen. Lyndon B. Johnson, the final version of the Space Act reserved clearly for the Defense Department the prerogatives of military space research and development. The applicable wording read this way:

". . . The Congress further declares that such activities shall be the responsibility of, and shall be directed by, a civilian agency exercising control over aeronautical and space activities sponsored by the United States except that activities peculiar to or primarily associated with the development of weapon systems, military operations, or the defense of the United States (including the research and development necessary to make effective provision for the defense of the United States) shall be the responsibility of, and shall be directed by, the Department of Defense; and that determination as to which agency has the responsibility for and direction of any such activity shall be made by the President. . . ."

In the context of the immediate post-Sputnik period, the Eisenhower Administration passion for civilian control of any greatly expanded national space effort was understandable. Not only was it rooted in the essential tradition of civilian supremacy in the US government. It also symbolized the deeply felt hope that agreement with the Russians to exclude all military activity from space might be possible. And it reflected Administration fears that overly space-minded military services—Army, Navy, or Air Force—might neglect their jobs in the here and now. There was a distinct danger of such star-gazing, particularly in the Army, where the Wernher von Braun team at Huntsville, Ala., could barely contain its enthusiasm to enter the ground force in the space race. Von Braun's enthusiasm and skill were demonstrated in the successful orbiting of Explorer I in January 1958. That feat somewhat loosened the hook on which the country was impaled after the Sputnik embarrassment. In the Air Force, too, there was much enthusiasm for manned military space programs, and there even was an instruction from ARPA to prepare plans for such a program.

The Air Force came up with a project, MISS (Man in Space Soonest), described in the May 1958 issue of this magazine (*"Blueprint for Tomorrow's Spacecrews,"* AIR FORCE, *May 1958*). MISS was handed over by the old Air Research and Development Command to NASA when the civilian space agency came into existence in October 1958. MISS was modified by NASA and evolved into the Mercury program. But the Air Force was deeply involved in the ICBM development program at the time, and the missile effort's priority overshadowed all other endeavors.

The Navy, too, was eager to enter space in a manned way. It had offered its entry in the post-Sputnik triservice man-in-space project competition instituted by ARPA and won by the Air Force with its MISS proposal. MISS had been developed with cooperation of the old NACA, then fast on its way to becoming NASA.

More Than Words

But the eight-year evolution of the MOL policy decision that President Johnson announced on August 25 involved much more than legislative terminology. Man's military space role soon became the question. No matter what the specific terminology of the Space Act, it is likely that the Defense Department would have continued its various *unmanned* near-earth orbital space programs, either openly and independently of NASA by Presidential direction, or, if necessary covertly, as in the case of the U-2. Acknowledged almost from the first was the potential utility of space in unmanned reconnaissance, communications, and early warning. The analogies with the early uses of aviation were obvious.

By the time of the transition from the Eisenhower to the Kennedy Administrations, the issue of manned military activity in orbital space began to boil. The Air Force, which was assigned prime responsibility for military space research and development from Defense Secretary Robert S. McNamara in March 1961, pressed the view that the only way man's military usefulness in space could be determined would be to put military men into orbit in military vehicles. "Stick time" in space was the requirement, the Air Force argued. But the general view in DoD was that NASA manned programs would provide sufficient "insurance" in the defense area, and that DoD could take advantage of NASA's data and flight experience as needed. The well-known lead-time problem was ignored.

At first, hopes ran high for attainment of such stick time in the still-alive Dyna-Soar manned orbital space glider, development of which plodded along in a kind of decisional limbo until December 1963, when the project was canceled.

Dyna-Soar finally fell victim to a combination of pressures. It was argued that by the time it flew in orbit, Dyna-Soar's technology would be outrun by on-going programs such as the NASA Gemini effort. It was said that not much would be learned about human reaction in orbital flight during the short

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times in orbit expected. And the important contributions Dyna-Soar might have made to broad path reentry and landing at conventional airstrips were discounted as not vital. These technical arguments, advanced mostly within the DoD Secretariat, were overshadowed by political questions. The Kennedy Administration was concerned over the "bomber in orbit" appearance of the Dyna-Soar, even though Dyna-Soar was a research vehicle and successor to the X-15 rocket airplane. The Kennedy advisers were bothered, too, by the developmental bill for Dyna-Soar in a period when the first resistance to the sizable cost of the moon program of NASA was beginning to jell.

Within the Air Force itself, Dyna-Soar support was divided. In some quarters, including some planners in the Air Force Secretariat, support continued strong. In other quarters, a combination of political and technical judgments encouraged the view that the Dyna-Soar was a lost cause and that the most sensible course for the Air Force would be to press for eventual approval of some sort of manned military orbital research laboratory. In such a lab, learning what could be *done* in space, rather than flight itself, would be the paramount purpose of the crew.

The orbital research lab idea was not new. During the Kennedy years, the Air Force had produced a number of ideas for such a manned facility in orbit, as well as the "Blue Gemini" proposal, all geared to on-site analysis of manned military utility in near-earth orbit. These proposals all ran smack into opposition, either in DoD, where specific missions were demanded for such Air Force ideas, or in NASA, which was unenthusiastic about competition in the near-earth orbital area.

A new feature of the political side was the signing of a number of "treaties" between DoD and NASA, in which both agencies promised to consult with each other in the formulation of near-earth manned space projects and in which each appeared to have a veto over any proposals of the other. The outlook, by the fall of 1963, seemed dim for manned military orbital programs. The NASA Gemini program was primarily geared to support of the Apollo moon-landing effort, and could not be expected to provide much in the way of national-security fallout, the Air Force pointed out meanwhile.

The Johnson Era

On November 22, 1963, Lyndon B. Johnson assumed the Presidency. Fate intervened to place in the White House the former Senator from Texas who had played a major role in the Senate and as Vice President in the formulation of the US space program. Senator Johnson and his colleagues in the Senate space committee had helped ensure the presence in the Space Act of wordage sufficiently strong and clear to allow DoD to work in space for national-security purposes. As Vice President, he had helped to formulate the momentous Apollo program commitment. As President, he was now destined to make the series of policy decisions that led to the MOL announcement of August 1965.

Within weeks of assuming the Presidency, Mr. Johnson, on the advice of Defense Secretary McNamara, announced the cancellation of the Dyna-Soar program. At the same time, he announced a decision to develop an Air Force Manned Orbiting Laboratory (MOL). No one thought at the time that the specific decision to proceed with MOL development would take another twenty months.

A new kind of commitment had been made—a commitment to explore the question of what man could do militarily in space. This decision marked the beginning of the end of the DoD policy, described above, of depending essentially on NASA developments for "insurance" in the national-security areas of space operations. It was a decisional milestone, from which there would be no turning back. It represented a logical implementation of the view expressed by the Kennedy Administration that the US would operate programs not only to explore space but to maintain the peace through space technology. Among the vigorous proponents of that view was Dr. Edward C. Welsh, Executive Secretary of the National Aeronautics and Space Council.

Some observers saw the new President's 1963 MOL announcement as a kind of sop to an Air Force denuded of Dyna-Soar and as a move to forestall his political opposition's increasing criticism—in anticipation of the coming 1964 Presidential election—of a national space policy that pressed an "all-out" assault of the moon but at the same time demanded specific military requirements and missions for any proposed manned military space project.

There is no doubt that the President was extremely sensitive to the potential impact of such criticism in a period that only a year before had seen a Soviet attempt to outflank the US with missiles in Cuba. But there was more to the decision than domestic politics. The cold realities of world power relationships were even more significant in the decision to give the Air Force an opportunity to demonstrate what uniformed men might do in orbit. The President has clearly understood those realities. He has recognized not merely the potential technological-surprise threat from the Soviets, despite their relative quiescence since the departure of Nikita Khrushchev from the scene. He has seen, too, the enlarging menace posed by a militant Communist China, which bears watching not only from Hong Kong but also from orbit. He has accepted the idea that if trained human eyes and ears, monitoring instruments and selectively using them, can enhance surveillance, then the money to be spent on MOL will be well spent. Just an inkling of the sort of data that can be obtained potentially from expert surveillance of the Chinese mainland is suggested by Dr. Yuan-Li Wu's article, "Solving the Red Chinese Puzzle from Space" (SPACE DIGEST, *February 1964. Excerpts are reprinted on page 40*).

In the nearly two years since the original MOL announcement, so much has happened that one can only skim the history here. For one thing, the MOL effort has spurred a new and useful kind of exchange between the Air Force and the DoD that, despite frequent differences of approach and attitude, has pro-

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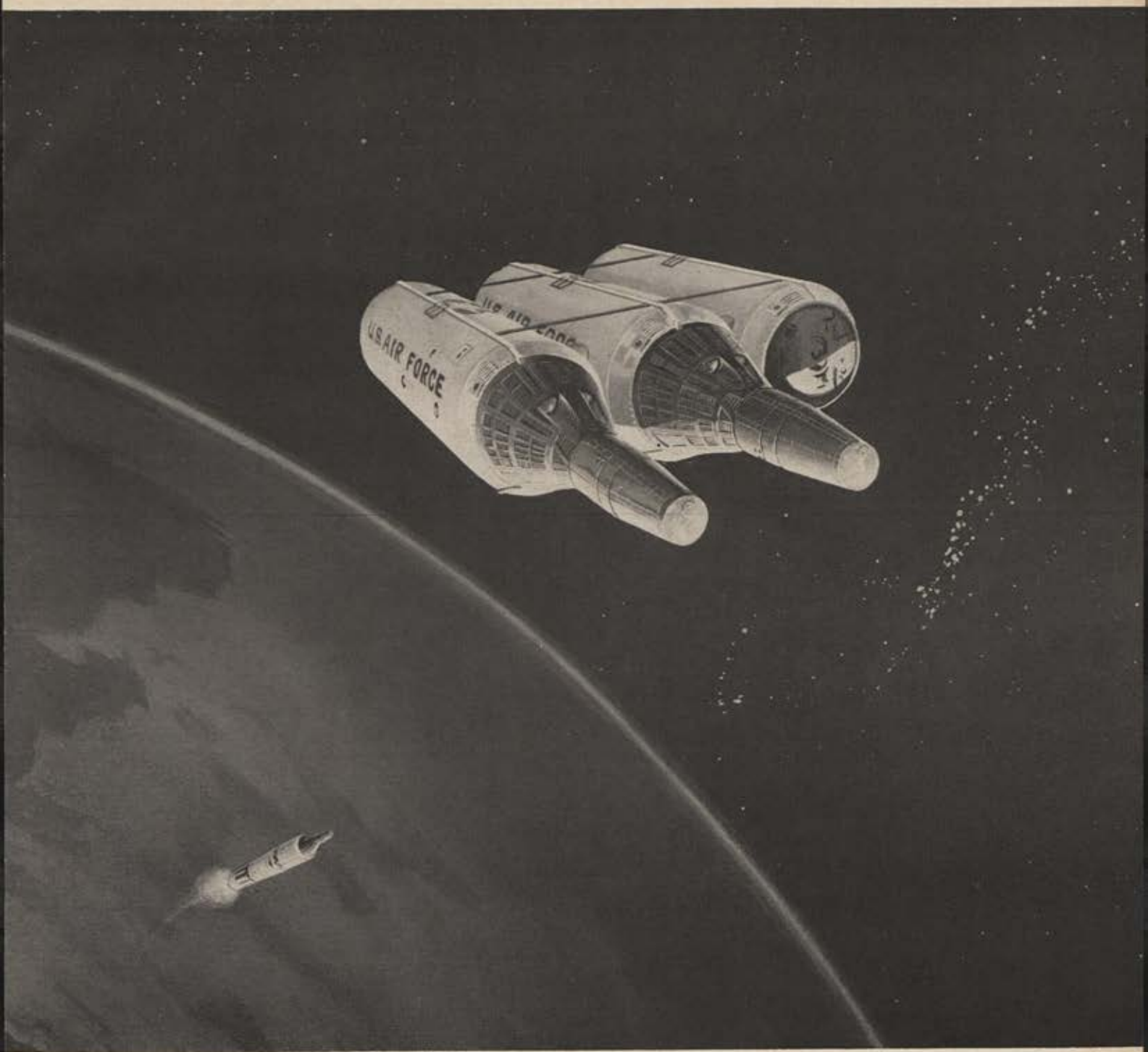

—Illustration by Richard Schlect

Three MOL vehicles are docked together in the artist's conception above. According to DoD announcements, the MOL design will include provisions for rendezvous and docking, but no firm plans for such operations are now being made. However, extensive rendezvous and docking operations probably will be necessary to accomplish the main MOL objective—to obtain firm answers about man's ability to perform complex operations in space. A long series of these complex operations are of interest. Most of them concern reconnaissance of land, sea, and air activity, analysis of great masses of data, rapid interpretation of critical information, and timely relay of this information into the DoD command and control network. In short, MOL will be the highest ground available to the military. All signs today lead to the prediction that it will be a most useful US observation station. However, to support and improve today's highly complex command and control system, the MOL must carry many cameras, infrared devices, radar and other electronic reconnaissance devices, computer-operated data interpretation and recording aids, plus data links and voice communications equipment to maintain contact with the ground. Sizable power supplies must be available for such equipment, and any space station which houses it all must be quite large. A single MOL vehicle does not have the capacity. Its maximum allowable weight is 25,000 pounds, of which 20,000 pounds must be devoted to the crews, their reentry vehicle, and their life-support systems. The 5,000 pounds remaining for experimental equipment is far short of what is needed to make the MOL into an effective reconnaissance and command and control vehicle. Four MOLs docked together (the three already docked plus the fourth being boosted in the lower portion of the drawing) probably would do the job in revolutionary fashion. If only a four-man crew were kept in this four-MOL station, its equipment payload probably could be boosted above 50,000 pounds. Medical experimentation is an important item on the MOL schedule, but the basic MOL design today is being dictated by astronaut flight experience and USAF ground experiments which show that man probably will be able to function for long periods in weightlessness. If spinning is needed for artificial gravity, the MOL would have to be redesigned.

duced a significant meeting of minds. Both the Air Force and DoD have learned important lessons in the process. DoD has, not without resistance, finally accepted the idea that beyond a certain point it is idle to demand absolute mission justifications in the case of a project such as MOL. At the same time, the Air Force, which because of its own historical experience in the missile program, really invented the space-age "systems approach" and at first was hoisted on its own petard when it tried to sell DoD, instead, an open-ended research-tool approach to MOL, finally did get through to DoD. A year ago (*see "Can MOL Beat the 'Systems' System?"* SPACE DIGEST, *September 1964*) there was a tug of war between DoD and the Air Force, with DoD pushing for specific MOL "systems" proposals from the Air Force and the Air Force hesitating to provide them on the grounds that the more specific it got the more nays could be elicited from DoD. That conflict seems done with for the time being at least.

An Idea Whose Time Has Come

MOL is an idea whose time has come. In the final deliberations that led to the decision, all affected agencies of the government assented to its implementation. Despite reports to the contrary, NASA, on the highest levels, approved, as did the State Department. The main delays in final action by the President were due to preoccupations with the Vietnamese war. Vice President Humphrey, a relative newcomer to space affairs but one of the fastest learners in the business, played a highly important role in the formulation of the MOL decision, a role equal in importance to that played by Vice President Johnson in the Apollo decision in 1961. As Chairman of the National Aeronautics and Space Council, he pushed hard for a final analysis of all questions relevant to MOL deployment. A list of some twenty-five specific questions, ranging from arms-control potential of the MOL to its possible impact on world opinion, was put to DoD before the

Solving the Red Chinese Puzzle from Space

The following is excerpted from Dr. Yuan-Li Wu's article, "Solving the Red Chinese Puzzle from Space," AF/SD, February 1964. The article was adapted from a presentation by the Asian specialist at a 1963 conference on satellite observation held at Stanford University, Palo Alto, Calif.

In order to be really effective, intention must be backed by capability. Capability in the military and general political sense depends, in turn, to a large measure, upon the state as well as direction of economic development. By direction is meant both the rate of economic development in general and the pattern and effectiveness of the allocation of resources toward ends that would have a strong bearing on the foreign and military policies of the country in question. Hence, it would be well for us to try to detect what Communist China's intentions are by looking into her capability.

Information on the current state of Communist China's economic development and the direction it is taking would be especially rewarding at the present time, because Communist China appears to be faced with the choice between steady and slow economic development or a reckless push that might lead to a more rapid advance to military power, but which would also entail more instability. Such information should seek to identify the pattern and rate of economic growth, the specific bottlenecks to development, and the means employed for their removal.

The employment of an external inspection system such as satellites in order to obtain information on military threats and capabilities such as large troop movements, missile firing, etc., is well known and requires little comment except to point out that in the particular case of Communist China availability of information from such a system may help allay certain unfounded fears and enable us to evaluate more clearly the true nature—as opposed to the questionable immediacy—of the Communist Chinese threat from a cataclysmic military point of view. The employment of such an inspection system in gathering *economic* data of the kind we have suggested must, however, be predicated upon the discovery of certain useful indicators that can be ascertained by the system employed. This, in turn, must rely upon the skillful exploitation of the built-in advantages of the system.

A priori, it would seem to a layman that certain characteristics of the satellite inspection system are pertinent in this regard. In the first place, apparently such an inspection system is capable of recording certain countable objects that might serve as the required indicators of the rate of economic growth, its pattern, its bottlenecks, and the successes and failures encountered by the planners in the removal of the bottlenecks.

Secondly, such an inspection system may be able to record by photograph, or other sensing devices, phenomena that are susceptible to ranking and are of economic significance, even though they may not be countable or possess otherwise measurable dimensions.

Thirdly, such an inspection system should be capable of reporting regularly and over an extensive period of time. These periodic records would then serve as the basis of a time series which are indispensable for purposes of comparison.

Fourthly, the microscopic view of extensive geographical areas at one time which would be afforded by a satellite inspection system, could be employed to reveal locational patterns of economic development that would not be identifiable in microscopic reports on the ground or in the usual printed word.

Lastly, the system could be utilized to discover new facts, such as new plant locations, new railways, new roads, and even new cities, which could not otherwise be discovered and accounted for in the interpretation of economic development and the formulation of hypotheses for further testing.

The possibility that such discoveries would help suggest new theories and topics for consideration cannot be overemphasized. Nor should we neglect the possibility that inspection systems of this kind would curtail the time lag that usually exists between the occurrence and development of certain activities and the availability of information on them. If this advantage is exploited, the effectiveness of policy-making would be enhanced. This is commonplace in military intelligence, but it does not seem to have been always sufficiently appreciated in the making of economic and political decisions.—END

final decision was announced. In the arms-control area particularly, the Vice President's long interest in the subject helped sell the MOL.

Congressional pressure for an MOL decision also played an important role. Both House and Senate space committees had made inquiries. And the danger of rapid obsolescence of a too-long-delayed MOL program was posed by the Senate space committee earlier this year when its chairman, Senator Clinton P. Anderson, Democrat of New Mexico, suggested that perhaps NASA and the Air Force ought to merge their proposals in the manned orbital study area and use NASA components.

A major source of congressional demand for action was the June 1965 issue of a report by the Military Operations subcommittee of the House Government Operations Committee, a panel headed by Rep. Chet Holifield, Democrat of California. The report urged immediate approval of the Air Force MOL, criticized DoD rigidity on requirements and justification in an area that is speculative by its very nature, and argued strongly against a joint DoD-NASA MOL effort in an endeavor that is primarily military, on the grounds of unfortunate past experience in many interagency technological efforts. There ought to be an MOL, the report said, and the Air Force ought to run it.

Meanwhile, on the technological front, the successful performance of NASA astronauts in the Mercury and Gemini programs had, from 1962 on, built an increasingly strong case for manned ability in space, despite the many problems of life support. This evidence was cited by Defense spokesmen in the immediate post-MOL-decision briefing held in the Pentagon.

Whither NASA?

Immediately after the announcement of the MOL decision, a few commentators committed to the view that the Air Force, because it has nuclear explosives in its inventory, is an inherent threat to the peace of the world, lamented the MOL decision as provocative, détente-disturbing, and a kind of death knell to NASA and the peaceful space policy of the United States. The pseudonymous Raymond D. Senter of the *New Republic* magazine, for example, posed the possibility of a mad airman in orbit setting off a war by turning in false alarms from the void. And columnist Marquis Childs, who also regularly sees the Air Force as a *bête bleue*, charged that the peaceful-uses-of-space policy of the US would be compromised by what he said was Air Force insistence on launch-details secrecy.

Mr. Childs, who is only an occasional and highly inexpert observer of the space scene, ignored the facts (1) that the Space Act assigns military space responsibilities to DoD, which has designated the Air Force as its agent, and (2) that the launch-secrecy policy associated with the Air Force space effort was established at the direction of DoD during the Kennedy Administration. That policy is under review at present, under the prodding of the State Department, which is quite properly concerned over the international image of MOL, of which a prime mission is manned strategic surveillance. State acknowledges the need for classification of details as to payloads, equipment, etc., which is a different matter.

The MOL decision in no way threatens NASA. NASA will continue to develop proposals for post-Apollo lunar exploration, and for manned orbital efforts in near-earth and synchronous environments, in its newly organized Saturn-Apollo Applications Office. Rather than threatening NASA, the MOL project is symbolic of the closer relationship between DoD and NASA that has developed over the past few years. There is an increasing amount of cooperation, interchange of personnel, and collation of research tasks under way between the two agencies.

After several years of evolution, the beginnings of a truly national and balanced space program are beginning to materialize, with a proper emphasis on man's potential contribution to national security. NASA's job of scientific space exploration, already dramatically fulfilled in the exciting years gone by, will continue. The military will continue to contribute to that program in a significant and essential support function. At the same time, NASA will—as did its predecessor, NACA—contribute data and hardware ideas to the military program.

Some will charge that the new balance between military and civilian manned spaceflight activity upsets for all time the peaceful "image" of the US space program. Such a view is a naïve and knee-jerking sort of reaction. From the very start of the US space program the military have been involved, in support of NASA's manned and unmanned efforts and in the independent operation of unmanned military orbital systems. This truth has never been denied by the three national Administrations that have held power since Sputnik.

What is signaled by the MOL decision is the national determination to press forward with a search for answers to the question: What can military man do to enhance already highly productive unmanned systems? This decision is rooted in realism and is the product of several years of evolution. Some of the decision is the result of specific, orderly, technical analysis. But much of it represents the confluence of events themselves.

We live in a dangerous world and space has now become part of that world. Therefore, it must be put to work in the maintenance of peace. MOL may be expected to show the way.

Even Mr. Senter, in his *New Republic* article in the September 11 issue of that magazine, acknowledged such a possibility. He even had the Russians cooperating with us. His article closed with these words:

"It is, however, possible that MOL will demonstrate the feasibility of a few American and Soviet spacemen in their respective spacecraft operating a continuous space watch. If it does, and if both nations exercise restraint, it could have a stabilizing effect, as have our mutual unmanned reconnaissance satellites. If man can be an efficient observer in orbit for extended periods, the time may come when the US should invite the United Nations to maintain a continuous space patrol, with a multinational crew, to warn of any impending or surprise attack."—END

The Air Force Manned Orbiting Laboratory offers unparalleled technical promise and could have a greater impact on future USAF operations than any previous system with the possible exception of the ICBM. MOL's potential for the improvement of reconnaissance, communications, and command and control functions will greatly enhance US capabilities in global air logistics, response to limited-war challenge, and the general support of strategic systems. It further offers, in linked-up form, the prospect of constructing useful space stations able to support national-security purposes even more effectively than the already-announced thirty-day, single-cannister laboratories. It is at least likely that—considering the Defense Department's stress on cost/effectiveness—rendezvous, resupply, and linkup will eventually be built into the operational MOL program . . .

MOL: The Technical Promise and Prospects

By J. S. Butz, Jr.

TECHNICAL EDITOR, AIR FORCE/SPACE DIGEST

PURELY from the technical standpoint, the Air Force's Manned Orbiting Laboratory must be viewed as one of the most revolutionary and promising projects ever undertaken.

All US operational experience with large rockets, as well as with both manned and unmanned spaceflight, indicates that MOL will be an outstanding success. This favorable prognostication is strongly supported by the long years of theoretical and experimental studies of orbital space stations which have been conducted by industry and government agencies. Unless a totally unexpected roadblock develops, the MOL could have a greater impact on Air Force operations than has any previous system, with the possible exception of the intercontinental ballistic missile. MOL's potential for improving reconnaissance, communications, and command and control activities is so great that it undoubtedly will give a big boost to US capabilities for mounting global air logistic operations, responding to limited-war challenges, as well as strongly supporting the arsenal of strategic weapons.

Such favorable predictions will be regarded as premature by many who have suffered the frustrations of the past eight years as the USAF has tried to convince three successive Administrations that it needed a manned space program. MOL has had its share of question marks and problems, and it has been criticized by both the proponents and opponents of a military manned space effort.

Many doubts have been raised about MOL since it replaced the Dyna-Soar in December 1963. It is widely believed in military and industry circles that time has been wasted and that the MOL timetable has been dangerously slow. The basic design concept also has been challenged, for the MOL obviously is a "minimum" orbital station. In no way can it be compared with the heavy ten- to thirty-man "national" vehicle that has been the object of considerable discussion by NASA. It is much less sophisticated than the four- to six-man station with a one-year lifetime, which two years ago was judged in high Administration circles to be the "most efficient" for the nation.

MOL's small (ten-foot-diameter, forty-one-foot-length), cylindrical configuration will give each of its two-man crew about as much operating and living area as they would have in an ordinary bathroom. Its ability to stay in space for only about thirty days does not even put it in the space-station class, according to many observers. These critical performance limitations, plus its restricted announced objective of "proving" that man can perform militarily useful tasks in space, do not immediately establish the MOL as a vehicle with great operational potential in the near future. Yet the potential is there.

The MOL potential has been obscured to a great extent by the government dialogue on the major policy problems posed by MOL. The Administration has had the old problem of walking a fine line between "not appearing warlike" and "showing the proper determination for self-defense." Whether these policy dilemmas have been handled as intelligently and as expeditiously as possible is a moot question. However, there is no denying that the policy problems are very real, that they are quite involved, and that they still have not been completely settled. An exhaustive review of these policy questions by Associate Editor William Leavitt is presented in this issue beginning on page 35.

One side of the government's dialogue has emphasized the exploratory nature of the MOL program and its defensive rather than offensive military potential. Administrative officials have maintained

over and over that the US has no intention of putting weapons in orbit. It has been stressed that the US military space budget will remain at about $1.5 billion per year as contrasted to the civil space budget of more than $5 billion. The MOL spending is not to affect these totals, and the current policy is to avoid even the implication that the US might be contemplating a spending race in the military spaceflight area.

The other side of the policy approach has been to counteract critics who say that the great potential of military operations in space is being ignored and that the US is not showing the proper initiative with modern technology. Here the main approach has been to emphasize the "mystery" surrounding man's ability to operate in space. From the outset, DoD spokesmen have described the MOL program goal in such terms as, "to learn more about what man is able to do in space and how that ability can be used for military purposes"; "to develop technology and equipment which will help advance manned spaceflight and unmanned spaceflights"; and "to experiment with the technology and equipment as it's developed."

President Johnson's announcement that the Douglas Aircraft Co. will design and build the MOL spacecraft and General Electric will plan and develop the experiments to be performed in MOL has not changed these basic policies. Most Administration statements still emphasize that MOL is intended to unlock the "mystery" of man's usefulness in space. Government spokesmen generally have reported that studies during the past eighteen months have provided a clearer understanding of the cost of making use of man in space and the military tasks that man might perform as an integral part of a satellite system. But MOL is still represented as a relatively simple system. At the principal DoD background briefing, an official explained that "rendezvous capability would be designed so it would be available, but it isn't planned at this time." He also reported that MOL would have "some capability" for changing orbits, and, on the subject of extravehicular activity, he said, "It could well be that we would [have crewmen leave the vehicle but] the extent is really not defined."

If one steps through the hedge of policy and looks at the mass of technical evidence available today, MOL takes on a completely new light. There is every reason to believe that very early in its flight program the MOL itself will be maneuvered, that MOL crewmen will conduct extensive tests outside of the vehicle, and that two or more MOLs will rendezvous and will be attached to each other to form quite a large platform in space (*see front cover*). These are the fundamental maneuvers of manned spaceflight. If rendezvous and docking and extravehicular activity aren't possible, then man isn't going to be able to operate freely enough in space to have any significant military usefulness. And, if these fundamental maneuvers can't be performed as readily as landing an airplane, then the Apollo program is doomed to failure and NASA's lunar-orbit rendezvous in flight plan for landing on the moon is not going to work.

Even though the first rendezvous in space has yet to be accomplished, there is massive experimental evidence indicating that it will be successful. All of the technical evidence also indicates that rendezvous will become a routine maneuver of spaceflight. No one at NASA is making boasts about current rendezvous capability, because there undoubtedly will be some anxious moments before a system is perfected. But, on the other hand, no one is characterizing rendezvous or any other part of the lunar-landing program as a "mystery" which has yet to be unlocked.

Policy problems, not technical doubt, are the reasons why DoD is not taking a similar tack with military man in space. The vast preponderence of evidence indicates that man will be useful. In fact, the evidence is strong that man will be so useful in space that his presence there will soon be classed as a necessity. The argument that MOL will soon blossom beyond a simple laboratory is based on four major points.

- **Feasible Beyond Doubt** — First and foremost, the feasibility of MOL is beyond question. Of all major projects undertaken since World War II, it pushes technology the least. This is not to say that the development will be an easy one, or that Douglas will have an easy time in the design and construction of the MOL spacecraft, or that General Electric is facing a straightforward task in the planning of the experiments that will be performed in orbit. The MOL packaging requirements undoubtedly will be stiffer than those that have faced submarine, aircraft, or spacecraft designers in the past. But there is no doubt that the MOL is well within the state of the art.

Many hundreds of millions of dollars have been spent by government and industry in studying spaceflight problems, which essentially are the MOL problems. Few programs have been built on a stronger technical foundation. Certainly, there is less doubt about the outcome of the MOL than there was for the ballistic missile program or for Project Mercury when these projects were initiated. One must agree with the critics who contend that the technology was available to have MOL flying as soon as the Titan IIIC booster was available, instead of lagging behind it by two years or so.

- **State of the Spaceflight Art**—A good deal already is known about man's capability in space. Christopher Kraft, a key figure in both the Mercury and Gemini projects and a veteran of many years of aircraft testing, reflected the general NASA opinion when he reported that astronauts can perform as well in spacecraft as they can in high-performance aircraft. Weightlessness and the other stresses of spaceflight do not degrade their performance in any significant way. The pilots' muscular, visual, and mental sharpness are not materially affected. They are able to match their ground performance in monitoring systems and responding to malfunctions and emergencies. NASA technical authorities also report that the astronauts' performance is good enough to allow them to take the controls of the rocket booster during the entire flight into orbit if necessary. USAF

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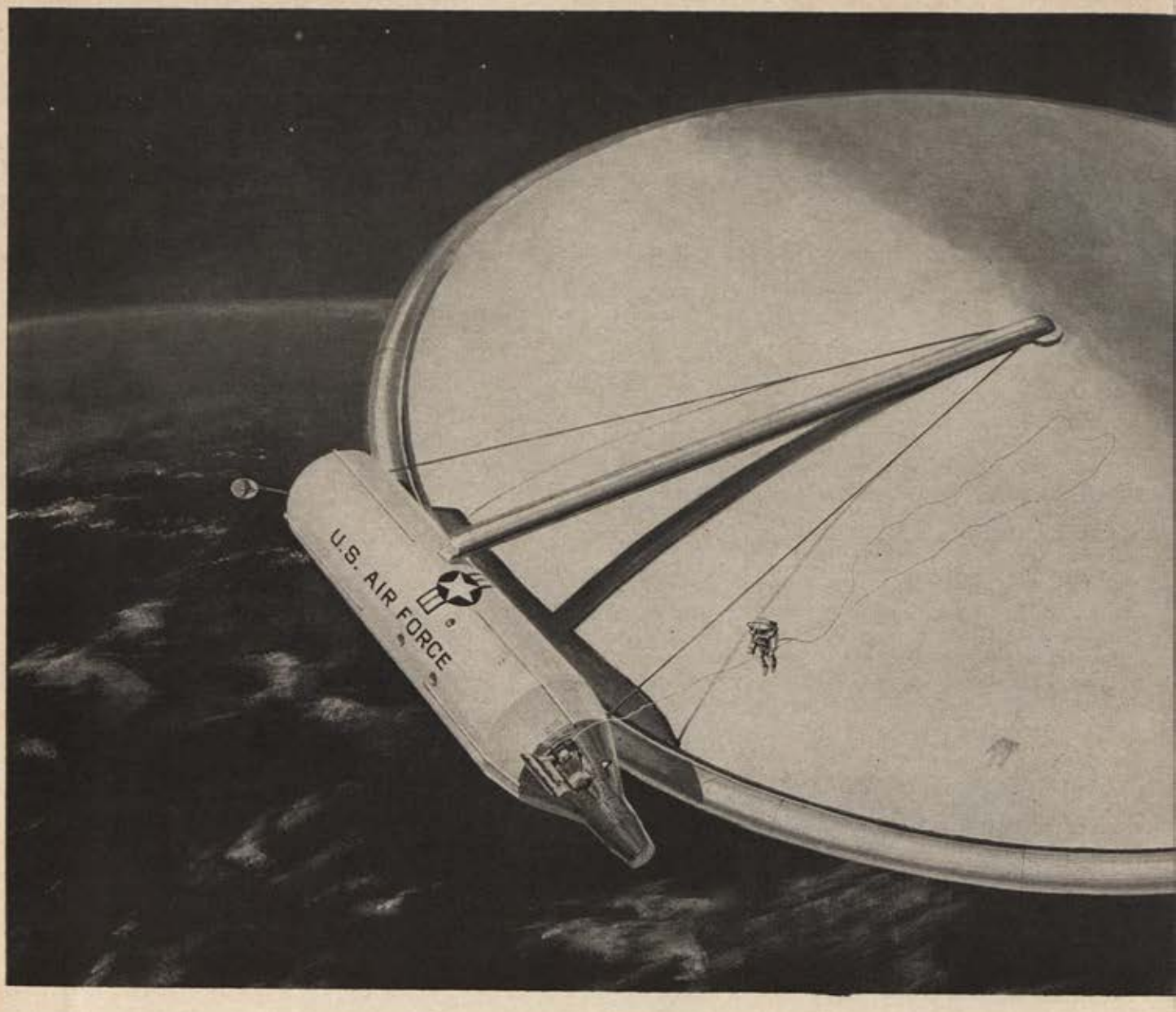

and industry simulator studies also indicate this.

Judging from astronaut performance and ground-based experiments in confined chambers, there is reason to believe that a trained pilot can function for thirty days without artificial gravity in a space station and retain approximately the same efficiency that he demonstrates in normal atmospheric flight.

The possibility has been raised by the sightings of Gordon Cooper and other astronauts that visual acuity might even be improved during spaceflight, at least for certain individuals.

By the latter part of 1968, when the first manned MOL is ready for orbit, the demonstrated state of the spaceflight art will be considerably advanced over what is known today. NASA will be operating three-man spacecraft. Group flights will be lasting ten days or longer. And rendezvous and extravehicular activity will be relatively commonplace. The total US experience in terms of man-hours of spaceflight will be several times what it is today.

• **Simple Versus Complex**—A convenient method of examining possible experiments and tasks is to separate them into two types—simple and complex.

Simple tasks include the control of subsystems such as environmental control units, data recording devices, data links and other communications equipment, and cameras, radar, and other types of sensors. Other simple tasks include the testing of man's fundamental psychological and physical reactions to spaceflight. The Air Force will want to know whether MOL crewmen will lose any of their ability to collect, interpret, reduce, and transmit information during a thirty-day flight. Other psychological and medical questions, in the simple category, also must be answered.

The key point about these so-called simple tasks is that the key questions will have been answered by 1968. Automatic controls have been developed for virtually all spacecraft subsystems. Unmanned vehicles of considerable sophistication have been in operation for some time—taking pictures, recording data on electromagnetic propagation, gathering information on neighboring planets, sending the data back to the earth's surface, and so on. In another

—Illustration by Gordon Phillips

Erection of a 100-foot-diameter antenna in space for radio communications and radar surveillance is a possible MOL experiment, according to DoD officials. In the artist's conception at left, the antenna was stowed in a container on the side of the MOL during the flight into space. Once in orbit, it was inflated and then permanently rigidized by filling with a quick-setting plastic foam. One of the crew, who assisted in the rigging of the antenna is shown returning to the open hatch of the Gemini, which serves as an airlock for reentry into the shirtsleeve-atmosphere living compartment of the MOL. A large antenna of this type will greatly reduce the power requirement for high-resolution ground surveillance and for wide band communications with ground stations. This antenna will be only one of dozens carried on the MOL, which will fairly bristle with all types of sensing gear. Undoubtedly the most modern arrays of small antennas will be grouped along the sides of the MOL canister. Their effective areas could be larger than that of the 100-foot rigidized disc antenna. Infrared domes will dot the MOL. The infrared systems, plus cameras and radar, will allow MOL to ceaselessly observe air, sea, and land activity in daylight and darkness, through cloud cover and in clear weather. All of these systems are progressing at a very rapid rate, and satellite reconnaissance five years from now is certain to be much more effective than today. Moving-target detection units, image-amplification systems, improved antennas, and microminiaturized computers and electronics, with their lower power requirements, are rapidly being improved, and as they improve, so do the prospects for operational MOL vehicles.

three years it is certain that the performance of such automatic systems will improve.

The simple tasks involving human testing also will receive great attention during the next three years in NASA's spaceflight program. The space agency won't get all of the answers to man's fundamental capabilities, but the Air Force will benefit greatly from the prior work and the MOL undoubtedly will be used primarily to study complex problems.

Complex tasks usually involve a large number of simple ones. For example, the docking and rigging of two spacecraft—so that they could share power supplies, controls, and other subsystems, and could function as one vehicle—probably would require that the crewmen work on the outside of the vehicles using several types of tools. Testing man's ability to use each tool would be a simple task. Evaluating his ability to erect a structure in space, to join several vehicles to form a space station, to refuel spacecraft from an orbital tanker, to prepare vehicles for launching into new orbit, all would require simple tools but would be classed as complex tasks.

The best indication available on the actual MOL flight objectives was given to the Congress recently by Dr. Harold Brown, newly appointed Secretary of the Air Force. He said, "Our unmanned military satellite experience tells us it is likely that only complex tasks will require a man in space." He listed six particularly significant complex tasks which, it is hoped, will be performed during the MOL flights. These are: equipment assembly, fine adjustment of equipment, flight plan reprogramming during orbital flight, maintenance and repair, data screening, and selective reporting of significant data.

Dr. Brown also reported that only three of these complex functions were not being handled now to some degree by men at ground control stations rather than in the satellite. The completely new tasks are: equipment assembly in space; flight plan reprogramming, which implies a considerable load in maneuvering rockets and fuel; and selective reporting of data.

Another good indication of specialized, complex military tasks that will be investigated aboard MOL

(Continued on following page)

was contained in a DoD-Air Force agreement on objectives for manned military space stations, which was signed in the summer of 1963. The five major objectives were: (1) general reconnaissance; (2) request reconnaissance of given spots; (3) post-strike reconnaissance; (4) continuous surveillance of an area; and (5) ocean surveillance. Four secondary objectives also were listed: (1) inspection of unknown space vehicles; (2) command and control of ground, sea, air, and space forces from space; (3) operational support of ground, sea, air, and space forces from space; and (4) bombardment. It should be noted that the potentialities of bombardment from space can be studied *without* carrying weapons into orbit. Such studies are necessary if the advantages and disadvantages of such weapons are to be understood precisely and proper contingency defenses prepared.

• **Cost/Effectiveness**—The long list of complex tasks above indicates one thing very clearly. A single MOL vehicle is not going to be able to make much of a dent in these requirements.

MOL's maximum weight will be just under 25,000 pounds, the maximum payload of its Titan IIIC booster. Dr. Brown reports that almost 20,000 pounds must be allocated to the structure, the Gemini reentry capsule, the environmental support equipment, and the other systems and supplies needed to sustain the crew for thirty days. This leaves about 5,000 pounds for experimental equipment, which is about equal to the payload of the largest US unmanned military satellites. The Atlas-Agena vehicle normally launches the large Samos reconnaissance satellite, and it can put nearly 7,000 pounds in a low earth orbit. Consequently, it can be assumed that the Samos, which handles the US strategic reconnaissance task now, carries at least two tons of cameras, infrared detectors, and other sensors, plus automatic controls, power supplies, etc.

Probably an MOL reconnaissance package could be more powerful than a Samos package. Its greater size would allow the MOL cameras to have a longer focal length, for instance. A few more sensors probably would also be available. However, the basic MOL would need a considerably higher equipment payload weight before it could be a significantly better reconnaissance vehicle than the Samos. The crewmen would allow a greater selectivity in the information gathered and transmitted to the ground, but to allow truly selective reconnaissance the vehicle would need considerable maneuvering capability. In the basic MOL, there would not be enough payload weight to permit a propulsion system for large-scale maneuvering.

In attempting to combine several complex tasks such as reconnaissance, satellite inspection, and command and control capabilities into a single MOL vehicle the designer is in an essentially unsolvable dilemma. The only way out of the dilemma is to rendezvous two or more MOLs and rig them together in orbit. Without such docking it will be impossible to carry the equipment and power supplies necessary to truly test man's usefulness in handling complex military problems in space.

Since the DoD has displayed a great determination to get the most out of the MOL program and to reach a very high level of cost/effectiveness, such docking arrangements would seem to be an inevitable part of the program.

Another aspect of the cost/effectiveness problem strongly suggests that there will be considerable docking in early MOL flight operations and that quite complex experiments will be conducted. The cost of each MOL vehicle plus its equipment load, has been estimated by Dr. Brown at $20 to $30 million. This does not include the Gemini reentry capsule which runs between $10 and $20 million. At these prices, if there is no rendezvous and docking, the DoD will throw away between $150 and $200 million worth of equipment during the seven MOL flights that have been announced for the development program.

Therefore, in view of DoD emphasis on cost/effectiveness, it would be reasonable to assume that maximum operational use will be made of each vehicle, with rendezvous bringing new crews and fresh provisions and extending their useful life beyond thirty days.

Two predictable patterns are emerging in space technology which bode well for MOL. Of great importance is the fact that one builds with confidence today. The reliability records of launch vehicles and spacecraft have risen to levels that were considered improbable only a few years ago, and they are still rising. Undoubtedly the Air Force-industry team will be able to maintain this record and create an MOL system of great reliability and utility.

The second important pattern is the astronauts' flight record. They have done well, and they have also performed according to prediction. There is every reason to expect that the favorable predictions of today will prove correct and that man will be able to function with very high mental and physical efficiency both on the moon and in near-earth orbit.

It is difficult to believe that MOL will solve any great mysteries about man in space. MOL is going to provide proof positive on a series of technical questions for which reasonable answers already exist. MOL is to be the clincher that confirms mountains of available data showing that man is a locked-on cinch to perform complex tasks in space for flights that will last at least one month.

MOL is riding a mountainous wave of technology, which already has demonstrated that it is feasible to build very large space stations that are much more sophisticated than the simple MOL vehicle operating alone.

Consequently, it seems certain that the MOL operations from 1968 through 1970 will go far beyond the bare bones of last month's announcement and that the MOL vehicle will be exploited to its fullest capacity as a building block for sizable platforms from which significant military support operations can be conducted. It is a necessary, welcome, and sure-to-succeed beginning of sensible exploitation of man's capabilities in near-earth orbit.—END

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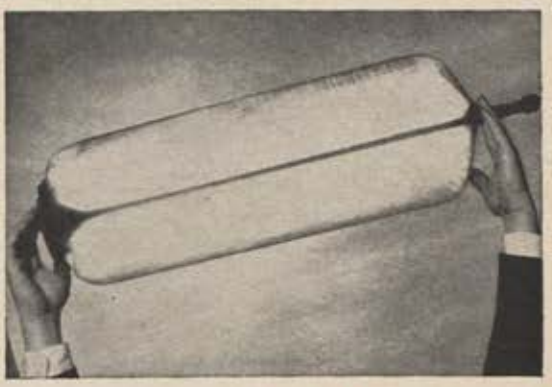

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DIVISION OF UNITED AIRCRAFT CORPORATION

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A

The Vietnam debate goes on here and around the world, and President Johnson continues to press for negotiations. In Vietnam itself, with airplanes to keep loaded with bombs and to keep in the air, with targets to destroy, and with the jungle to contend with, men of the Air Force continue . . .

The Air War in Vietnam

An AF/SD Photo Feature

Day after day Air Force F-100 Supersabres like these, as well as F-105s, F-104s, and B-57s, take off from Vietnamese airfields to hit the Viet Cong again and again—wherever they can be found in concentrated groups. With bombs, incendijel, and missiles, the jets hit targets that often look like any other village and sometimes like uninterrupted jungle, in an attempt to keep the VC moving, unable to plan strategy, and unable to rest.

Sometimes the only thing that can be seen as the jets turn and head for home after a mission is the thick black smoke hovering over the target as in this picture of a Viet Cong concentration after a strike by an F-100. Later, the report comes in from ground forces that have moved in—sixteen structures destroyed, seven others damaged, and, sometimes, a few VC bodies found. The important thing is that the concentration has been broken up and Vietnamese and US forces can move in and, hopefully, hold a little more territory.

A recent addition to the air war in Vietnam are the huge B-52 Stratofortresses. Taking off from Guam, the giant SAC bombers rain tons of 750- and 1,000-pound conventional bombs on Viet Cong targets. The Stratoforts at left are part of a group of twenty-eight B-52s that dropped some 540 tons of bombs on a VC staging and training area only thirty miles from Saigon.

—United Press International Photo

With his gun camera, a USAF pilot took this picture of a Bullpup missile, fired a split second earlier from his F-100 Supersabre. The missile is streaking toward a camouflaged Viet Cong position near a canal twenty-nine miles southwest of Saigon. On that same day, September 8, B-52s struck against Viet Cong strongholds around Ben Cat, twenty miles north of Saigon, in their twentieth long-distance raid on guerrilla areas.

Aircraft that carry no guns, or bombs, or missiles are also part of the air war in Vietnam. Transports keep the war moving in a country where there are few roads and railways, and those that do exist are regularly cut or damaged by the enemy. The Air Force transport carries everything—pigs, cows, and people; weapons, ammunition, and fuel. They are often shot at, and hit, and they fly in and out of airfields that look like, and sometimes are, cow pastures. Here, a C-123 takes on Vietnamese villagers destined for one of the fortified communities.

Value engineering has been used in industry for some time to find less expensive methods of manufacturing, without lowering quality. Now, for the last three years, the Department of Defense has been including value-engineering clauses in its contracts. These provide contractors with a monetary incentive by ensuring that the producer gets a fair share of the savings incurred by his cost-reduction proposals . . .

Value Engineering: Avenue to Profits

By Brig. Gen. Frank E. Rouse

COMMANDER, SAN ANTONIO AIR MATERIEL AREA

GOVERNMENT contractors are rapidly discovering a new avenue to profit: sharing value-engineering savings realized by the goverment.

As an organized, creative approach to identifying unnecessary costs, value engineering is not particularly new to industry. In the last few years, many progressive companies have used it to drive their manufacturing costs down and swell their profits. What is new to industry is the value-engineering clause in government contracts.

The Department of Defense now includes value-engineering clauses in many of its contracts to provide contractors a monetary incentive to direct their value-engineering efforts toward reducing the government's costs.

Since first introduced into government contracts about three years ago, value-engineering contractual provisions have been progressively improved to ensure that the contractor gets his fair share of the savings. To further encourage contractors to submit cost-reduction proposals, the Armed Services Procurement Regulation was changed recently to provide additional arrangements for sharing savings. (See Section I, Part 17, Armed Services Procurement Regulation as changed by Defense Procurement Circular No. 11, 9 October 1964.)

The Department of Defense has two kinds of value-engineering contract provisions. There is the "incentive clause" which offers the contractor a monetary reward if he is able to control and reduce the government's costs while performing on the contract, and there is the "program-requirements clause" which obligates the contractor to engage in value engineering as an item of work. Generally, but with some limitations, the value-engineering incentive provision is included in all advertised and negotiated procurements in excess of $100,000, and the value-engineering program requirement clause is included in all cost-plus-fixed-fee contracts in excess of $1 million.

Currently, there are three types of value-engineering cost savings realized by the government in which a contractor may share, depending on the terms of the specific contract. First, a contractor may share savings realized against the items on the contract. Second, he may share in savings to be realized in the procurement of additional quantities either by the receipt of a single lump sum reward payment, based on estimated future requirements, or by receipt of royalty payments tied to actual delivery of any additional quantities procured. Third, he may share collateral savings that accrue in areas such as operations, logistics support, and training.

Under the value-engineering incentive clause, the contractor's share of savings realized against items on a contract is usually about fifty percent. His share of future acquisitions savings may be up to forty percent and his share of collateral savings is ten percent.

To illustrate as simply as possible how these provisions translate into profit, let's assume that a firm receives a government contract for the manufacture of 50,000 items machined from nonstandard stainless-steel tubing which sell for three dollars each, or a total of $150,000, including $13,500 profit. Let's also assume that the contractor value engineers the item and suggests that standard heat-treated aluminum tubing of adequate strength be substituted for the stainless steel to reduce cost. Since the extra strength of the stainless steel is not needed and aluminum has the neces-

Examples of Value-Engineering Savings—and Bonuses

Many contractors are increasing the profits on their government contracts by receiving a fair share of the money saved by their cost-reduction proposals. Here are just two examples:

- *An engine overhaul contractor was paid a bonus of over $56,500 when he designed a stainless-steel sleeve for worn oil pump bearings that permitted overhaul of rear engine cases previously rejected.*
- *An aircraft arresting barrier contractor was paid more than $34,000 when he greatly reduced the price of a contract by presenting a value-engineering proposal for the elimination of some unnecessary parts and the substitution of less expensive components without decreasing the reliability of the barrier.*

Value engineering is being practiced within the military, as well as by its contractors. The San Antonio AMA was credited with more than $18 million in savings during the first half of Fiscal Year 1965. Here are some specific examples:

- *Over $57,000 was saved on the procurement of 1,068 generator oil seals by replacing a $57.46 three-piece seal with a one-piece $2.97 standard seal.*
- *SAAMA personnel discovered that plastic intake and exhaust shields could be substituted for metal and fabric ones on several types of aircraft. Some of the specific savings were: Plastic exhaust shields for the F-106 cost $144, while the metal ones cost $595. Total saving on procurement of thirty-nine was over $17,500. The AMA bought 912 KC-135 plastic intake shields for $14.60 each, versus $59.21 for the metal type, for a total savings $40,684.*
- *A process of nickel braze repair was developed enabling AMA personnel to reclaim T34, T53, J57, J60, and J75 engine parts, which were beyond repair by gas or arc welding. This one development had saved the Air Force $14.9 million by the end of 1964.*
- *An innovation in a cleaning procedure that helped prevent damage to the T34 engine reduction gear during cleaning, reduced the necessity of condemning these gears by forty percent for an annual saving, based on the yearly overhaul requirement, of about $115,000.*
- *An item on an aircraft spray deicer that had cost $19,691 was replaced with one costing $14,847 for a saving of over $155,000 on a buy of thirty-two deicers.*

sary corrosion resistance, the contractor's proposal is accepted. This results in a new unit selling price of two dollars, changes the total selling price to $100,000, and effects a total net price reduction of $50,000.

The total savings to the government would then be determined by considering this net price reduction, collateral and implementation costs, and other applicable factors. If actual savings to the government were determined to be $45,000, and the contractor's share of this was fifty percent, the value-engineering effort would be worth $22,500—almost twice the profit estimate of the original contract.

Now, let's further assume that this contract contains a royalty-sharing agreement. The government then would pay this contractor a royalty on subsequent deliveries of this item for a specified period up to three years. He would receive this royalty even if the item were purchased from another firm.

The lump-sum method of sharing savings from future acquisitions is an alternate to the royalty-sharing arrangement. Here is an example of a situation in which it would apply: The government is reasonably certain that it will buy a total of 190,000 generator seals over a period of three years; however, because funds are limited, or other conditions, it initially awards a contract for only 50,000 seals. A value-engineering change proposal received on this initial contract would be evaluated on the basis of the anticipated follow-on buy of 140,000 seals as well as the original buy of 50,000 seals.

Under the lump-sum payment method, the contractor receives payment before the projected buy is actually made. Accordingly, the lump-sum method is used when future requirements are relatively firm. The royalty-payment method is used when future requirements are uncertain. It provides that the contractor will share savings only on actual purchases.

Sharing of collateral savings is one of the newest value-engineering incentives. Contracts with a value-engineering clause normally provide for sharing collateral savings in addition to any of the other incentives. In general terms, collateral savings are the incidental benefits that result from a value-engineering change, such as benefits that would accrue to the government from the reduction in the quantity of spare parts required to support the end product. This type of value engineering decreases the government's cost in many areas, such as maintenance, warehousing, and accounting.

Some firms, without value-engineering resources of their own, have found it profitable to hire engineering consultants to develop value-engineering change proposals on government contracts. New materials and better fabricating techniques being developed almost daily provide a potential to decrease the over-all cost of every product, and the monetary incentives offered by the government are now an important new avenue to profit.—END

The author, General Rouse, took command of the San Antonio Air Materiel Area in July 1965. He had been, since 1963, Director of Logistics for the US European Command in Paris. Prior to that assignment he was Deputy for Materiel for Air Defense Command. In his over thirty-two years of service he has served in several Hq. USAF staff positions.

Much has been said in recent years about the tendency of modern specialization and production techniques to undermine our traditional pride in craftsmanship. The Zero Defects program is an organized effort to reverse this trend, and, from the experiences of Martin Company and the many other organizations in industry, the military, and government that have adopted this "do it right the first time" idea, it is apparent that the program is highly successful . . .

Zero Defects: Management's Answer to Mediocrity

By Charles A. Blaney

EXECUTIVE DIRECTOR OF PRODUCTION OPERATIONS
MARTIN-ORLANDO

PRESIDENT Lyndon B. Johnson, in a letter to the Commanding Officer of the Red River Army Depot, Tex., recently wrote:

"All through our nation's history, we have honored the men in uniform who are called upon to keep peace and defend freedom by seeking to supply them with the finest of weapons and materiel needed for their missions. In this age of advanced technology, it has become far more important than ever before that we maintain the very highest standards of quality, and the goal of defect-free material is both imperative and attainable.

"The 'Zero Defects' program offers timely support for the objectives of our determined effort to eliminate waste wherever it occurs in the programs of the federal government. I regard producing defect-free materiel —doing the job right the first time—as one of the finest means of getting the most for every dollar we must spend."

The Zero Defects program the President referred to is perhaps the most challenging and rewarding quality-improvement program ever devised. No other employee-motivation program has moved so far so fast in the history of the defense industry.

Since the Zero Defects program was first kicked off at Martin-Orlando three years ago, it has been endorsed by the Department of Defense, put into practice by the US Army, US Navy, and US Air Force, and the most recent count shows that more than 1,000 companies — representing 2,000,000 employees — are vigorously striving to "do the job right the first time"— in keeping with the basic Zero Defects philosophy.

Including Martin divisions in Orlando, Baltimore, Canaveral, and Denver, the roster of defense firms which have embarked on employee-motivation programs of this kind includes:

General Electric, Litton, Douglas, North American Aviation, General Dynamics, Universal Match, Thiokol Chemical, Corning Glass, Raytheon, Dresser Electronics, Hercules Powder, Kaiser Aluminum, Northrop Nortronics, General Instrument, AiResearch, Lockheed-Georgia, Philco, ALCOA, Basler Electric, Ford Instrument, RCA, and Hughes Aircraft.

Zero Defects programs have been implemented by firms in England, Canada, Germany, Italy, and Japan.

Even more amazing is a report in a Russian trade weekly, the *Ekonomicheskaia Gazeta*, of April 14, 1965. Excerpts from the lead paragraph follow:

"The contents of this interesting collection disclosed in substance and in particulars the system and organization for zero defects planning and product execution resulting in first-rate examples of work after the first try and initially instituted at the machine works in Saratovo. This progressive system has received wide attention in the USSR; it has been examined and subsequently adopted by some 2,000 enterprises. . . .

"The zero defects system, which is designed to deliver products of superior quality at the first try, promises good fortune to all who attain that goal."

Obviously, Zero Defects is serious business and should be treated as such.

George E. Fouch, Deputy Assistant Secretary of Defense, put Zero Defects in perspective at a Department of Defense ZD Seminar last fall when he said:

"The Office of the Secretary of Defense is vitally interested in the Zero Defects program. One of our major responsibilities is to obtain defense materiel

The author, Mr. Blaney, has been Executive Director of Production Operations for Martin Company's Orlando, Fla., Division since 1961. He has been with Martin for twenty-nine years and has production experience with the B-29 and the F-100, as well as such famous Martin planes as the B-26 and the B-57, and many missiles and electronic systems. He is responsible for procurement, product programming, manufacturing, production control and facilities, and all related functions at Martin-Orlando.

of the requisite quality so that our armed forces may properly perform their assigned missions. . . .

"Hence, it is clear that we need pride in workmanship that is akin to that of the Old World watchmaker."

Following endorsement by the Department of Defense, Gen. J. P. McConnell, then Vice Chief of Staff, USAF, on December 4, 1964, directed all major air commands to initiate a Zero Defects program. In August 1965, after he had become Chief of Staff, General McConnell followed his earlier directive with a request to all staff agencies within Hq. USAF to initiate internal ZD programs. To implement this program, a special ZD Council is being formed under the direction of Col. C. M. Holland.

Lt. Gen. Thomas P. Gerrity, Deputy Chief of Staff, Systems & Logistics, USAF, is a staunch booster of the Zero Defects program:

"What we're looking for in the Air Force in this [ZD] program is a much higher plateau of reliability and mission effectiveness of our weapons—at lower costs. The lower costs follow from the former two efforts. If we can attain that, then, within the relatively limited budgets that we have in the Air Force, we will be able to maintain our forces combat-ready today, at lower cost, and this will enable us to invest more in research and development and acquisition of modernized weapons for the future. We'll not only be able to do the job of readiness today, but we'll be able to . . . maintain our readiness in the future."

The US Army, in addition to the US Air Force, is also adopting the Zero Defects program across the board.

What is there about the Zero Defects program that has created this tremendous enthusiasm on the part of the defense industry and the military? Why has it achieved such spectacular success as the world's foremost quality-improvement program?

First of all, those of us engaged in defense work are accustomed to operating by total performance criteria which include delivery of a quality product, on time, and within the contract cost.

Schedule dates are definite. Performance on the basis of delivering a product on time is easily measured. The specific goal, then, in the area of schedule performance and production control, is to meet all customer requirements and have no inventory on hand.

Performance in the area of cost is also an easily measured criterion. In his book, *My Years with General Motors,* Alfred P. Sloan describes a return on investment concept as a "soundly conceived, theoretical reference." Management, in effect, details—in specific terms—the precise "return on investment" which is required. The cost "reference point" is precise. Everyone knows exactly what is expected of him.

However, quality has never had such a goal. Through the years we have operated at an *acceptable quality level* (AQL).

A goal committed to an acceptable quality level is a goal of imperfection. To correct this situation, we have committed ourselves to the Zero Defects program which has a "soundly conceived, theoretical reference" for quality.

People are generally conditioned to accept what I call the "passing-grade" complex. In other words, if you score seventy percent on a test, that is, an acceptable passing grade. Unfortunately, this complex has carried over into industry so that too many of us are willing to accept the attitude that we are human, and humans make mistakes.

Zero Defects was developed to encourage people to do their job right the first time. The concept behind the program is simple: Since people believe they will always make errors, it doesn't bother them too much when they make a few. Yet they are very careful about cashing paychecks and in their other personal activities. They have, in effect, a dual standard. We, as management, have not given them a standard of performance concerning the quality of their work—cost and schedule performance, yes, but quality, no.

Thus, people who want to do a good job, and that includes almost everyone, never really had a sufficiently high standard until they were told that the target was Zero Defects.

Zero Defects is not a way of guaranteeing 100 percent defect-free systems. But it is a method of getting closer to it. All discrepancies cannot be caught by inspection and test. Besides being expensive, these operations are not foolproof.

The only way to have no discrepancies is to prevent them. If everyone did his job right the first time, there would be no errors to overlook. This attitude of defect prevention is what ZD tries to develop.

There is a considerable amount of material available today on the Zero Defects program—how to get the program started, how to maintain employee interest, and what can be expected in the way of results.

While these are important aspects of the program, there is one point that must be made absolutely clear. With Zero Defects we are not interested in perfection for the sake of perfection. But we are interested in Zero Defects as it affects reliability and maintainability. And, if any defense firm plans to stay competitive, it must take into account both cost and schedule requirements.

No one, be he a design engineer or a production worker on the line, wants to turn loose of a job until he is absolutely certain that it is the best possible design or the best piece of hardware. Yet there comes a time when management must take into account not only the quality of the end item, but the fact that it must be delivered to the man in the field when he needs it, and within the agreed-upon cost.

That's why the Zero Defects concept is so important. When the job is done right the first time, it has to be more economical than the job which is rejected or reworked. When the job is done right the first time, it automatically stays within the schedule.

Zero Defects started at Martin-Orlando three years ago on the Pershing missile program. Up to that time our quality program, like others, emphasized inspection and detection.

In January 1962 we went out on a limb and told the Army that we would deliver a complete Pershing Artillery Set to Fort Sill, Okla., ahead of schedule and with no defects. Furthermore, we promised that the equipment would be ready to fire twenty-four hours after its arrival at Fort Sill.

We met that challenge. The Pershing was delivered two weeks ahead of schedule, and twenty-three and

(Continued on following page)

The Pershing missile, shown being launched at left, was developed by Martin Company. It was the first weapon system produced with the Zero Defects concept in effect. Begun in January 1962, a complete Pershing Artillery Set was delivered to the Army at Fort Sill, Okla., two weeks ahead of schedule, as promised. Not one defect was found in any of its 25,000 parts.

one-half hours after its arrival it had been erected and checked out and was ready to fire. There was nothing wrong with any of its 25,000 parts.

The Zero Defects concept had worked because the people on the Pershing project had made it work.

The next step was inevitable. We asked ourselves: "If our employees were willing to make the effort to turn out a perfect system this time, why can't we do it all the time? Why don't we make Zero Defects a permanent part of our quality program?"

This was the birth of the Zero Defects program, and the results have been tremendously rewarding.

Typical examples as reported by industry across the nation are:

- **Martin-Orlando**—a fifty-four percent reduction in hardware defects during 1963 and an additional twenty-five percent drop in 1964 with savings in excess of $2 million.
- **General Electric, Lynn**—$2 million in savings in scrap and rework and reduced reinspection and retest since implementation of the program in 1963.
- **Douglas Aircraft**—sixty-nine percent reduction in manufacturing defects in 1964; now seventy-two percent so far in 1965.
- **Radio Corporation of America**—an error-cause removal program is resulting in savings of $250,000 a month.
- **Sperry-Utah**—scrap rate reduced from approximately $13,000 to $8,000 a month since start of program in December 1964.
- **Lockheed-Georgia**—savings of $216,000 in scrap and rework since start of program in December 1964.

With results such as these it is easy to see why the program has been so readily adopted by both industry and the military.

It also explains why most prime contractors are pressuring their suppliers to adopt the ZD program or one like it, particularly since from fifty to sixty percent of the cost of the end item is usually procured from sources outside the company.

More than 100 of Martin-Orlando's suppliers have started Zero Defects programs largely through the encouragement of our Supplier Quality Department personnel who have made more than eighty ZD presentations to almost 200 companies just since January of this year. More than half of these firms have already started ZD programs.

Management is indeed finding an answer to an age-old problem. How do you instill in the American worker the pride of craftsmanship that was a tradition among his ancestors—both in the Old and the New Worlds?

The Renaissance produced the greatest craftsmanship the world has ever known. Why? Because the artisans of that era felt an identity with the great spiritual and intellectual reawakening that was sweeping the continent of Europe.

We have a need for this spirit in America today. And we have the atmosphere in which such a spirit should flourish. Both the needs of national defense and the challenge of the exploration of space can provide the incentives that are required—if the worker feels identified with them.

This sense of craftsmanship is a human resource that we have long failed to exploit. The need for it now is real and immediate. The underlying philosophy of Zero Defects helps fill that need.

The fact that a forklift driver moved almost 13,000,000 pounds of fragile electronic equipment without a single instance of damage, or a payroll clerk made more than 40,000 computations in two months with Zero Defects is certainly noteworthy. And so is the story of the production worker who made 50,000 consecutive perfect solder joints and the statistician who made more than 300,000 calculations without error.

But even more important than these noteworthy achievements is what Zero Defects means to—and does for—people, their relationships with each other, and their responsibilities on the job. You can expect excellent results when your people have an attitude of pride toward their work.

The successes achieved by people across the nation under Zero Defects programs have been an inspiration to those of us in management who stuck our necks out in the firm belief that our people, properly motivated, would accept the challenge and improve their level of performance even higher than that which was "acceptable" to our customer.

Imagine for a moment how much money we could save our government and ourselves if we accepted totally the concept of Zero Defects in every act we performed. The results would be staggering.

Zero Defects has had fantastic growth, and there is no doubt that the concept will continue to spread—not only throughout the defense establishment but into every avenue of endeavor of every individual in America who has a sincere desire to improve himself and his fellow men.

As one of the creators of the Zero Defects program once put it: "The attitude of defect prevention—Zero Defects—is all that stands between mediocrity and a great performance."—END

"Henry, why can't we just get on the plane?"

We're happy to see people taking an interest in our fan-jet engines.

You might call it fatherly pride. The fan-jet was an American Airlines invention in the first place.

So you can imagine the mixed emotions we have, now that other airlines have these engines on a number of their planes, too.

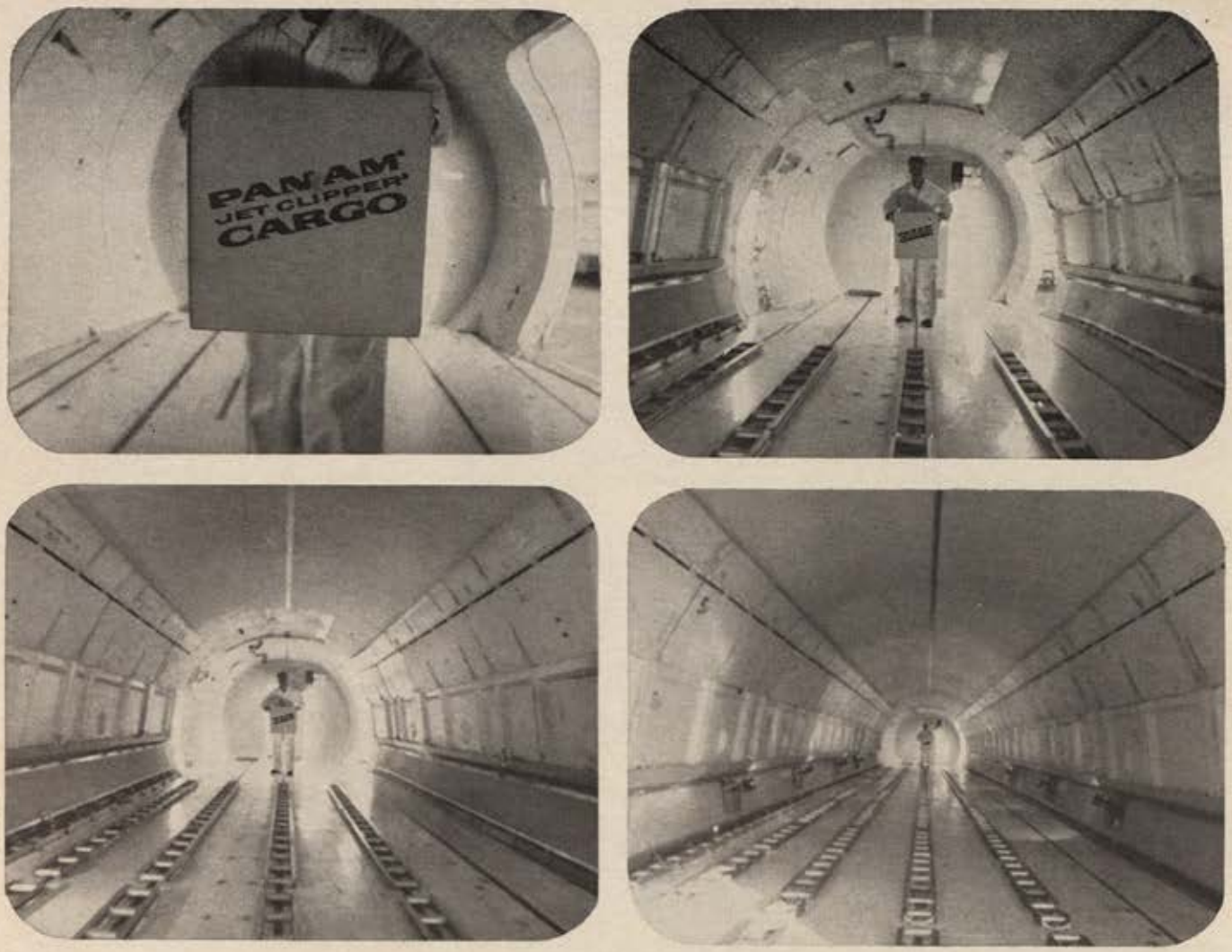
But if (for some strange reason) you do take another airline, you ought to ask for one of their fan-jet flights. Just to see what it's like.

Fan-jets get you off the ground 30% faster than ordinary jets. It's kind of impressive, seeing an airplane do what it's supposed to do, so briskly.

Of course, asking American if you'll get a fan-jet is a waste of time.

We haven't taken anybody up in an ordinary jet in years.

American Airlines



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SPACE DIGEST

VOLUME 8, NUMBER 10 • OCTOBER 1965

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Creating technology today is the key to successful development, without false starts and costly overruns, of the advanced aerospace systems of tomorrow. Therefore, our technological research programs should be sufficiently broad so as to cover a cluster of targets. By thus advancing the state of the art in broad areas, applications of our knowledge to specific needs in the future can be made . . .

Doing Our Technological Homework Now —To Meet Tomorrow's Requirements

BY DR. RAYMOND L. BISPLINGHOFF

Special Assistant to the Administrator,
National Aeronautics and Space Administration

THE purpose of evolving new aeronautical and space technology is to fulfill the requirements for specifically defined systems to perform approved missions which the nation may desire to do at some future date. It is clear that such systems must be designed around technology which is in hand. One cannot make such designs by gambling on technology which *may* be available tomorrow. History has shown that the technology used for advances in man's development is usually accumulated over periods of years in the absence of definite requirements but in the presence of an encouraging environment. It seems clear that preeminence in aeronautics and space in the future will certainly demand *a continuous evolvement of new technology*.

The nation's aeronautics and space programs are replete with examples where today's missions are made possible because new technologies were pioneered years before requirements for such missions were conceived. One such example relates to the creation in the 1950s of a technology for employing hydrogen as a fuel for aircraft and rockets. This work, which culminated in the operation of a regeneratively cooled hydrogen-oxygen rocket thrust chamber in 1957, only a month after the first Sputnik was launched, served as a basis for our commitment to the use of hydrogen-oxygen rocket systems in the upper stages of our advanced vehicles from Centaur through Saturn.

Blunt body reentry concepts were pioneered at the NASA Ames Research Center using analytical tools and high-speed wind tunnels and firing ranges prior to inception of the Mercury program and thus laid the groundwork for this important part of manned flight.

Aeronautical systems have frequently been preceded by years of vigorous technological development. Supersonic commercial flight actually represents another stage in a development that has taken place over many years. Shortly after the war, the X-1 research airplane demonstrated that supersonic controlled manned flight was possible. Since then a variety of research aircraft, including the record-holding research airplane, X-15, have steadily raised the flight speeds and altitudes of controlled supersonic flight. The National Advisory Committee for Aeronautics, predecessor agency of NASA, inaugurated a program in 1956 to develop the technology of supersonic commercial air transportation. Nearly a decade later this technology is being put to work to fulfill a specific requirement for a supersonic transport.

If we examined carefully the responsible requirements for new systems which have been laid down in the recent past, one would find that they were generally within the state of their underlying body of technology, or represented no more than a modest stretching of that technology. On the other hand, we are all familiar with unfortunate examples of requirements for new systems which

Operational systems are often preceded by years of development. Research planes, above, were predecessors of today's aircraft. From left, around X-3 jet, are rocket-powered X-1A, D-558 jet, delta-wing XF-92, variable-wing X-5, rocket-powered D-558, and X-4.

demanded exceptionally large strides in new technology.

The consequences of not having done our homework prior to undertaking a system development to meet an explicit requirement are overruns in cost and time. These costs in resources are often so high that the means must be found to evolve new technology in advance of requirements. One would conclude from this that the formulation of a *responsible* requirement demands an underlying body of technology.

The Selection of Missions

One of the most important purposes served by the creation of technologies is to provide options in the selection of new requirements or missions. The existence of several technical options is fundamental to sound planning. Because of the many important implications of space activities, policy planners will require that they be given options. It therefore seems desirable that the development of a new branch of technology be directed toward a related class of requirements or missions rather than a single requirement.

Single requirements conceived years in advance will, in all probability, turn out to be ill-conceived with a high likelihood of shifting so that an initial narrowly conceived program is off the target. Our programs of technology development must be sufficiently broad so as to cover a cluster of targets. For example, in the field of turbojet propulsion, a common requirement for supersonic-transport and vertical-lift engines is high-temperature turbine operation. A program of technology in high-temperature materials, turbine-blade and combustion-chamber cooling will benefit both. In the field of ramjet propulsion, the same technology will provide the basis for both air-breathing recoverable boosters and hypersonic transport aircraft.

In the development of new space technologies we find that the bodies of the solar system provide natural planning increments for visualizing classes of missions. It was natural at the outset to aim at the class of missions associated with operation in near-earth orbit. These missions imposed reasonably well-defined demands on boosters, communications, tracking, control stabilization devices, and life-support and atmospheric entry systems. These technologies are now, for the most part, reasonably well in hand.

The second step was aimed at a class of missions associated with operation from the surface of the earth to the orbit of the moon and on its surface. The technologies required for this class of missions are not vastly different from those required for near-earth orbit.

Multiple-Objective Analysis

The next class of missions toward which we have aimed our sights represents another jump in distance to the planets. It turns out that the increment in space capability required for this jump demands a reservoir of new technology not now available. Planetary missions represent an example of how flexibility can be achieved by examining several objectives simultaneously. Five related objectives have been set for hypothetical study. These five are Mercury, Venus, Mars, Ceres (one of the asteroids), and Ganymede (a moon of Jupiter).

Venus and particularly Mars were selected because their proximity to the earth makes them candidates for initial manned planetary missions. The other three probably would not be early objectives, but missions to them may have some requirements common with those of missions to Mars and Venus. Mercury is of interest because of its proximity to the sun. Ceres is the largest of the asteroids. Ganymede is of interest since a manned landing on Jupiter itself does not appear feasible because of its size.

Consider as an objective a manned planetary landing expedition involving up to eight men and lasting between 500 and 1,000 days. Our studies tell us that we must make large advances in a broad range of technology, including chemical and nuclear propulsion, electric power generation, life-

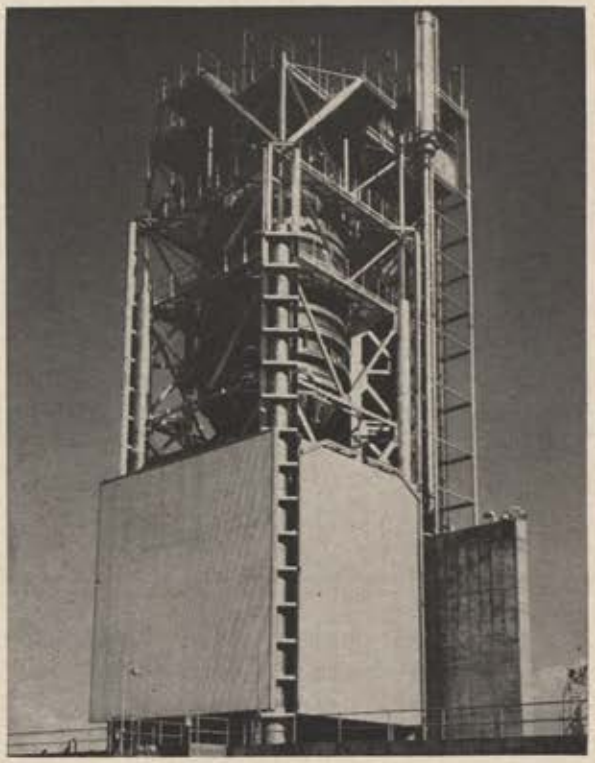
support systems, protection from the environment, entry vehicles for the planetary and earth atmospheres, communications, materials, guidance, and human factors.

We must learn how to boost very large payloads from earth into near-earth orbit because the planetary spacecraft will weigh in the range of one to four million pounds in earth orbit. If such a large spacecraft is assembled from smaller pieces, we must develop rendezvous and orbit assembly techniques. The technology needed for this task has other applications such as earth-orbit laboratories, the servicing of large scientific observatories and other satellites, and extensive lunar operations. Our studies show that nuclear rocket propulsion is the most efficient propulsion method for going to and returning from a planet. . . . We are engaged in developing this technology. . . .

Nuclear propulsion is not limited to such missions. It will be useful also in lunar operations or any other applications in space where large payloads are needed. Planetary spacecraft will need a large amount of electric power of the order of tens of kilowatts to megawatts. Onboard power is one of our most pressing technological requirements as was brought home to all of us in [the Gemini-5] flight. Such electric power technology would be useful for earth-orbit laboratories, large scientific observatories, large communications satellites, lunar operations, and unmanned spacecraft using electric propulsion to penetrate deeply into space and communicate to earth. Life-support systems which can be used on any long-duration mission are another critical need. Communications rates, 100 times greater than present, are required for efficient interplanetary communications. There are other examples, but I think [it is evident] that we use manned planetary mission studies to set challenging goals for extending spaceflight technology along a broad front.

The Aeronautical Spectrum

We make similar projections in aeronautics where we find the challenges are at opposite ends of the speed spectrum. As our population grows, we find an increasing need for an airplane that economically combines zero or short takeoff and landing characteristics with reasonably high (500-knot) cruise speeds. At the other end of the speed spectrum is the hypersonic transport to provide faster and more efficient air transportation over semiglobal ranges. Each application offers challenges in stretching aeronautical technology.



NERVA is the name given to nuclear engine, under development by Aerojet-General, which will give sufficient power for exploring distant planets. Above is test stand for engine at Jackass Flats, Nev., site.

It is sometimes suggested that a new technology can be created in the absence of experimental hardware. This has not generally been shown to be true. Experimental subsystems and systems serve at least two purposes. In the first, they are used to flush out areas of ignorance and uncertainty to which more research effort should be applied. These areas are very frequently not predictable in advance. Their second purpose is to provide an objective onto which the entire program of research can be focused. This targeting of effort gives the program participants a greater unity of purpose and tends to motivate their work. Our experience has generally shown us that the development of a new technology requires a focal point in the form of advanced hardware.

Most experimental subsystems would never fly as parts of an operational system. They would, however, provide "know-how" for the design of whole families of mission components, each member of which is adapted to its own mission system. Subsystem hardware alone is generally not sufficient. System experience in the appropriate environment is also necessary. The testing of individual components or subsystems does not generally provide the kind of data required in planning

space missions or in assuring that a given system can provide a level of performance that can make a flight mission feasible. Compromises are often required in matching the components and assembling them in a full operating system. System experience, however, should be obtained with breadboard systems in ground environment simulators whenever possible. Flight tests with flight hardware should be conducted in advance of an explicit requirement only when ground simulation is not meaningful.

Every program of technology development should be assessed continuously in the light of the nation's changing plans and policies. If it is evident that a given program no longer makes sense, action should be taken to drop it and divert the resources elsewhere. Action must also be taken when a new technology is developed to the point where we are confident that it is ready for mission application, but a firm mission requirement has not yet materialized.

Under these circumstances, the work should be stopped and placed on the shelf, so to speak, for future application. The tendency is, of course, very strong to continue to work indefinitely on the last few percent refinements or to try to force it into a mission application. Old concepts and developments should not be forgotten or dismissed since they may fit new goals. We must be increasingly on guard against doing research which has already been done, and we do this through coordination with the work of others. . . .

Keeping Track of Our Work

Coordination of NASA research with the objectives and research of the Department of Defense is carried out through the Supporting Space Research and Technology Panel (SSRT) of the Aeronautics and Astronautics Coordinating Board (AACB). Through this panel . . . we have extended our research coordination to the Army, Navy, and Air Force. All of the services and NASA have adopted the same concept of fundamental work unit of research and now employ identical forms for recording research task descriptions.

At the present time, we are in the process of working out a common system of storing these data on magnetic tape so that exchange and coordination of research will be facilitated in the future. During the past year, we concentrated on the compilation and coordination of research tasks in the life sciences, space power, propulsion, and

New fuel cell developed by General Electric features tough solid polymer, which increases life expectancy of system four to five times. Onboard power, as demonstrated by difficulties with Gemini-5 fuel cell system, is pressing technological requirement.

electronics and control. It is our purpose to employ these means to conduct annually a full coordination at the task level of NASA and DoD aeronautics and space research.

Another important step in strengthening the advanced research and technology program is that of obtaining advice from the scientific and engineering community. As part of this process we have twelve research advisory committees. During the past year, these committees had a total of 252 members, eighty-five of whom are from industry, fifty-three from universities and nonprofit organizations, fifty-two from other government agencies, and sixty-two from NASA. The members of these committees, who serve without compensation, are selected on the basis of their scientific stature.

It can be said that the standing of nations will depend, in the future, very largely on the balance of technologies between them. A balance of technologies in our favor will, however, require much wisdom in the selection of new technologies in which to invest our resources and resolution in their development.—END

Dr. Bisplinghoff was NASA Associate Administrator for Advanced Research and Technology from 1962 until his recent assumption of his new post. A distinguished aerospace engineer in his own right, he came to NASA from MIT where he was Deputy Head of the Department of Aeronautical Engineering. The above article is adapted from his recent testimony presented August 24, 1965, before the Senate Committee on Aeronautical and Space Sciences.

THE PROBLEM OF TRANSPORTING MAN TO THE PLANET EARTH

When man returns to earth from orbiting space stations, lightweight materials that can support temperatures higher than 3,000 degrees F for as long as an hour will be needed. They will enable maneuverable reentry vehicles to land at space bases in this country.

These materials have already been developed by Lockheed. They are composites, produced from fibers such as silica or graphite—and then bonded inorganically through a special Lockheed process that retains their original properties.

Lockheed's composites permit significant savings in heat shield weight because their densities are as low as 12 to 18 pounds per cubic foot, approximately half that of other state-of-the-art competitive materials. In higher densities, fiber composites can support critical structural loads. These versatile materials can be formed into a variety of shapes, and they can also be attached to spaceship substructures by simple mechanical methods instead of more complex techniques. Most important, Lockheed's new composites mean larger payloads—to and from space.

Materials such as these are just one measure of the technological competence of Lockheed: a corporation dedicated to the conquest of new worlds through innovation.

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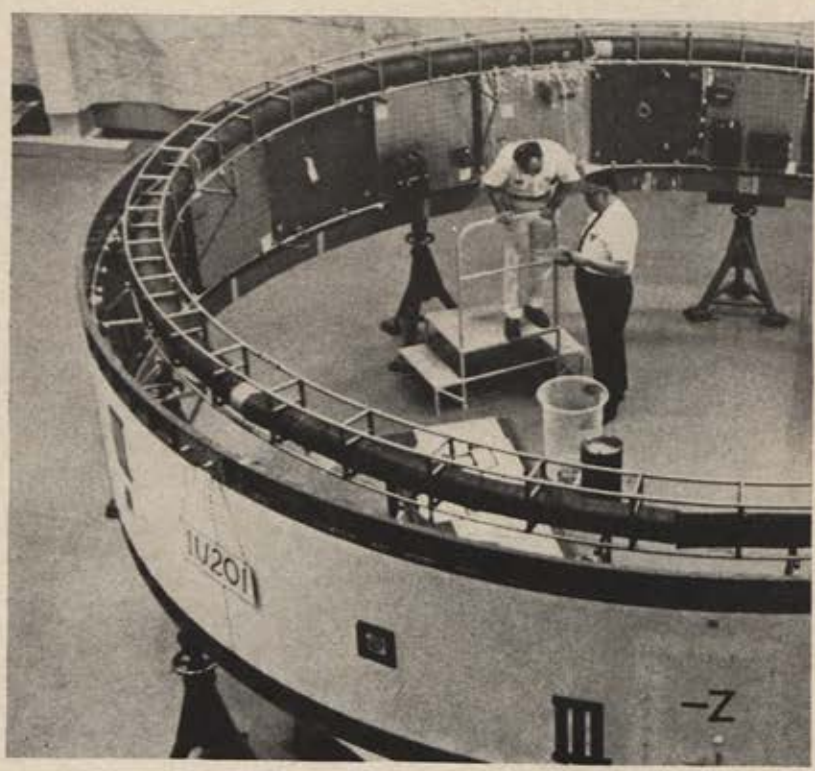
Tackling jobs like these takes systems know-how

- ☐ Steer Titan III launch vehicles from pad to orbit
- ☐ Build a nerve center for Saturn launch vehicles
- ☐ Solve down-to-earth problems from space
- ☐ Memorize all the Gemini-V flight plan alternatives

Steering Titan III launch vehicles from pad to orbit. ☐ This is the job for a compact, rugged IBM computer, a key element of the Titan III guidance system. It's from a line of IBM ASC-15 guidance computers that have flown more than 50 successful missions aboard Saturn I, Titan II and Titan III-A. ☐ Before a mission, IBM's computer checks instruments and controls. During flight, the rugged computer generates signals to correct roll, pitch and yaw to keep the vehicle on course. ☐ This IBM computer withstands the thrust of rocket blast-off and temperature extremes. And its record in the testing arena of outer space proves that it's tough, reliable and accurate.



Building a nerve center for Saturn launch vehicles. ☐ Since April, 1964, IBM has been lead contractor for this part of NASA's Saturn launch vehicle program. This is a management assignment to construct Instrument Units for Saturn 1B and Saturn V which are being developed under the direction of the Marshall Space Flight Center. ☐ The Instrument Unit is Saturn's control center. Located between the Apollo spacecraft and the upper stage of a Saturn vehicle, it controls and guides Saturn's first, second and third stages before releasing Apollo for its lunar flight. ☐ IBM's job includes designing and manufacturing data adapters and computers for the Instrument Unit, plus total systems integration and checkout of the more than 50 electronic units that make up the Saturn launch vehicle.

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Solving down-to-earth problems from space. ☐ Orbiting space stations 200 miles high will provide a new point of view for the study of earth resources, weather patterns and crop yield. With this information, scientists will be able to recommend action to avert famine, flood and disease. ☐ IBM's job is to define these space station experiments for NASA. IBM simulation labs are developing new techniques to be used in surveying the earth from orbiting spacecraft. And IBM scientists are presently studying the problems and recommending the best sequence of experiments for space flights of the future.

Memorizing all the Gemini-V flight plan alternatives. A massive assignment. However, at NASA's manned spacecraft center in Houston, Texas, 5 powerful IBM 7094-II's—along with one of the world's largest memories, the IBM 2361 Model II Direct Access Core Storage Unit—can accomplish this and much more. As fast as far flung outposts across the world transmit their real-time in-flight data on each Gemini flight, IBM computers are analyzing the data . . . storing it . . . forwarding it to the NASA flight controllers for decision . . . and building the increasing store of facts and data so necessary for the first flight of American astronauts to the moon.

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A Space Digest Photo Report

At Air Force Systems Command's Research and Technology Division laboratories across the country, young scientists and engineers in blue are starting their careers in an environment which affords responsibility commensurate with talent. The continuing hope of the Air Force is that many of these "bright young men" serving military tours will stay on . . .

AFSC's Research and Technology Division . . .

A Young Man's World

A SCIENTIST or engineer is trained by years of painstaking study. Such individuals have the normal human desires —ambition, security, and dignity. If we expect the best of these individuals, and only the best are wanted to serve in the Air Force, we . . . must ensure them the opportunity to attain these desires."

This is the credo, as expressed recently by its Commander, Maj. Gen. Marvin C. Demler, USAF, of the Research and Technology Division of the Air Force Systems Command. The individuals General Demler is talking about are the many young men in their twenties with specialized scientific and technical training who are starting their working careers in the Division's laboratories across the country. They are young men the Air Force hopes to persuade to stay on in uniform.

How can that be done? General Demler believes that giving these bright young men in blue responsibility commensurate with their talents is the best answer.

In that way, General Demler declares, the "military scientist will associate with his peers in the academic and industrial fields. He will utilize facilities that are the best presently available and constantly being improved. And probably most important from a personal standpoint, he will be afforded the opportunity to advance professionally through postgraduate study at government expense and go on to more important assignments."

Maj. Gen. Marvin C. Demler, Commander of AFSC's Research and Technology Division, holds an M.S. in aeronautical engineering from the University of Michigan, and is a Harvard Business School alumnus.

The research and development field now increasingly embraces management as almost a science in itself—affording additional opportunities for the young blue-suiter starting out, he says.

As to security, General Demler acknowledges the gap between pay in private enterprise and the military—but that is only part of the story. There is security of another kind in working for an organization that never slows down.—END

1st Lt. D. R. Seger (left), project engineer at Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio, is 1962 ROTC graduate of University of Louisville, with M.S. in aerospace engineering from Air Force Institute of Technology. Left, he assists in airborne zero-G tests of Modular Maneuvering Unit slated for use in NASA Gemini program.

1st Lt. John D. Henderson (left), B.S., University of Alabama, and 2d Lt. Charles Schimmel, Jr., M.S., University of Alabama, analyze materials in hyperballistic studies at the Directorate of Armament Development, Eglin AFB, Fla. The Directorate, an operating element of Air Force Systems Command's Research and Technology Division, is the site of much significant current study.

Infrared laser phenomena analysis is the job under way, among many others, at the Effects Branch of Research and Technology Division's Air Force Weapons Laboratory, Kirtland AFB, N.M. Aligning the experiment is 1st Lt. Ronald L. Grotbeck, who holds a B.S. in physics from St. Thomas College, St. Paul, Minn. Lieutenant Grotbeck is among many young research and development officers now on active duty who are considering permanent Air Force careers.

1st Lt. Nathan G. Tupper, a 1962 Air Force Academy graduate, is a metallurgical engineer working, above, on creep-testing of a refractory metal at the Division's Materials Laboratory at Wright-Patterson.

2d Lt. Lincoln A. Furaya, a native of Hawaii with a B.S. in electrical engineering from Washington University, St. Louis, Mo., designs communications gear at Rome Air Development Center, Griffiss AFB, N.Y.

Capt. Norman M. Haller of Systems Engineering Group, Wright-Patterson AFB, is Air Force Academy graduate and project engineer for inertial guidance systems. He earned M.S. in engineering at MIT.

2d Lt. Harold W. Rose, who holds B.S. and M.S. degrees in electrical engineering from University of Colorado, is a research engineer in laser technology at the Avionics Laboratory at Wright-Patterson AFB.

1st Lt. William H. Summers holds B.S. in chemical engineering from University of Wisconsin, is working on master's. At Edwards AFB, Calif., Rocket Propulsion Laboratory, he directs tests of rocket fuels.

Capt. Robert R. Rankine works on evaluation of flight control hardware for reentry vehicle at Flight Dynamics Laboratory, Wright-Patterson AFB. He won B.S. in electrical engineering at U. of Illinois.

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ITT developments in micro-electronics have already lent themselves to advances in extra-terrestrial hardware. The low-cost Army geodetic satellite, built by ITT, is a good example.

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ITT

Speaking of SPACE

BY WILLIAM LEAVITT
Associate Editor, AIR FORCE/SPACE DIGEST

'So Who Should We Send?'

WASHINGTON, D.C., SEPTEMBER 15

As it turned out, the Russians didn't accept President Johnson's invitation to send over an official observer for our next Gemini shot. Reciprocity risks were too great. One thing might have led to another, and, before the Presidium knew it, détente might have broken out like a mid-winter virus. Too much of a good thing and all that.

But what if they had bought the idea? Things might have gone something like this:

SCENE: THE KREMLIN

FIRST SECRETARY BREZHNEV: Alexei, we've got this bid from LBJ to send an observer to their next launching. He threw it in, I must say, outrageously, with the announcement of their Air Force Manned Orbiting Laboratory, but I don't think we can dismiss it out of hand.

PREMIER KOSYGIN: Leonid, you're the public-relations expert, if you'll forgive my using such an expression. Maybe it would be a good idea to send someone, but I'm against it. They'll be pushing us hard for reciprocity. Besides, who's going to pay for it? There was nothing in Johnson's pitch about expenses. I understand from our Tass boys that those motels at Cocoa Beach charge an arm and a leg.

BREZHNEV: Alexei, they call you an economist, but, between me and you, you're a bookkeeper, and that's why you're where you are and I'm where I am. I think we should accept the invitation. Why? I'll tell you why . . . because maybe we could learn something. Let's not worry about reciprocity. If they expect an invitation to our next shot, so who says we have to give slavish devotion to bourgeois codes of politeness? Excuses why not to invite them we can always think of.

KOSYGIN: OK, OK, Mr. Big, if you want to send someone, so send someone. Don't come to me later when the neutralist-country press starts screaming for us to be fair. So who should we send?

BREZHNEV: So who have we got? Let's see. Blagonravov? No, he's been over there so many times he's old hat. How about you? No, they'll want to talk about Vietnam. What's Zhukov doing these days? No, he'd have to go talk with Ike at that farm, where is it, in Arizona, or someplace? No . . . I have it! I have it! Perfect! I should work for Madison Avenue, if *you'll* excuse the expression. Khrushchev! In one stroke, we could give the old boy a nice vacation in Florida, get publicity like there was no tomorrow, and show that these days the transfer of power in the Soviet Union is an orderly and civilized thing. It's settled! Nikita Sergeyevich goes!

(The scene shifts to New York's Kennedy International Airport, where the former premier of the Soviet Union has just arrived aboard an Icelandic Airlines DC-6B. The press rushes forward to interview the familiar rotund figure.)

REPORTER: With all due respect, Mr. Khrushchev, how is it that you have flown in on Icelandic? After all, you're representing the Soviet Union in response to an invitation from the President of the United States. Surely the Soviet government has intercontinental jets. Why, at the Paris Air Show, you showed off that big. . . .

KHRUSHCHEV *(through interpreter)*: As is well known to you gentlemen, I am a retired public servant. My government asked me to perform this small duty on behalf of the Soviet people. I was glad to do it, of course. But Madame Khrushchev and I are living on a pension. And we must watch our kopecks. Icelandic is perhaps a bit slower, but it is reliable and quite comfortable. I am glad to be here again and hope to learn much. What

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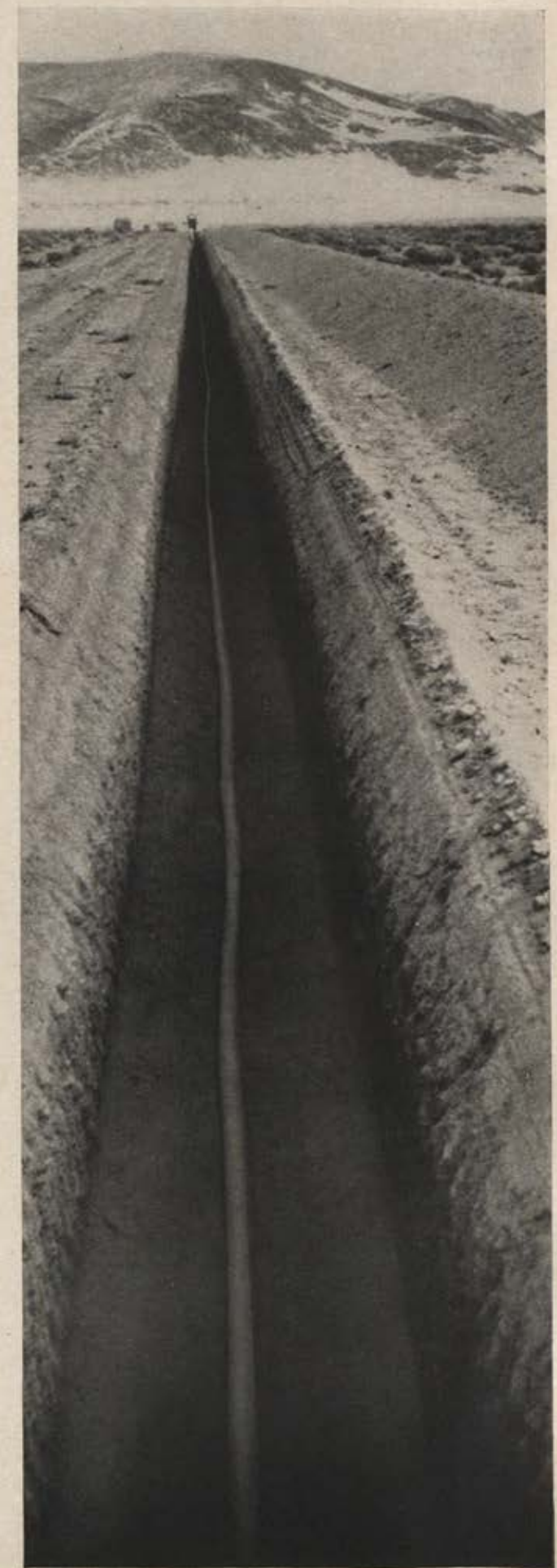
CORPORATION

We dug and refilled a 4000-mile trench to protect 9300 communications circuits against disaster



We split the continent with a trench four feet deep to give the United States its first blast-resistant coast-to-coast underground communications cable system.

More than four years ago when the first of 2500 giant reels of coaxial cable started unrolling in New York State, we began an important project that will give added protection to the nation's vital communications.

Today, 9300 circuits—available for voice, data, teletypewriter, telephoto—are included on this route. It stretches across 19 states and has 950 buried reinforced concrete repeater (or amplifying) stations.

Spotted strategically along the route about 50 feet below ground level are 11 manned test centers. Also of reinforced concrete, they have automatic air filtration and ventilation and living quarters stocked with emergency food and water.

This vital transcontinental link will serve the needs of government agencies, businesses and individuals.

This is a job that needed the Bell System's unified research, manufacturing and operating capabilities. It is another implementation of a basic Bell System policy: "In communications, the defense of the nation comes first."

Bell System
American Telephone and Telegraph and Associated Companies

is that crowd over there? I hope not to meet me. Those days are gone forever.

REPORTER: No, sir, the Beatles are landing in a few minutes.

KHRUSHCHEV: In the Soviet Union, such hooligans would be sent to the virgin lands.

REPORTER: Mr. Khrushchev, while you are here, will you be visiting any other parts of the United States and will you be seeing any government officials? Are there any plans for a meeting with President Johnson?

KHRUSHCHEV: I am here to watch a space launching. That is the only thing on my official schedule. I've already seen all those cornfields, and they probably still won't let me see Disneyland. So what else is there for me to see? As I told you already, I'm living on a pension. Do you know what it costs for a foreigner to visit the United States when he's spending his own money?

REPORTER: Where will you be staying while you're down at the Cape?

KHRUSHCHEV: Well, I heard that you could rent little efficiencies, I think you call them, off the strip at Cocoa Beach, that are pretty reasonable. Then, there's a possibility—if things work out—that I might be able to stay at a nice little *dacha* that *Life* magazine used to use to hide the families of the Mercury cosmonauts from the rest of the press. If it works out, I'll stay there. Well, excuse me, gentlemen, I must find the way to my flight to Florida.

(The scene now shifts to Cape Kennedy, where Khrushchev has just attended the prelaunch briefing for the press and is about to board the battered Air Force bus that will take him to the launch site.)

REPORTER: Mr. Khrushchev, what did you think of the briefing?

KHRUSHCHEV: Interesting, very interesting but what am I going to do with all these press kits? I won't be able to carry them *and* my lunch. Where can a fellow get a drink of vodka around here? Do we have time?

REPORTER: My pleasure, there's time.

KHRUSHCHEV (*sampling domestic vodka in motel bar*): Not bad, but what kind of name for vodka is Lucky Pierre?

(Khrushchev rides out to launch site, views launch from launch control, and gets rushed by reporters to press site circus tent where he has consented to further questioning.)

As is well known, Nikita Sergeyevich Khrushchev was always a highly articulate observer of space.

REPORTER: What did you think of the launch, Mr. Khrushchev?

KHRUSHCHEV: In the Soviet Union, our socialist scientists and engineers, working as the vanguard of the united socialist peoples of the world, can put a locomotive into orbit.

REPORTER: Yes, but what did you think of our launch? As the first official Soviet observer you must have some comments.

KHRUSHCHEV: As an old peasant proverb goes that I remember from my days as an exploited mine worker in the Ukraine—"You can't make borscht without beets."

REPORTER: What does that have to do with your impressions of our launch?

KHRUSHCHEV: If you had spent some time as a child working in a mine in the Ukraine, you would know. Instead, you are a lackey of the capitalist press, which, as is well known, is controlled by the Rockefellers, Du Ponts, and their cohorts in the ruling circles of the United States.

REPORTER: I thought your trip here was supposed to be nonpolitical.

KHRUSHCHEV: It is. I am only citing the facts.

REPORTER: Mr. Khrushchev, what do you think of our open policy on launchings, as compared with the secrecy in the Soviet Union, and do you think that your visit here will encourage any reciprocity from the Soviet Union?

KHRUSHCHEV: We have nothing to hide in the

Soviet Union. We just don't believe it is good taste to have all this publicity before we do something. We like to talk about what we've done after we do it.

REPORTER: What about reciprocity?

KHRUSHCHEV: I am here as a private citizen of the Soviet Union, representing the Soviet people, and I cannot speak for the government of the Soviet Union. You should take this question up with the appropriate Soviet authorities.

REPORTER: There has been a lot of talk that the reason for your removal as Soviet premier was your public talkativeness, among other things. Could you give us some idea of what really happened back in October last year?

KHRUSHCHEV: Perhaps the best way to answer your insulting question would be to quote another old Russian proverb: "When you are making kasha, do not sow your wild groats."

REPORTER: I don't understand what that's supposed to mean. I asked you about the circumstances surrounding your ouster as premier and party chairman. What's that got to with groats?

KHRUSHCHEV: That's the trouble with you newspapermen. No imagination. If I could think of an American proverb that would explain things, I would quote it for your benefit. But I am not fluent, as you know, in English, so there's nothing I can add to what I've said.

REPORTER: What can you tell us about your life in retirement?

KHRUSHCHEV: I am not working on my memoirs, if that's what you mean by your provocative question. I spend most of my time watching television or reading or going to museums. We have a lovely Golden Age club in our apartment building, so I keep busy.

—By Jake Schuffert for SPACE DIGEST

"Don't laugh, gentlemen. After you're in space a few years, she may look pretty good!"

REPORTER: Are you involved in politics at all, in a kind of elder statesman way, or anything like that?

KHRUSHCHEV: In the Soviet Union, one is either involved in politics full time or not at all. I am definitely retired from politics.

REPORTER: There are rumors that while you are here, you will be involved in discussions, on behalf of your government, of the Vietnamese situation and other major international crises.

KHRUSHCHEV: Excuse me, gentlemen, I am anxious to return to my quarters at *Life* magazine's facilities here at Cape Kennedy. They have been kind enough to provide me with an excellent room in their *dacha* here, and I have some business to go over with some of their people.

(The scene shifts back to the Kremlin. A copy of Life *magazine is spread out on the conference table.)*

FIRST SECRETARY BREZHNEV: Well, how could any one have predicted such a fantastic thing! That old fox.

KOSYGIN: I may be a bookkeeper, but I have some brains—and, I might add, some intuition, too. Well, Mr. Big, you can handle this mess of cabbage.

BREZHNEV: I'll handle it. Get some of those agitprop experts over from the Ministry of Culture. We'll work up a denunciation campaign that will make the Stalin bit look like the Bolshoi Ballet.

KOSYGIN: Look, maybe we're moving too fast. What about the hot line? Let's try to talk LBJ into shipping him back.

BREZHNEV: Look, stupid, in the first place LBJ knows a good thing when he's got one. In the second place, *Life*'s got an ironclad contract with Nikky. This is just the first installment of what I know is going to be an interminable series.

KOSYGIN: I suppose you're right. I won't bother saying I was against the whole thing. Maybe we should have paid his expenses, at least. Now, we really look crummy, on top of everything else.

BREZHNEV: How does this sound: "It comes as no surprise to the government of the Soviet Union that a former citizen, well known for his depraved deviationism, a principal reason for his removal from a high post in the Communist Party and government of the Soviet Union, has chosen to betray his homeland and defect to. . . ."—END

Missile chess

This may be the world's most serious game. Our ability to play it well can be the difference between whether we live in our own free world or behind someone else's walls.

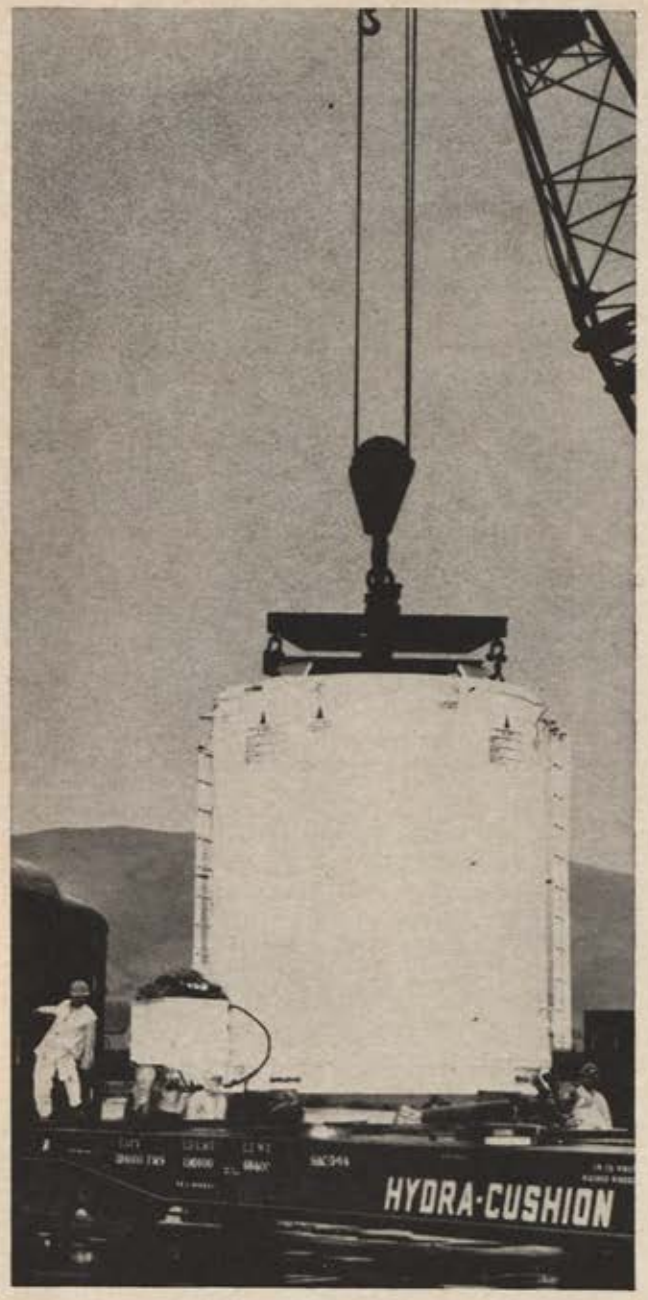
So in Douglas laboratories, researchers are working on making missiles invisible to detecting devices. Every advance they make is communicated to another group of Douglas engineers and scientists engaged in developing systems that seek out and destroy "invisible" missiles. When the second group succeeds, those employed in hiding missiles in the sky go to work again to break the checkmate.

Continuous improvement takes place...a basic requirement if the U.S. is to maintain leadership in missile technology.

The Douglas approach grows out of experience gained in producing a greater number and diversity of missiles than any other company. These include such great performers as *Thor*, *Hercules*, *Sparrow*, *Genie* and *Zeus*.

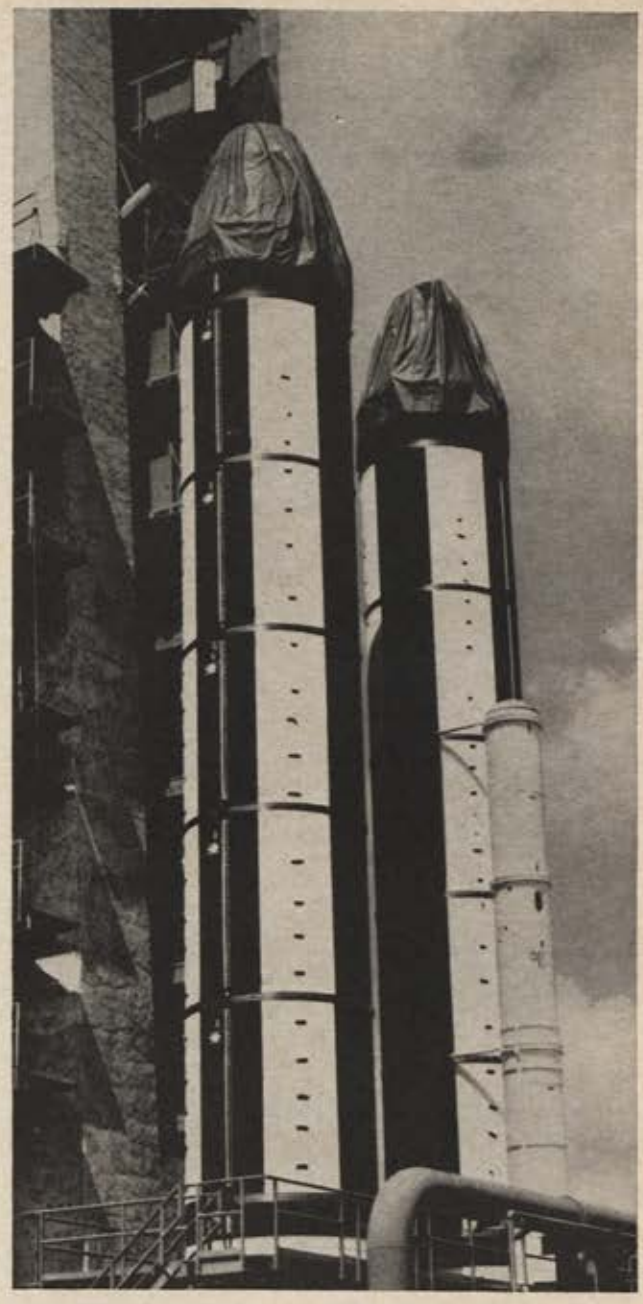
DOUGLAS

MISSILE AND SPACE SYSTEMS DIVISION



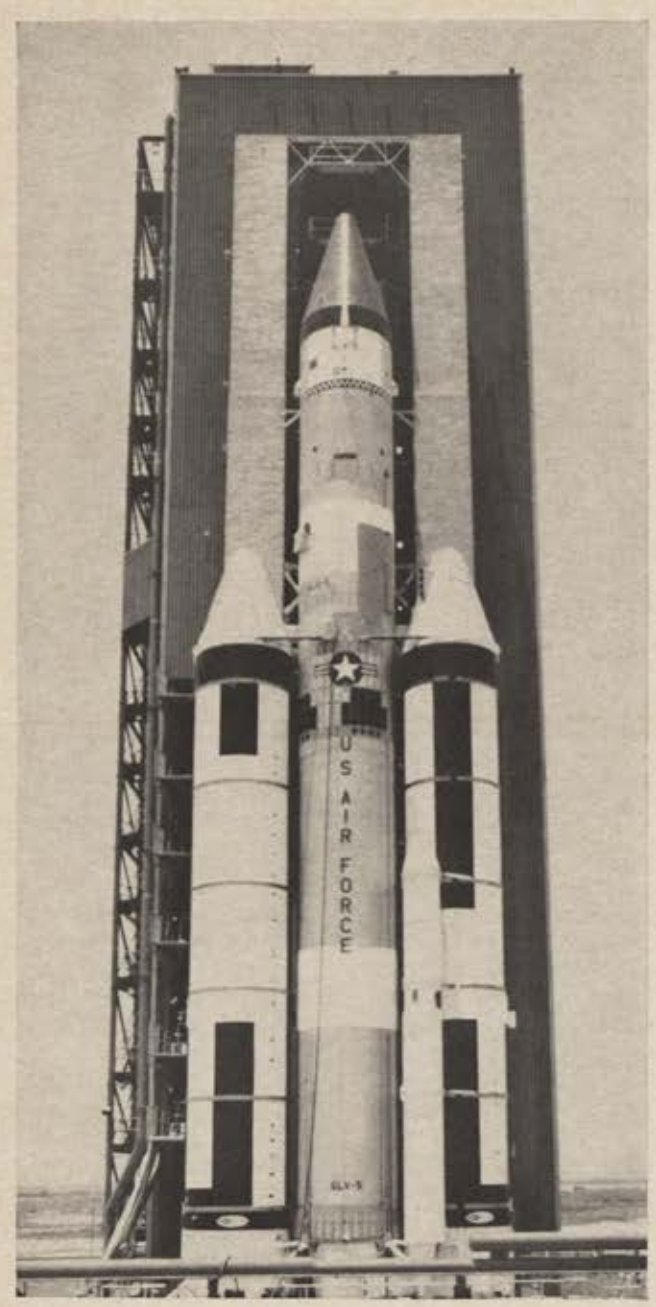
ONE FOR THE MONEY

America's newest and most powerful flight-ready motor for space programs is a big penny-pincher. This single building-block solid propellant segment weighs 40 tons, yet it is easy to handle, safe to store, and economical to build. The five-segment 120" diameter boosters in USAF's Titan IIIC mean low-cost high reliability for a variety of missions from here on out.



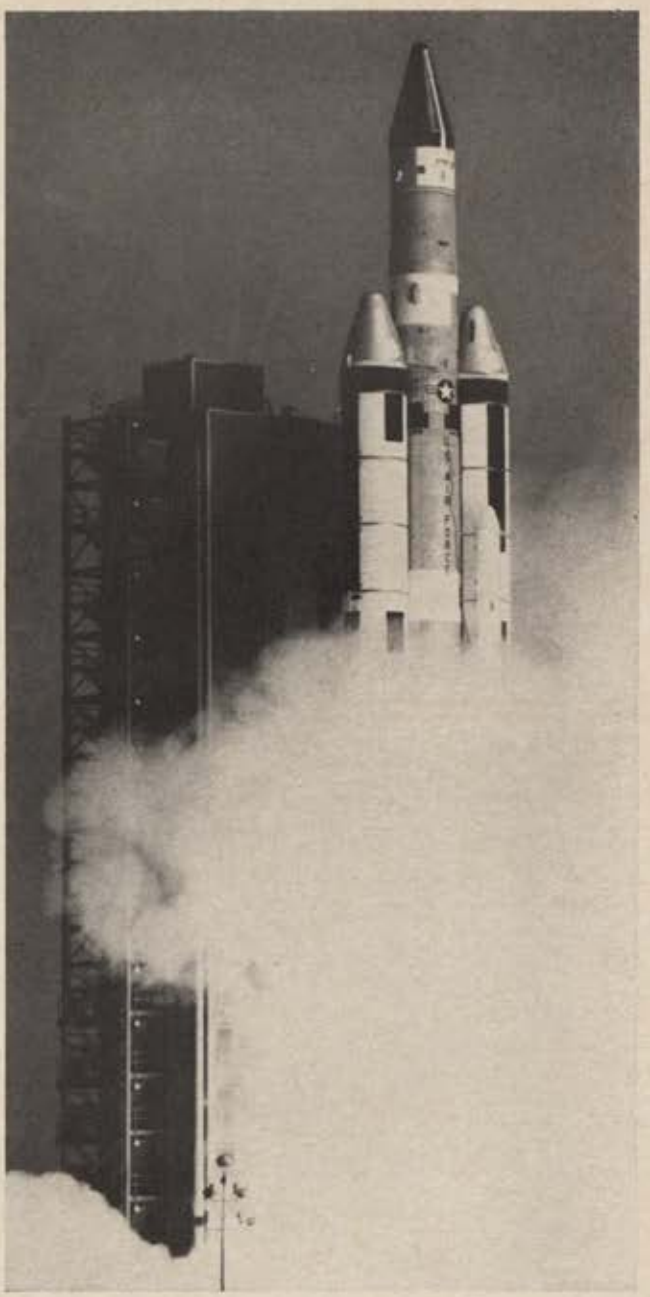
TWO FOR THE SHOW

The world watched as the core vehicle was mated with two of UTC's million-pound-thrust booster stage motors at launch pad 40 in Cape Kennedy's ITL (Integrate-Transfer-Launch) complex. The segments which made up the motors had been cast and cured at our Development Center in California and delivered to the pad on hydra-cushion flat cars. A unique joint developed within United Aircraft Corporation linked them solidly together.



THREE TO GET READY

Solid rocket motors are essentially simple, so checkout for the booster stage of Titan IIIC was virtually complete when thrust vector control plumbing was installed on the assembled boosters. Final checkout on the liquid-propelled core vehicle and all interface systems proceeded during countdown. At the moment of lift-off, the booster stage lent two-and-one-half million pounds of thrust to the enormous space launch vehicle. The head start this gives to the core vehicle is tremendous. It's like moving Cape Kennedy *straight up to orbital altitude.*



ALL SYSTEMS GO!

A bare two minutes after ignition, the solid rocket boosters have burned up their 400 tons of propellant. At this point, the core vehicle can begin its mission.

It's a very significant milestone in rocket technology: **Big solids are here.** And from here we can go almost anywhere we want. Bigger payloads won't need new systems; all you have to do is add more segments to the boosters, or more boosters to the core vehicle. The dream has become a reality. All systems are go.

United Technology Center
SUNNYVALE, CALIFORNIA

DIVISION OF UNITED AIRCRAFT CORPORATION

Dr. Walter Dornberger, the man who headed the project that developed the German V-2 rocket and who has since worked tirelessly to further US missilry and space exploration, now predicts that after Project Apollo gets a man on the moon, America will have to back up and review its space programs. In an exclusive interview upon the eve of his retirement as Vice President for Research of the Bell Aerosystems Co., the space pioneer says the only answer to an operational capability in space is a reusable spaceplane that can be used as a shuttle between a permanent space station and earth, one that can take off and land on conventional runways. Our present ballistic booster system, he says, is expensive and cumbersome. Dr. Dornberger says, in effect . . .

WALTER DORNBERGER—SPACE PIONEER

If Walter Robert Dornberger were a younger man, in the uniform of the US Air Force, he would be the Billy Mitchell of the space age.

Last month, on September 6, Dr. Dornberger reached his seventieth birthday. He will retire at the end of this year as Vice President for Research of the Bell Aerosystems Co. at Niagara Falls, N. Y. He will not go down in history as a Billy Mitchell, for the only uniform he ever wore was that of the German Army, where he had the rank of major general. At the same time he will not be forgotten as America's most outspoken critic of the conservative approach to space.

Walter Dornberger came to the United States in 1947 as a ward of the Air Force, which took him out of a prisoner of war camp in England, where he had been confined since the end of World War II. He went to Wright-Patterson AFB, Dayton, Ohio, as a consultant to the Air Materiel Command.

USAF was interested in Dr. Dornberger because he had been engaged in rocketry since 1930. In that year, as a captain assigned to the German Army's Board of Ordnance, Ballistics Branch, he was a newly graduated Master of Arts in mechanical engineering from the Berlin-Charlottenberg Technical University. He was awarded his doctorate degree in engineering in 1935, but only after experience in the development of solid-propellant rockets and assuming command of a new experimental station at Kummersdorf, near Berlin.

It was during this period that Adolf Hitler became both Chancellor and President of Germany. Initially, interest of the Nazis in rockets was high because this type of weaponry, unheard of in 1918, was not specifically named among the forbidden potentials listed in the Treaty of Versailles.

By 1936, the famous German Rocket Research Center was established at Peenemünde. This came about because Dr. Dornberger, by this time a colonel, had assembled a staff of the finest rocket engineers in Germany and shown progress in experiments that pointed the way to the V-2. His chief engineer was a young space buff named Wernher von Braun, now Director of NASA's Marshall Space Flight Center at Huntsville, Ala.

It was von Braun, in fact, who suggested Peenemünde as a site for the growing effort when it became evident that a firing range was needed for rockets that would go 200 miles or more. After a long series of tests, the first V-2 was fired from the station on the Baltic Sea in June of 1942. It was a failure, and it was not until October that one was a success, and this was followed by more failures.

Through all this, the German rocket effort had spotty but generally poor support from the Hitler government. At one point, the Fuehrer had a dream that the V-2 would never reach England, and Peenemünde lost its priority rating in the German war effort.

It was not until the summer of 1943 that Dr. Dornberger, by then a major general, had a chance to show Hitler films of what he had done and convince him that the project should be pushed. It was in September of 1944 that the first V-2 rocket hit England. By this time, after D-Day, with all of the administrative problems plus Allied bombings of the Peenemünde plant, it was too late for the new weapon to save the Third Reich.

Of the aftermath, it is necessary to record here only that Dr. Dornberger had on the drawing boards, when the war ended, a rocket called the America Project. It was designed to hit New York from a base near Hamburg. It was the pioneer ICBM.

In the scramble by Russia and the United States to grab German aeronautical and space scientists after the war, Dr. Dornberger was considered one of our prize catches. The US Army already had recovered huge quantities of V-2s and V-2 parts, as well as truckloads of Dornberger blueprints. With the man, all were brought to this country.

In his short experience at Wright-Patterson AFB, Dr.

AIR FORCE
OCTOBER, 1965

Let's Get Operational in Space

By Claude Witze
SENIOR EDITOR, AIR FORCE/SPACE DIGEST

AND VISIONARY

Dornberger became a US citizen and found himself frustrated by military and government red tape. You have to "convince at least 200 different people in twenty different offices and committees before a job can start," he complained. "Too many people, too many questions, too many answers."

The escape was provided by Larry Bell, then President of his own aircraft company in Buffalo. Here, Dornberger was given a free hand to work and talk as much as he wanted. He helped develop the Rascal air-to-surface missile and pushed the Dyna-Soar program, in which Bell finally figured as a subcontractor.

Today, Dr. Dornberger has been evaluated by William G. Gisel, who is the President of Bell Aerosystems, in these words:

"He has displayed a relentless desire to advance the state of the art in rockets and space programs. . . . He has been forthright and unwavering in his concept that space represents a new frontier for exploration, he has devoted his entire life unstintingly to the advancement of military and scientific operations, and has been a loyal and devoted citizen of the United States."

On the occasion of Dr. Dornberger's retirement after fifteen years with Bell, AIR FORCE/SPACE DIGEST Senior Editor Claude Witze, who has known Dr. Dornberger for most of this period, paid the space pioneer a weekend visit at his wooded retreat on Back Creek Road, in Boston, N. Y., about fifty miles from Buffalo.

It was a weekend of reminiscence, broken by hard looks into the future. There was bratwurst, cooked over an open charcoal fire, and beer. Then there were more stories about the past, about Hitler, the V-2, Peenemünde, and more looks into the future. There were hikes up into the *Wald*, rising steep behind Dr. Dornberger's modern home that faces on a wooded creek.

There was a quiet session in the study where the two talked for nearly two hours into a tape recorder. Mr. Witze reports on that record in the accompanying article.

IN THE spring of 1958, about six months after the Russians launched Sputnik I, Walter Dornberger was a witness before the Select Committee on Astronautics and Space Exploration of the House of Representatives. The hearing is the one that led the committee, in late May of 1958, to report out a bill to establish the National Aeronautics and Space Administration.

On the stand, Dr. Dornberger talked about his proposal to send a man into space in a maneuverable vehicle. The project was known as Dyna-Soar. He said he first made the suggestion to the Air Force in 1951, and "it was finally accepted as a line proposal after seven years. We could now fly with a man around the globe, if we had started in 1951."

Later, a congressman asked, "What took place in between the time of your original proposal and 1958?"

Replied Dr. Dornberger, with a tone of evident exasperation:

"I can tell you what happened. I made 678 presentations about that project to all the different military offices involved in all parts of the country."

Dr. Dornberger's persistence in wading through the maze of commands, research offices, laboratories, committees, *ad hoc* study groups, and industry symposiums has few equals.

Dr. Clifford C. Furnas, President of the State University at Buffalo, N. Y., former Assistant Secretary of Defense for Research and Development, and an intimate of Dr. Dornberger's, says that this persistence is the German engineer's great contribution to America.

Dr. Furnas feels that the Dornberger scientific and engineering effort has been both commendable and stimulating. But it is the Dornberger role as a

(*Continued on following page*)

publicist and gadfly, as a salesman for the Big Step, as a literate and peripatetic alarmist, that has filled a void.

Seventy years old in September, Dr. Dornberger today has lost none of his courage, his foresight, his energy, or his determination to make people talk sense about space—particularly about the military requirement for an operational capability in space with manned vehicles and platforms.

It is almost impossible to meet or listen to Walter Dornberger and not come out of the experience with a firm opinion about the man. To some he sounds like a jingoist, a Russophobe, and a science-fiction fan. To others he talks sense.

Thus far, he usually has been right. He told Hitler in 1934 that the Nazi rocket program should have the highest priority, but the Fuehrer was interested only in the kind of tactical airpower that he used so successfully in Poland and France a few years later. It was not until 1943 that Dornberger was permitted to go to work on the crash program that produced the V-2 rocket bomb. But for Germany it was too late. There are many who believe the delay was Hitler's greatest mistake.

At the 1958 House committee hearing, Dornberger recommended that the new NASA, to be created out of the old National Advisory Committee for Aeronautics (NACA), be denied the right to "develop, test, launch, and operate aeronautical space vehicles." He argued, lucidly and with conviction, that NASA should supply "research, know-how, and facilities"—as NACA had done before it—but that the operational chores properly belonged to industry and the military.

"The research agency," he declared, "should have no authority to make a decision." He pointed out in 1958 that "the NACA up to now has not developed one single airplane. The airplanes were developed by the civilian organizations, by the commercial organizations, or by the military."

> "It took mankind hundreds of years to learn to use the sea, but only fifty years to use the air. Space can be used in twenty-five years, if we get started. I doubt that the use of space vehicles will be more hazardous than the use of the submarine."

Dornberger still tilts with bureaucratic windmills. He does so at every opportunity. It is this readiness to push his case that led the writers Stewart and Joseph Alsop to describe him a decade ago as a "self-assertive, highly opinionated former German general who talks in a heavy German accent, with an absolute teutonic assurance." They added that "this dogmatism might be irritating in another man, but in Dornberger it is impressive."

This is illustrated today by his attitude toward the entire US approach to the space program. Himself the outstanding pioneer in the development of ballistic rockets, he feels strongly that we have erred in relying on this single vehicle, with its inherent limitations.

"With the present approach, using ballistic boosters," he says, "we are dependent on a system that is so cumbersome and clumsy that any supply or logistic system to serve space stations is impossible.

"You cannot launch fifty boosters in a week, each one with a payload. It is impossible, even with all the facilities at Cape Kennedy. That means our whole approach to space is no good, if we really want to think of space as an operational area.

"We must use a completely different approach. We must get away from this launching from pads, which costs millions and billions of dollars, to the more conventional way of taking off from a runway."

> "The Russians developed the first satellite. We don't know if they have a military mission 'defined,' but they use space for military applications."

In a recent speech, he illustrated his point with what he called a fairy tale. Dr. Dornberger embellished the story, but basically it was about three Frenchmen who wanted to go to New York. They had a $20 million dock built at Cherbourg and then spent another $250 million for a luxury liner that would sail from this dock. They won the Blue Ribbon for their fast crossing of the Atlantic, then sank the liner near the Statue of Liberty and went ashore in a rowboat.

He says that any similarity between this fantasy and the way we send payloads into space is "really just accidental."

But Walter Dornberger has his tongue in his cheek and his eyes sparkle as he dreams up such fairy tales. He is convinced that our whole approach to space is wrong and "we forgot to go slowly." He predicts that after we have gone to the moon we will start over again. Project Apollo cannot be turned back, he says, but the next time "we must create an environment in space that can be used by men, not only for research but for commercial and military purposes."

This environment he is talking about is a permanent space station, one that will never come back into the atmosphere. This will require a logistics system—a recoverable, reusable space transporter to carry people and supplies back and forth to space. The Dyna-Soar was a crude but necessary step in this direction, replaced today by the concept of the aerospace plane.

The fact that this approach has not been used, Dr. Dornberger reasons, can be blamed on the fact that military requirements gave us the big booster. In the beginning there were the Atlas, Thor, and Titan I missiles, and we were forced by their very existence to use them after Sputnik led the way. Like the fancy ship that was sunk after it sailed from Cherbourg to New York, the missiles make a one-way trip.

The Dornberger thesis is that a manned station in near space is as practical as a military base on Okinawa, a laboratory at the South Pole, or an aircraft parts and maintenance depot in Chateauroux. Once established, all that is needed is a logistics system to keep it going. From such a space station, expeditions can

be sent to the moon, or many other places in space, with engines that give a thrust of only 20,000 pounds, instead of the millions of pounds required on one-way booster trips.

The fact that this has not already been done is a serious gap in our space posture, and Dornberger is far from alone in his alarm over the deficiency. Other experts, both scientific and military, recognize it. Dr. I. M. Levitt, of Philadelphia's Franklin Institute, says a spaceplane is "desperately needed" and that the only formal research on one was eliminated when the Air Force's X-20 (Dyna-Soar) project was killed a few years ago.

At a recent meeting of the American Institute of Aeronautics and Astronautics, it was pointed out that the cost of putting a 20,000-pound payload in orbit is more than that of operating a squadron of B-52 bombers for one year. Dr. Alexander Flax, Assistant Secretary of the Air Force for Research and Development, added that USAF is working on the building blocks, but that it will be some time before new launch vehicles can be put in operation to do the present job at lower cost.

At the same meeting, another paper from an industry expert said there are military reasons why the concept cannot be neglected. The paper concluded that we know how to design a manned military vehicle for operation in space and that it would have three definite missions: reconnaissance, inspection, and operational support.

It is this military requirement that is uppermost in Dr. Dornberger's approach. He argues that the Russians have not altered their goal to dominate the world and that the military situation on the usual battlefields—land, sea, and air—essentially is stalemated. This means an aggressor nation must look for telling supremacy in a new area—space. At present, space is only a sort of road over which we can send ballistic missiles. But, Dornberger says, space is really a medium in which we can operate and fight,

> "You think the Russians are following a peaceful course in space? Have you ever found in the Moscow parade, where they show the vehicles, the big boosters that they are accompanied by civilians or scientists? Of course not. They are accompanied by soldiers. Behind the Russian effort in space is the military man, not the civilian."

and the balance of power in space will be seized by the nation that learns to do this.

"If I were a Russian," Dornberger says, "I would aim at making the United States blind."

The logic behind this assumes that the real balance of military power will favor the nation that can successfully keep the location of its targets on the land and sea secret from a potential enemy. This simple fact lies behind the Russian phobia about its own security and its flat refusal to submit to any type of inspection program. It lies, also, behind our own heavy dependence on the Polaris system.

The Polaris, incidentally, provides a good point to support the Dornberger argument. The submarine system relies on navigation satellites. If the enemy makes the satellite inoperative, he will impede, perhaps completely stop, use of the underwater-launched missile. It follows, Dornberger argues, that if the Russians decided to wage all-out war, the first thing they would do is cripple our navigational satellites, as well as our reconnaissance vehicles that can pinpoint targets in Russia.

Dornberger also contends that the Russians prefer mobile to hardened and fixed sites for their long-range missiles. This is a policy he recommended to Hitler for the V-2 and is one of the points on which he was overruled, the result providing better targets for Allied bombers. In the case of Russia, he says, they can put many of their missiles anywhere they choose for a final firing position. If they blind our reconnaissance satellites—which today perform the U-2 mission from space—our counterforce and retalitory capability would be useless.

> "We have to assume that in an all-out war, if the Russians really mean it, they will put atomic bombs in space and explode them there."

Dornberger is not without support. A couple of months ago Gen. B. A. Schriever, Commander of the USAF Systems Command, said, "A Soviet breakthrough in space technology could yield real military advantages. There is always the possibility of Soviet space developments which could render our present deterrent forces ineffective." And Vice President Humphrey, at about the same time, said, "We would be foolish if we did not understand the military implications of Soviet space science, as well as our own."

To ensure against this possibility, Dornberger believes it is possible to make satellites that are undetectable except by our own devices. At the same time, he sees it as a requirement that we should be able to detect, examine, and destroy satellites of another country. The reason: They could be offensive weapons.

As recently as last July, Dr. Albert C. Hall, then Deputy Director for Space in the Office of the Director of Research and Engineering of the Defense Department, said, "Studies over the years since Sputnik I continue to reaffirm that space is not a medium in which we can foresee an aggressive threat." He said that it does not make military or economic sense to keep bombs in orbit and that deterrents are more effectively deployed on land and sea.

Dornberger rejects the thesis that space holds no advantages as a launching-spot for weapons. There is a United Nations agreement to outlaw bombs in orbit, as Dr. Hall has pointed out, but Dornberger is far from convinced that a signed paper is a defense against them. Once they have been put there by another country, he says, it will be too late to deal with the crisis.

(Continued on following page)

Dr. Wernher von Braun, left, Director, Marshall Space Flight Center, Huntsville, Ala., during one of his visits to Bell, examines Bell's Lunar Landing Research Vehicle with Dr. Dornberger. Dr. von Braun was Dr. Dornberger's chief engineer during development of the German V-2 rocket.

Nor does Dornberger share the popular idea that space is not a sensible place for a launching pad if someone wants to deliver a bomb. Of course, it is cheaper to send a weapon from one spot on earth to another spot on the earth. But he sees the weapon as more of a threat, a sword of Damocles, if it is in orbit. As for the accuracy of delivery, which the conservative school says will be poor if a weapon is fired from space, Dornberger again disagrees.

"We already are picking up satellites from space with an airplane that catches them in a basket on the way down," he says. "If we have accuracy enough to do that, we have accuracy enough to put a nuclear weapon on target."

The recent Department of Defense decision to proceed with a Manned Orbiting Laboratory (MOL) represents, to Dornberger, a small and halting concession to the military requirement. To him, the achievement of a true defensive system in space, a permanent fortress, a home for a police force, is the pressing demand. This does not mean the construction in space of a single military outpost. He sees a requirement for many units—possibly as many as forty or fifty—that would be able to operate from bigger space stations, to perform missions, to "cover a beat" or run military "patrols" in space.

"A realistic step in the right direction," he said recently, "would be the establishment of a man-made base in space, supplied by recoverable, reusable shuttle spacecraft, and for heavy payloads, by our ballistic boosters. Such a base, with a space laboratory as a beginning, would be assembled piece by piece, unit by unit, brought up and maintained in a permanent orbit at altitudes of 250 to 300 miles. . . .

"Such bases will consist of many units interconnected by space prime movers and space taxis. With the exception of the shuttle vehicle, no device will ever return to earth through the atmosphere. It will be the big spaceport, from which all future space efforts have to start. It will have laboratories, assembly and maintenance facilities, storage, housing, and checkout facilities, fuel stations, etc. In one word, all that is necessary to serve efficiently all operations in space. It will be like a beehive, with men, machines, and instruments all over the place."

Dornberger's concept puts the men in the most important role. They will make the decisions, and even their comfort is a matter of concern. They must be freed from the sardine-can environment. He has not spoken of having a post exchange in space, but speaks seriously of the need for fast delivery service from the PX.

"Every man circling the globe," says Dornberger, who is himself a hearty eater, "should have every day on his breakfast table a fresh egg, brought up from earth." He concedes at once that this goal probably sounds as ridiculous as his proposal for Dyna-Soar sounded in 1951.

And the Dyna-Soar requirement still stands, although technology has turned it into a different bird, now classified by its inventor as an "air-breathing, recoverable, reusable space transporter." In view of where we are in the national space program, with two military men already having spent eight days in orbit under NASA colors, the development of this vehicle probably is a matter of greater urgency than any other.

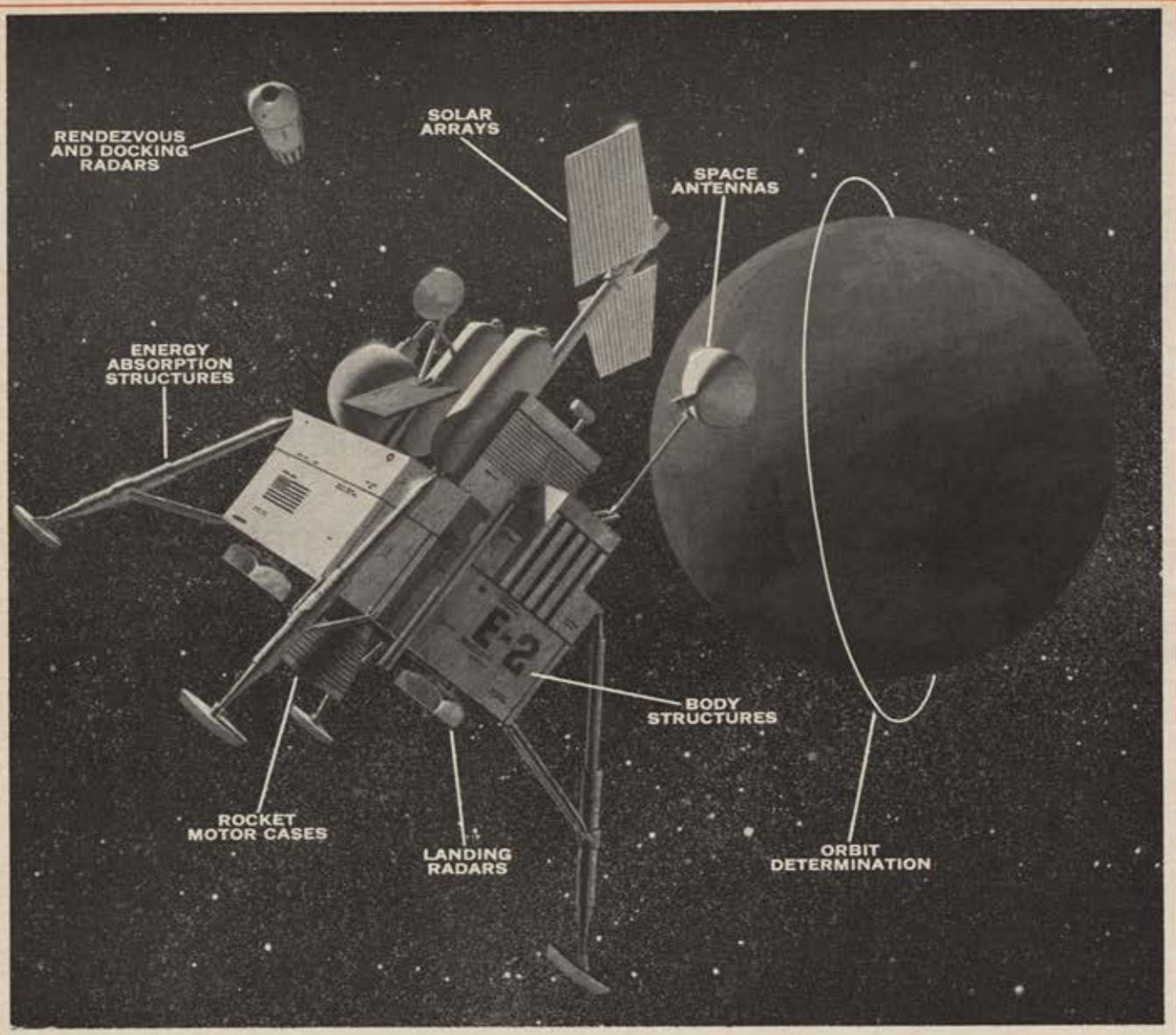
Usually Dornberger now speaks of this vehicle in terms of a two-stage aerospace plane, always leaving himself open to take advantage of even better technology, if it should appear feasible. Dyna-Soar was a delta-winged glider to be boosted into orbit by a modified Titan II. It would have been capable of hypersonic reentry, and the pilot would have landed it at an airport of his choosing. The project was started in 1960—which Dornberger considered nine years too late—and was canceled in 1963 after an investment of $400 million. By this time, the technology had outpaced Dyna-Soar. Only history will know whether the delay in obtaining "stick time" in space has given the Russians an unbeatable advantage.

> "The 'building-block' approach, favored by the Defense Department, is a pretty good idea if you really build the blocks. Then they have to be put together in a system, to prove what can be done. The weakness of the present building-block approach is that it falls short of fulfillment."

On the subject of the space transport vehicle, Dornberger still waxes hot and enthusiastic. He scorns those who insist that all missions can be performed with ballistic boosters. He says he becomes jubilant when he hears of people in high places who demand a "well-defined mission" and "cost/effectiveness." But he cannot understand their conservatism when he shows that a space transport will have an essential mission, and that its cost/effectiveness will far surpass that of the approach now being followed.

He cites the case of Charles Lindbergh's flight to Paris in 1927. The mission and performance of the

(*Continued on page 87*)



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Spirit of St. Louis would have wiped the project from the Defense Department budget. Dornberger points out that today, every evening, there are twenty-five Boeing 707s heading out over the ocean from New York's Kennedy International Airport alone, that the mission is highly justified, and the cost/effectiveness cannot be challenged.

He believes that Gemini Astronauts Conrad and Cooper are the Lindberghs of the space age, but there is a serious deficiency in our effort to provide them with proper equipment. Lindbergh landed at an air-

"We have people with the same imagination and talent as the Russians, but we don't let them do anything. We always wait for someone to say it can't be done."

port and so, Dr. Dornberger believes, should have Conrad and Cooper.

There are two fundamental requirements, Dornberger says:

The first is the takeoff and landing on any runway already suitable for jet airplanes.

The second is the provision of an engine that can capture and store oxygen from the atmosphere before it gets into space. This will bring the takeoff weight down to practical levels.

Dornberger did not have the ramjet to put in his early design for the Dyna-Soar, but he now looks to it for the first stage of propulsion to get his hypersonic vehicle off the ground. It would be powered by hydrogen and take its oxygen from the air until it leaves the atmosphere. While in the atmosphere it also should be capable of capturing and storing more oxygen for use in space. Propulsion would be by rocket once it reached space. In the long run, if it runs out of fuel in space, there must be a fuel station there where the vehicle can be replenished. For reentry, the ablative heat-shield approach, used on space capsules, must be abandoned. The transport vehicle must be capable of being braked and flown, like an airplane, to any landing spot selected by the pilot.

Dornberger is the first to acknowledge that he is proposing an expensive program. Yet he argues, persuasively, that the investment would be wise and, in the long run, profitable. He says that if fifty percent of the money we have spent on today's one-shot-at-a-time thrust capability had gone into a recoverable

"In space the enemy will come from all sides, not along a valley."

vehicle program, we would be closer to our requirements today. Now he believes a first system could be operational—at least for experiments—in seven years. It would take an annual budget of $100 million, climbing to $1 billion a year by the time the first real space pilot left the runway.

Without this effort, Dornberger asserts, space cannot be cultivated and used for the improvement—and defense—of our civilization.

The intense concern with defense—"I cannot really describe the military missions in space beyond that of defending the free world"—probably has its roots in the work of Dornberger, the two-star German general at Peenemünde.

"Back in 1942, at the first successful launching of the V-2 missile, I made a speech in which I told my people that this was only the beginning," he says. "I told them that our first task after the war would be to get something like the V-2 back to the ground. And that can only be done by a man guiding it. I was certain from the beginning that space would be conquered by man and not by automatic machines. I told them we had to find ways and means to get man up and let him control the vehicle and maneuver it back to a landing.

"You know," he continued, "we do not yet have a fully automatic device to land an airplane. I know you would not go aboard an airplane in New York, destination Paris, knowing there was no man aboard to fly it, only an automatic gimmick. You would refuse to ride in it.

"Also, there is the military application. Somehow, we must convince the people responsible for the safety of our country that space really is a medium in which men will operate sooner or later, for both peaceful

"McNamara says we have overkill capability, and he has sound reasons why we need it. The Russians won't let us use it; they will stop us from space. They can use space to make our overkill capability meaningless."

and military purposes. In this respect, it does not differ from the land, sea, or air."

To illustrate this, without provoking new discussion about the universal horror with which today's public views the thought of weaponry in space, Dornberger cites the communications problem. All communications systems between earth and men or machine in space are insecure, he says.

This vulnerability makes it essential that we find a new system for communication into space. High-altitude atomic explosions have already demonstrated that radio is unreliable, although we still do not know a great deal about this phenomena because the experiments were limited, and the nuclear test-ban treaty forbids further research.

It appears that a nation set on conquest could cripple space radio communications with an atomic or nuclear blast in space. Dornberger suspects that laser beams could be used for space communications and would be invulnerable to nuclear blasts. But he is not sure, and there is no way to find out in view of the ban on experimentation.

He is equally concerned about the vulnerability of command and control stations on the ground, sea, and air. "We need a command station in space," he says. "It needs the same sort of information we now have at headquarters of the Strategic Air Command. It

(*Continued on following page*)

"The scientist is fundamentally pessimistic; he has to be. The engineer, on the other hand, is devoted to accomplishment, to doing the job. The country's efforts in the space area should be run by engineers and not by scientists. Scientists should help the engineers. The scientists always try to sit down and tell the engineer that his question, to begin with, is wrong. I am not interested. I only want to know: How can I do it? The scientist, if he is put in charge, cannot follow a straight line to find out how something can be done."

"I cannot understand this saying, that we have no mission in space. Is the protection of the free world not a mission?"

"I am quite sure that in the next few years we will see a complete revision of our space program. The [Apollo] lunar shot will set our space effort back for years, because it takes so much talent and money. We should not seek this glory. We should seek to utilize space."

"We didn't go to the war with one ship, we went with whole fleets of ships. We must envisage this same sort of thing for a possible war in space."

Dr. Dornberger is retiring at age of seventy, after fifteen years with Bell Aerosystems. Quotes, left, and throughout text are taken from Mr. Witze's interview with him.

must be invulnerable in space and its communications must be invulnerable. Lack of these facilities is a weakness in our defense of world peace."

And, later:

"It is clear to me that the Russians are preparing to use space for military purposes and that we must make our space systems invulnerable, maneuverable, and manned."

One inescapable fact about Dornberger that comes to the surface in any long and intimate discussion with him is that he is an engineer and not a scientist. He has short patience with the conservative and plodding approach, the one that is skeptical about engineering capability, that speaks these days about a "technological plateau."

Here, again, he goes back in his career for an illustration. The year was 1939 and the place, of course, was Peenemünde. Dornberger staged what he called "The Day of Wisdom."

"We got the order to develop an early missile, the one that eventually led to the V-2," he related recently. "We had a number of problems we could not solve. So I contacted some universities and technical institutes and asked if they could help us.

"They were not much interested, largely because they did not know what it was all about. But they agreed to try.

"I ordered my people to write down each of their problems in a maximum of one page for each problem. They were to define them in the most clear-cut manner possible. This way, we assembled about 125 problems we could not solve.

"Then I called in about 200 scientists from universities and institutes and bought them a good dinner at the Officers' Club. And I told them we had these problems, and they had the facilities to help us.

" 'Now,' I said, 'I will read these problems. And any man who believes he can solve one of them is to raise his hand.

" 'But I don't want you to write me a 300-page memorandum with the answer in a footnote on page 246. I want only the answer in two or three pages. This is clear-cut and it can be done.

" '*Do not question the problem. It exists.*'

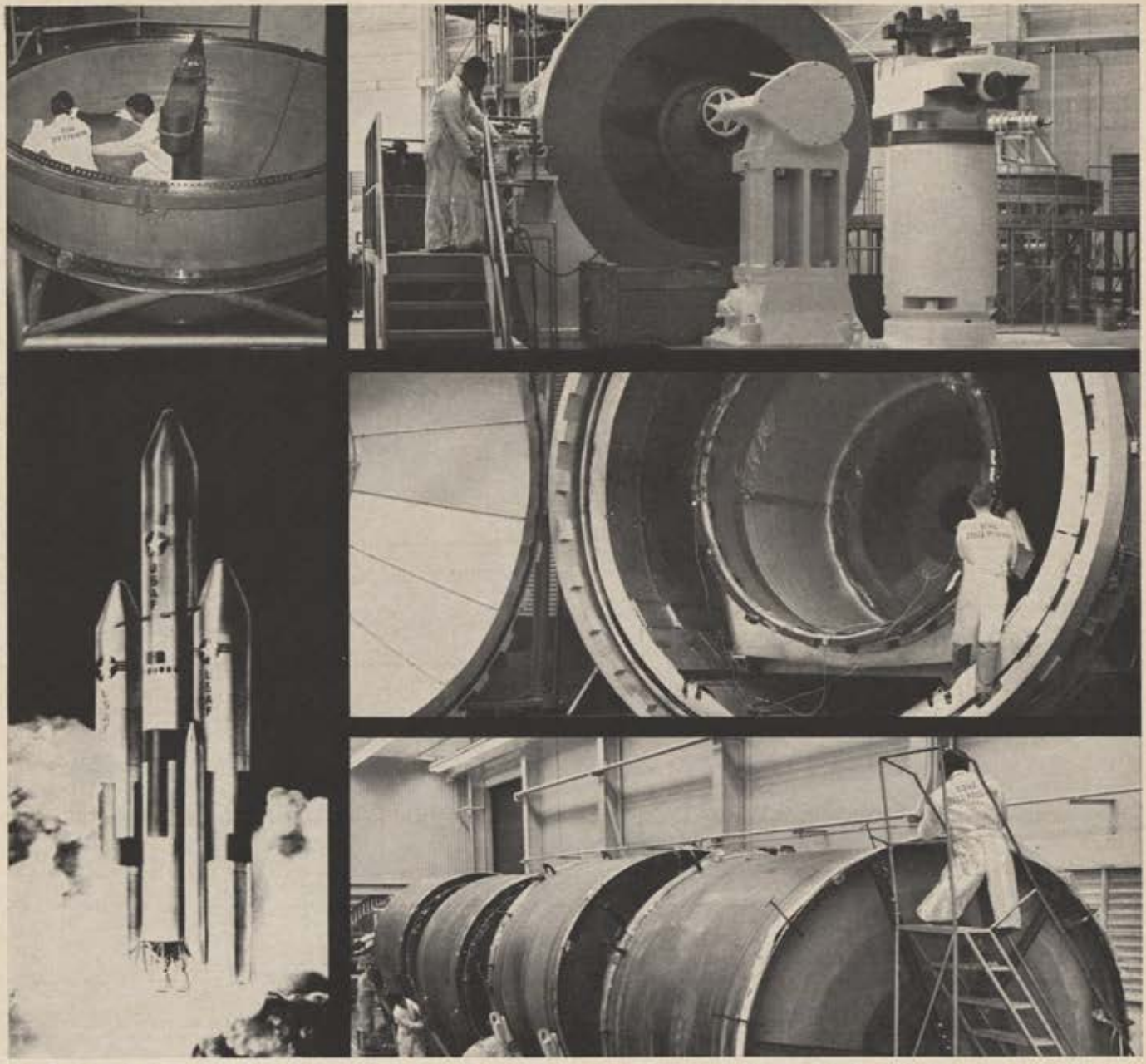
"In a little over an hour, I had all the problems covered at least twice.

"And we got our answers, the slowest not more than a year later, and they were 100 percent right.

"Without this approach, the scientists inevitably will devote their attention to the question and not to the answer.

"Somehow, it seems to me today, that we are not working hard enough on the answers. The questions are being challenged while the defense of the free world hangs in the balance."

It also may explain why Dr. Dornberger made 678 presentations about the Dyna-Soar concept between 1951 and 1958.—END



HERE'S THE INSIDE STORY FROM ROHR

TITAN III-C BOOSTER INSULATION

Above are fabrication sequences in the insulation of motor cases for the solid rocket strap-ons of the Titan III-C, standard Air Force launch vehicle, recently successfully flight tested at Cape Kennedy. These buna-N rubber insulative components are manufactured by Rohr's Space Products Division to meet United Technology Center's precise requirements. Both precured and cured-in-place techniques are used in insulating the 10-foot diameter center segments and aft closures. These components, varying in thickness from a fraction of an inch to almost a foot, have performed perfectly throughout the motor's extensive development and test program. Reliability is assured by close control of manufacturing processes, including curing under high pressure in Rohr's 15-foot by 35-foot autoclave. Technologies developed at Rohr Space Products Division in the large solid rocket field encompass the full range of insulation materials in use. In addition to providing the insulation, booster intertank structures for the solid boosters on the Titan III-C are also manufactured at Rohr.

For the full story on this and a variety of other nonmetallic fabrication capabilities, please contact: Marketing Manager, Dept. 61, Space Products Division, Rohr Corporation, Riverside, California.

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News and Comment about Air Force People . . .

By Jackson V. Rambeau

AFA DIRECTOR OF MILITARY AND INDUSTRIAL RELATIONS

Overdue Credit

Enlisted members of the armed forces may soon be able to count inactive-duty Reserve service toward retirement credit if a bill just endorsed by the Defense Department and the White House is enacted by Congress.

In one of the more asinine inequities between officer and enlisted service, an officer retiring with twenty years' active duty or more draws retirement credit also for any time he served in the Reserve Forces on inactive duty, up to thirty years' total service, giving him the maximum seventy-five percent retirement. But through an oversight in the original law, the same credit is not extended to enlisted men.

AFA's Airmen's Council called attention to this injustice more than two years ago, and delegates to AFA's National Convention in September 1964 unanimously passed a resolution calling on Congress to correct the error.

Maj. Gen. Bob Eaton, USAF (Ret.), former USAF Director of Legislative Liaison and an adviser to the Airmen's Council, has worked tirelessly to persuade Congress and the Administration to act. Three members of Congress introduced bills to correct the inequity this year.

Under normal congressional procedures, bills affecting the armed forces are sent to DoD and the Budget Bureau for comment. In the case of this legislation, after lengthy delays in the Pentagon—while each of the services weighed the obvious inequity against the many administrative headaches involved in computing enlisted retirement credits—DoD endorsed the bill and sent it to the Budget Bureau, which affixed the White House blessing.

These hurdles have been overcome, but now it's up to Congress to pass the bill. Heading for adjournment, Congress may put off action until next year.

As written, the bill will not authorize recomputation for enlisted men already retired, but anyone retiring after its enactment will be allowed to count Reserve time previously served.

Morale Buster

After an embarrassing two-month delay, the Air Force was able to promote a long list of lieutenant colonels and majors on September 1, after President Johnson signed a bill authorizing USAF to exceed its officer grade limitation for another year.

The Air Force has been struggling with a highly restrictive officer grade limitation for at least six years. It has been a steadily growing "morale buster" each year. The basic problem dates back to 1954 when Congress established the Officer Grade Limitation Act, designating the maximum number of officers which each service could have in each grade. At that time, the Air Force had a higher proportion of company-grade officers than any other service. To make certain that USAF would not promote officers at a faster pace than the Army and Navy, Congress gave USAF fewer field-grade slots, with the understanding that grade allocations would be revised when it became necessary.

By 1959 the Air Force had reached its OGLA ceiling, but, instead of amending the Act, Congress merely gave USAF temporary authority to promote 3,000 captains to major. Two years later, with many majors now overdue for promotion, it approved an increase of 4,000 in lieutenant colonel spaces and renewed that authority for two years in 1963. When that legislation expired on June 30, the Air Force not only could not promote individuals who had been selected, but without some relief it would have had to demote thousands of officers to return to its 1954 ceiling.

These temporary extensions may be welcome enough to those who would otherwise be denied promotion, but with each passing year the Air Force lags further behind its sister services in promotion cycles. The real solution rests in the Bolté proposal, which would establish the same standards of officer manning, promotion, and retirement in all services. Named for Gen. Charles L. Bolté, USA (Ret.), who chaired a top-level interservice group in preparing the proposal, the Bolté bill has been pigeonholed since early 1963, apparently because it poses a heavy workload for the congressional committees which would have to tackle its many ramifications.

Ironically, it was during hearings on the first Air Force "relief" bill in 1959 that Rep. Carl Vinson of Georgia, then Chairman of the House Armed Services Committee, suggested that the Defense Department propose legislation to amend OGLA, which in turn led to formation of the Bolté board.

General Bolté's group apparently did its work too well. Rather than recommend piecemeal solutions to the

On hand to induct Lt. Gen. Cecil H. Childre, center, as CONAC Commander on August 18 were Maj. Gen. Curt Low, Asst. C/S for Reserve Forces, Hq. USAF, and Dr. Ted Marrs, Deputy to AF Secretary for Reserve and ROTC Affairs.

officer grade structure, which would have necessitated further revisions later, it properly decided that a complete overhaul was necessary to put all services on the same footing. The resulting bill they drafted came to 160 mimeographed pages.

The Air Force Association has strongly endorsed the Bolté bill. Resolutions to that effect have been passed by two National AFA Conventions. As AFA's President Jess Larson emphasizes on page 6 of this issue, we implore Congress not to delay longer in carrying out this obligation.

Surplus Airlift?

Chairman L. Mendel Rivers (D.-S.C.) of the House Armed Services Committee, who has won several recent victories in skirmishes with the Defense Department—notably the billion-dollar military pay raise, the Guard-Reserve merger reexamination, and the requirement that DoD give Congress prior notification of intended base closings—now intends to look into DoD's plans to disband a number of Reserve Forces transport groups.

Three Reserve groups have already been marked for elimination: two C-123 units at Memphis, Tenn.—the 919th and 920th—and a C-119 group—the 923d—at Carswell AFB, Tex. A fourth unit—the 929th Group at Muskogee, Okla., equipped with C-119s—will be dropped when its base is closed in July 1967.

As we have previously pointed out, literally dozens of Air Guard and Reserve transport units are earmarked for elimination in the next five years.

Mr. Rivers, who is an acknowledged expert on airlift—he pushed hard for the C-141 and C-5A programs, and the MATS base at Charleston, S.C., is in his district—wants his committee to review these and other DoD airlift plans, and he has set up a special subcommittee for that purpose. It is headed by Rep. Melvin Price, an Illinois Democrat who is also knowledgeable on the subject of airlift since his district embraces MATS Headquarters at Scott AFB, Ill.

Secretary of Defense McNamara contends that the Lockheed C-141 StarLifter and the upcoming C-5A heavy logistics transport will so greatly expand US airlift capability that the old and relatively inefficient C-119s, C-97s, and C-121s of the Reserve Forces can readily be retired. But some members of Congress insist that we may need all the airlift we can get, particularly the assault airlift capability represented in the C-119. This is no time, they argue, to break up well-qualified Reserve Forces transport crews.

Rep. Melvin Price, Illinois Democrat, has been named Chairman of subcommittee on airlift in House Armed Services Committee. His home district includes Hq. MATS at Scott AFB, Ill.

The immediate problem is that the two Memphis groups have no aircraft at present, having given up their C-123s to the active Air Force for use in Southeast Asia. Congressman George Grider of Memphis, a retired Navy captain, wants DoD to assign other available transports—C-119s if necessary—to keep the units intact.

Refreshing COLA

Because housing in Alaska costs far more than a serviceman's quarters allowance, he gets supplemental pay to cover the extra expense. The same holds true for many overseas posts.

But it's certainly no secret that it costs more to live in Washington, D. C., or New York City than in many communities in the continental US.

AFA will support a legislative proposal now being circulated in the Defense Department which will ask Congress next year to authorize a cost of living allowance (COLA) for various locations in the continental US as well as in Hawaii, Alaska, and overseas.

The proposal points out that "although the basic allowance for quarters (BAQ) was adjusted in 1963, steady increases in housing expenses within the US have made the current BAQ rates inadequate for many areas.

"A growing number of members of the uniformed services are experiencing severe financial hardships created by assignments to such areas. The escalation of housing expenses, while it follows general trends in the American economy, applies unevenly across the US. . . . Therefore, it is more appropriate that a general increase in BAQ not be proposed, but that a system be authorized which recognizes the needs of the uniformed services in specific geographical areas."

The proposal suggests that the supplemental allowances be used to "reimburse the eligible members of each grade for the average housing expenses reported for their grade in designated areas." It estimates the cost to the Air Force for the first year at just under $50 million.

Housing is a major factor in living costs, but the bill may also authorize some allowances for military families on duty in places where they do not have ready access to commissaries, base exchanges, and military recreational facilities.

Parting Shots

A reenlistment bonus for Reserve Forces enlisted men has been proposed by Rep. F. Edward Hébert (D.-La.) in a bill recently introduced in Congress. This is a big step in a long campaign by three AFA Councils—Airmen's, Guard, and Reserve—to secure enactment of such a bonus to stimulate enlistment of prior service personnel and to keep trained men in the Reserve Forces.

Mr. Hébert's bill would provide a flat $100 a year bonus to all members of the Reserve Forces who have completed two years of active duty or six years' Reserve service. It would cover any enlisted Reservist in grade E-2 or above, in an organized unit or in individual training status, who participates satisfactorily each year. Maximum amount to be paid to any individual would be $2,000 over twenty years of Reserve service. It's money well spent, for it costs far more than that to train a single replacement.

Authority to promote general officers in the Reserve, which expired June 30, 1964, has been renewed in a bill which took only three weeks from initial committee hearings to passage by both houses of Congress. But, though there have been no Reserve general officer promotions for more than two years, it is taking the Air Force longer to set up a board than it took Congress to enact the bill. No action is expected before October. The Air Force is committed to Congress to recommend thirteen to brigadier general and five to two-star rank.

DoD has approved the establishment of twenty Category A Reserve Forces combat support units, totaling 2,200 members, to work with MATS and AFLC. It also okayed the new Part 3 training program, including a limited number of two-week tours. This is the program which might have been eliminated along with re-

(Continued on following page)

covery groups except for a last-minute appeal by AFA President Jess Larson to Air Force Secretary Zuckert to hang onto this pool of qualified and dedicated Reservists. Secretary Zuckert not only moved quickly to halt their disbandment, but pushed the new program through to approval.

The fifteen Air Guard and eleven Reserve groups selected by the Defense Department to be ready for possible deployment by the end of the year *(see "Aerospace World" in September issue)* have all been visited by a team led by Dr. Theodore Marrs, Deputy for Reserve and ROTC Affairs to the Secretary of the Air Force. Purpose of the team, made up of representatives from CONAC, the National Guard Bureau, and Hq. USAF, is to ensure that the units will be as near to 100 percent in manning and equipping as possible by January 1. Dr. Marrs credits close teamwork between Lt. Gen. Cecil Childre, new CONAC Commander, and Maj. Gen. W. P. Wilson, Guard Bureau Chief, with facilitating the buildup.

Mrs. Lester J. Charnock, wife of Technical Director of Research and Technology Division's Systems Engineering Group, Wright-Patterson AFB, Ohio, smiles happily as husband receives AF Exceptional Civilian Service Medal from Maj. Gen. M. C. Demler, R&T Division Chief.

In a program initiated by its Civilian Personnel Council, AFA at each National Convention honors at least three Air Force civilian employees for exceptionally distinguished service of major significance to the US Air Force. Any AFA member may submit nominations to the Council. For awards to be made at the Convention in Dallas next March, nominations must reach AFA Headquarters by November 15.

To be recommended for an AFA award, a nominee must be currently employed by the Air Force, and his career should reflect exceptionally meritorious devotion to duty and extremely significant contributions of broad scope to the efficiency, economy, and general improvement of Air Force operations.

Each nomination should be submitted in seven copies, to include a draft of the proposed citation not to exceed ninety words; the name, present title, grade, and organization of the employee; the date and place of his or her birth, marital status, education and degrees, and significant extra-Air Force activities; and a résumé of his federal service, with emphasis on Air Force service.

Awards

To the American Telephone & Telegraph Co., the first USAF Award for Support of the Air Reserve Forces, a program reestablished by the Air Force, at the recommendation of AFA's Guard, Reserve, and Airmen's Councils, to honor employers for personnel policies which safeguard job opportunities and pay of employees serving in the Reserve Forces. The award was to be presented to AT&T President W. T. Romnes by USAF Chief of Staff Gen. J. P. McConnell on September 17 during AFA's Fall Meeting in Washington, D. C.

To Lester J. Charnock, Technical Director, Systems Engineering Group, R&T Div., AFSC, Wright-Patterson AFB, Ohio; Rufus L. Crockett, Directorate of Civil Engineering, Hq. USAF; William B. Petty, former Deputy Comptroller of the Air Force; John E. Taylor, Chief of Civilian Personnel, Hq. AFLC, Wright-Patterson AFB, Ohio; and Dr. Hans J. P. von Ohain, Chief Scientist, Aerospace Research Laboratories, OAR, Wright-Patterson AFB, Ohio, Air Force Decorations for Exceptional Civilian Service.

To CMSgt. Robert R. Perry, engineering coordinator for C-141 Joint Test Force, election to the National Academy of Sciences, first USAF airman to be accorded this honor.

Senior Staff Changes

Maj. Gen. Milton B. Adams, assigned as Dep. for Ops., TAC, Langley AFB, Va., orders now rescinded and assigned as Cmdr., Tactical Air Reconnaissance Center, Shaw AFB, S.C., replacing Brig. Gen. Kyle L. Riddle . . . **Joseph W. Angell, Jr.,** from Chief, USAF Historical Div., Liaison Office, Hq. USAF, to Special Assistant for Policy, Office of the Cmdr., AFSC . . . **Maj. Gen. Fred J. Ascani,** from Cmdr., Systems Engineering Gp., AFSC, and additional duty as Dep. Cmdr., Research & Technology Div., to Vice Cmdr., 5th AF, Fuchu AS, Japan.

Brig. Gen. Russell A. Berg, from Dir., Special Projects Office, OSAF, El Segundo, Calif., to Dep. Dir., MOL Program, and additional duty as Dep. Cmdr., MOL, AFSC, Los Angeles, Calif. . . . **Brig. Gen. Sterling P. Bettinger,** from DCS/Personnel, MATS, Scott AFB, Ill., to Dir., Plans and Policy, J-5, NORAD, CONAD, Ent AFB, Colo. . . . **Brig. Gen. Joseph S. Bleymaier,** from Dep. Cmdr., Space Systems Div. for Manned Systems, AFSC, Los Angeles, Calif., to Cmdr., AF Western Test Range, Vandenberg AFB, Calif., replacing Brig. Gen. Jewell C. Maxwell . . . **Arnold G. Bueter,** from Associate Dir. of Accounting and Finance, Hq. USAF, to Dep. Comptroller, USAF Comptroller . . . **Brig. Gen. Sam J. Byerley,** from Cmdr., 14th Strat. Aerospace Div., Beale AFB, Calif., to Cmdr., TUSLOG, Ankara, Turkey.

Brig. Gen. James W. Chapman, Jr., assigned as Cmdr., 1001st Air Base Wing, Andrews AFB, Md., orders now rescinded and assigned as Asst. to Cmdr., Travis AFB, Calif. . . . **Brig. Gen. Louis E. Coira,** from Vice Cmdr., USAF Security Service, Kelly AFB, Tex., to Cmdr., USAF Security Service, replacing Maj. Gen. Richard P. Klocko . . . **Brig. Gen. Robert L. Delashaw,** from Vice Cmdr., 19th AF, TAC, Seymour-Johnson AFB, N.C., to Cmdr., 832d Air Div., TAC, Cannon AFB, N.M. . . . **Maj. Gen. Joseph L. Dickman,** from Dir. of Ops., J-3, NORAD and CONAD, Ent AFB, Colo., to Dir., NORAD Combat Operations Center . . . **Brig. Gen. Robert J. Dixon,** from Asst. for Joint and National Security Council Matters, Hq. USAF, to Cmdr., 45th Air Div., SAC, Loring AFB, Me., replacing Brig. Gen. Frank B. Elliot.

Brig. Gen. Frank B. Elliott, from Cmdr., 45th Air Div., SAC, Loring AFB, Me., to Comptroller, SAC, Offutt AFB, Neb. . . . **Maj. Gen. William E. Eubank, Jr.,** from Dep. Cmdr., 2d AF, SAC, Barksdale AFB, La., to Asst. to CinC, with retirement scheduled Oct. 31 . . . **Brig. Gen. Harry L. Evans,** from Asst. Dep. Cmdr. for Space for MOL, AFSC, Andrews AFB, Md., to Vice Dir., MOL, OSAF . . . **Brig. Gen. Arthur E. Exon,** from Cmdr., Wright-Patterson AFB, Ohio, to Dir., Defense Contract Administration Services Region, DSA, Los Angeles, Calif.

Maj. Gen. Gordon M. Graham, from Asst. Dep. for Ops., TAC, Langley AFB,

Maj. Gen. Richard P. Klocko, former head of USAF Security Service, has succeeded Maj. Gen. J. Francis Taylor as Commander of AF Communications Service, Scott AFB, Ill.

New Commander of the USAF Security Service is Brig. Gen. Louis E. Coira, who moves up from Deputy Commander to succeed General Klocko. He is a 1938 West Point graduate.

Va., to Dep. for Ops., replacing Maj. Gen. John N. Ewbank . . . **Brig. Gen. Philip H. Greasley,** from DCS/Plans, ATC, Randolph AFB, Tex., to C/S, ATC . . . **Brig. Gen. George M. Higginson,** assigned to DCS/Operations, AFCS, Scott AFB, Ill., orders now rescinded and assigned to Andrews AFB, Md., in patient status . . . **Brig. Gen. Hubert S. Judy,** from Dep. Dir. of Plans for Advanced Planning, DCS/Plans & Ops., Hq. USAF, to Dep. Dir. for Plans, NATO Military Committee & Standing Gp., Washington, D. C. . . . **Maj. Gen. Richard P. Klocko,** from Cmdr., USAF Security Service, Kelly AFB, Tex., to Cmdr., AFCS, Scott AFB, Ill., replacing Maj. Gen. J. Francis Taylor, Jr.

Brig. Gen. David I. Liebman, from Chief, Strategic Operations Div., J-3, JCS, to Military Asst. to Asst. Sec. of Defense for Public Affairs . . . **Maj. Gen. Chester E. McCarty,** from C/S, USAFE, Lindsey AS, Germany, to Asst. to Cmdr., ADC, Portland International Airport, Portland, Ore. . . . **Maj. Gen. Loren C. McCollom,** from Dep. Cmdr., 17th AF, USAFE, Ramstein AB, Germany, to Cmdr., Technical Training Center, ATC, Amarillo AFB, Tex. . . . **Rex C. Mack,** from Chief Scientist, Hughes Aircraft Co., Culver City, Calif., to Dir. of Operational Requirements and Development Plans, DCS/R&D, Hq. USAF . . . **Brig. Gen. Jewell C. Maxwell,** from Cmdr., AF Western Test Range, AFSC, Vandenberg AFB, Calif., to Dir. of Supersonic Transport Program, FAA, Washington, D. C.

Brig. Gen. Roger E. Phelan, from Dep. Dir. of Plans for Policy, DCS/Plans and Operations, Hq. USAF, to Dep. Dir. for Plans, J-3, US European Cmd. . . . **Earl A. Raymond,** from Financial Manager, Financial Programs Div., Directorate of Plans and Hospitalization, Office, Surgeon General, to Chief, Operations Div., Directorate of Budget, Comptroller of the Air Force . . . **Brig. Gen. William H. Reddell,** from Dep. Dir. of Materiel, SAC, Offutt AFB, Neb., to DCS/Materiel, MATS, Scott AFB, Ill., replacing Maj. Gen. Donald W. Graham . . . **Brig. Gen. Kyle L. Riddle,** from Cmdr., Tactical Air Reconnaissance Center, Shaw AFB, S. C., to Asst. Dep. for Ops., TAC, Langley AFB, Va., replacing Maj. Gen. Gordon M. Graham . . . **Brig. Gen. Daniel E. Riley,** from Vice Cmdr., Electronic Systems Div., AFSC, L. G. Hanscom Fld., Mass., to Cmdr., Western Contract Management Region, AFSC, Los Angeles, Calif.

Gen. Bernard A. Schriever, Cmdr., AFSC, Andrews AFB, Md., assigned additional duty as Dir., MOL Program, OSAF. . . . **Brig. Gen. Pinkham Smith,** Cmdr., 314th Air Div., PACAF, Osan AB, Korea, assigned additional duties as Chief, AF Advisory Gp., MAAG, Korea; Cmdr., Air Forces, Korea; Cmdr., Korean Air Defense Sector; and AF Member, Military Assistance Command . . . **Charles A. Sither,** from Asst. Chief, Counterintelligence Div., Office of Special Investigations, The IG, Hq. USAF, to Security Officer, the Executive Offices (White House).

Maj. Gen. J. Francis Taylor, Jr., from Cmdr., AFCS, Scott AFB, Ill., to Vice Cmdr., AFCS, replacing Brig. Gen. Douglas E. Williams . . . **Brig. Gen. James H. Thompson,** from Cmdr., 810th Strategic Aerospace Div., SAC, Minot AFB, N.D., to Dep. for Base Activation, 2d Air Div., PACAF, Vietnam . . . **Maj. Gen. M. Sam White,** from Federal Air Surgeon, FAA, Washington, D. C., to Command Surgeon, PACAF, Hickam AFB, Hawaii, replacing Maj. Gen. Robert S. Brua . . . **Brig. Gen. Douglas E. Williams,** from Vice Cmdr., AFCS, Scott AFB, Ill., to C/S, AFCS . . . **Brig. Gen. Richard A. Yudkin,** from Dep. Dir. of Plans for Policy, DCS/Plans & Operations, Hq. USAF, to Dep. Dir. of Plans for Advanced Planning, replacing Brig. Gen. Hubert S. Judy.

RETIREMENT . . . Maj. Gen. Cecil E. **Combs,** Oct. 31; Maj. Gen. Augustus M. **Minton.**—END

NOW, A NEW GRADUATED FOR AFA FLIGHT PAY INSURANCE—

*New Premium Schedule, Based on Age, Provides Maximum Benefits at a Fair Premium for **All** Flyers*

RATES BEGIN AS LOW AS 1% OF ANNUAL FLIGHT PAY!

AFA pioneered Flight Pay Insurance to reduce financial pressures on flying personnel grounded by accident or illness—and we're still learning about it!

We've learned, for example, that 95% of all Flight Pay Insurance claims result from illness—and that groundings increase sharply with age. A thorough analysis proved that the risk of grounding for a 50-year-old flyer was *four times greater* than the risk for a 25-year-old.

Our objective has always been to provide maximum benefits at minimum cost for *all* flyers. But our study showed that younger policyholders would, in effect, be subsidizing older ones as long as both paid equal premiums as a percent of flight pay.

The new rate structure, starting at 1% premium for ages 20-29, eliminates this disparity and provides solid benefits, at premiums calculated in proportion to risk, at every age.

Unlike ordinary income, flight pay income *stops* if you can't fly because of injury or illness.

But AFA Flight Pay Insurance replaces 80% of your lost flight pay *tax-free* (the equivalent of 100% of regular, taxable flight pay) for up to 2 years if grounding is caused by aviation accident . . . up to 1 year if caused by illness or ordinary accident.

- Protection is *guaranteed*. It is even guaranteed against pre-existing illness after your policy has been in force for a 1-year period.
- Payments are retroactive to the date of grounding, once your grounding exceeds the 90-day period allowed for making up lost flight time.
- And, AFA's new graduated premium plan lets you insure your flight pay income at a fair premium all through your career, with premiums beginning as low as 1%.

NOTE: All policies are dated on the last day of the month in which the application is postmarked, and protection against accidents begins as of that date; protection against groundings due to illness begins 30 days later. Of course, coverage cannot be immediately extended to include illnesses which existed prior to the time at which you insured your flight pay, but after 12 months you are fully covered against all illnesses.

NO ACTION REQUIRED FOR CURRENT POLICYHOLDERS!

Policyholders whose rates would normally increase under the new plan will be able to renew their coverage at the current 2% rate for *at least* another 12-month period. Policyholders whose premiums would be *lower* under the new plan may take advantage of the lower rates at their next policy renewal date. NO ACTION ON THE PART OF ANY CURRENT POLICYHOLDER IS REQUIRED AT THIS TIME! Full information will be mailed to *all* policyholders with their next renewal notices.

PREMIUM PLAN

PROTECT YOUR ***TOTAL*** INCOME NOW!

YOU Can Be Grounded and Lose Flight Pay!

EXCLUSIONS—*The insurance under the policy shall not cover loss to any Member resulting in whole or in part from or due to any of the following:*

Criminal act of the Member or from injuries occasioned or occurring while in a state of insanity (temporary or otherwise).

"Fear of flying," as officially certified by responsible authority of the Member's Service and approved by the head of the Service in accordance with applicable regulations.

Caused by intentional self-injury, attempted suicide, criminal assault committed by the Member, or fighting, except in self-defense.

Directly or indirectly caused by war, whether declared or not, if act of an enemy in such war is the direct cause of loss insured hereunder, hostile action, civil war, invasion, or the resulting civil commotions or riots.

Failure to meet flying proficiency standards as established by the Member's Service unless caused by or aggravated by or attributed to disease or injuries.

Inability of a member to continue to meet physical standards for Hazardous Flight Duty because of a revision in those standards, rather than because of preceding injury or disease causing a change in the physical condition of such Member.

Mental or nervous disorders.

Alcohol, drugs, venereal disease, arrest or confinement.

Willful violation of flying regulations resulting in suspension from flying as a punitive measure, or as adjudged by responsible authority of the Member's Service.

Suspension from flying for administrative reasons not due to injuries or diseases, even though the Member may have been eligible for or was being reimbursed at the time of the administrative grounding because of a previously established disability.

Loss of life shall not be deemed as loss for purposes of this insurance.

Primary duty requiring parachute jumping.

Voluntary suspension from flying.

A disease or disability pre-existing the effective date of coverage, or a recurrence of such a disease or disability, whether or not a waiver has been authorized by appropriate medical authority in accordance with regulations or directives of the service concerned, *unless the Member was insured under the master policy issued to the Air Force Association for 12 continuous months immediately prior to the date disability (grounding) commences.*

RATE TABLE—AFA FLIGHT PAY INSURANCE

ANNUAL COST (by attained age)
(Calculated as % of Annual Flight Pay)

Annual Flight Pay	20-29	30-34	35-39	40-44	45-49	50 +
	(1%)	(1½%)	(2%)	(2½%)	(3%)	(4%)
$1200	$12.00	$18.00	$24.00	$30.00	$36.00	$48.00
1260	12.60	18.90	25.20	31.50	37.80	50.40
1800	18.00	27.00	36.00	45.00	54.00	72.00
1920	19.20	28.80	38.40	48.00	57.60	76.80
1980	19.80	29.70	39.60	49.50	59.40	79.20
2040	20.40	30.60	40.80	51.00	61.20	81.60
2160	21.60	32.40	43.20	54.00	64.80	86.40
2220	22.20	33.30	44.40	55.50	66.60	88.80
2280	22.80	34.20	45.60	57.00	68.40	91.20
2400	24.00	36.00	48.00	60.00	72.00	96.00
2460	24.60	36.90	49.20	61.50	73.80	98.40
2520	25.20	37.80	50.40	63.00	75.60	100.80
2580	25.80	38.70	51.60	64.50	77.40	103.20
2640	26.40	39.60	52.80	66.00	79.20	105.60
2700	27.00	40.50	54.00	67.50	81.00	108.00
2760	27.60	41.40	55.20	69.00	82.80	110.40
2820	28.20	42.30	56.40	70.50	84.60	112.80
2880	28.80	43.20	57.60	72.00	86.40	115.20
2940	29.40	44.10	58.80	73.50	88.20	117.60

(If you plan to pay premiums semiannually, divide figures above by 2 and add $1 for your semiannual payment.)

GIVE YOUR FAMILY TOTAL INCOME SECURITY! MAIL THIS APPLICATION TO AFA TODAY!

NEW AFA FLIGHT PAY INSURANCE PREMIUMS

(AS A % OF ANNUAL FLIGHT PAY)

AGE	PREMIUM
20-29	1%
30-34	1½%
35-39	2%
40-44	2½%
45-49	3%
50 and over	4%

AIR FORCE ASSOCIATION FLIGHT PAY PROTECTION PLAN

Exclusively for AFA Members—Underwritten by Mutual of Omaha

10-65

Rank (please print) ..... Name .....

Serial Number .....

Address .....

City ..... State ..... Zip .....

$..... Annual Flight Pay ..... Date of Birth .....

I enclose:

☐ $..... semiannual premium (one-half annual premium, plus $1 service charge)

☐ $..... annual premium

This insurance is available only to AFA members.

☐ I enclose $6 for annual AFA dues (includes subscription ($5) to AIR FORCE/SPACE DIGEST)

☐ I am an AFA member

I understand the conditions and exclusions governing AFA's Flight Pay Protection Plan, and I certify that I am currently on flying status and entitled to receive incentive pay, and that to the best of my knowledge I am in good health, and no action is pending to remove me from flying status for failure to meet physical standards. I authorize AFA, or AFA representatives, to examine all medical records pertinent to any claim I may submit.

Signature of Applicant ..... Date .....

APPLICATION MUST BE ACCOMPANIED BY CHECK OR MONEY ORDER

Send Remittance to: **FLIGHT PAY, AFA, 1750 PENNA. AVE., N. W., WASHINGTON, D. C. 20006**

We look for a simple way out.

We've found that's the way to work when we're on a project in our special areas.

Our specialties are avionics support systems for aviation and anti-submarine warfare. Our prime objective is simplicity of design—the surest way to achieve economy, reliability and success the first time around. But that takes depth in science as well as engineering and production.

We've got that kind of depth. We work in pure science and on the operational level to come up with practical solutions to real problems.

If you have a problem in our specialties, we'd like to be in on the solution. One thing for sure, our 900 people won't complicate matters.

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AFA NEWS

CHAPTER OF THE MONTH

Niagara-Frontier Chapter, New York, cited for extremely effective programming, thereby focusing community and state attention on the Air Force Association mission.

New York AFAers turned out en masse the weekend of July 23-24 at Niagara Falls, for the annual **State AFA Convention.** All proceedings on the well-planned schedule were considerably enlivened by the presence of a large group of Royal Canadian Air Force Association members including the RCAFA National President, **George Penfold,** of Toronto. **James W. Wright,** New York State President, was in charge of the two-day program. **William Rapp,** President of the host Niagara-Frontier Chapter, was Convention Chairman and in charge of on-the-scene arrangements.

The New York leaders gave a unique twist to the traditional cocktail party at the convention. The reception on the first evening was called "The Presidents' Reception," in honor of all AFA Presidents present, including Mr. Wright and Mr. Penfold; the New York Chapter Presidents; **Jess Larson,** National AFA President; and **Salvatore Capriglione,** New Jersey State President. During the program, a group of RCAFA members attired as Canadian Mounted Police formally presented the RCAFA colors to Mr. Wright.

A Symposium on Guerrilla Warfare featured **Claude Witze,** AIR FORCE/SPACE DIGEST Senior Editor, who spoke on **"The Role of Airpower in Vietnam."**

New York State President James Wright, left, presents the Harry Copeland Memorial Award to Dr. Clifford C. Furnas, President, N.Y. State University at Buffalo, for his contributions to aerospace education. Niagara-Frontier President William C. Rapp looks on.

At New York Convention, from left, Medal of Honor winner Forest Vosler, AF/SD Senior Editor Claude Witze, AFA President Jess Larson, Northeast Regional VP Vito Castellano, AFA's Gus Duda, host Chapter President William Rapp.

The annual Awards Banquet featured an address by Mr. Larson on the convention theme, "The Coming Revolution in Aeronautics," plus the presentation of New York State AFA awards to several individuals. The Unit's Harry Copeland Memorial Award was presented to **Dr. Clifford C. Furnas,** President of the State University of New York at Buffalo, for his contributions to the advancement of aerospace education. The award (*see cut*) was presented by Mr. Wright, who was named the State Organization's "Man of the Year" for his outstanding and energetic administration as State President, and for his efforts in organizing and chartering five new Chapters in the state during the year. Mr. Wright was later installed for a second term as New York State President. **New York City's Iron Gate Chapter** was selected as "Chapter of the Year" in the State, and received a special trophy in recognition of its Second Annual Air Force Anniversary Ball held earlier this year.

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AFA's **San Francisco Chapter** recently sponsored a premiere of the Twentieth Century-Fox motion picture, "Those Magnificent Men and Their Flying Machines."

Pre-premiere events included a fly-in of ten antique aircraft to the San Francisco Airport, where pilots of the **Antique Aircraft Association** were met by AFA delegates and Twentieth Century-Fox stars. They then attended a champagne brunch. Later, a parade of old autos carried them to the Warfield Theatre where a cocktail party preceded the screening.

Early birdmen—and women—were feted during the evening. Notable oldtimers present were **Bob Fowler,** eighty years of age, who was the first man to fly more than 100 miles nonstop; and early aviatrix Mrs. Jean Kibbe.

Highlight of the evening was the presentation of a check representing the proceeds of the function, by **Chapter President Bill Berman** to the Air Force Aid Society's CHAP (**Children Have a Potential**) program. **Maj. Gen. Carroll W. McColpin,** Commander of ADC's 28th Air Division (SAGE) at Hamilton AFB, Calif., accepted the check on behalf of the society.

(Continued on following page)

On hand for San Francisco benefit premiere activities are, from left, Bill Berman, Chapter President; Don Vance, Secretary-Treasurer; Henny Stevens, Chapter "Miss AFA"; Cal Ferris; Raquel Welch, 20th Century-Fox actress; and Bob Stevens.

Tennessee Valley Chapter President John F. Wood talks with Maj. Gen. Sam Phillips, Apollo Program Director, NASA; and honored guests Col. Scott Fellows, USAF (Ret.), and Brig. Gen. Edmund O'Connor, Marshall Space Flight Center.

Col. Edward Grey, USAF (Ret.), London Chapter President, presents European Organization's scholarship award to Marna Carver, valedictorian of London's Central High School. Marna's mother and Maj. Gen. John S. Hardy look on.

AFA's largest Chapter, the **Ak-Sar-Ben Chapter of Omaha, Neb.**, recently contributed $1,000 to the **Aerospace Education Foundation.** In addition, the Chapter contributed $3,500 to the **Offutt AFB Children's Recreational Fund** to be used to construct a children's recreation area.

The Chapter now has **4,188 members,** due largely to the untiring membership solicitation efforts of its founder, **Arthur C. Storz,** a National Director of the Air Force Association for many years.

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More than 100 members and their guests attended a recent meeting of the **Texas Faith Chapter** at the Sheppard AFB Officers' Open Mess.

The principal address was made by **Brig. Gen. T. R. Ford,** Deputy Chief of Staff for Materiel, ADC, Ent AFB, Colo.

From left, AFA National Director Earle N. Parker; X-15 pilots Maj. Robert Rushworth and Capt. Joe Engle; and Dr. Walter Hesse, Dallas Chapter President, who were participants in AFA Seminar, "The Coming Revolution in Aeronautics," in Dallas-Fort Worth area.

General Ford spoke on "**The Air Defense Command Story,**" and supplemented his talk with slides and film. A question-and-answer period followed his presentation.

In his remarks, **Maj. Gen. Robert M. Stillman,** Commander of Sheppard AFB at the time of the meeting, but who has since retired, spoke of the importance of maintaining a strong Air Force Association and urged the local group to continue to work for a larger, stronger, and more effective Chapter. **Chapter President Harold Shappell,** on behalf of the Chapter, presented to General Stillman an illuminated world globe in appreciation for the great leadership he gave to Sheppard AFB and the friendship he extended to the citizens of the entire area.

Among the guests were Wichita Falls **Mayor Winston Wallander; Maj. Gen. J. H. Wallace,** USAF (Ret.), former Commander of Sheppard AFB; and **J. S. Bridwell,** who sold the first 300 acres of land for the base to the government for a token fee of $1.

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Pennsylvania's Montgomery-Delaware Valley Chapter, recently formed by the consolidation of the Montgomery County and Delaware County Chapters, held its Installation Dinner at the Plymouth Country Club, Norristown, Pa.

Brig. Gen. John S. Bagby, USAF (Ret.), was guest speaker, and State President **Robert A. Patterson** presided and conducted the installation ceremony.

Chapter officers installed were **Francis E. Nowicki,** President; **Dr. Thomas F. McKeon, Jr., Vito Scriptunas,** and **Nicholas Alexaki,** Vice Presidents; **Daniel P. Gallagher, Jr.,** Secretary; and **William E. Katrina,** Treasurer.

Other guests of honor were **Robert Honeyman,** Montgomery County Court of Common Pleas Judge; **Robert Johnson,** State Senator from Harrisburg; **Edward Holl,** State Legislature member from Harrisburg; **Dr. Allen C. Harman,** Superintendent of Montgomery County Schools; **J. Phil Doud,** Montgomery County Democratic Party Chairman; and **Dick Dean,** Norristown *Times-Herald* city editor.

° ° °

Members of California's **Sacramento Chapter** recently traveled to Reno, Nev., for a joint luncheon meeting at Nugget Hotel with the **Lake Tahoe Chapter** and representatives of AFA in Reno.

Reno Mayor **Hugo Quilici** welcomed the group and **Bill Gilson,** Vice President (North), representing the California State Organization, gave a report of AFA activities in his area.

Appropriate remarks were made by **Col. Will Dolzell,** Commander of the 152d Tactical Reconnaissance Group (ANG), Reno Municipal Airport; **Brig. Gen. Clarence Talbot,** USAF (Ret.) of Sacramento, Calif.; and **Marie Henry,** who is Secretary of the Lake Tahoe Chapter.

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CROSS COUNTRY . . . AFA's **Great Lakes Region** held a Regional Meeting in Milwaukee, Wis., recently with the Region's Vice President, **Glenn Mishler,** presiding. . . . **Pennsylvania State Organization's** annual convention will be held in Beaver Falls on October 23. . . . Baton Rouge will be the site of the **Louisiana State Convention** on October 9-10. . . . Burley, Idaho, will host the **Idaho State Convention** on October 16. . . . October 25-29 will be observed as "**Aerospace Week**" in **St. Louis, Mo.** . . . Congratulations to **Dr. "Bud" Delaney,** newly appointed Vice President (South) of the **California State Organization,** and also to **Dolly Foster,** who replaces Bud as **Orange County Chapter President.**

—DON STEELE

Bob Stevens'

"There I was..."

Never was so little known
by so many about so much. . . .
But we learned, luv.
We learned.
Oh, how we learned.

ENGLAND, circa 1943, we had an L-of-a lot of experiences:

This Is AFA

The Air Force Association is an independent, nonprofit airpower organization with no personal, political, or commercial axes to grind; established January 26, 1946; incorporated February 4, 1946.

Objectives

• To assist in obtaining and maintaining adequate airpower for national security and world peace • To keep AFA members and the public abreast of developments in the field of aviation. • To preserve and foster the spirit of fellowship among former and present personnel of the United States Air Force.

Membership

Active Members: US citizens who support the aims and objectives of the Air Force Association, and who are not on active duty with any branch of the United States armed forces—$6 per year.
Service Members (non-voting, non-officeholding): US citizens on extended active duty with any branch of the United States armed forces—$6 per year.
Cadet Members (non-voting, non-officeholding): US citizens enrolled as Air Force ROTC Cadets, Civil Air Patrol Cadets, or Cadets of the United States Air Force Academy—$3 per year.
Associate Members (non-voting, non-officeholding): Non-US citizens who support the aims and objectives of the Air Force Association and who are individually approved for membership by AFA's Board of Directors—$6 per year.

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Community Leaders

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ARIZONA: Robert Landry, 7223 Black Rock Trail, **Phoenix**; Hugh Stewart, 709 Valley National Bldg., **Tucson**.

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CONNECTICUT: Joseph C. Horne, Yankee Pedlar Inn, **Torrington**.

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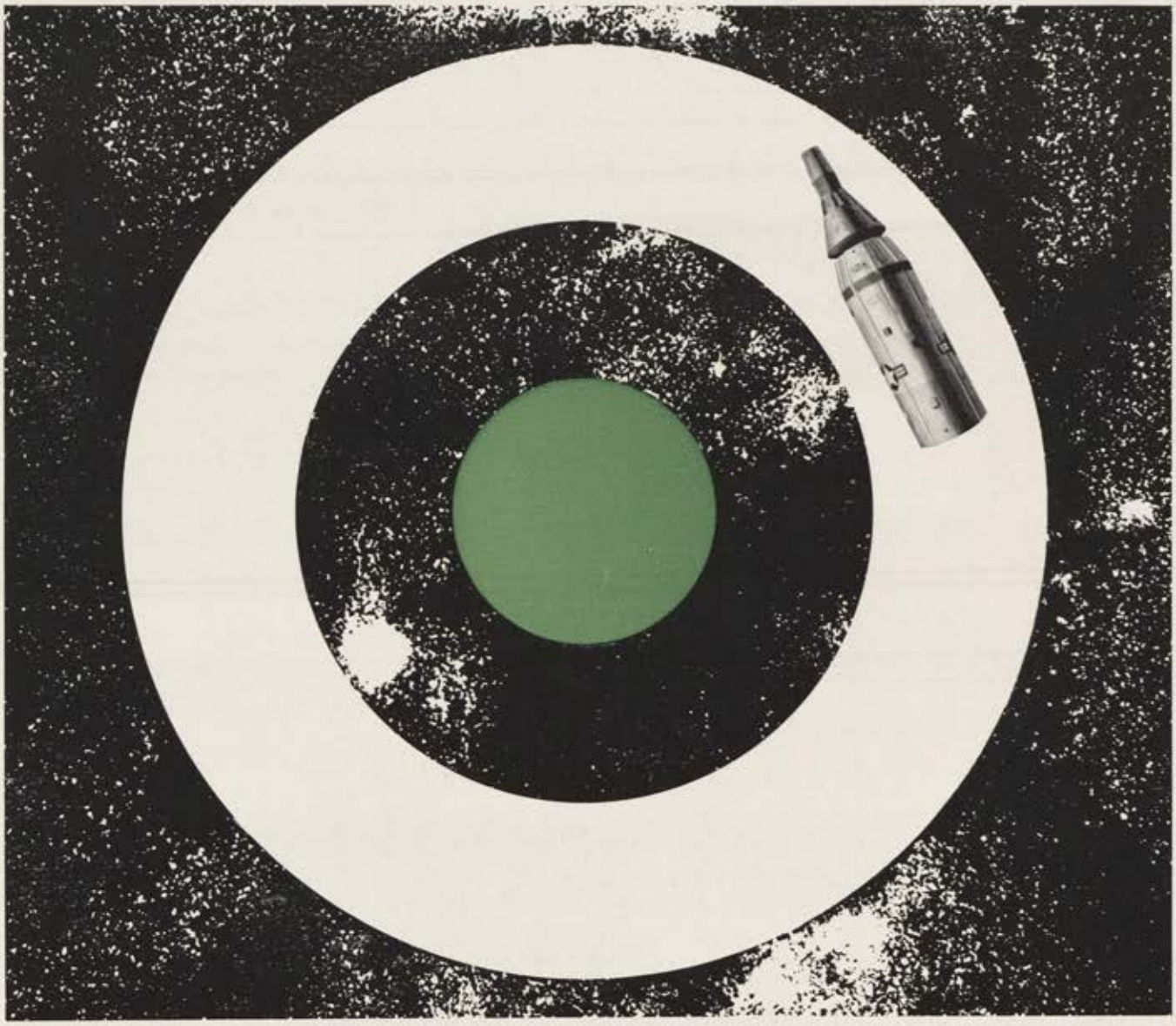
WISCONSIN: Leonard Dereszynski, 300 E. College Ave., **Milwaukee**.



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