DECEMBER 1965 / 50¢

AIR FORCE

and SPACE DIGEST

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

C-5A

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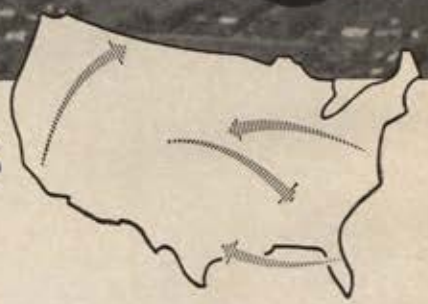

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AIR FORCE and SPACE DIGEST

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VOLUME 48, NUMBER 12 — **DECEMBER 1965**

The Vietniks . . . A Commentary / BY WILLIAM LEAVITT — 6

Some young Americans are marching in protest against what they claim is the "immoral" US presence in Vietnam. Who are these protesters and what are the roots of their fervor? There is no all-purpose answer to the question, but, at the same time, it is certain that they do not understand the stakes of the struggle in Asia.

C-5A—Even More Than Meets the Eye / BY J. S. BUTZ, JR. — 33

In view of the revolutionary improvements in weight-lifting capability promised by Lockheed's aborning giant bird, there are valid arguments for an eventual military/commercial market for as many as 1,200 C-5A-type aircraft. The oncoming mammoth is well within the state of the production and management arts, and it may well serve a near-future transport requirement far larger than what many too-conservative analysts are predicting today.

Logistics: Lifeline to Southeast Asia / BY ALLAN R. SCHOLIN — 42

Fighting a war thousands of miles from our shores involves the most effective use of the logistics art. Logistics is the key to matching the nation's productive resources to the skills and courage of its military people in South Vietnam.

SPACE DIGEST

What Management Should Know About Scientists
BY DR. HARRY LEVINSON — 51

There are recognized difficulties in the relationship between managers and scientists. A good deal of the trouble centers around the self-image of scientists and their dual obligations—to professional colleagues and to employers—that are unique to people in research laboratories. Here are some important pointers from a noted psychologist on how to improve relations between the lab and front office.

BATO—A Method of Weight Lifting for Spaceflight
BY DR. EDWARD TELLER — 56

There is considerable promise for space propulsion in the use of the controlled energy of nuclear explosions. Research to establish firmly the feasibility of such techniques would be worth the expense. One area that would need considerable study would be that of materials. A noted physicist comments on the technical aspects of nuclear blasts as a mode of propelling spacecraft on missions even to Mars.

Speaking of Space / BY WILLIAM LEAVITT — 62

The Soviet claim of orbital bombing capability, coming as it did in the face of Russian subscription to the United Nations resolution against deployment of weapons of mass destruction in space, obviously has political content in terms of Russia's struggle with China for Communist hegemony as well as her competition with the West. But at the same time such boasts should not be taken lightly.

Air War in Vietnam: Countering Escalation / BY KENNETH SAMS — 72

This special report traces the air combat role in Vietnam. Whether the Viet Cong did or did not really plan a major monsoon offensive during the past several months cannot be known for certain. But in any case, they surely escalated their efforts, and their thrust has been perceptively blunted by the increased deployment of airpower all across Vietnam, a fact which has changed the character of the war.

SAC's 1965 Bombing-Navigation Competition / BY DONALD R. SMITH — 84

USAF's manned-bomber deterrent continues to be vitally important to national security, and the men of the deterrent force are demonstrating their skills in a better-than-ever form, as evidenced by the results of the recent SAC Bombing-Navigation Competition, the first since 1961. Several of the competing crews were fresh in from Vietnam. Here is a report on how SAC sharpens its skills.

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Who are the protesters? What do they want? How did they get that way?

The Vietniks . . . A Commentary

By William Leavitt

ASSOCIATE EDITOR, AIR FORCE/SPACE DIGEST

THESE are strange times. The United States is engaged in a bitter, undeclared, jungle war, thousands of miles from our shores. Americans who are fighting that war know better than anyone else that it is the most complex conflict in which our country has ever been involved. Militarily, there are no front lines, no safe havens for the rear echelons. It is intolerably difficult, most of the time, to distinguish friend from foe. Politically, we are allied with a government that has yet to achieve either stability or democracy as we understand the terms in the United States. Our motivations for involvement in the war are threefold:

- To help defend South Vietnam against internal and external aggression so that it may evolve some decent measure of stability and freedom for its long-suffering people.
- To guarantee by this action the freedom of other countries in Southeast Asia to do the same.
- To demonstrate that a militant Communist China's proclaimed formula for so-called "wars of national liberation" cannot work if terrorism is resisted with courage and with strength.

Yet while American casualties mount in South Vietnam, other young Americans, most of them of college age and living in a draft-proof shelter provided them by law, are parading in protest, talking of blocking troop and supply movements, and reaching such execrable extremes as calling the President of the United States a murderer. Some are even proclaiming their intention to instruct high-schoolers in techniques of evading military service.

Much of the inspiration for this spurious campus "peace movement" comes from a small but vocal band of faculty members and other academics who have dismayed their own colleagues for years with their displays of dogmatic ignorance—men who have yet to accept the ugly truth that totalitarianisms of the left or the right side of the political spectrum meet at the bottom of a circle. These are the men who blandly praise the false "people's revolutions" of Fidel Castro's Cuba and Red China while claiming that our own country is run by a diabolical oligarchy, permanently opposed to progress and liberty.

Who are the Vietniks, as the press has dubbed them? What do they want? How did they get that way? Before speaking to these questions, it should be pointed out that, although the Vietniks are a highly annoying irritant to the rest of us, they by no means represent the majority of American youth. Thousands of young men on campuses, despite taunts, continue their efforts to meet national obligations through ROTC training. Other thousands are rising up in protest against the protesters and have expressed their strong support of the country's effort in Vietnam and of the military men who are doing the fighting and the dying.

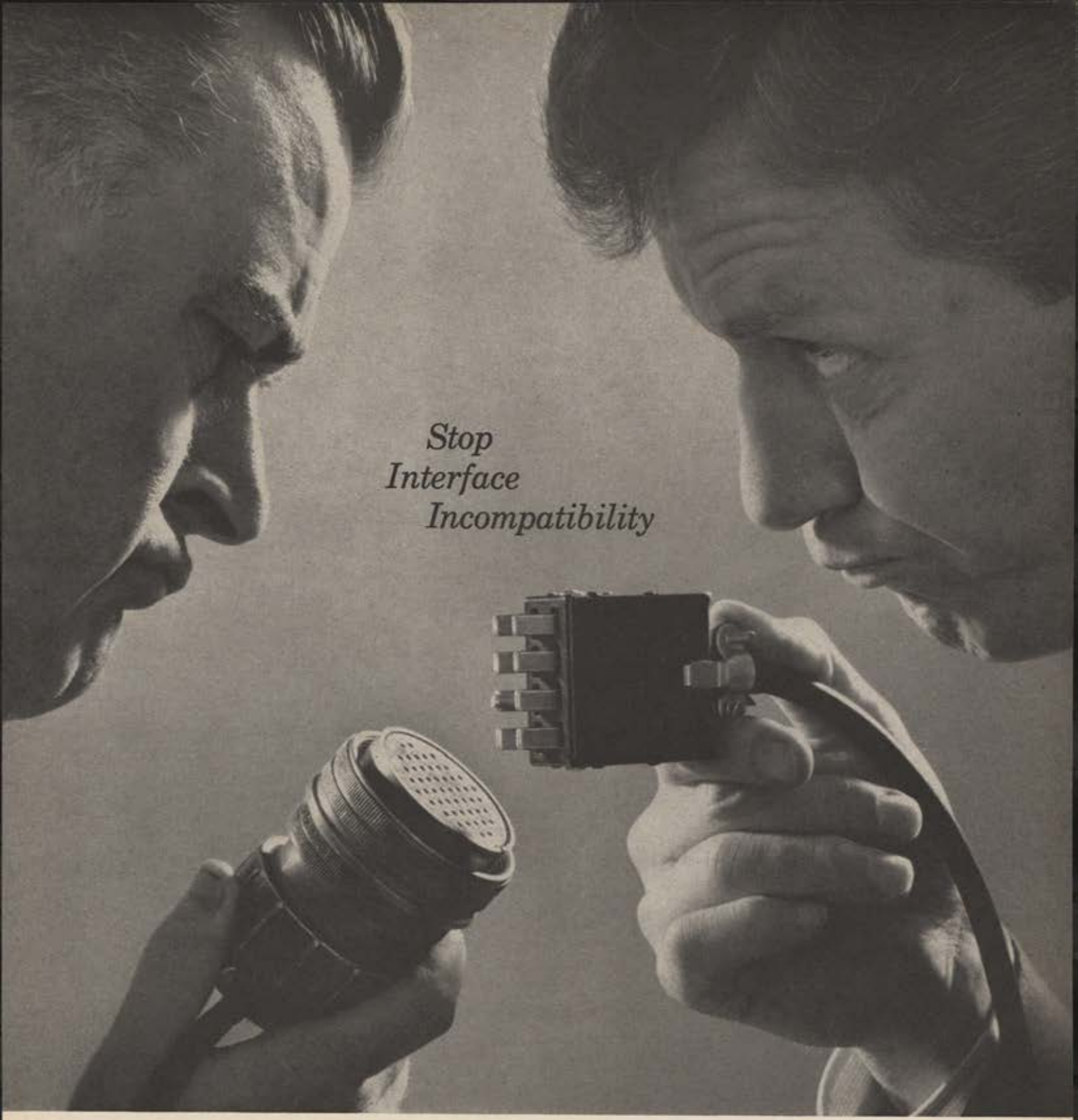
One more thing should be said: The Vietniks, in their mindless protests, have made one important contribution which they could never have intended. In their push to dramatize the "immorality" of the American involvement in Vietnam, they have instead helped bring home to the public the significance of the conflict and the depth to which we are committed in Southeast Asia in the defense of our own security and the freedom of other lands from Communist expansionism and terrorism, masked as "liberation." Many Americans, who are not directly involved through the presence of a father, a husband, a son, or a brother in Vietnam, had previously not thought deeply about this commitment. For, until very recently, the Vietnamese war had been understandably remote for most Americans. Not only remote but strange—a war in which the repulsion of aggression, not "victory" in the traditional military sense, has been the avowed aim. As is well known, the United States has the power to destroy quickly not only North Vietnam but also Red China. But the stakes in a nuclear world, not to mention fundamental questions of humanitarianism, make such a decision remote indeed.

Then who are the Vietniks? Essentially they are misguided zealots who believe that the real world is unacceptable and must be changed overnight. Like most zealots they ignore any reality that contradicts their vision. They denounce the "immorality" of the American use of force against terrorism and stubbornly insist that the Viet Cong are liberators. With misguided idealism they identify with the "underdogs," blinking the documented facts of wholesale assassinations and atrocities committed by the Viet Cong. They call the US presence in Asia "irrelevant" but minimize militant China's proclaimed intention to remake the world in her totalitarian/utopian image. They object to the acknowledged inequities of American society—which *is* attempting, painfully, to reform itself—but are willing to hand over other people in other places to absolute tyranny.

There are historical precedents for this so-called "peace" movement.

Dissent has always been a feature of the American scene, dating back to the American Revolution. The inequities of the Civil War draft, in which exemption

(Continued on page 9)



The responsibility of a systems manager is to deliver a system, free from electronic or mechanical incompatibilities, on time and within budget. It requires the early resolution of interface conflicts, establishment of an error budget, and assignment of the functional tolerances for minimum cost trade-offs. Systems management and configuration control have been our primary business for 15 years. Vitro Laboratories, Silver Spring, Maryland.

Vitro CORPORATION OF AMERICA / 90 PARK AVE., NEW YORK 10016

Which counts more: the sum or the parts?

A successful space mission requires the focusing of many viewpoints. One man sees the capsule as dead weight to be accelerated. Others view it as a problem in control, stress, thermodynamics, life support. Each view is correct; none is complete in itself.

At United Technology Center, we specialize in propulsion. Solids, liquids, hybrids, ranging from powerful boosters to tiny, variable-thrust motors for landing or docking. Just as important, our capabilities include a deep **identification with the total mission,** not just our part of it.

Put another way, we're team players—from the first word of the contract all the way to the final touchdown.

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could be bought, helped set off bloody riots in New York City. For arguable reasons, the Mexican and Spanish-American wars were opposed by segments of the body politic.

Involvement in the first World War was looked upon by some as unjustifiable entanglement in European affairs. And between the two World Wars there was a "peace" movement which has distinct parallels to the present activity. Then university students in England joined the Oxford and similar movements and pledged never to fight for King or country. They were imitated here by American youths who called themselves the "Veterans of Future Wars."

In England, particularly, part of the damage done was blockage of the rearmament that might have given Hitler pause. In this country, the Communist Party of the USA took clear advantage of the "peace" movement of that time, and older heads will recall that the ranks of the protesters were visibly thinned on the morning after the Nazi attack on the Soviet Union in June 1941.

Except for pure pacifists, who will bear no arms in any cause (a right guaranteed them by our constitutional system), there were virtually no protesters left after the moment of truth that came to the United States on December 7, 1941. Most of the "peace" marchers fought, and bravely, when they understood that peace at any price was a sterile hope in the face of implacable Nazi will to enslave Europe and the world.

Today things are different and yet the same. Communist aggression is masked in cruelly fraudulent slogans like "wars of national liberation." There is subtlety in aggression. Tyranny is described as "people's democracy." There is The Bomb and the fear that goes with it. And there is the fact that so many of the student protesters have long been sheltered from world realities in the affluent society that prospers in the nuclear shadow. Frustrated by the imperfections of the world and of the society in which they have grown up, many students have turned inward, complaining against the complexity of American life and politics that makes progress evolutionary, not revolutionary.

In the fields of civil rights and the antipoverty effort, they have denounced liberals, moderates, and conservatives alike for not changing everything *now*, today. Their fervor has now spilled over to foreign policy in a radical fashion, which will distort some lives and minds for years to come but which for most will dissipate as they come to understand the realities of politics and power, whether in the domestic or foreign spheres.

The simplistic quality of the protesters' approach is illustrated by their lack of programs and their dependence on slogans. They demand "negotiations" to end the war but are unable to produce evidence of any viable response from North Vietnam or China except claims that the student protest signifies a rising up by the American people against Administration policies.

They shrug off the idea that their protests are helping harden Hanoi's line. They scoff at warnings of Communist exploitation of their movement. They say that today's Communist, whether oriented toward

—N. Y. Herald Tribune Photo by Terence McCarten

Demonstrators in New York City's Foley Square parade in support of David Miller, militant pacifist charged with publicly burning draft card in protest against Vietnamese War.

Moscow or Peking, is an "individualist" and poses no danger of takeover of their movement. They ignore the reality of Communist presence, stated by the Attorney General of the United States, who at the same time has very clearly defended their right of dissent. They ignore the bitter lesson of Communist exploitation of the peace movements of the 1930s. The fact that communism may no longer be exclusively controlled by Moscow makes it no less a danger. In our view, its pluralism has become an even greater danger. The youngsters claim idealism but their idealism stops at the water's edge. They still argue the discredited myth that military people and the defense industry enjoy the prospect of a heated-up cold war. They deny by inference the truth that every man—including statesmen, soldiers, and industrialists—wants his sons to live in peace.

The protesters scoff at the GIs as "Mickey Mouse" and "square." Yet we wager that today's soldier, sailor, and airman in Vietnam could give them each a short course in cold-war geopolitics that would be more than instructive—as could many a Peace Corps returnee.

Yet it should be said, and should be said strongly, that their simplistic thinking must not be answered in an equally simplistic manner. No one knows better the complex nature of the struggle in which our country is so painfully engaged than the men who are fighting the battle in Vietnam and at the same time trying to put South Vietnam back together again. It serves no useful purpose to shout "draft them all" or "treason." For the most part, the protesters are, as we have said, misguided zealots who have closed their eyes to the ugly truths of our times.

Within the law, theirs is the right to dissent. At the same time, ours is the right and duty to face up to the painful and costly task of defending, as best we can, our own vision of the future.

They have read about war and called it horrible. But they have forgotten that it was a *soldier* who, from his heart and experience, called it hell long ago.—END

Space Pioneer

Gentlemen: . . . I want you to know how much we at Bell Aerosystems Company appreciate the excellent article ["Let's Get Operational in Space," October '65] which Claude Witze has written on Dr. Walter R. Dornberger, our Vice President for Research.

Over the years since Walter first joined us, he has been the subject of many articles appearing in numerous publications. Over-all, it is my personal feeling that Mr. Witze's article is beyond doubt the finest, most incisive, and colorful I have read concerning my remarkable friend and associate.

Both you and Mr. Witze are to be congratulated on this superb personal profile.

William G. Gisel, President
Bell Aerosystems Company
Buffalo, N. Y.

Correction and Compliment

Gentlemen: Reference page 30 [Aerospace World" by Allan R. Scholin] of the October Air Force/Space Digest. Maj. Philip E. *Nease*, Jr., was AFFTC pilot Maj. Philip E. *Neale*, Jr.

Let me say also that I am an avid reader of your . . . fine magazine, as you might suspect from the foregoing. All of us here at the Air Force Flight Test Center at Edwards AFB look forward to the valuable information and timely features . . . the AFA staff puts together.

Charles V. Eppley
Edwards, Calif.

Home for Christmas

Gentlemen: What is Christmas Day at home with a vacant chair? That vacant chair may very well represent your own—or your neighbor's—son or daughter in a service or veterans' hospital far from home. And what is their Christmas Day?

A hospital is a lonely place at best. Our servicemen and women are given the finest medical care possible, but there is one form of therapy that the government cannot provide—the presence and affection of loved ones.

But Operation Reindeer and Lynbrook Lodge 1515 of the Benevolent and Protective Order of Elks activities coincides so closely with what the Protective Order of Elks stands for, they consider it a great privilege to work with this worthwhile endeavor. The Lynbrook Lodge is pleased to announce its sponsorship of Operation Reindeer Home for Christmas Fund during their annual Christmas drive for the year 1965.

This is the sixteenth year Operation Reindeer has supplied this missing therapy. It provides hospitalized servicemen and women with free transportation to their homes at Christmas time, on Mother's Day, and on other occasions during the year. These boys and girls are carefully selected by Chaplains, Personnel Services Officers, and the USO in their VA and service hospitals.

Operation Reindeer is being helped by many prominent people, including Bob Hope and Milton Caniff ("Steve Canyon"), and it has the cooperation of such important companies as Trans World Airlines and Greyhound Bus Lines. Perhaps you, too, will find it possible to participate with us in this great work. Perhaps you can make a small space on your Christmas gift list for one of these boys and girls.

We shall greatly appreciate any assistance you can give to this cause.

Please send your check to:
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57 Hempstead Ave.
Lynbrook, L. I., N. Y. 11563

Lt. Gen. William E. Hall,
USAF (Ret.)
Farmingdale, N. Y.

It Just Might!

Gentlemen: You did an extra good job on the annual Air Force Almanac this year! It is a peach of an issue. I was particularly impressed by John Lang's article, "Public Opinion and National Security." If we could only get it in the hands of every high school and college student in this country. Who knows, perhaps it might even do some good with our demonstrators, although I think most of them are beyond help. . . .

Barry C. Trader
Denver, Colo.

New Lyrics

Gentlemen: Your editorial, "Bless 'em All," in the October issue of Air Force/Space Digest made me wonder if the song itself could not use new lyrics. I submit the following:

Bless 'em all, bless 'em all,
In Congress they're having a ball.
Bless all the Senators and all the Reps,
It's my promotion that they did forget.
And, it's Bolté that we really need;
It's not coming with very much speed.
There'll be no promotions this side of the ocean,
So, cheer up, my lads, bless 'em all!

Bless 'em all, bless 'em all,
To our country we're giving our all,
We'll go to Thule, or stand on alerts,
But get no promotions to pin on our shirts.
At our Standards of Conduct we work;
In Asia, we never will shirk.
There'll be no promotions that side of the ocean,
So, cheer up, my lads, bless 'em all!

Bless 'em all, bless 'em all,
Without Bolté the quotas are small.
Congress, please pass a bill that's so fine,
To be passed over, would cause me to pine.
Just change it one small bit,
And keep the Reserves "hip-pocket."
There'll be some promotions both sides of the ocean,
So, cheer up, my lads, bless 'em all!

1st Lt. Sanford B. Kozlen,
USAF Res.
Carmichael, Calif.

Reprieve in Space?

Gentlemen: It is realistic to anticipate that some form of military showdown, beyond the current level of limited conflict, is inevitable. Indeed, had it not been for the mutual disaster implicit in a general exchange of nuclear ICBMs, such a showdown would presumably already have taken place.

There is an increasing probability that one side or the other will be able to achieve the ultimate strategic victory, in the 1970s or earlier, without damage or loss of life on the *surface* of the earth. The new battlefield lies just above our atmosphere in earth-orbital space and will extend further

(Continued on page 13)

The SHRIKE is an air-launch missile of the Bureau of Naval Weapons, developed by the U.S. Naval Ordnance Test Station, China Lake, California. Responsibilities of Texas Instruments Incorporated include engineering and manufacturing support and production.

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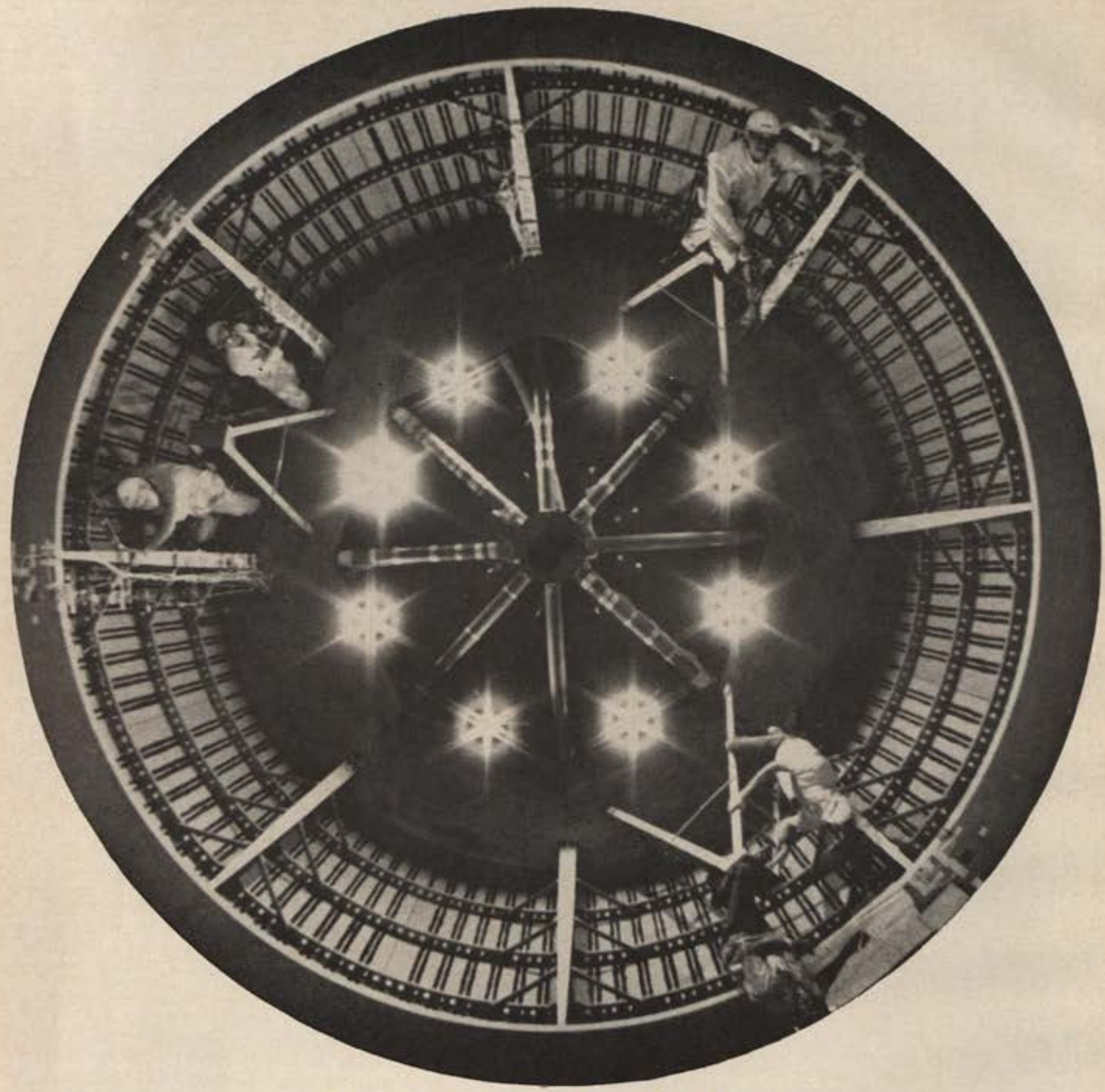


TORTURE CHAMBER

In a huge laboratory building in Huntington Beach, California, 60 foot high rocket stages like this one are undergoing twisting strains and searing heat even more severe than what they will meet during actual missions. They are being tortured beyond endurance on earth to make sure of perfect performance in outer space.

This structures laboratory is only one of 11 buildings in the Douglas Space Systems Center, which is very probably the most advanced company-owned space complex in the world. It incorporates the finest and most modern equipment including a space simulation chamber 39 feet in diameter capable of housing a complete manned spacecraft.

Here, Douglas is building the S-IVB, the *Saturn* stage which will power three *Apollo* astronauts from earth orbit to moon orbit. Also being developed are manned orbiting space laboratory designs, and work is progressing on other orbiting and planetary programs relating to the advancement of U.S. space supremacy.

DOUGLAS
MISSILE & SPACE SYSTEMS DIVISION

out into space with the passage of time. The weapons? Orbiting or "stationary" satellites armed with high-megaton warheads, or other lethal devices. The defense? Manned and unmanned space interceptors, controlled from space platforms, from the earth, or both.

In such a prospect, there is great new hope and great new peril. The hope for the free world is that the United States, as in all past wars far from its shores, can achieve victory without destruction of its homeland. Or any other nation's. The peril is that the United States could lose the decision at long range, much as in medieval times, when the population of one belligerent, though unscathed, found itself forced to accept the political consequences of a decisive clash between knights in armor on some remote battlefield.

Suppose that two men, "A" and "B," confront each other in a small room. Each has a hand grenade in his left hand, with his finger on the pin. This connotes the present posture of the Soviets and the United States, with the hand grenade representing each opponent's arsenal of earth-based intercontinental ballistic missiles.

Now suppose that in their right hands A and B are able to acquire concurrently a new weapon—a Colt .45—connoting a lethal military capability in space. The grenades cancel each other out; neither A nor B dares to use it. Not so, however, with the gun in the right hand. Each man can try to beat his adversary to the draw and shoot the gun out of the other fellow's hand. In fact, he will be compelled to do so if he hopes to prevail, for if A shoots first and shatters B's gun hand, A has won. He can then command B to hand over his grenade or risk taking a bullet in a more vulnerable spot. He holds a pair of aces against one ace.

Why, it might be asked, if this analogy is valid, wouldn't A decide to take a shot at B's heart, instead of going for his gun hand? In other words, why wouldn't he attack his enemy's homeland directly from space? Because destruction on the surface of the earth is precisely what both sides have been avoiding, and will continue to avoid, at almost any price. But if the deciding edge can be gained in space without a surface war, it seems inconceivable that the rulers in the Kremlin would neglect to seize it, and the sooner the better—for them.

Will the United States be ready? Although our country has dedicated itself to the "peaceful" uses of space, it has never abdicated its responsibility to defend itself against hostile operations in space.

The decisions being reached today by the heavily burdened man in the White House will determine whether we, or the Soviets, will draw the second ace, in space, that will determine the final arbiter of One World, on a planet unscarred, tomorrow.

BEIRNE LAY, JR.
Brentwood, Calif.

Through the East to the West

Gentlemen: I only recently became aware that you published my letter in your issue of September ["Airmail," page 13]. Your editorial comment following the letter intrigues me. While you agree that "containment" vis-à-vis the Soviet Union as an effective policy is "arguable," you go on to try to point out an area where it has been effective, ". . . they have been deterred from attacking Western Europe."

If this were not so serious a situation, this example of "effective containment" would be laughable. The Communists, as early as 1917, recognized the impregnability of Western Europe from their standpoint. Rather than go *through* Western Europe toward world conquest (or do you agree that this is their goal?), they enunciated the policy of going *around* the bastions of anti-communism. Lenin, in 1917, stated that, "First we will take Eastern Europe, then the masses of Asia, and then we will encircle the United States. . . ." To further emphasize their firm policy he stated that the road to Paris led through Peking and Calcutta.

Now, it would take a very complete ignoring of the facts of history to deny that the Communists have stuck to that route. To state that Russia was close to attacking Western Europe could have been true only if the Western powers quite obviously had laid down a Red carpet for them. Under any other circumstances the Communists were only too happy to foster the false notion that they were striking West instead of East so that the West would leave virtually unguarded the vast masses of land and people which are *now* under the yoke of Communist tyranny.

It is this clear failure to deter the Communists from an over-all plan, which the West has known about since 1917, which leads me to condemn containment.

COLLIN D. COOPER, M.D.
La Canada, Calif.

AIRPOWER in the news

By Claude Witze
SENIOR EDITOR, AIR FORCE/SPACE DIGEST

Tomorrow's Effectiveness

WASHINGTON, D. C., NOVEMBER 10

The Russians have not said anything about the cost/effectiveness of delivering warheads on target from an orbit in near space, nor about the cost/effectiveness of an intercontinental missile fired from a mobile platform. But they have told us that they have the capability of becoming operational with both forms of weaponry. If they couple the intention with the announced capability, they could be in shape to exploit new technological frontiers that are effective, regardless of cost.

In the United States we have abandoned the mobile Minuteman, an ICBM that would have been launched from a railroad car. We have dropped the mobile midrange ballistic missile (MMRBM). We have only token interest in orbital bombardment research because we know there are cheaper ways to deliver a warhead on target.

It now appears, from the display staged November 7 in Moscow to mark the forty-eighth anniversary of the Bolshevik Revolution, that the Russians may be preparing to vastly complicate our burden of defending the free world.

Take, for example, the simple fact that since 1963 the Reds have shown us thirteen new missile systems as the nonsecret evidence of their continuing effort. A key example is that of a solid-fuel missile, called Scamp in the NATO lexicon, that the Russians say has intercontinental range. Scamp had been seen before, but this fall it appeared on a new tracked ramp that can carry it and serve as a launching platform as well. The Soviet news agency Tass says this weapon will be "elusive to enemy air and space reconnaissance."

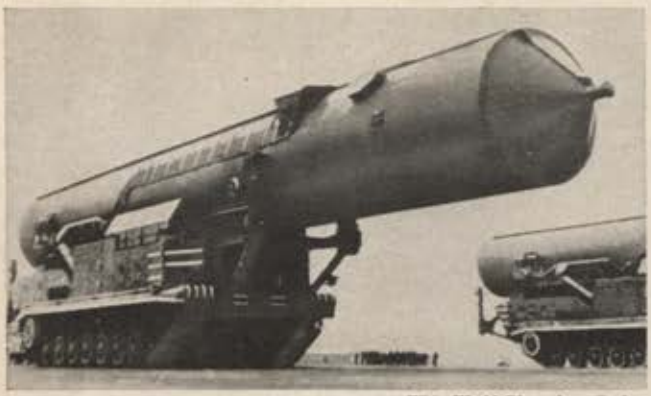
This development fits perfectly with the Russian determination to keep its strategic targets secret and to frustrate an enemy whose missile capability is centered on hardened and fixed sites. The mobile ICBM would be an ideal weapon to face such an enemy, especially if that foe had made the mistake of neglecting the development of manned delivery systems. Only the latter would have the capability to seek out and destroy missiles like Scamp. Tass, looking ahead a decade, has described the weapon as "very maneuverable and invulnerable." The cost was not mentioned, but the claim for effectiveness was expressed in superlatives.

The second and more sensational debut was made by Scrag, a rocket that is about the size of the US Titan II. This vehicle also was shown at the Moscow parade last May, when it was called Big Brother by Western observers. At that time it was an ICBM, and now it has something added. Scrag, the Soviet press agency said, is capable of leaving its warhead in orbit around the earth and firing at any target. If Scrag becomes operational it would violate a United Nations resolution, adopted with Soviet support in 1963, which calls on all nations to keep weapons out of space. The resolution was passed by the General Assembly after both the US and Russia had renounced any plans to put bombs in orbit.

The fact remains that published Russian statements on orbital rockets have been appearing with increasing frequency since 1958. At the same time, more and more American observers have been warning that a Russian capability to wage nuclear war from space constitutes a real threat to our strategic superiority. As in the case of the mobile ICBM, cost/effectiveness has no bearing on the Russian decision-making process if they decide to make Scrag operational. The effectiveness would be the criterion, not the cost.

It probably is true that, within today's state of the art, the orbiting nuclear bomb can be an effective weapon. One warhead, or a chain of them extending across a continent, could hang over a nation as Dr. Walter Dornberger has suggested, "like a sword of Damocles." Fired, they could hit a target on earth in from four to six minutes, far less than the transit time of an ICBM. As for their

(Continued on page 17)



—Wide World Photo from Sovfoto

This is Scamp, big but hard to find. The Russians say it has intercontinental range, but Western experts doubt this means 5,000 miles. What is new and important is the huge tracked transport carrier. It is a launching platform that can give the missile mobility, making it a difficult target.

—Wide World Photo from Sovfoto

And this is Scrag, as big as USAF's Titan II and certainly a long-range rocket. Upon its second public showing, Tass announced that it is "orbital" and can put its warheads in space. From there, they can be directed against any ground targets. If true, this is a significant advance.

The nation
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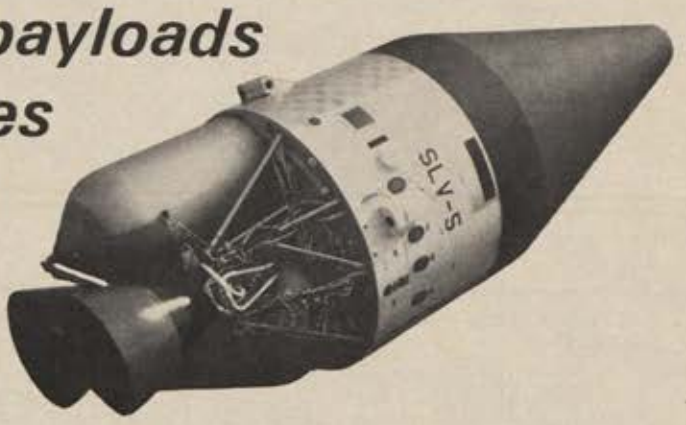
that can stop, start, turn in orbit,
move a heavy payload
from one orbit to another,
put multiple payloads
multiple places
with pinpoint
accuracy.



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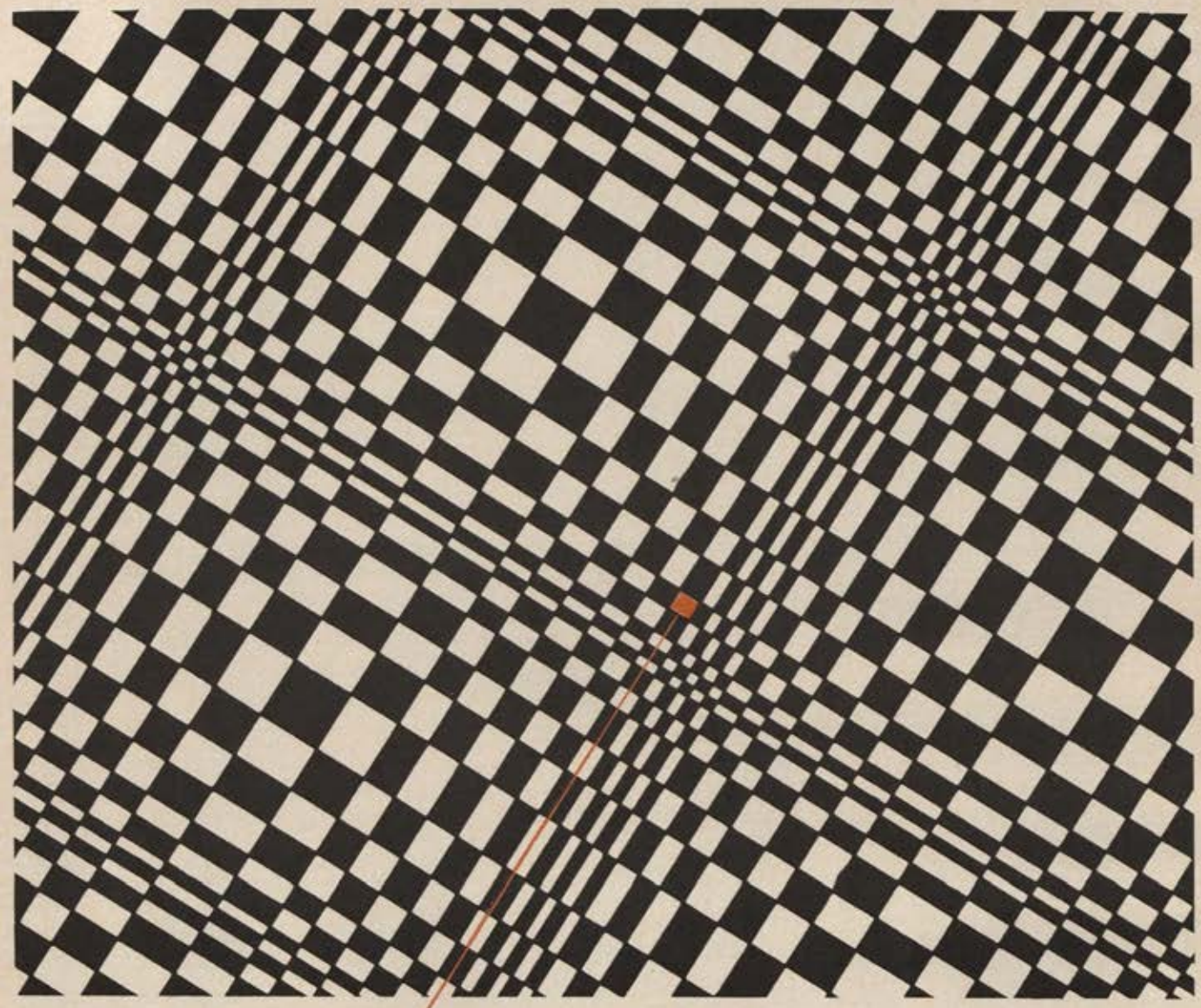

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accuracy, there is no reason to believe they would be less accurate than a satellite brought out of orbit to be caught in a basket carried over the Pacific by a talented Air Force crew. This is an exercise that has become routine in the recovery of experimental satellites.

There are other advantages, particularly for an aggressor power:

1. **The presence of the weapon in orbit.** It is similar in some respects to the showing of the flag by a Navy fleet, the flyover of a squadron of bombers, or the arrival of the US Marines on a foreign shore. On top of this, there is the possibility of demonstrating that the bomb in orbit can do its job. There are American military men who now anticipate that Russia will stage a practice run, with a harmless warhead, in the near future.

2. **The quick-strike capability.** From the command to fire to the detonation on target there would be an elapsed time of about five minutes.

3. **The credibility of a weapon in orbit.** In this respect a bomb in space would recapture some of the qualities of a bomb in a manned airplane. At the time of the Cuban crisis in 1962, the Strategic Air Command provided an umbrella of credibility for all action taken by the United States on the land and on the sea. The Russians knew SAC was in the air and armed. The White House told the Kremlin SAC would do its job, in Moscow, if this country were hit by a missile from Cuba. Russia backed down.

4. **The political and psychological effects.** It is true that weapons in orbit could terrorize civilian populations. The fact that they are in space, invisible but known to be overhead, would have an effect on government decisions.

5. **The effect of weapons in orbit upon our earth-bound deterrent capability.** Gen. B. A. Schriever, Commander of the USAF Systems Command, has said: "There is always the possibility of Soviet space developments which could render our present deterrent forces ineffective." There is little doubt that he was speaking of the orbital bomb as a possibility. This apprehension would be more widespread among our allies than in the continental United States. With orbiting bombs over North America, our friends in Great Britain, West Germany, France, and the Scandinavian countries could be expected to lose confidence that our SAC power, based on land, sea, or in the air, would be used to protect their interests.

—Wide World Photo from Sovfoto

Further evidence of the Russian emphasis on mobility for its missiles is seen in these launchers. They are carrying smaller rockets designed to fight ground forces, as they roll across Red Square in Moscow. Parade gave observers new insight into Russian pressure to cash in on modern technology. Lenin's tomb is in the background.

Less than three years ago there was a summary of this potential, published in the *Air University Quarterly Review.* It was written by Col. R. S. Sleeper of the Air Force Systems Command. Here is what he said of the Soviet threat to restrict our use of space and impede any American effort to launch a missile or air attack:

"Assume, for example, that one nation over a period of time builds in great secrecy and then suddenly launches an overwhelming force of spacecraft that have significant offensive bombing and interception capability. Assume that elements of this space-alert force are overflying the second nation at all times—in fact, they are patrolling its skies.

"Under these postulated conditions the second country's strategic retaliatory power is to a significant degree preempted. The initiation of nuclear war in response to such a patrol force would seem unlikely. Yet the political-psychological impact of such a spaceborne force on the leadership and populace of the second nation would probably cause fundamental accommodation of its national objectives to those of the first nation.

"Is this what Gromyko had in mind by his remark on December 23, 1960? 'The time has come when it is possible to cut short the attempts by the aggressors to start world war. More, conditions are being created in which war can be eliminated for good from the life of human society.' Whatever the answer to this question may be, no elaboration of the gravity of the potential threat of the Soviets' developing a capability to restrict our freedom in space is needed. It is clear that the Soviets must not be permitted to win a military technological superiority in space.

"The conflict must be won by the United States, not for cold war advantages, not for national prestige purposes, but for vital national survival. In winning this race our goal is not to dominate any nation or to dominate space. Our goal should probably be to attain the capability to prevent any hostile force from dominating space. To put it in positive terms, our goal should be to ensure the peaceful use of space."

If we assume, also, that the Russians have completed the development of an orbiting weapon system, it probably means the program dates back to their first recorded mention of the idea in 1958.

If the threat materializes and Red bombs go in orbit over the United States, the blame will not be placed on the White House, the State Department, or the Defense Department's concern with cost/effectiveness. The blame will be placed on the Air Force, which already recognizes the technological threat. Isn't anybody listening?

Meanwhile, There Is the Bomb

Hovering in the background of Russia's evident advances in ballistic missile technology is a growing debate about the world's efforts to contain nuclear proliferation. Pictures of the Moscow missiles were spread across page one of the leading newspapers and shown to our television audiences. There has been no such publicity for all of the recent words about the safeguards we need to protect us

(Continued on following page)

from technological inferiority in the nuclear-weapons area.

The best place to start is with an outstanding address made in the Senate on October 1 by Henry M. Jackson, the Washington Democrat. Mr. Jackson is chairman of the Nuclear Safeguards Subcommittee of the Senate Armed Services Committee and chairman of the Military Applications Subcommittee of the Joint Committee on Atomic Energy. You will recall that he also heads the Subcommittee on National Security and International Operations of the Senate Committee on Government Operations. He does his homework for all of these assignments, which interlock into an interesting and critical expertise.

Mr. Jackson's report of October 1 followed hearings, held in closed session, about the limited nuclear test-ban treaty adopted in 1963. His concern, for the most part, was with the four safeguards recommended by the Joint Chiefs of Staff and imposed as conditions under which the United States signed the 1963 treaty. The conditions said that the treaty should not be permitted to interfere with our security and it should allow:

1. The conduct of comprehensive, aggressive, and continuing underground nuclear test programs designed to add to our knowledge and improve our weapons in all areas of significance to our military posture for the future.

2. The maintenance of modern nuclear laboratory facilities and programs in theoretical and exploratory nuclear technology which will attract, retain, and ensure the continued application of our human scientific resources to these programs on which continued progress in nuclear technology depends.

3. The maintenance of the facilities and resources necessary to institute promptly nuclear tests in the atmosphere should they be deemed essential to our national security or should the treaty or any of its terms be abrogated by the Soviet Union.

4. The improvement of our capability, within feasible and practical limits, to monitor the terms of the treaty, to detect violations, and to maintain our knowledge of Sino-Soviet nuclear activity, capabilities, and achievements.

Mr. Jackson gave the Senate a report card or probation report on the observance of these standards. He gave the Atomic Energy Commission and the Defense Department credit for carrying on with a good underground test program—with sixty-two tests completed since the pact with Russia was signed. Most of the tests were concerned with weaponry, and "significant information" was developed.

He found that the nation's laboratories have had adequate support, but pointed out that the value of the laboratories depends on the underground testing. Without the experiments, the scientists would stagnate, he said.

Mr. Jackson heard testimony that we are keeping up our facilities and abilities to resume atmospheric tests if that is necessary. This could be brought about by big advances made by the Communist Chinese, who did not sign the treaty, or by the Russians, who have upset a nuclear moratorium when it served their purposes to do so. Here again, he emphasized that continued underground tests are essential to the readiness program.

The Senator said he is convinced that the limited test-ban treaty is being monitored well by satellites and instruments. In fact, improvements have been made in this area of scientific activity.

Then he turned to the future, stressing that there are many unknowns and disputed approaches to the detection process. The task of identifying the cause of a seismic shock is growing more complicated, and positive identification still depends on the collection of radioactive debris.

All of this has a bearing on the current effort in some circles to promote an expansion of the limited test-ban treaty into a comprehensive test ban treaty that would outlaw all nuclear experiments. Mr. Jackson told the Senate that ". . . several members expressed their concern that we are undertaking negotiations which could lead to a comprehensive test ban without being sufficiently informed about the techniques that could be employed to circumvent the terms of such a treaty. In this connection, it is worth emphasizing that the art of concealment of nuclear tests, when it is pursued, goes forward, in my opinion, faster than the art of detection."

He went on:

" . . . if an underground nuclear explosion is small enough, it will escape detection, even by the improved detection system. Methods of making relatively large underground nuclear explosions look seismically like small explosions are also possible.

"I, for one, do not believe that what we don't know can't hurt us. In fact, the opposite is true. Knowledge gained from even small underground nuclear explosions is important, and we can never say that such knowledge may not be crucial.

"Remember that we don't know how to identify underground nuclear explosions from a distance and, if they are small or decoupled, we don't even detect them. For a long time the Soviets were claiming all underground nuclear explosions are detectable and on-site inspections are unnecessary. Similar to the Nazi propaganda before World War II, they apparently believe if you tell a lie enough times people will eventually believe it. . . . "

Mr. Jackson then declared that we do not know how to monitor a comprehensive test-ban treaty without on-site inspections.

This was the heart of his warning. He said the present limited treaty has worked, but this was "due in a major way to the proposal of the Joint Chiefs of Staff for the four safeguards and because those four safeguards are being implemented. A comprehensive test ban would destroy three of those safeguards and without adequate means of verification, including on-site inspections, would make a mockery of the fourth safeguard."

Mr. Jackson's observations were not widely circulated, but they resulted in an interesting major speech in the Senate by Senator Robert F. Kennedy, the late President's brother who now represents the State of New York.

Mr. Kennedy proposed that Communist China be invited to join in the Geneva Disarmament Committee talks. He feels that all nations "must be prepared to rethink their positions; to make compromises; and to place an overriding priority on the prevention of nuclear proliferation." As for Red China, he acknowledged that that nation has expressed hostility to the United States, that they expect a "protracted conflict" with us, and that they are interested in "our destruction and humiliation." He then quoted President Kennedy: "World peace does not require that each man love his neighbor."

Mr. Kennedy thinks that the rulers of China "may be persuaded that their long-run interest, like that of the United States and all other nations, lies not in the spread of nuclear weapons but in their strict control."

Well, it may be. But somehow the conduct of Communist China, and Communist Russia as well, is not designed to fertilize this idea in the Western world. As long as China is the major issue it should be made clear that it soon will be a major nuclear power.

Ambassador Goldberg, at the United Nations, has cited Peking's record of infamy in opposing a move to admit Red China. He has warned that this would be a backward step. It is the counsel of the Goldbergs and the Jacksons that should be heard.—END

SHARP-CHUTER

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Letter from Europe

By Stefan Geisenheyner
AIR FORCE/SPACE DIGEST EDITOR FOR EUROPE

Ten years ago last May, the newly constituted German Luftwaffe consisted of a handful of T-6 trainers. A year later the T-33 was added. Today the Luftwaffe's combat wings fly highly complex weapon systems—the Lockheed F-104G as an interceptor and fighter-bomber and the Fiat G.91 as a close-support fighter.

The intermediate equipment of the late 1950s and early '60s, the F-86 and F-84F, is considered obsolete and is rapidly being replaced by newer aircraft. Still, nobody makes any bones about it—even the present-day equipment of the Luftwaffe is approaching a state of obsolescence. The F-104G and the G.91 are children of the past decade and are beginning to show it. Although in regard to performance and armament both aircraft can still be considered modern and useful, the rapidly progressing modernization of the eastern air forces demands replacements in the West.

F-104Gs are basic interceptor and fighter-bomber weapon system of the German Air Force. Although still modern and useful, they are already approaching obsolescence.

Many systems in both aircraft have been periodically updated and will continue to be modified in the future. Small as well as big changes in armament and electronics were made to keep pace with modern combat requirements, but only a certain number of such improvements can be incorporated into an aircraft without requiring changes to the airframe or the engine. It is estimated that both the F-104 and the G.91 can fulfill their combat missions effectively until the early 1970s, when the introduction of new types will become mandatory.

Learning from past experience and a careful analysis of the theoretical combat conditions of the coming decade, the Luftwaffe has now formulated requirements for its second-generation combat-aircraft equipment. In view of the high vulnerability of present-day airfields in congested Central Europe, it comes as no surprise that the combat types requested—and already granted by the German government—fall into the V/STOL category.

Protection by dispersion is the idea behind this decision, with the introduction of a heavy V/STOL multipurpose fighter and a light multipurpose V/STOL close-support aircraft. Likewise on the request list is an interceptor with no actual V/STOL capabilities, but which could be launched by catapult or rockets, thus—at least for the start—making airfields unnecessary. Reequipment of the Luftwaffe missile wings is only in the wishful-thinking stage, since political considerations may prohibit supplying the German AF with the desired longer-range missile.

During a recent roundtable discussion, the chief of the

Italian Fiat G.91, the Luftwaffe's present close-support fighter, can fulfill its mission effectively until the early 1970s. The small jet is extremely maneuverable as can be seen in photo of G.91s in tight bank.

The replacement for the G.91 will be the VAK 191B, a joint venture of the German and Italian governments. Above is a model of the light V/STOL fighter. The first GAF V/STOL combat squadron will become operational in 1971.

Luftwaffe, Lt. Gen. Werner Panitzki, gave some highly interesting particulars about this upcoming generation of new combat aircraft, which will be designed, constructed, evaluated, and operated in close cooperation with the USAF and the air forces of other NATO allies.

The G.91 close-support fighter will be replaced by the VAK 191B, a light V/STOL fighter which is being funded and built as a joint venture with Italy. This aircraft has been in the study stage for some years and, though an urgent requirement has existed for this type of aircraft, political and financial considerations prevented the beginning of the actual construction until one year ago. Today, the Italian and the German governments are backing the venture fully, and the first flight is expected to take place in 1967.

The VAK 191B is constructed around three engines: two Rolls-Royce Rb.162 lift engines and one Rb.193 vectored-thrust turbofan, all of which are installed in the fuselage. This mixed-propulsion concept is novel because all existing VTOL aircraft employ either a lift-thrust engine combination or a vectored-thrust engine. The idea behind this novel approach is to sacrifice payload for operational safety. The aircraft will weigh about seven tons and reach a speed of Mach 0.9. It will have only marginal all-weather capability at first, but this will be improved in the future as technology progresses. From the onset of the design work, emphasis was placed on a high degree of easy maintainability, incorporating a building-block approach to all aircraft systems, as well as engine and airframe. After extensive, one-year-long tests by the manufacturers (VFW in Germany and Fiat in Italy), some experimental squadrons of the Luftwaffe and the Italian Air Force will be equipped with the new design in 1969. Operational testing for maintainability and armament, and, above all, the logistical problems, will consume about two years. The first VAK 191B combat wings should become operational in 1971.

This extremely long time span of actual operational evaluation is envisioned by the Luftwaffe because the VTOL concept demands a completely new approach to all problems involving maintenance and logistics. New tactics have to be worked out to ensure full use of the capabilities of the V/STOL concept, which will change about everything one is accustomed to for operating aircraft from airfields. Furthermore, the capability to fly fast as well as extremely slowly or even backward, if required, offers military advantages that have not yet been explored. For instance, the VAK 191B is planned to fly battlefield surveillance missions for the army as well as strike missions deep in enemy territory.

When planning first began for the second-generation aircraft for the Luftwaffe, it was hoped that this V/STOL aircraft could be adapted to fly all conceivable missions of modern-day warfare—strike, reconnaissance, interception, and close support. Planners concluded, however, that this couldn't be done. The necessity arose for another, far heavier aircraft with a longer range, higher speed, and greater payload, which could fly nuclear or conventional missions deep in enemy territory, at supersonic speeds and at low levels.

The outgrowth of this requirement is the German-American Advanced V/STOL Project, which has been making headlines on and off during the past year. The requirement calls for a V/STOL fighter with a takeoff weight of about twenty-one to twenty-three tons. A payload of at least six tons has to be carried at speeds up to Mach 2 plus. All-weather capability is considered mandatory. A range of 400 nautical miles is thought to be adequate, to include vertical takeoff and landing; yet experience has shown that this last consumes a prohibitively high amount of fuel. A STOL takeoff should increase the range considerably and becomes feasible because the aircraft will employ variable-geometry wings as well as lift-thrust engines.

Four US aircraft manufacturers and two German companies have been selected to proceed with design studies for this V/STOL aircraft. They are the Boeing Co., Lockheed Aircraft Corp., McDonnell Aircraft Corp., the Republic Division of Fairchild Hiller Corp., as well as Vereinigte Flugtechnische Werke and Entwicklungsring Süd. In the spring of 1966, the winning design will be chosen from the proposals submitted. The first prototype is scheduled to fly about 1970, and the first operational aircraft will be evaluated by Luftwaffe and USAF squadrons beginning in 1972. In 1974, the first wings are planned to become operational with both air forces.

For this German-American program, the experience that will be gathered with the VAK 191B becomes invaluable. In fact, it can be expected that the methods of dispersion of the aircraft, the logistics problems, and the questions concerning the tactical use of such V/STOL aircraft will have been largely solved, and the over-all cost of the project will be reduced.

Although the German government is firmly committed to both VTOL combat aircraft programs, it is not putting all its eggs into these baskets. As a successor to the G.91, the VAK 191B is certainly the preferred aircraft, but just in case unforeseen technical difficulties arise, the GAF keeps close tabs on the joint French-British development of a conventional light combat aircraft, the so-called ECAT program, which, in the opinion of the Luftwaffe, would be the next best choice. Should the heavy VTOL fighter run into trouble with its timetable or otherwise, the GAF would consider buying the F-111. At first, a similar variable-geometry design of European manufac-

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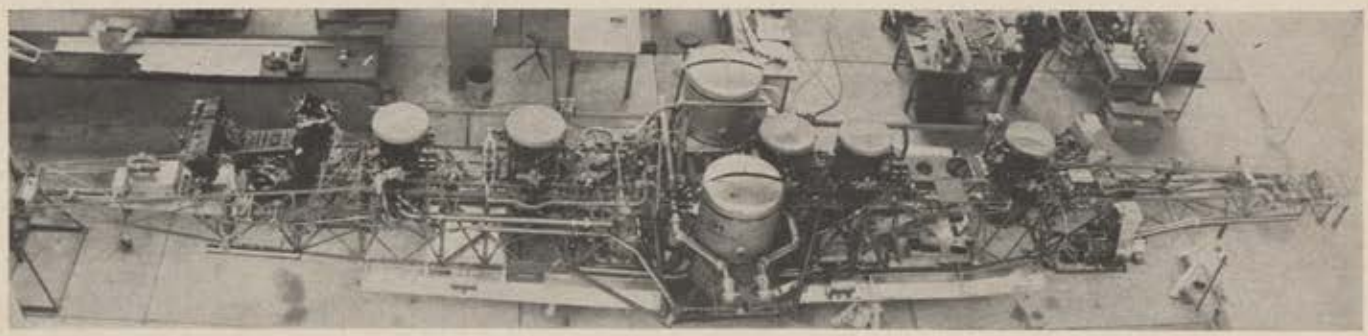

The flying testbed of the VAK 191B V/STOL fighter, shown above, is in its last stages of construction and may have already flown when this article goes to press. It is built around three engines. There are two Rolls-Royce Rb. 162 lift engines and one Rb. 193 vectored-thrust turbofan, all of which will be installed in the fuselage. No existing V/STOL aircraft has this mixed-propulsion concept, which sacrifices payload for operational safety.

Although the aircraft will not be ordered, the Luftwaffe has learned much from its participation in the evaluation of the Hawker Siddeley V/STOL P.1127, shown above performing a vertical takeoff. The evaluation squadron, stationed in Great Britain, was made up of representatives from the German, United Kingdom, and US armed services.

ture was planned as backup, but, since the estimated costs were too high, this plan was abandoned and a straightforward ordering of the F-111 would come about should the need arise.

Since neither of the two VTOL aircraft could serve efficiently as an interceptor, a program is presently under way to update the F-104G for use in the next decade. As the over-all policy of the GAF demands dispersion of the aircraft to numerous small fields, the interceptor wings would have to follow this trend. Tests have proven that the F-104 can be catapult-launched or perform zero-length rocket-assisted takeoffs. Though nothing is firm yet, it can be assumed that one or the other system will be put into use in the near future to adequately protect the Luftwaffe interceptor wings against enemy attack through dispersion.

Even after the introduction of both the heavy and the light V/STOL systems in 1972 this launch method for interceptors would be kept operational. The by-then ancient F-104G could possibly be replaced by a re-engined F-104, incorporating a new missile and fire-control system. However, nothing has been decided in this respect, since upcoming air defense missiles may render the manned interceptor obsolete.

As already mentioned, the main problem in the eyes of the Luftwaffe is not so much the technical feasibility of the VTOL concepts or their tactical use, as the mountain of difficulties surrounding the acquisition of real estate for hundreds of dispersed fighter bases all over the country; their upkeep and protection; and the logistical pipelines necessary to maintain them. Whereas the centralized airfield provides protection (though meager) against guerrilla operations, the dispersed bases offer excellent targets for such activity.

The acquisition of real estate will prove to be a major stumbling block. Where does one find a farmer on this globe who wants a supersonic VTOL fighter based on his land? The logistics problems are basically unsolved. Should a far-out base have its own ample supply of fuel and spares, or should the base be continually supplied by a fleet of trucks? Helicopters or STOL aircraft could be used for the same purpose. But is this approach cost/effective? Completely new thinking is needed to solve all these problems, and the two years allotted the GAF during the evaluation of the VAK 191B seem a very short span of time indeed for the magnitude of the task.

Especially in regard to the future communications requirements of the V/STOL combat wings—air traffic control, radar surveillance, and air-ground control—the present systems are wholly inadequate. A totally new system is planned, therefore, tailored to the special needs of the air tactics and technology of the coming decades. This, however, is still in the early planning stages and the GAF cannot hope to have it fully operational before the end of 1979.

The Luftwaffe's F-104G fleet with its atomic capability is presently complemented by a missile wing equipped with Pershing missiles. The GAF is not satisfied with the range of this weapon and claims it is not able to fulfill its NATO missions with it. A requirement exists for a longer-range missile. However, political considerations have up to now prevented the Luftwaffe from obtaining a new missile. The Soviets would react violently if the Germans were equipped with a nuclear missile capable of reaching Soviet soil. Though NATO advocates the reequipment of the GAF with a longer-range ballistic missile, the US government cannot comply with this request without increasing tension between East and West.

The reequipment plans of the Luftwaffe are rapidly taking concrete form. First steps toward the solution of tactical and logistical problems were made by participating in the evaluation of the Hawker Siddeley V/STOL P.1127 in Britain, where the UK, the US, and Germany are cooperating closely. Although this aircraft will not be ordered, the experience gathered was well worth the financial participation in the program. The testbed of the VAK 191B will soon start its first hovering flights, and for the Advanced V/STOL Project a joint USAF-GAF project office has been set up in Dayton, Ohio. Few doubts remain that the Luftwaffe of the 1970s will be one of the best-equipped air forces of the world.—END

Ground crews, as well as pilots, have gathered invaluable information about V/STOL logistics, maintenance, and tactical problems during the P.1127 evaluation in Britain.

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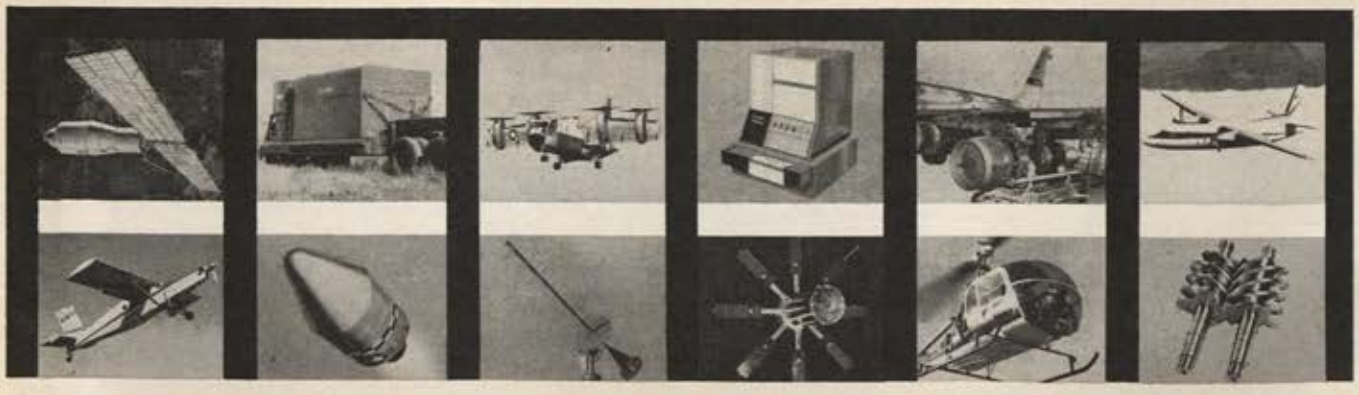

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News,
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& Comments

AEROSPACE WORLD

By Allan R. Scholin

ASSOCIATE EDITOR, AIR FORCE/SPACE DIGEST

WASHINGTON, D. C., Nov. 15

The Administration's policy of restricting air strikes in North Vietnam to targets of interdiction and surface-to-air missile sites drew strong criticism late in October from Gen. Curtis E. LeMay, USAF's former Chief of Staff.

General LeMay's off-the-cuff remarks came at a luncheon an hour after he had been awarded the Collier Trophy for 1965 by Vice President Hubert Humphrey (*see "Bulletin Board," page 88*).

"We're hitting the wrong targets," he said. "We're getting people killed who shouldn't be killed."

General LeMay, who retired in February, is recognized as the world's foremost authority on strategic bombing. Early in World War II he developed the techniques of daylight precision bombing over Europe, employing closely grouped formations to defend against enemy fighters. Later he directed low-level fire-bomb attacks by B-29 Superforts against Tokyo. After World War II he took over the Strategic Air Command to make its manned bomber force the most powerful and precise in the world.

If US air strikes are intended to bring North Vietnamese leaders to the conference table, "they're not getting the message," General LeMay said. Instead, by merely "pecking around the edges," we not only are not hurting the North Vietnamese, but are playing to their psychological advantage by leading them to believe our bombings are no more than an endurable nuisance.

But we could stop the fighting, he asserted, if we hit North Vietnam's powerplants, factories, and port facilities "and other resources that they are proud of."

One reason the US has avoided attacking North Vietnam's principal port of Haiphong was left unsaid both by General LeMay and the Administration in its mild response to his remarks. It is that in doing so we might well hit ships and personnel of many of our free world allies who continue to trade with North Vietnam.

☆

Will the Tactical Air Command get a new close-support fighter next year to replace its F-100s? Or will it instead get more F-100s?

The answer to this and many other questions on what's ahead for the Air Force is contained in the closely guarded DoD budget for Fiscal Year 1967 due to go to the White House early in December.

TAC would reportedly be happy to get a couple of wings of Northrop F-5As. A dozen planes now being combat-tested in Vietnam were expected to pave the way for DoD approval of a substantial order. Instead, as Jack Rambeau points out in "Bulletin Board" *(page 88)*, DoD may take back two wings of F-100s from the Air Guard, probably without their pilots and ground crews.

If there is to be a new aircraft buy for TAC, it just might be the Ling-Temco-Vought A-7A instead of the F-5A. Secretary McNamara's enthusiasm for "commonality" is well known and the Navy A-7A has just made its first flight at Dallas. LTV's Crusader II, as the A-7A has been christened, is a long-range subsonic fighter whose airframe was developed basically from the Navy's F-8A Crusader. It is powered by a Pratt & Whitney TF30 engine, the same as that in the F-111, but without afterburner.

The DoD press release issued in connection with the first flight of the A-7A claimed that "on the basis of costs, the Navy found it can purchase about three subsonic aircraft for the price of one supersonic plane, giving it the capability of putting three planes over a target instead of one." Its range is more than double that of the F-5A and it can carry three times as much payload.

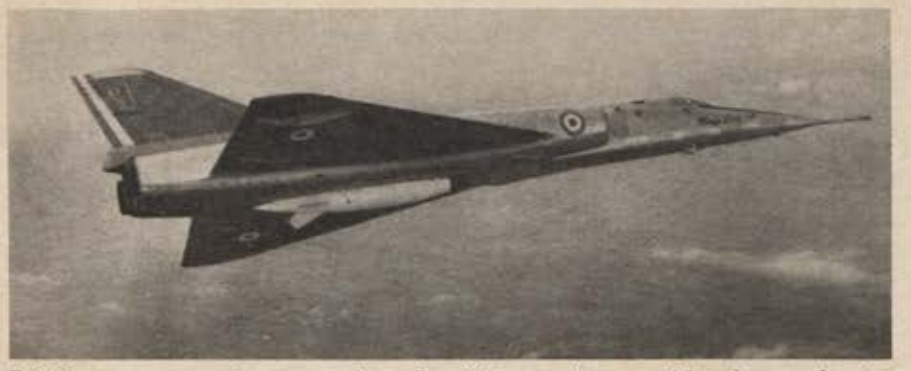
☆

Air Force Secretary Harold Brown outlined USAF's tactical warfare requirements in an address before the Los Angeles Chamber of Commerce early in November.

"In some ways, the war in Vietnam is different from any we have fought in the past," he said. "Our tactics have

(Continued on following page)

Brig. Gen. George B. Simler, 2d Air Division Ops chief, waits to greet Maj. Alfred H. Hopkins, Jr., pilot of first Northrop F-5A to touch down in Vietnam. Planes, based at Bien Hoa, flew mission soon after arrival.



British government is reported to be giving serious consideration to buying this French Dassault Mirage IV nuclear bomber instead of General Dynamics F-111A. Equipped with Rolls-Royce Spey engines and beefed up for low-level operations, it would cost only half as much, French say, but RAF wants F-111.

Effective for all renewals due on or after January 1, 1966, a new dues structure for AFA memberships will go into effect. Two alternative plans are offered:

1. One-year membership at $7.00 (an increase of $1.00).
2. Three-year membership at $18.00 (no increase, since the three-year membership eliminates annual handling costs).

The $1.00 increase in the annual membership fee is the first raise since 1958 and is the direct result of rising costs. After careful examination of all factors, the AFA Finance Committee recommended—and the Executive Committee concurred—that the dues structure had to be revised to best serve the interests of the Association. The Board of Directors, by unanimous vote, reached the same conclusion. The resulting Board action set the nominal increase of $1.00 for one-year memberships and established the new three-year membership program, which permits the members to share in the administrative savings involved.

The increase in dues was arrived at reluctantly, but it was felt that it was unavoidable and that the new three-year program was a reasonable solution to the problem.

had to be adapted to this strange environment, and we have found that there is much room for imaginative thinking about techniques and equipment."

Elapsed time between request for air support and its arrival on target is being cut by better communications and by training Air Force people to work directly with the Army in target selection and weapons delivery, he said.

He pointed out that in an underdeveloped country like Vietnam it is not possible to disperse high-performance fighters like the F-100, F-105, and F-4 near areas where ground fighting is in progress or likely.

"We are therefore testing a representative lighter-weight fighter, the F-5, that can operate from rough, semiprepared strips. We think it will work well. . . ."

Much effort is also going into development of new avionics and support equipment, Secretary Brown noted. To discover and identify targets in heavily forested country, USAF is developing very accurate navigation systems to put the pilot on target, and bomb delivery systems of even greater accuracy.

"Our objective is to be able to pick up and destroy any type of tactical target, day or night, in any weather and in any terrain," Secretary Brown reported. "The Army doesn't stop fight-

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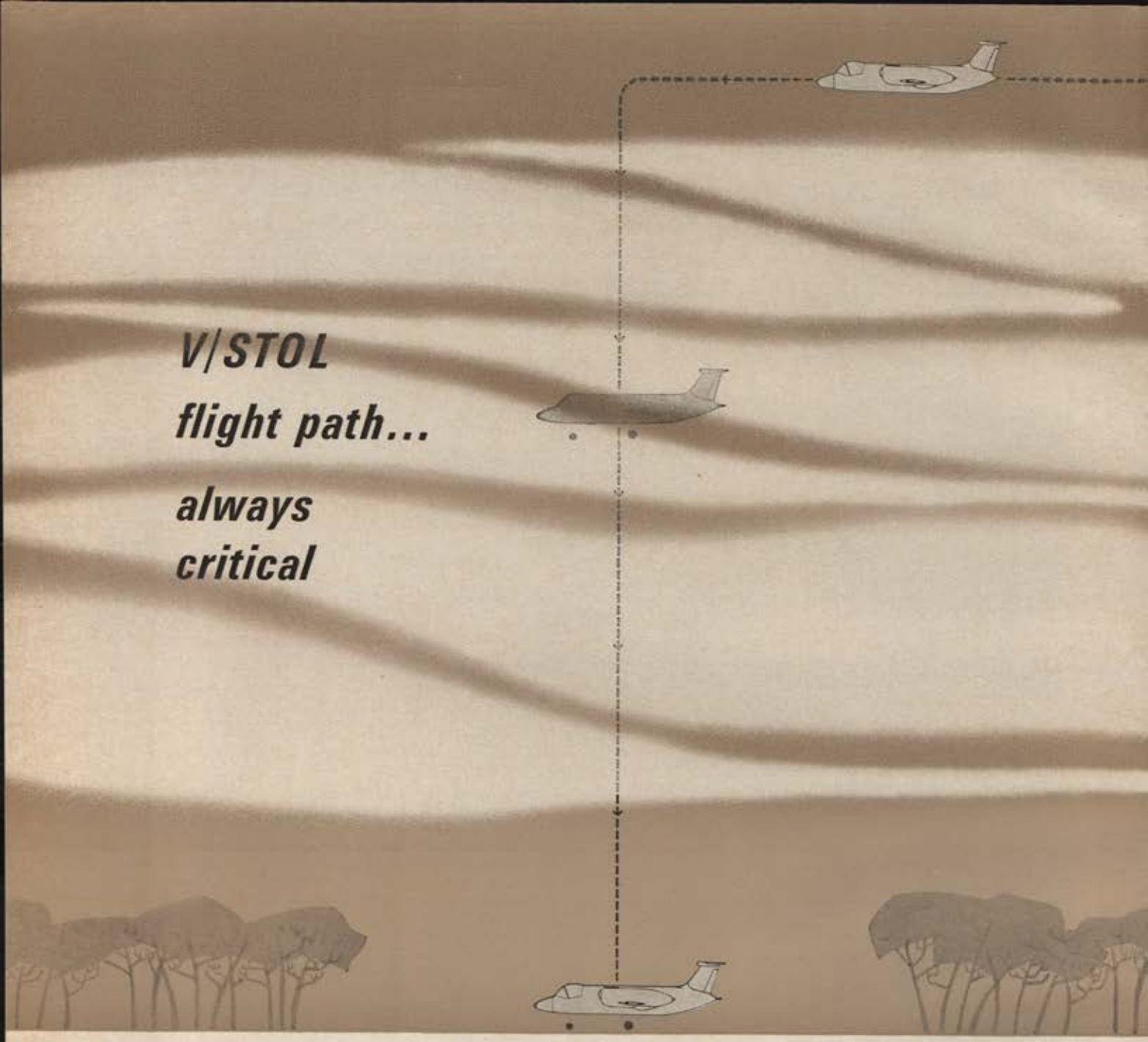

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ing at sundown or when it rains."

As surface-to-air antiaircraft missiles in the hands of potential enemies become more accurate and portable, he said, "we probably are going to need a very accurate standoff missile for our tactical fighters."

USAF could use a small transport to improve its "retail delivery" capability, he indicated. Heavy long-range transports like the C-141 and the forthcoming C-5 are ideal for moving men and supplies from the US to a theater of operations, and the C-130 is doing a good job in intratheater airlift.

"But in the future," he said, "we may need a smaller transport with short takeoff and landing characteristics—one that can get into and out of rough, short fields rapidly . . . interfacing as far forward as possible with Army helicopter transports and ground transportation systems."

Pointing out that "tactical airpower will always be one of our most important areas," he called for "new ideas" in concepts, doctrine, tactics, and techniques, and in the hardware areas of materials, propulsion, ordnance, airframe design, and electronics.

"The ground forces cannot fight to seize and control enemy territory without the support of the Air Force tactical arm," he declared. "We intend that it shall always be a strong arm."

☆

US Navy and Air Force teams assigned to recover Gemini 6 and 7 astronauts are hoping the Gemini 7 mission will get off on schedule December 4 so that they can get home before Christmas.

Astronauts for the Gemini 7 mission are USAF Maj. Frank Borman and Lt. Cmdr. James A. Lovell, Jr., USN. The two-week mission will be the first spaceflight for each.

If they meet the December 4 date, the launch of Gemini 6 will follow nine days later, on December 13. Aboard for the two-day flight will be Navy Capt. Walter Schirra, who logged a six-orbit spaceflight in 1963, and Capt. Thomas P. Stafford of the Air Force.

Objective of the Gemini 7 mission is to gain further information on the effects of long-duration flight on man. Gemini 6 is programmed to rendezous with Gemini 7 on its fourth orbit and try to stay with it as long as possible. NASA emphasized that while Gemini 6 is expected to approach close to

(Continued on following page)

Blasting off en route to 400-foot altitude in first live test of zero-zero ejection seat is Maj. James C. Hall, AF Reservist. Test of seat, built by Weber Aircraft, was complete success.

Gemini 7, it will not dock with it nor will astronauts leave either ship to visit the other.

Christmas promotions are in prospect for Borman, Lovell, and Stafford if the flights go off on schedule. At President Johnson's direction, all military astronauts get a grade boost after their first space mission.

☆

An Air Force Reservist and veteran parachutist has made the first live test of a zero-altitude-zero-airspeed ejection seat. He is Maj. James C. Hall, whose military assignment is as Chief Escape Systems Instructor at the AF Flight Test Center, Edwards AFB, Calif.

Major Hall, who is President of Parachuting Associates, Inc., volunteered to test the ejection seat developed by Weber Aircraft Co. of Burbank, Calif., to recover a pilot whose aircraft is disabled on the ground.

The system is a three-stage device which first ejects the pilot from the cockpit, then fires a 4,500-pound-thrust rocket to boost him to 400 feet. There another charge separates him from the seat and opens his chute.

The device worked perfectly in Major Hall's test, and he suffered no ill effects. "I volunteered to ride this ejection seat because I believe in it," Hall said. "I can now instruct airmen on the do's and don'ts of zero-zero ejection with a firsthand knowledge."

Weber engineers note that in 1964 thirty-five airmen were killed during landing or takeoff accidents. In many of these cases the pilots ejected, but their chutes failed to open in time. Present operational systems require a minimum flying speed of 100 mph and an altitude of 100 feet or more to allow for full parachute opening.

Major Hall's successful test culminated three years of laboratory engineering and more than forty zero-zero tests with dummies.

☆

A rigid-rotor compound aircraft designed by Lockheed-California Co. of Burbank has been selected by the US Army as its future armed escort helicopter. The initial contract calls for ten prototypes. Lockheed and Sikorsky had been finalists in the competition to develop what the Army calls its Advanced Aerial Fire Support System (AAFSS).

The first helicopter conceived and designed exclusively to provide suppressive fire in escorting troop-carrying helicopters to combat landing zones, it will be capable of cruising at speeds above 200 knots—more than fifty percent faster than any other operational Army helicopter.

Lockheed's rigid rotor, first tested in its experimental XH-51, offers a highly maneuverable as well as extremely stable platform at all speeds and while hovering. It incorporates a thrusting pusher propeller, short stubby wings, and an antitorque rotor, in addition to the main rotor blades. The two-man rotorcraft will be powered by General Electric's new T64-S4A gas turbine engine generating 3,400 horsepower.

The Army plans to equip it with a variety of weapons, including machine guns, grenade launchers, rockets, and antitank missiles.

Lockheed's AAFSS is expected to be operational by the end of the decade. The Army is reportedly seeking an interim armed escort chopper with more speed and firepower than its present Bell UH-1Bs. Bell's Huey-Cobra, a modification of the UH-1B with slimmed-down fuselage and 180-mph speed, is a top candidate.

☆

News Notes—Nine world speed and altitude records set by USAF aircrews in two **YF-12A** prototype interceptors at Edwards AFB, Calif., have been officially certified by the Fédération Aéronautique Internationale (FAI) in Paris. The records originally announced were slightly amended by FAI to these final figures:

Lockheed-California Co. has won contract to build Army's Advanced Aerial Fire Support System (AAFSS). Designed to replace Army's present armed helicopters, AAFSS will be a compound rotorcraft, similar to this Lockheed XH-51A experimental copter, which has flown at a record 272 mph.

Destined for Air Rescue Service units in Southeast Asia, this Sikorsky HH-3C helicopter has just been delivered to USAF. More powerful than standard CH-3C, which has been in USAF service since 1963, HH-3C is armor plated and is equipped with additional communications and rescue gear.

• **Straight-course speed record** of 2,070.101 miles per hour and absolute sustained altitude record of 80,257.86 feet, set by Col. Robert L. Stephens, Gilmer, Tex., and Lt. Col. Daniel André, Memphis, Tenn.

• **Speed around a closed course,** 1,688.889 miles per hour, by Lt. Col. Walter F. Daniel and Maj. James P. Cooney.

• **Speed for the 500-kilometer closed course,** 1,643.041 miles per hour flown by Colonel Daniel and Maj. Noel T. Warner.

Other records set by Colonel Daniel and Major Cooney were 1,688.889 miles per hour for the 1,000-kilometer closed course with no payload; with 1,000-kilogram payload; and with 2,000-kilogram payload. The YF-12A's world absolute speed and altitude marks also constitute FAI jet-class world records.

The **Martin-Marietta Corp.,** Orlando, Fla., and the **Boeing Co.,** Seattle, Wash., have been selected by AF Secretary Harold Brown to proceed with the contract definition phase of the **Short Range Attack Missile (SRAM)** program. They will get fixed-price contracts to verify preliminary SRAM design and engineering and to set firm contract and management planning factors. If a decision is made to go ahead with SRAM, one of the two will be chosen by next summer to continue the program. An air-to-surface attack missile with nuclear capability, SRAM could be carried by the F-111 and late-model B-52s.

Military services and the **Federal Aviation Agency** have taken a long step toward developing a **single NOTAM (Notice to Airmen) system** by agreeing to bring together and ultimately consolidate their respective NOTAM operations. The Air Force-operated USAF/USN Central NOTAM Facilities has been moved from Tinker AFB, Okla., to be collocated with FAA's National Flight Data Center in Washington, D. C. FAA will manage the new National NOTAM System. The Air Force will provide connections between USAF/USN bases and FAA's domestic communications system and monitor military inputs.

Air Force **survival training** will be transferred from Stead AFB, Nev., to **Fairchild AFB,** Spokane, Wash., next month. It will continue under Air Training Command. . . . Also in January, TAC will take over **Mountain Home AFB,** Idaho, from SAC. TAC will activate the 67th Tactical Reconnaissance Wing there, to be equipped with RF-4C Phantom II jets. . . . Nine RF-4Cs were flown to Tan Son Nhut AB, Vietnam, recently by crews of the **16th Tac Recon Squadron,** Shaw AFB, S. C., to boost tactical reconnaissance capability in Southeast Asia. —END

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PRICE. The development work is behind us. GPL is ready with equipment... not paper. Our customer benefits from low cost without the sacrifice of quality or time. But even more important than Cost is...

COST EFFECTIVENESS. What is the *total cost of ownership?* What is it today, on paper? What will it be a year from now? GPL's proven on-time, on-budget, on-spec record – plus *proven* reliability – is the added assurance a GPL customer has of delivering what he promised to deliver... when... and at the lowest total ownership cost.

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For further information, write: GPL Division, Dept. AF125, General Precision, Inc., Pleasantville, N.Y. 10570.

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AIR FORCE
DECEMBER, 1965

The giant Lockheed C-5A has military and commercial potential far greater than the predictions of many observers, who have taken an overly conservative view of the future of aeronautics. Although its design, development, and production will certainly pose challenges in all areas, the airplane's main features are well within the state of the art from both the technical and management points of view. The C-5A will not only revolutionize troop and equipment transport but also may well serve important command and control functions, aerial refueling, and even naval assignments, among many others. There are quite valid arguments for an eventual total civil/military fleet of some 1,200 C-5A-type aircraft, rather than the 300 being projected today. When commercial aviation sees the advantages of such weight-lifting capability at relatively modest prices and recognizes how the C-5A could meet freight and passenger air transport needs just around the corner, this large figure makes sense. It is just as likely that the military will buy many more C-5As than the currently projected number—for the same reasons.

C-5A—Even More Than Meets the Eye

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

THE recent announcement that the C-5A transport would be produced for the Air Force by the Lockheed-Georgia Company stimulated an unusual flood of optimistic predictions about the aircraft's importance and the revolutionary effects it will have on US military effectiveness and on commercial aviation.

Few airplanes have received such praise and so many votes of confidence from so many sources—before they even reached the drawing boards. Secretary of Defense Robert S. McNamara, high civil officials of the Air Force, USAF general officers, newspapers, national magazines, TV, radio, and the trade press all have given the C-5A a much bigger buildup than they normally afford a new aircraft.

Wide recognition has been given to the C-5A's unprecedented cargo-carrying capacity—100,000 pounds of payload for 6,300 miles (San Francisco-Tokyo or Honolulu-Saigon) or 250,000 pounds of cargo for 3,700 miles (New York-Paris). This is about three times the work capacity of the Lockheed C-141, the smaller brother of the C-5A, which is now entering service. The C-141 itself is a prodigious worker. One C-141 StarLifter is the equivalent of seven piston-driven C-124 aircraft over long hauls such as the transpacific routes. And a fleet of 132 C-141s, which will be available in the next few years, will more than double the present US military airlift capacity to Southeast Asia.

The C-5A has an important added virtue that no other transport can claim. It can carry virtually any of the Army's heavy equipment, including the fifty-ton Main Battle Tank. Another key feature is the aircraft's relatively low operating cost. According to DoD estimates, the C-5A will cost about fifty percent more to operate than the C-141. But it will do three times the work so that the direct operating costs in cents per ton-mile should be about half of the C-141's. Since the C-141 is expected to carry cargo under optimum conditions at four to five cents per ton-mile, the C-5A apparently has a real chance of getting this figure down to two cents.

The truly revolutionary implications of such economics are obvious, but also difficult to comprehend completely. Essentially, the C-5A will allow the US to place formidable land forces on any trouble spot in the world within twenty-four hours. These Army units will not be "token" light infantry forces of the type that are now rushed in by air in emergencies. The C-5A will move heavy mechanized infantry and armored divisions, complete with tanks, trucks, artillery, and combat supplies.

A force buildup that would take more than a month with current sea and airlift will be achievable in a week with a fleet of 100 C-5As. A comparative example is provided by Operation Big Lift in 1963, which required 204 transport planes to airlift 15,000 unequipped troops to Europe in sixty-three hours. Once at their destination the men picked up tanks, trucks, ammunition, and other supplies which had been pre-positioned. Less than 100 C-5As could move the same number of troops plus their tanks, equipment, and supplies the same distance within twenty-four hours.

Current plans call for Lockheed to develop the C-5A and deliver fifty-eight aircraft under a contract valued at approximately $2 billion. This contract is unique in that it covers the engineering design, testing, and development, plus the tooling-up and production of the fifty-eight aircraft and their spares. It is expected that contracting for the complete package

(Continued on following page)

will save government substantial amounts of money.

DoD also has an option to buy fifty-seven more aircraft. Many sources are estimating that the military will purchase at least 200 C-5As. This would be enough to completely modernize the US global logistics pipeline during the 1970s. In addition to operations in emergencies, these aircraft would be kept busy, day in and day out, moving men, equipment, and supplies. The relatively low operating cost and the prodigious capacity of the C-5A would mean that many more types of supplies would move by air. The amount of materiel in the logistics pipeline would be reduced substantially, with major savings in dollars and personnel. Some experts foresee the C-5A taking over virtually the whole overseas logistics job with only bulk cargoes moving by sea. If this happens, Parkinson's Law may be reversed for once, and the trend toward increasing numbers of support personnel per fighting man may turn sharply downward.

Estimates of the C-5A's high productivity and low operating cost have generated many predictions of rapid success in commercial aviation as well. In passenger service the C-5A is expected to cut operating costs in half and to bring air fares down to bus prices.

Whether this is desirable is a matter not entirely agreed upon. Economists disagree about the size of the new market that will be generated by such a fare structure. Also, there is concern about the great size of the C-5A and its 700-passenger capacity which, according to many experts, would make it useful only on current high-density routes such as the North Atlantic and New York-Los Angeles. However, there can be little doubt that some airlines will have the C-5A hauling passengers shortly after it becomes commercially available in the early 1970s. The airline business is too competitive to allow the C-5A's potential to go untested for long after it is certificated and ready for service.

Another sure bet is that the C-5A will be used as soon as possible in civil air freight service, which offers unprecedented opportunities for inventory reduction and dollar savings. Air freight business now is growing at a rate of almost twenty-five percent per year and shows no signs of slowing down. With the impetus of the C-5A's low direct operating costs—about half that of the best transports in civil service today—added to the already strong attractions of air freight service, the industry could reach almost explosive growth conditions.

Currently Lockheed estimates a market of 100 C-5As among airlines for both passenger and freight service. So, if one accepts the 200-airplane market es-

The C-5A will become attractive for a wide variety of military missions if it fulfills expectations and becomes a highly reliable, durable workhorse. The artist's conception at left shows a possible Air Defense Command configuration. A search radar is enclosed in the disc-shaped radome above the fuselage and a height-finding radar in the strut supporting the disc. On the C-5A, these radars can be larger, more powerful, and have much greater range than airborne installations of this type which are now operational. Elaborate communications and computer installations also can be carried in the cavernous interior to allow the C-5A crew to control other ADC aircraft over hundreds of thousands of square miles. In addition to early warning and intercept control, there is also the possibility of the C-5A's becoming a potent missile-launching platform. It will have sufficient fuselage volume and payload capacity to also carry a large number of air-to-air missiles. For example, around thirty AIM-47, Mach 6, 800-pound, 12-foot-long, 100-mile-plus-range missiles developed for the YF-12A could be carried aboard the C-5A in addition to the radar and command and control equipment. The missiles could be stored in racks in the fuselage and fired through openings in the enlarged wheel fairings as shown in the drawing. Larger missiles with much more range could be carried so that the C-5A would have the possibility of becoming effective against supersonic bombers and a valuable supplement to the supersonic interceptor force. And the C-5A's great range would allow it to attack invading bombers at unprecedented distances from the US.

—Illustration by Richard Schlecht

timate for the military, the total market estimate is 300 aircraft. In dollar terms this is impressive—$5 billion plus.

Such a prediction reflects an unusual degree of confidence on the part of Lockheed and all of its potential customers.

However, despite the unusually optimistic predictions made on all sides for the C-5A, it seems worthwhile to take a closer look at the project and its limitations and potential. The C-5A is a big step forward in many respects, but no one has yet come up with a good crystal ball for predicting the future in aviation. Overoptimism often was the problem in the early days, but since the Korean War the tendency has been to underestimate the potential generated by the technological revolution.

One good example is the performance improvement of the jet engine. In 1958, top management at the National Aeronautics and Space Administration declared that gas-turbine engine research wasn't needed any longer, that all possible future improvements could be made by industry using technology then available. In the intervening seven years a veritable revolution in knowledge has taken place. It has been proven conclusively that the jet engine's unused growth potential is far greater than that which has already been exploited. Major advances include new lightweight materials and design techniques and cooled turbine blades, which allow the engines to run at significantly higher temperatures. Thus, the new generation of jet powerplants is much lighter than existing engines of similar power, and use less fuel.

Without this new technology, the C-5A's fine performance would not be possible. Its General Electric GE1/6 turbofans produce 40,000 pounds of thrust each, have a considerably higher thrust-to-weight ratio than any large engine in use today, and have a lower specific fuel consumption.

In this same vein, no one in or out of the engine business anticipated the improvement that has been achieved in jet-engine life. Today, some models are operated by the airlines for more than 5,000 hours between overhauls, and still longer life apparently is a certainty. These engines are largely responsible for the low operating cost of turbojet and turbofan transports, as compared to piston-driven aircraft, which have less than half the engine overhaul life.

Another key area in which the expert prognosticators miscalculated badly, at least in their public statements, was the size of the jet transport market. Ten years ago arguments were still raging over the

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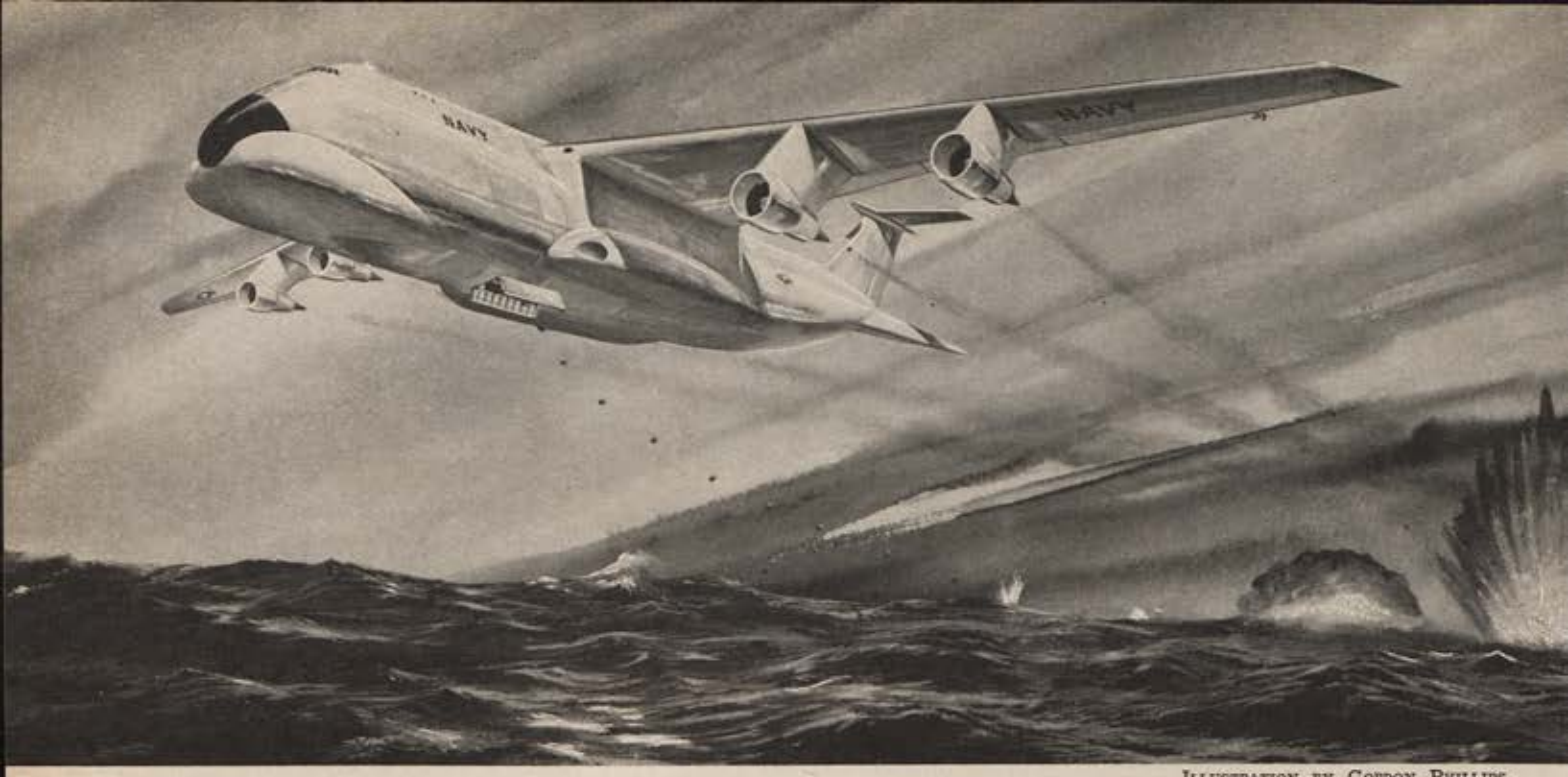

ILLUSTRATION BY GORDON PHILLIPS

The C-5A also could become attractive for a number of Navy missions. Above, the artist shows a possible modification for antisubmarine warfare. The large internal volume and heavy payload capacity would allow a more extensive and sophisticated load of submarine-detection equipment to be carried than on current aircraft. In addition, an unprecedented load of depth charges and homing torpedoes could be accommodated. Modifications for the ASW mission probably would include an extended wingspan to improve flight efficiency in the 150- to 200-knot speed range. Possibly engine design changes would be made to improve part-throttle fuel consumption. Range and endurance, however, should be outstanding, because the aircraft could be operated with two engines shut down during much of mission, which must be conducted at altitudes of more than about 500 feet and at low speeds.

relative merits of the turboprop versus the turbojet engine, and there was great concern about the economics of large jet aircraft in airline service. No one felt confident enough to predict that by 1965 around 900 US-built jet transports would be in use by the airlines and that around 300 would be on order with enough new purchases anticipated in the near future to put the industry in a mild boom condition.

Many other examples of faulty prognostication in aviation can be cited. However, the main point is that the estimate of a 300-aircraft market for the C-5A probably is grossly in error. If the estimate proved to be correct, it would be unprecedented.

Looking toward a larger market is quite heady. The total dollar values rise rapidly, and if 1,200 airplanes were sold, the total price would be in the neighborhood of $17 billion, or nearly the equal of an Apollo program.

Initially, such thoughts seem entirely out of line. However, there are good reasons for believing that the final sale of the C-5A and its derivatives will be closer to 1,200 than 300.

First of all, the C-5A is technically well within the state of the art. There is nothing in its design or production plan that hasn't been done before. It rides a strong backlog of experience in the development and operation of high subsonic-speed transports.

Some design problems have new orders of magnitude. For example, the aircraft's 712,000-pound gross weight is better than twice that of the C-141, its 222-foot span is forty percent more than the C-141's, and its 236-foot length is sixty-five percent longer than that of the C-141. As a result, the C-5A's natural control response is relatively sluggish. However, automatic control and stability system technology has advanced to the point where the C-5A will have a relatively low minimum speed in the 115- to 130-knot range, depending upon weight, and a short-field capability comparable to current civil jet transports. It is to take off fully loaded in 7,850 feet and land at its normal landing weight in less than 5,000 feet. The twenty-eight low-pressure tires in its landing gear will allow the C-5A to operate from sod fields. Its eyelid-type door on the nose, and the clamshell doors on the rear of the fuselage, will allow drive-through loading. That is, the cargo being delivered can be hauled or driven out of one end, while a new load is brought in at the other. With this design the turnaround time on the ground, including fueling, for the C-5A will be about an hour under normal circumstances. Integral rail and roller systems will allow aerial delivery of heavy cargo.

Production of the C-5A will be manageable with current knowledge, just as the performance requirements, such as those discussed above, are within the technology. The basic tooling will be similar to that used on the C-141, 707, B-52, and other large aircraft. That is, the tooling will accommodate sheets of skin measuring approximately three feet by fifty to sixty feet. It would be preferable to go to larger sheets to reduce the number of joints in the skin, because the joints, with their necessarily heavy backup structure, rivets, etc., weigh considerably more than continuous skin. Achieving low structural weight on any metal aircraft depends largely on reducing the number of skin joints, and, on an aircraft the size of the C-5A, this is of critical importance. However, as things stand today, it would take a major effort to produce and

(*Continued on page 39*)

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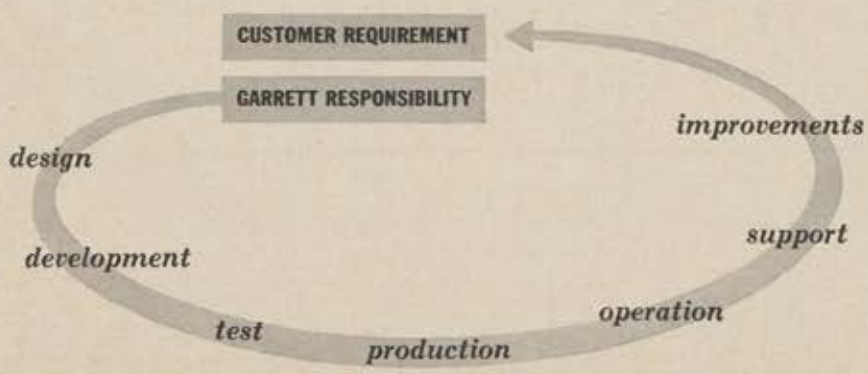

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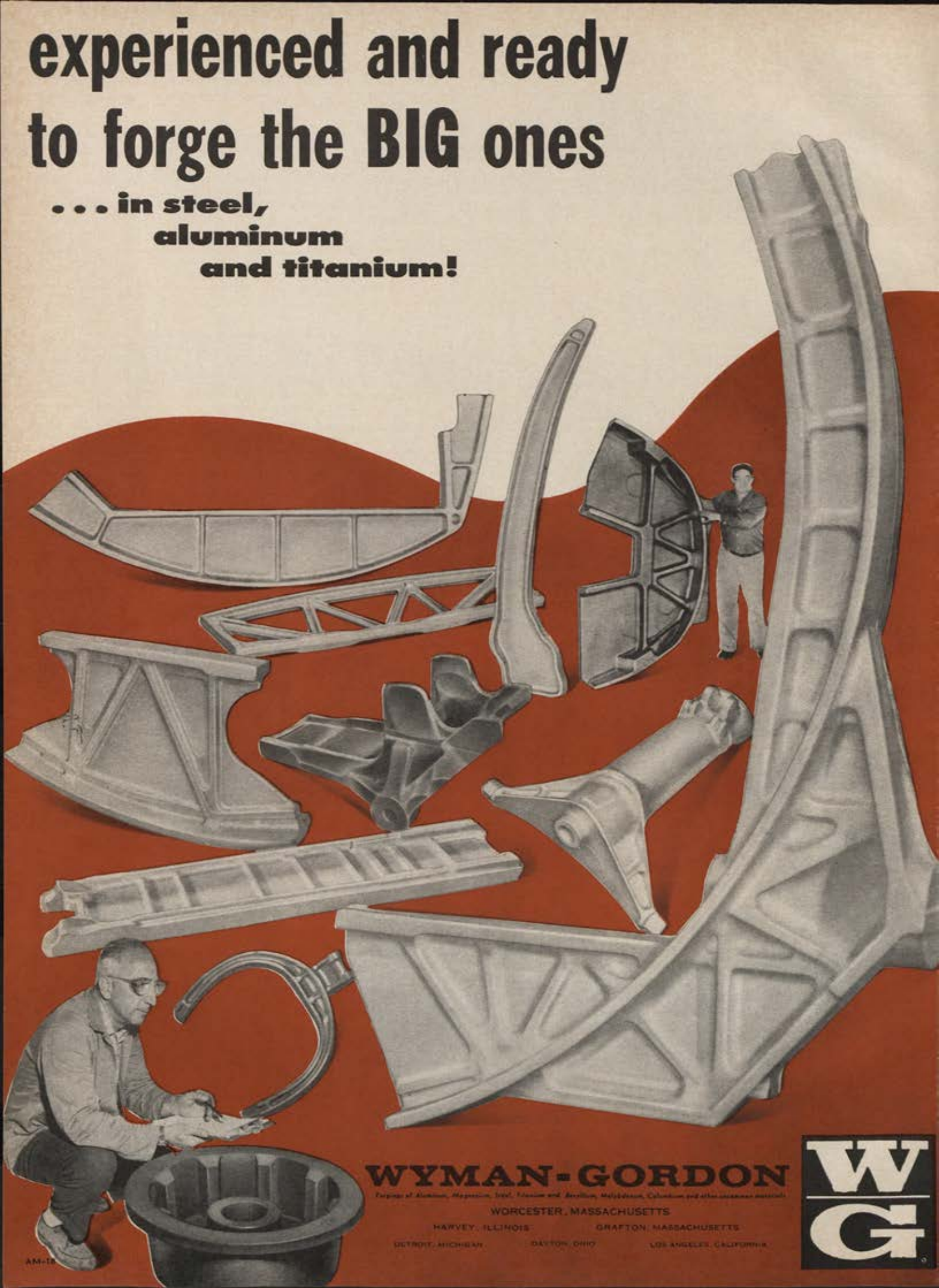

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ship larger aluminum panels. So far such a facility expansion has not been considered economic. However, if larger aircraft than the C-5A are constructed, this might become worthwhile.

The final major assembly procedure, the attachment of the sixty-three-foot-high vertical tail, will have to be accomplished out of doors, because the high bay area at the Lockheed plant in Marietta, Ga., will not accommodate the completely assembled aircraft. Otherwise, the C-5A production line and subassembly areas will resemble those currently seen.

Improved management is the second reason why the C-5A market should be large. If there is any breakthrough connected with the C-5A, it is in the area of management.

The past ten years have seen great improvements in two prime phases of management. One is the ability of the top echelons to keep track of and effectively control the work of thousands of people. The other is the ability to collect detailed data on the performance of all operational systems, to analyze this data, and to effectively use this information to improve the design of new systems. A corollary ability of importance in this second area is to effectively feed information from advanced research and test programs into the design cycle.

These are traditional tasks of engineering management. In recent years they have become troublesome because aircraft and their systems have become increasingly complex and great masses of data must be processed on a timely basis if management is to be effective.

The use of PERT (Performance Evaluation Review Technique) and similar computerized systems to manage the strategic missile programs have been well recorded. They are credited with making these complex developments tractable and for making it possible to produce them in a relatively short period and within reasonable budgetary limitations.

What hasn't been so well recorded is that the management systems have been continually strengthened, and now they are much more powerful than the original PERT. For the C-5A effort Lockheed has tailored a system called Sentinel. It combines four older systems. One is the original PERT-Time which was primarily good for monitoring a schedule. Another is PERT-Cost, which allowed a close check on many cost elements. A third system was aimed at monitoring sixty to eighty technical parameters, such as weight and drag, to make it possible at any time to determine how well the total system was meeting the performance requirements. The fourth system is designed to evaluate over-all cost/effectiveness.

The Sentinel is designed to allow a continuous check on how well the company is meeting schedules, costs, performance, maintainability, and reliability requirements, and it even shows how much of an incentive profit can be expected. Program changes can be evaluated rapidly and thoroughly. For example, if there is some question about the desirability of incorporating new numerical control techniques in wing construction, Sentinel will answer these questions rapidly and completely. It will indicate the most advantageous time at which to begin using the new process, and how much savings it will provide, its effect on aircraft performance, the change it will make in the cost of a wing two or three years hence, the incentive profit it would generate, and so on.

A great many such questions must be answered. Numerical control, for example, is in a period of rapid innovation. Major improvements in the methods of employing these automatic machines are being demonstrated constantly. There will be significant opportunities for altering the C-5A design and production plans during the next two years, with dollar savings for both the government and the company. The C-5A development is so complex that it would be virtually impossible to take maximum advantage of such opportunities without a system such as Sentinel.

Sentinel also will allow changes to be made on the basis of operational experience with older transports such as the C-130 and the C-141. A major library of data, describing in detail the malfunctions of all types of military transport systems, is being built up. In the past, without a computer system, it has not been possible to assemble operational data in such detail, or to make full use of it in designing more reliable systems. Sentinel should greatly improve the situation.

Another vital service performed by Sentinel is to illuminate trouble spots in a program long before they reach crisis proportions so that orderly corrective action can be taken.

All major firms have similar advanced management systems. Sentinel is not unique. But Lockheed gives it a major part of the credit for winning the C-5A competition.

Another indicator is that Lockheed has quoted some rather low prices for the C-5A. The current agreement is unique in that it combines development and initial production into a single contract worth around $2 billion. This is about $35 million per aircraft or $115 per pound.

The government also has an option to buy fifty-seven more aircraft in the second production order for a total price of less than $800 million, a per aircraft cost of about $14 million or $47 per pound. This is close to the $30 to $40 per pound common for fully equipped high subsonic-speed jet transports today. Since most of these aircraft are well out on the learning curve, with several hundred already produced, the C-5A prices indicate great confidence. These prices should be reduced substantially as the production passes 300 aircraft and Lockheed takes advantage of the learning curve.

The Sentinel management system is largely responsible for these low prices by keeping wasted effort to an absolute minimum.

The third reason for believing that the C-5A market will be large is the relatively large number of possible military uses. It is difficult to imagine that the C-5A will be used solely for logistics purposes. If the aircraft does as well as is expected and becomes a thoroughly reliable workhorse, then it is inevitable that it will be pressed into a variety of services.

One ideal mission would be command and control.

(Continued on following page)

The C-5A's great internal volume and heavy payload would make it much more effective than current command and control aircraft which can carry only a small percentage of the desired communications, computation, and data storage and display equipment.

Air defense is another mission that would come under discussion. An artist's conception of a C-5A modified for ADC use is presented on pages 34 and 35, along with a discussion of its advantages and disadvantages.

The Navy also has missions which a slightly modified C-5A could satisfy handsomely. One is mine-laying. No other aircraft could approach the C-5A in mine capacity or operational radius.

Undoubtedly, an aircraft with the C-5A's payload and range characteristics could strengthen the Navy's antisubmarine warfare capability if its costs were right. An artist's conception of such a C-5A modification and a discussion of the mission are on page 36.

It also is difficult to imagine a better aerial tanker than the C-5A. The current tanker fleet is not going to last forever and replacements will be necessary in the latter 1970s. And, even if bombers are completely passé in ten or fifteen years, a significant number of tankers will be necessary for fighter operations. The C-5A will be the logical choice to replace the KC-135s as they are retired.

All in all, the military market seems considerably larger than 200 aircraft for the type of C-5A that is being forecast today—that is, a highly reliable aircraft with relatively low purchase price and an outstandingly low operating cost on the basis of pounds of payload delivered. It appears that the Sentinel management system will allow the aircraft to be modified at relatively low cost so that the cost/effectiveness per mission would remain high.

The rapidly growing civil market is the fourth reason for believing that the total demand for C-5As will be high. Great arguments are being made about the passenger and freight traffic that will materialize in the 1970s and 1980s, when large aircraft such as the C-5A will be needed. The basic trend is toward more optimistic predictions as both the passenger and freight growth rates continue to remain high.

C-5A VITAL STATISTICS

Length	236 ft.
Wingspan	223 ft.
Height of tail	63 ft.
Cargo compartment floor area	2,743 sq. ft.
Empty weight	approx. 300,000 lb.
Basic mission weight	712,000 lb.
Cruising speed	500 mph
Delivery of first production model	—early 1968
Operational date	—early 1969
Commercial availability	—mid-1970s
Currently planned production rate—10 to 12 per year	

Cargo capacity of C-5A is illustrated in this demonstration conducted with Lockheed's mockup. More than ninety percent of the Army's equipment can be accommodated, including the mobile sixty-ton-plus "scissors" bridge for rapid tank assault across ravines, tanks, heavy helicopters, etc.

The freight growth situation has reached the point that C-5As will be needed in the mid-1970s if no totally unexpected change takes place. One Pan American vice president reported recently that ton-miles of cargo moving over the Atlantic in 1964 were twenty-two percent higher than in 1963, and that his company, during the first three-quarters of 1965, was forty-five percent ahead of that figure. On Pan American's total system, he said the freight business was up sixty percent so far this year. He concludes that something spectacular is beginning to happen.

If the future is less spectacular than this executive imagines and the growth rate returns to about twenty-five percent per year, then the airlines will need six times as many jet cargo transports of 707 and DC-8 size in 1975 as they have today. In such a competitive situation, there would be a good market for an aircraft such as the C-5A, which had a direct operating cost well under that of its contemporaries. A Sentinel-type management system which can keep modification costs low should produce a competitive civil version of the C-5A, which would not have the heavy floor, tie downs, rollers, etc., needed to carry and drop heavy military loads.

The passenger service potential is less clear, but if the civil air freight operations go well, it seems inevitable that the C-5A would be modified rapidly to carry passengers.

In the final analysis, there are strong indications that the total civil/military market for high subsonic-speed jet aircraft is going to be much larger in the 1970s than it was in the 1960s. The main requirements of all operators of such aircraft, whether civil or military, will be lower operating cost, and increased productivity—the ability to carry more payload over longer distances each day. As the C-5A will set new standards in both of these areas, it is certain to be a solid choice for a large portion of this market.

The market potential seems so great that the C-5A probably will not long remain an oddity much larger than its contemporaries. Other jet transport manufacturers probably will rise to the challenge and steadily increase the size of their aircraft so that by the mid-1970s they will be ready for the C-5A.—End

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WEIGHT (OZ.)	1.0	1.0	1.6	1.6	3.2	3.2	1.5	1.5	1.0	3.2
INERTIA (GM-CM²)	0.19	0.19	0.19	0.19	0.77	0.37	0.18	0.45	0.19	0.77
INDEX ANGLE	90° ±3°	90° ±3°	90° ±3°	90° ±3°	90° ±3°	15° ±1°	90° ±3°	90° ±3°	45° ±2°	45° ±2°
TYPE	PM 2Ø	PM 2Ø	PM 2Ø	PM 2Ø	PM 2Ø	VR 3Ø	PM 2Ø	PM 2Ø	PM 2Ø	PM 2Ø
RATED D.C. VOLT.	28V	28V	28V	28V	28V	28V	28V	28V	28V	28V
RESISTANCE (OHMS/PHASE)	460	300	300	300	300	150	300	300	135 per PHASE	130 per PHASE
NO LOAD RESPONSE RATE PULSE/SEC	250	320	350	330	220	600	360	280	600	440
NO LOAD SLEW RATE PULSE/SEC	510	930	700	610	265	1600	375	650	2700	1200
HOLDING TORQUE OZ-IN ONE PHASE	0.37	0.35	0.50	0.53	1.1	0.60	0.80	0.58	0.60	1.5
DETENT, OZ-IN ZERO INPUT	0.12	0.05	0.05	0.13	0.24	—	0.17	0.10	0.05	0.12
TYPE NUMBER	MSA-8-A-1	MSA-8-A-2	MSA-10-A-1	MSA-10-A-2	MSA-11-A-1	RSA-11-A-1	MSM-8-A-1	MSL-8-A-1	MSA-8-A-3	MSA-11-A-2

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High-priority cargo for South Vietnam is loaded aboard Lockheed C-141A StarLifter at Travis AFB, Calif. Plane is one of sixteen operated by 44th Air Transport Squadron, first MATS unit to be equipped with C-141A. A second squadron at Travis is now transitioning to StarLifter, and two East Coast MATS units, at Charleston AFB, S. C., and Dover AFB, Del., have received their first increment of the 500-mph transport. It carries 50,000-pound payloads from Travis to Saigon in eighteen hours.

Matching the nation's productive resources to the skills and courage of its fighting men is the science, or more properly the art, of logistics. And, if for no other reason than that our industrial capacity is far superior to that of any other nation or bloc so far aligned against us, the US knows no peer in the practice of that art . . .

LOGISTICS:

THIS nation's principal logistics problem in supporting the force buildup now under way in Southeast Asia is not one of producing the necessary weapons and supplies but in getting them there over a 10,000-mile pipeline and finding elbow room to exercise them once they arrive.

The US now has in South Vietnam military forces totaling about 160,000 men—97,000 Army, 37,000 Marine, 15,000 Air Force, and about 10,000 Navy and Coast Guard. These figures do not include civil service and contractor personnel working on military projects, nor several thousand USAF members who help fight the air war from bases in Thailand.

The 10,000-mile pipeline to Southeast Asia offers a real test of the logistics system developed by the Air Force and the Defense Department in the years since the Korean War. The stresses of combat operations from newly established bases at the end of this long pipeline have uncovered numerous flaws in the system, but over-all it is working very well. The NORS —Not Operationally Ready, Supply—rate for USAF aircraft in Southeast Asia is lower than that for the rest of the Air Force. Units often experience temporary shortages of supplies and munitions, but these are primarily the result of distribution problems within the theater and not of the system itself.

Certainly no system is more thoroughly managed and supervised. Each echelon in the chain operates a Logistics Readiness Center, manned around the clock to receive and process emergency requirements. There is one at PACAF, at AFLC, and at Air Force Headquarters. DoD has established a Vietnam Support Expediting Task Force in the Pentagon, headed by Army Brig. Gen. Hal D. McCown, with USAF's Col. Harry A. Sachaklian as his military deputy and the other services represented by senior logistics experts. Its job is to review any flaws in the system. Working directly under the Assistant Secretary of Defense for Administration, Mr. Solis Horwitz, it has the responsibility to isolate current and potential logistics problems and to report them to the Secretary of Defense.

Initially, the services ran into difficulties in getting approval from DoD intermediate echelons to provide combat units with higher ratios of supplies and equipment. Often the kind of justification DoD insisted on just wasn't available, largely because the Administration itself had not yet decided on the degree of buildup that might be required. Military logistics experts knew from experience that increased quantities would soon be needed, but DoD accountants couldn't bring themselves to trade on hunches. Meanwhile, the all-important factor of lead time to procure and produce new items reached a critical point.

In this situation, Paul Ignatius, Assistant Secretary

At Saigon's Tan Son Nhut Airport, USAF ground crewman guides C-141A into position for offloading. StarLifters spend minimum time at Saigon, moving on immediately to Yokota AB, Japan. There they pick up sick and wounded, fly nonstop to Travis in nine hours. With new crews taking over at Wake, Clark, and Yokota, plane completes circuit in 36 hours.

LIFELINE TO SOUTHEAST ASIA

By Allan R. Scholin

ASSOCIATE EDITOR, AIR FORCE/SPACE DIGEST

of Defense for Installations and Logistics, moved forcefully to reorient the viewpoint of his subordinates so that now, as far as Southeast Asia is concerned, the hunches are honored and the documentation is submitted after the fact.

"The logistician's ideal is to reduce all his operations to a routine," says Colonel Sachaklian. "In practice, his task is to adjust to the unexpected." The efforts to reduce Southeast Asia logistics to a routine are showing some success. A substantial buildup of forces in a relatively primitive area with extreme environmental conditions carries with it problems that can be forecast in general, but are difficult to predict on a day-to-day basis. For example, heat and humidity will shorten the life of a radio set but it's hard to tell whether it will last a week or a year. Yet it is a tribute to the skill of logistics personnel in Vietnam, and the support system in back of them, that no significant combat operation has had to be revised or canceled because of materiel deficiencies.

Ideally, equipment and supplies would move from US sources to the Far East by the most economical means, which in most cases would be by ship. Materiel would flow to US ports, arriving just as the ships are ready to be loaded, be offloaded promptly at the far end, and just as promptly forwarded to the customer. But it's not quite that simple.

To bring together in manageable form the complex factors of requirements and consumption rates, production and delivery schedules, transportation timetables, and tonnage capacities of ports at either end, of ships and planes plying between them, and of the distribution network within Southeast Asia, requires fast, sure communications to get the information and computers to assimilate that information and produce master schedules. This machinery is in existence. Refinements are constantly being incorporated to make it work better.

At present, responsibilities for operating this logistics network are shared among the Air Force Communications Service, which runs the worldwide Autodin network for the Defense Communications Agency; the Air Force Logistics Command and Defense Supply Agency, which receive, interpret, and fill USAF orders; the newly established Military Traffic Management and Terminal Service (MTMTS), which controls movement of goods to embarkation points; MSTS and MATS, which carry the shipments to Southeast Asia; and USAF's 2d Air Division in South Vietnam, which delivers them to their ultimate destination.

Air Force Logistics Command employs two operating concepts to keep USAF units supplied. One is the "pusher" principle. Where consumption rates are

(Continued on following page)

Paul R. Ignatius, Assistant Defense Secretary for Installations and Logistics, reoriented DoD procedures to clear the track for Southeast Asia buildup. "Secretary McNamara told me to see to it that our forces get everything they need to do the job," he says. "I am prepared to do just that."

known or can be anticipated, it regularly forwards materiel to using units without prior requisitions. This system covers a wide scope of items—fuel, munitions, aircraft tires and spares, engines, food, clothing, and housekeeping goods. To reduce this system to a routine, AFLC constantly reviews consumption rates and adjusts quantities accordingly.

The second concept covers requisitions initiated by the customer. When a base needs an item, it punches out an IBM card identifying the base, showing the stock number of the item and the quantity desired, affixing its priority rating, and indicating the date it wants delivery.

From Vietnam this information is fed into the Autodin net, going by cable to Clark or Kadena, then by radio to the US and direct to the AFLC depot responsible for stocking the item. There the information goes into a computer which determines whether or not the part is in stock. If it is, the computer feeds back into Autodin a reply to the originating base advising that the part is being shipped. Simultaneously it determines the mode of shipment according to priority, date required and weight, and adjusts the depot's stock balance records—all this before anyone at the depot is aware the requisition has been received. At periodic intervals each day, depot personnel direct the computer to print out its stored requisitions, draw the items from warehouse bins, and ship them in accordance with the computer's instructions.

Republic F-105 Thunderchief fighter-bombers are overhauled at Sacramento (Calif.) Air Materiel Area before being deployed to Southeast Asia for strikes against North Vietnamese targets.

Carrying the system one step further, the FMC Corporation recently installed a semiautomated warehouse for test at the Ogden (Utah) Air Materiel Area. Instructions from the computer trigger a mechanism to draw the item from its bin and send it by conveyer belt to the shipping unit.

If the requested item is not in stock, the computer searches its memory to find an alternate source—another depot or, on open contract items, the manufacturer, relays the requisition to that point via Autodin, and notifies the requesting agency of the action it has taken.

When the computer cannot turn up a source for the item, it prints out that information, which then goes to an office within the depot assigned logistics responsibility for the item. This may be the Weapon System Control Point (WSCP), the System Support Manager (SSM), or the Inventory Manager (IM), depending on the type of item requested. It is that office's responsibility to find the part. Armed with a complete inventory of the location of each such item in use throughout the Air Force, it may call upon a ZI base to furnish the part; it may, if time permits, order the part from the manufacturer or other commercial source; or it may recommend a substitute item which will meet the requirement.

To meet requirements in Southeast Asia, AFLC has had to levy on other USAF units for substantial quantities of equipment. The same is true in the other services. The $1.7 billion in supplemental funds which Congress appropriated in September covered only the most critical shortages. When the full bill for all services is presented after Congress reconvenes in January, it is expected to come to $10 billion or more.

The total weight of supplies airlifted to Southeast Asia by MATS and its contract carriers has risen from 7,000 tons in July to a forecasted 11,000 tons in December. The monthly total is expected to level off at about 10,000 tons as the US reaches its force buildup goals sometime next year. About forty percent of this tonnage goes to Air Force units.

More than 200 MATS military transports are regularly operating between the US and Southeast Asia. In a recent month, they logged 36,000 flying hours. Ten commercial carrier lines under contract to MATS, operating Boeing 707, Douglas DC-8, and Canadair CL-44 transports, flew almost the same total, and another 3,000 hours was logged for MATS by the Air Force Reserve, flying Douglas C-124s, and the Air National Guard in Boeing C-97s and Lockheed C-121s.

In the first quarter of the current fiscal year, ending September 30, MATS's military and civilian transports airlifted nearly fifty million pounds of cargo and 95,000 passengers across the Pacific.

Lockheed C-141 StarLifters are substantially boost-

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ing the MATS airlift capability. Sixteen are in service with the 44th Air Transport Squadron of MATS's 1501st AT Wing at Travis, and a second squadron, the 75th, also at Travis, is in C-141 transition training. The 1501st Wing is commanded by Brig. Gen. Maurice E. Casey, one of the first MATS pilots to fly the StarLifter.

On a typical transpacific mission, the C-141 carries slightly more than 50,000 pounds of cargo at a cruising speed of 425 knots. In payload it is exceeded only by the Douglas C-133 Cargomaster, which carries about 55,000 pounds but cruises at 270 knots. The normal StarLifter route is from Travis to Wake to Clark to Saigon, then to Yokota, Japan, and back nonstop to Travis. On a fireball mission—and, as General Casey explains, most of its missions are in that category—the C-141 arrives in Saigon eighteen hours after leaving Travis. It has made the return flight from Yokota to Travis in as little as nine hours. Outbound, the StarLifter carries priority cargo. On the return trip it normally carries sick and wounded from Vietnam and other Far East bases.

Equipped with 463L cargo-handling system elements, the C-141 can take on or offload a full palletized load in less than thirty minutes. The Travis terminal was the first to be equipped with the 463L conveyer and packaging system. Cargo offloaded from trucks can be sorted for shipment by a single operator. Two men can load a pallet carrying 7,500 pounds in minutes, and special cargo-loading trucks take the pallets from the terminal to the aircraft. Elements of the 463L system are also incorporated in other MATS transports, and the cargo-loading truck bed can be raised or lowered to the level of the fuselage floor.

Carrying up to eighty litter patients, C-141A StarLifter flies nonstop from Yokota AB, Japan, to Travis AFB, Calif., in about nine hours. Lockheed transport can also airdrop troops and cargo. By the time the last C-141 is delivered in 1968, MATS's airlift capability will have been doubled.

Similar cargo-handling equipment is now in use in Saigon and Bangkok and in other MATS terminals in the Far East. The system has paid off in dramatically increasing the daily utilization rate of military and commercial carriers.

The Defense Department has prescribed rigid standards for cargo eligible to be airlifted by MATS. In the military priority system, each requisitioned item carries a priority of from one to twenty. This scale is made up of two elements—the unit's combat status and its own assessment of how badly it needs the part.

Items bearing priority numbers one to three are, in turn, designated transportation priority one; priorities four to eight bear transportation priority two. These two classes are normally eligible for air transport. Priorities nine to twenty are not *(see chart)*.

Cargo entering the terminal at Travis AFB to be flown to Southeast Asia covers a wide spectrum. You would expect to see jet engines and other aircraft spares. But it can also include such surprising items as oil drums, 750-pound bombs, and even desks and typewriters.

In some JCS-directed projects, as for example the deployment of a combat unit to a "bare base" in Vietnam, all equipment necessary to set up and operate the unit may be assigned transportation priority one. Hence, a desk and typewriter for that unit might take precedence over an aircraft engine for another base scheduled for installation a week away.

Each service maintains an Air Traffic Liaison Officer (ATLO) at MATS terminals to see that high-priority cargo is moved first, and to decide which items within the same transportation priority will be given preference. Similarly, the services each keep a Water Port Liaison Officer (WPLO) at ship terminals.

Demands of the buildup in Vietnam have swamped the priority system. To relieve the demands on air transport, AFLC initiated a plan with the support of the other services for MSTS to set up a SEA (Southeast Asia) Express, a fleet of ships which handle other-

(Continued on following page)

DoD PRIORITY SYSTEM

Unit's Assessment of Need

Forces Activity Designator	A	B	C	D
I	1	4	11	16
II	2	5	12	17
III	3	6	13	18
IV	7	9	14	19
V	8	10	15	20

Forces Activity Designator:

I—US combat forces in action, and other activities designated by JCS.
II—Active and foreign forces in an immediate state of readiness for combat.
III—US and foreign forces maintained in a state of readiness.
IV—Selected US and foreign forces scheduled for employment in support of approved war plans.
V—All other.

Transportation Priority One: Supply priorities 1 through 3.
Transportation Priority Two: Supply priorities 4 through 8.
Transportation Priority Three: Supply priorities 9 through 15.
Transportation Priority Four: Supply priorities 16 through 20.

wise air-eligible cargo whose delivery can be deferred for a maximum of thirty days. By giving SEA express vessels preference, both in onloading and offloading the cargo, the thirty-day delivery schedule can normally be met.

But even this service is often overloaded. At the Army terminal at Oakland, Calif., recently, when a SEA Express ship arrived at dockside, orders went out to load it entirely with transportation priority-one cargo. "Okay," replied the dock superintendent. "What priority-one cargo do you want?" The ship could accommodate a maximum of 10,000 tons. The port that day had more than 17,000 tons of top-priority cargo on hand. It was up to the service WPLOs to decide what would be left for the next shipment.

Most ammunition for Air Force units in Vietnam is handled by a fleet of ten MSTS ships, designated Special Express, which operate regularly between the Navy's ammunition port facility at Concord, Calif., and the South China Sea. At least two ships are on station at all times off Da Nang and Nha Be, serving as floating ammunition depots. Lighters ply between them and shore, each carrying a few days' supply. Two more ships are standing by in the Philippines, ready to move in as the first two deplete their stocks, two are taking on cargo at Concord, and the other four are in transit to or from the Far East. As the pace of war steps up in Vietnam, USAF's Special Express fleet may be expanded.

Figures on tonnages handled by the Military Sea Transport Service are not released by the Defense Department, but Vice Adm. Glynn R. Donaho, USN, Commander of MSTS, has noted that airlift delivers less than two percent by weight of supplies shipped to Southeast Asia. That would put the total carried by surface vessels at about 500,000 measurement tons a month, of which about a tenth is for Air Force units.

Accommodating this flow of supplies from the US has required some expansions in air and water ports of embarkation. When Travis AFB, Calif., MATS's primary West Coast port, was swamped this fall, auxiliary aerial ports were set up at McChord AFB, Wash., and Norton AFB, Calif. The Sacramento Air Materiel Area serves as a backup staging point to assemble some air cargoes for Travis. Some supplies also move direct to the Far East by commercial carriers from Kelly AFB, Tex.

Similarly, the Oakland Army Terminal, where most MSTS ships take on cargo for Southeast Asia, frequently bulges with an uncomfortably heavy backlog of materiel. To relieve the pressure there, some MSTS ships pick up cargo for Vietnam from other West Coast ports and even from the Gulf and East Coasts.

But the pressures on US embarkation ports are minor compared to those at the other end of the pipeline. There is dock space for only five ships at Saigon, reached through a narrow channel that could be blocked by a single ship. As a result, ships often lie at anchor in the South China Sea for days. The record is forty days, but delays of ten to twenty days are not uncommon. For this reason, the construction of

Production of conventional ammunition for US Air Force has been quadrupled in the past year. These bombs for North American F-100 fighters at Da Nang are delivered from MSTS ships anchored offshore.

a modern port at Cam Ranh Bay, 200 miles northeast of Saigon, is proceeding at top speed to serve US and Vietnamese military units based in the upper half of South Vietnam. The US is also assisting the Thai government to enlarge its naval base at Sattahip, on the Gulf of Siam south of Bangkok, to support US forces based in Thailand.

Finding ramp space to offload MATS transports also presents problems at South Vietnam's overcrowded airfields. A major airbase is being built in conjunction with the new port at Cam Ranh Bay, and at least eight other fields are under construction in South Vietnam and Thailand. As they are completed, some combat units now jammed into Tan Son Nhut, Bien Hoa, and Da Nang will be shifted, and more fighter groups are programmed to move in.

When the new bases are ready, USAF will be able to drop its present policy of rotating TAC fighter squadrons and instead will move in a full base complement with housekeeping and support personnel. This in turn will relieve the present overload on Clark AB in the Philippines and on bases in Okinawa and Japan which now handle maintenance and backup spares for the fighter units.

It will also, incidentally, cut down the long absences from home of TAC crews who have been sandwiching ninety-day tours in Vietnam between Strike Command exercises in the US and overseas and other rotational duty.

In summary, the US is, indeed, encountering some problems in maintaining combat forces in an underdeveloped land 10,000 miles from home. But the logistics problems of the Viet Cong and its backers are infinitely greater. And while those of the US and its allies are being resolved, the Viet Cong's are growing steadily worse.

US aerospace power is vital to our logistics lifeline to Southeast Asia, both in delivering urgently needed supplies and equipment to our forces there and in protecting the ships that carry the huge bulk of the logistics payload.

We can be thankful that we, and not the enemy, have control of the air over Southeast Asia and its approaches. There's no need to consider the consequences to our shipping if the airpower situation were reversed. It that were the case, we wouldn't be in Southeast Asia at all.—END

THE SPACE AGE IN PERSPECTIVE

SPACE DIGEST

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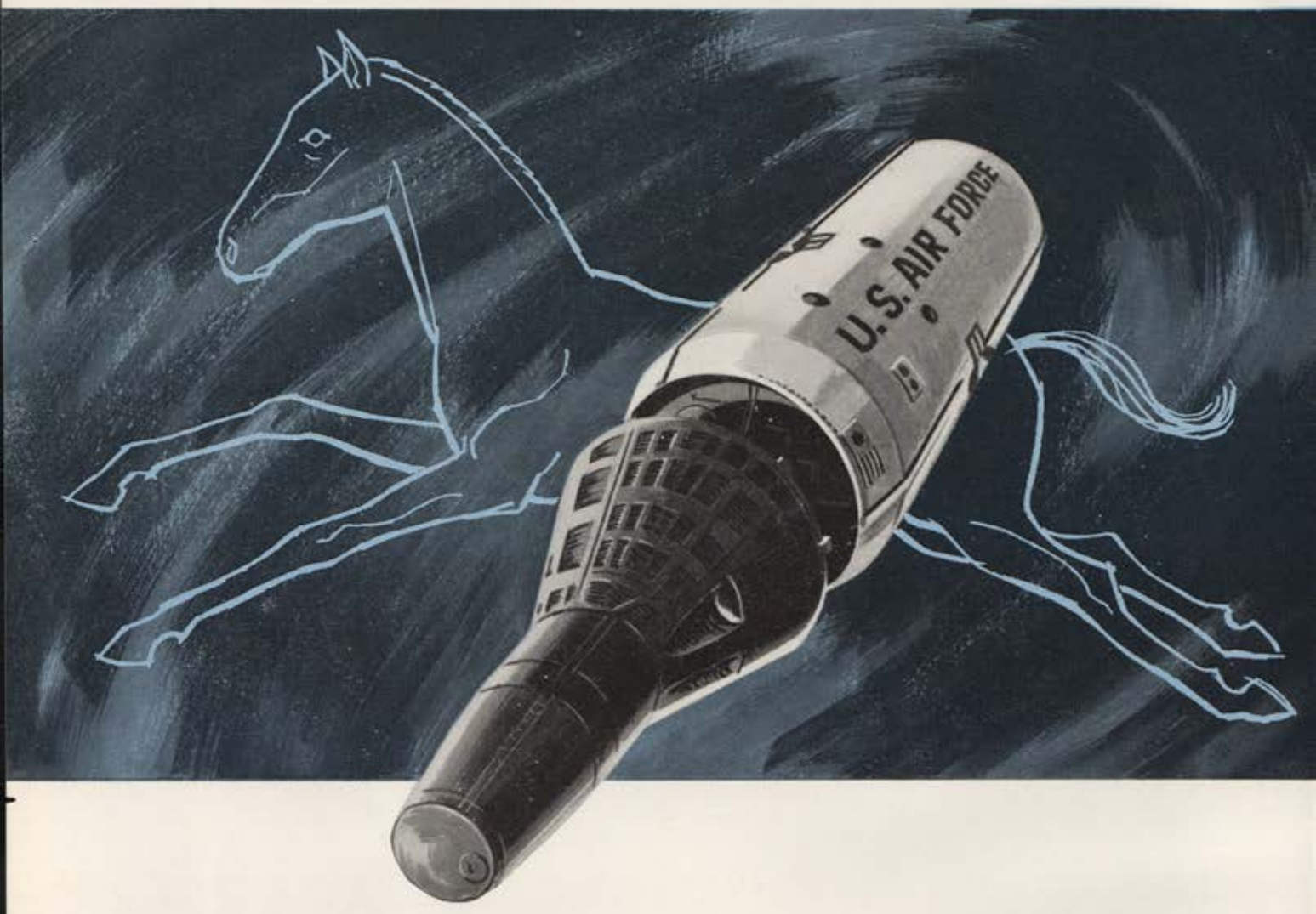

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Much of the difficulty involved in the relationships between managers and scientists may be traced to the problems associated with the scientist's self-image and dual obligations of his employers and his colleagues. Here are some suggestions by a psychologist on . . .

What Management Should Know About Scientists

BY DR. HARRY LEVINSON

WITH pressure building up for more innovation in industry, more scientists are finding their way into the business world—as consultants as well as researchers. This creates a special problem for the manager who must work with or manage scientists and who often has difficulty in his relationships with them.

Much of this difficulty stems from at least two major causes: the scientist's public image and the scientist's dual loyalties.

The scientist's image. Though a scientist is in an occupation highly respected by the public, he is also, according to the popular image, in a world apart. The public would have him nearsighted but farseeing, brilliantly innovative but absentminded, widely acclaimed but impervious to applause, capable of highly involved abstract thinking but naïve and eccentric in his everyday reasoning. The manager often adopts, quite unconsciously, the public image of the scientist, and therefore sees him as someone strangely mysterious and incomprehensible; in short, a little crazy.

The scientist's dual loyalties. A scientist has two obligations: one to his employer and one to his colleagues. The latter obligation is no less important than the former. He must, therefore, always meet two sets of standards: productivity and professional sophistication.

If the manager is to work more effectively with the scientist, he must first have a more accurate understanding of scientists and the particular problems they have working in industry. That understanding might well begin with another, closer look at these two causes of difficulty.

Generalizing about any group of people is hazardous; generalizing about scientists is no exception. Yet generalizations, used cautiously, can contribute to understanding.

Dr. Bernice T. Eiduson, of Los Angeles' Reiss-Davis Clinic, who studied forty highly creative scientists intensively, points out that scientists are singled out for attention as adults for the same reasons that they were singled out as children: because they seem intellectually gifted. Behind the intellectual gift, she reports, often lies a certain family constellation.

As children, the scientists whom she studied had little intimacy with their families. Recognition and approval, first from parents and later by honors, praise, and scholarships, were closely tied to the child's achievement. The child's intellectual abilities made it possible for him to enjoy his own company. He daydreamed, fantasied, worked intellectual problems, read, and followed where his curiosity led him, relatively independent of others. Searching for parent substitutes, he often looked to teachers and other adults who in turn reinforced his intellectual interests. The result of all this was not so much common person-

ality traits among scientists as intensive focus of the scientist's personality on scientific work.

Thus, the life style of the child becomes the life style of the adult—limited attachments to others, heavy investment in intellectual work and in fellow scientific workers, and creative use of fantasy. Since their work itself arises out of pressing inner needs, other motivations become a poor second stimulus.

"The majority scorn 'impure' motivations such as recognition, exhibitionism, personal aggrandizement, pragmatic reward—unless these are inescapable concomitants of devotion to the search for truth," Dr. Eiduson concludes.

Harvard psychologist Anne Roe points out that the consequence of being so deeply involved, emotionally, in his work is that the scientist is his own most essential tool. *He* must decide what observations to make, and all his scientific equipment is nothing more than a way of extending his ability to sense and perceive. The equipment neither provides the questions nor the answers. The scientist himself must do that.

"What seems to happen," Dr. Roe observes, "in creative efforts in science as well as in every other field, is that the individual enters a state in which logical thinking is submerged and in which thought is prelogical. . . . This stage of the creative process is accompanied by generally confused or vague states of preoccupation of varying degrees of depth; it is well described as 'stewing.' It is this stage which cannot be hurried or controlled. . . . This process requires not only the basic capacity to assimilate experiences but very strong motivation to persist in the effort. Strong motivation is also required if one is to continue with a search which may for a long time be unproductive. Motivation of this kind and strength derives from the needs and structure of the personality."

From these reports, similar to many others, we can infer that scientists are more likely to invest themselves in their work than in other people, that their work itself provides them with both gratification and recognition, and that their work both encourages them and requires them to think and act independently. To do what they expect of themselves and what society expects of them demands that they think differently from others and also that they pursue their own line of thinking with persistent determination.

The scientist's underlying questions are, "Why," and "How do you know?" and his answers must always be based on evidence. As a scientist, his competence lies in how imaginatively he can ask new questions and how thoroughly he can document his answers. The process has a number of implications.

The competence of a scientist, for all practical purposes, can be judged only by other scientists equally knowledgeable in this field. His stature and standing *as a scientist,* therefore, hinges on the judgment of his colleagues in science, not his superiors in management.

Not only must a scientist depend on his scientific colleagues for evaluation of his scientific work; his managerial supervisors must also depend on them—unless the managers themselves are competent in his field.

There is no alternative but for the scientist *and the manager* to use the profession and its standards as a frame of reference. The manager should, therefore, welcome the scientist's dual affiliation as being in the company's own long-run interests.

Although the scientist is dependent upon his scientific colleagues for evaluating his scientific performance, as an employee of a company he is no less dependent on management for evaluation of his contribution toward organizational goals. He is also dependent on management to make his scientific work in the company possible and for his advancement in the organization. By definition, then, the manager is not an outsider looking in upon the scientific activity in his organization but a participant in its evolution.

The task of the manager is to organize people and processes into increasingly predictable activities. Regularity, control, and efficiency are ordinarily his watchwords. But the nature of science

is that discovery is unpredictable, and the manager whose task it is to reduce various forms of rebellion now must facilitate a form of rebellion and encourage those who foment it by creating and maintaining a climate conducive to scientific productivity.

This is the point at which the manager can begin to apply his understanding of the scientist as a person, and his understanding of the scientist's dual loyalties.

• *First, he will reject the assumption that the scientist is odd.*

If the manager believes that the scientist is odd and radically different, if he expects the scientist to be a problem child, temperamental and erratic, some scientists will live up to that image. They will contrive to be different, whether in dress, appearance, temperamental demands, or in some other fashion.

But when the manager rejects the assumption that the scientist is odd, he no longer plays up the seemingly irrational behavior of some scientists. He also begins to work toward ending the separation between scientists and others in the organization.

Knowing that the scientist, generally speaking, is not likely to be the hail-fellow-well-met kind of a person, the manager will have to initiate personal contacts and facilitate the communication between scientists and nonscientists. He will also begin to assess more realistically how much managerial responsibility a given scientist might assume.

Power Struggle

If, for example, the research function is new to the organization, it is likely that there will be some confusion about what the scientist or the research group is to do. And it is also likely that there will be a power struggle to control and contain what to some will seem like a new threat. To cope with this problem, the scientific function should be given equal status with other units in the organization, its head reporting directly to the manager.

Sociologist William Kornhauser of the University of California at Berkeley, who did a comprehensive study of the role of scientists in industry, concludes that any other reporting system encapsulates the scientist and may well lead to his ultimate rejection, for he becomes subordinate to a given unit and subject then to the political struggles in which that unit is involved. As a threat to the way things are presently done, the scientist who is buried in an organizational structure is likely to be suppressed, denied autonomy and facilities to do his work, and not permitted to be really involved in organizational problems.

Having decided to establish the scientific function in an organizational position, where it is protected until it can develop enough maturity to hold its own with other units, the manager can go on to the next step—agreement on goals. Formulating goals for the scientific function will not be easy, for managers typically are not clear what they want from scientists. Some want the scientist to increase the efficiency of present operations. Others want improved products or the development of new processes. Still others want

to develop basic research which, though seemingly unrelated to present needs, will ultimately provide the basis for products and processes.

As Professor Kornhauser indicates, these three activities are not compatible with each other in the same research group. Choices will have to be discussed and made. The scientist must know what is expected of him, what kind of support he will have in fulfilling these expectations, and what kind of feedback he will have about his work.

Placing the scientist on equal footing with other organizational units and establishing agreed-upon goals create the conditions for a dialogue between scientists and nonscientists. However, given the personality of the scientist and his identification with his work and its values, the dialogue may produce conflict.

Kornhauser's report indicates that the conflicts between scientists and managers usually turn on differences in values. The scientist values knowledge; the manager profit. The scientist values high quality of research; the manager's thinking is usually oriented to lowest possible costs. The scientist is focused on the long term, the manager more frequently on short-term results. These issues will need to be talked out.

• *Second, the manager will set up a reward system which fits the scientist's values.*

Although the scientist is basically interested in the development of knowledge, increasingly he has also become a professional. More and more scientists are consultants; many have established independent laboratories and research firms.

When eighty-two of the most productive scientists in a 1,200-man laboratory were asked what attracted them to their organization, they replied their interest in their work and their technical freedom. Douglas Williams, a management consultant, surveyed scientists to determine the criteria they used for evaluating an organization as a potential employer. He got much the same results. Williams' respondents also valued association with and stimulation from high-caliber colleagues and a creative, intellectual atmosphere; technically trained management who did not tell them *how* to do their work; and freedom to choose the problem which interested them without too much management control.

Of course, there are qualifications. Mark Abrahamson, Assistant Professor of Sociology at Illinois Institute of Technology, reports from his study of 181 scientists in five laboratories that, while the most difficult adjustments for the scientist in industry come from unfulfilled demands for

autonomy, this conflict is most acute in the first three years of a scientist's career in industry. The initial three years are a time of testing each other —scientist and manager. The conflict diminishes with time. As scientist and manager come to trust and depend on each other, the demands for autonomy decrease and management more willingly grants autonomy. This trust, in turn, also makes the scientist less dependent on his professional group in time, for he now has another source of regard which he values.

Not all laboratories in industry can allow for ideal freedom for the scientist nor for the untrammeled pursuit of basic science. Many have to limit themselves to research leading to marketable products and services. This necessarily limits autonomy. Some companies deal with this problem by inviting scientists to suggest research projects subject to management's approval. Some allot a small amount of free time for research of the scientist's own choosing. Some provide more free choice for senior scientists and those engaged in basic research.

Although a scientist may have considerable status outside the company among his colleagues, he can only feel unappreciated if he does not have comparable status inside. According to a study of seventy-five scientists by Albert Chapulsky, of the Philco Corporation, both scientists and research management agreed that merit salary increases, promotions, and increase in complexity and challenge of assignments were highly valued incentives for scientists. Another study revealed that scientists looked for advancement possibilities through two avenues—research activity and administrative channels.

Status Incentives

Scientists are often not interested in promotion to administrative positions until they find themselves subordinate to others with less experience and reputation. Then they have status incentives to assume administrative responsibilities. In addition, creativity tends to decline with age. The scientist then needs other ways of using his experience and skill, and of retaining his place in the organization. Once in the business world, and either having moved into administrative responsibilities themselves or seeing higher financial rewards going to managers, scientists will tend to value management positions more highly.

- *Third, give careful attention to supervision.*

If the scientist must depend on management for evaluation, promotion, and increasing autonomy, then the supervisory relationship takes on as much meaning as for any other employee.

One criterion scientists use to judge a prospective laboratory is its reputation for scientific advances and the reputation of the director and the people around him as scientists.

In part, this is because of the identification of the scientist with his colleagues and profession, but in part, too, it is because the scientist believes a fellow scientist will understand that bureaucratic controls tend to destroy creativity. A scientist supervisor will more likely depend on control by colleagues than control by hierarchy. Such a control pattern is typical of the university, and the more similar in specialty a group of scientists is, the more colleague control will prevail.

A scientist supervisor, by virtue of his own experience, can more easily understand the difficult resocialization process the scientist must experience as he goes from the university to industry. If he can remember his own experience, he will lend his most intensive support during the critical first three years. The nonscientist manager can take a leaf out of this book if he must supervise scientists, depending heavily on colleague control and providing especially consistent support during the initial crisis period.

When Chapulsky asked his sample of scientists to write in their own words the specific nonfinancial incentives which would be the most effective motivators for research scientists, "a surprising forty percent mentioned appraisal and recognition of performance . . . and among those scientists scoring above the median on the publication-patent index, this incentive was tied for first place with the incentive of promotion to higher rank."

Although this finding might seem to be in conflict with our earlier observation that scientists are unconcerned about public recognition, it is not. Chapulsky adds that the major emphasis in the scientists' comment was not upon public recognition, but instead on the ordinary everyday methods of recognition such as praise and discussion of performance with the supervisor.

Allowing for Failures

An important aspect of supervision that must be considered is allowance for failure. Among 100 companies recognized for research effectiveness, the median failure rate was found to be fifty-one percent, where failure is defined as projects instituted or designed for a market appearance that was never reached.

The question of judging performance, particularly failure, can be a difficult one. Who knows whether another week, a month might make the difference between failure and success? No one, of course. Yet a man stands on his performance, and the scientist is no different. Even scientist-managers have a painful time deciding when to stop a given project or to discharge a man. A certain amount of arbitrariness seems inevitable. But if the scientist has to be allowed a reasonable rate of failure, so must the manager.

So, in sum, the scientist is no mystery man, and the manager does not have to be a magician to work with him. The successful manager's techniques, reduced to their simplest levels, are essentially no different than those applicable to managing others: understanding the ways in which personality needs are fulfilled in work and making that fulfillment possible; understanding the meaning of being a man among the cultural circles important to the person and making it possible for him to fulfill those expectations; understanding the continuing need for growth and facilitating that process through supervision; providing support on the one hand and creating opportunity on the other.—END

Dr. Harry Levinson is a noted psychologist who since 1955 has been Director of the Industrial Mental Health Division of the famed Menninger Foundation at Topeka, Kan. He writes frequently on psychological aspects of business and conducts many seminars on psychological problems. The above article is condensed, with permission, from the September-October issue of Think Magazine, *a publication of the International Business Machines Corp.*

The controlled energy of nuclear explosions could provide an efficient method of space propulsion, according to one of the world's leading atomic scientists. Much research would be needed to establish practicability firmly and to find materials capable of withstanding repeated nuclear explosions, says Dr. Teller, but the effort would be most worthwhile for the advancement of manned spaceflight . . .

BATO—A Method of Weight Lifting for Spaceflight

BY DR. EDWARD TELLER

THE problem of space travel is essentially a matter of weight lifting. The main difficulty is that the muscle needed for lifting has a great deal of weight in itself. Most of the fuel in our present space vehicles, for instance, is required to lift fuel and not the payload. Therefore, it seems obvious that nuclear fuel, which weighs next to nothing, is the right fuel for space vehicles.

The application of nuclear propulsion to spacecraft is one of great promise but poses formidable problems. At least in one respect, however, the application of nuclear energy in space appears clear and simple. If we should want a smaller amount of energy to provide needed power to continue to operate equipment for lesser purposes, we have an excellent plan right now. This plan is to carry the energy in the form of isotopes, radioactive isotopes, which will, in a predictable fashion, disintegrate and produce energy at very little weight. Radioisotopes will not produce very much energy, but they will produce very reliable energy that can be converted into electricity.

Even this comparatively small source of nuclear power is not so easily handled because of the presence of penetrating radiation. Such radiation is a threat to humans on the spacecraft and also to certain pieces of equipment such as photographic plates and semiconductors. Therefore, efforts must be continued to select a radioactive source which will produce as few radiation hazards as possible so that it might safely be shielded with a minimum of weight.

However, power supplied by radioactive isotopes cannot provide the brute force required for the big job of launching a missile—obtaining the massive deployments of payload into space. This is where a more effective harnessing of nuclear energy is most needed.

While it is true that nuclear energy weighs next

to nothing, this does not suffice to solve the problem. Scientists and technicians at [the Atomic Energy Commission's] Los Alamos Scientific Laboratory, in a diligent fashion, have applied themselves to the task of making a powerful nuclear reactor that will develop nuclear energy out of fissionable elements. Unfortunately, this power cannot be used as expeditiously or as effectively as we would desire. The nuclear power heats the interior of a reactor which can't be heated beyond its melting point. The reactor is honeycombed with a number of passages through which a working fluid passes. This fluid will be heated and then expelled. Unfortunately, the temperature of the fluid is limited because heat must be conducted to it from the reactor.

Necessity of carrying this reactor fluid would impose an added weight penalty on the space booster. Although we would not have to carry a lot of weight in nuclear fuel, we still would have to carry a lot of weight in working fluid.

We all know that in accelerating a rocket, there is a certain simple quantity that is all-important. This is the velocity of the exhaust gas called "specific impulse" by engineers.

In chemically driven rockets we, perhaps, can obtain a speed of 4.8 kilometers [2.98 miles] per second (called 480 in terms of specific impulse). If, instead of chemical rockets, we use the best nuclear reactor imaginable at the present time, we may get as much as eight kilometers [5 miles] per second. Conceivably, breakthroughs in chemical power (using beryllium hydride) might upgrade the specific impulse of chemical rockets to almost six kilometers [3.7 miles] per second, but this figure represents the maximum potential of the chemical power mode. Clearly, a nuclear-reactor-driven space vehicle would better utilize the working fluid, and this would be a considerable advance in space propulsion. Nevertheless, the advantage in specific impulse is rather limited. We must think of something that gives us higher velocities, higher specific impulses. Such a concept is BATO (Bomb-Assisted Takeoff).

The mechanics of BATO are deceptively simple. Basically, it would consist of an internal combustion chamber of tremendous strength—made of materials that we may have to invent—which will weigh in the neighborhood of a thousand tons. A very small atomic bomb would be exploded in the middle of this tough chamber. The advantages of this propulsive system are immediately apparent. In BATO, it would not be necessary to transfer heat from a solid reactor to a working fluid which must become a gas—as in a nuclear reactor. Instead, the energy from the atomic explosion inside the chamber would be deposited directly into the form of a propulsive gas, streaming out of the nozzle to supply a really high specific impulse. A second small atomic bomb would then be gently injected into the combustion chamber and the process would be repeated many times to supply the amount of thrust required for the vehicle's space mission.

On the face of it, BATO would seem to be a very expensive operation. However, thinking in terms of space enterprises, such as going to Mars, landing there, and taking off again to return to earth with samples of materials from Mars, a BATO-driven spaceship would save the nation many billions of dollars. BATO will be expensive, but our estimate is that it will be only one-tenth as expensive as either a conventional chemical or a conventional nuclear reactor propulsion system.

The question may be asked: Is the BATO concept practical? My estimate, and also that of my colleagues working on this concept, is that it can be done. I believe that we can make a vessel which will take the type of explosion I am proposing.

A physicist may assume that the problem is solved, at least in principle. But from an engineering standpoint, many very difficult problems still remain. We can calculate the combustion chamber of BATO will take one explosion. But to get a spaceship to Mars, land there, and take off again for earth will require many explosions. Just how well the chamber materials will stand up under this repeated atomic punishment and not succumb to fatigue factors is still not known. If we ever undertake this project seriously, I believe that the main effort should be an investigation into the properties of materials. We must gain much more experience and a better understanding of the nature of fatigue in materials.

A very favorable factor in the development of BATO is the fact that much of the research can be performed cheaply. The nuclear explosives needed to test the strength of the combustion chamber can be produced at relatively small cost. Actual testing can be performed repeatedly and safely underground. A serious BATO project would require yearly funding of a few million dollars in the relatively inexpensive first stages of the development. Only after repeated underground experiments have demonstrated that most of the difficult problems have been solved would the test program evolve into the problem of spacecraft takeoff.

After we solve the problems of construction, materials, fatigue, injection of nuclear explosives —all of which I believe possible through relatively simple experiments—then the problems and further work on BATO would become expensive. However, by this time it would be possible to say that the BATO program would be a success. If, at this time, we could not firmly predict success, we should not continue the program.

Turning our attention now to other uses of nuclear power in connection with the exploration of space, let us assume we have the capability to go to the moon. I believe that going to the moon must not be a stunt—as a stunt it is too expensive. When we go to the moon, we should stay there for some time. Many of the people we send there should be scientists—scientific adventurers, if you like. They should bring back from the moon important knowledge made possible by their scientific training. Let us further assume that we have a colony of six or twelve people on the moon—a goodly portion of them being scientists —we then are faced with many grave problems in logistics and life support. When we think, for instance, of feeding these young men and perhaps women on the moon, we must remember that every glass of water, every sandwich, has to be paid for by its weight in gold. Obviously, it would be beneficial if, to some extent, we could make this lunar colony self-sufficient. Nuclear power might make this possible.

We should have a large nuclear reactor on the moon. Actually, reactors are monstrosities. They are exceedingly heavy. But all the weight is in the shielding materials. The nuclear reactor cores, themselves, are light. Therefore, only the cores should be shipped to the moon, where adequate shielding material can be found. Once in operation, the reactor could provide electricity and heat in the alternatingly hot and cold, atmosphereless, and hostile lunar environment. In addition, such a reactor may be able to provide oxygen provided there are oxides such as ferric oxide on the moon. Heated by the reactor, this compound would change into ferrous oxide, thereby freeing oxygen and thus solving the breathing problem for humans. If there are any limestone-like formations on the moon, carbon dioxide could be obtained through the simple process of heating. The most important question, however, is the availability of water.

It is the general belief that no water exists on the moon. Quite possibly this is not true. All rocks on earth contain a small percentage of water, sometimes as low as one-tenth of one percent. Subjected to very high temperatures, perhaps water could be boiled from lunar rocks. Many geologists believe that our oceans were formed in this way. Through volcanic action, water was boiled out of rocks, and this became the source of the world's water supply. This same process also may have occurred on the moon but, because of the moon's weak gravitational pull, the water escaped into surrounding space. Perhaps it would be possible to utilize heat from the reactor on the moon to boil water from lunar rocks.

Four years ago in the desert of New Mexico we detonated a small nuclear explosion 1,000 feet underground. Following the explosion, a steamy white vapor, more than 100,000 tons of it, was released from the underground cavity. It is possible water could be procured on the moon in a similar manner through a controlled small underground nuclear explosion. This detonation might be accomplished during the very cold lunar nights. The steam escaping from the lunar cavity could be collected and quickly frozen. Eventually the water might be collected in a covered reservoir and used for the growth of algae. The lunar explorers may grow their own food.

One may also use electricity from the reactor to electrolyze water. The resulting oxygen and hydrogen might be used as fuel for common chemical rockets. Thus the moon would become a refueling base. Because of the low gravity, the lunar base would be particularly appropriate.

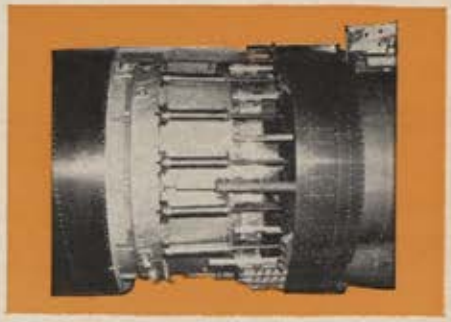
These are merely a few of the possibilities opened up to us by the application of nuclear power to space travel and lunar exploration. Perhaps they are fantastic. Probably most of these ideas will never become a reality. But we are going into space with the same kind of inevitability that launched Christopher Columbus on his epic voyage of discovery hundreds of years ago. From the viewpoint of the individual in Columbus' time, I think it took more courage and more endurance to set out on the unknown Atlantic in an unscientific age than it does today to go on a scientifically calculated space trip.—END

Dr. Teller is one of the world's most noted nuclear scientists and is presently Professor at Large at the University of California. The above is condensed from an article which appeared in the Summer 1965 issue of Apogee, *a publication of the Douglas Aircraft Co.'s Missile and Space Systems Division, Santa Monica, Calif. The Summer 1965 issue of* Apogee *had as its theme the use of nuclear energy for spaceflight.*

Rohr has designed and built more Thrust Reversers than any other company in the world

Rohr-built Thrust Reverser for the Boeing 707 — in service since December, 1957.

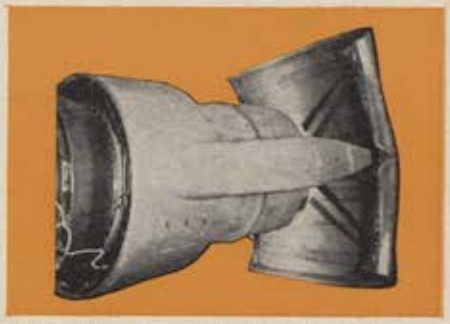
Rohr-built Thrust Reverser for the Boeing 727 — in service since February, 1963.



Rohr-built forward fan Reverser for the Boeing 720 B — in service since June, 1960.

Rohr-designed and Rohr-built Thrust Reverser for the Lockheed JetStar — in service since March, 1961.

Rohr-designed and Rohr-built Thrust Reverser for the Lockheed C-141 — in service since December, 1963.



Rohr-designed and Rohr-built Thrust Reverser for the Douglas DC-9 — soon to be in service.

Since 1940 Rohr has been recognized in the aircraft industry as a major developer of high temperature components. And Rohr participated in the manufacture of the nation's first jet engine Thrust Reverser. Since entry into this field in 1955, we have produced (or have on order) over 5,000 Thrust Reversers of differing systems including cascade, target, and modulating designs for flight path control and ground deceleration. High proficiency has been gained in preliminary design, analysis, hot and cold flow model testing and full scale static testing. Participation in full scale wind tunnel testing has added greatly to our basic technology. Continuing research and development programs are in process on very advanced Thrust Reverser concepts utilizing an in-plant propulsion components test facility. A logical outgrowth of these programs, development of a flight-weight thrust deflector for VTOL aircraft is well under way here today.

REVERSERS PRODUCED AT ROHR

Boeing 707 Series
Boeing 720 Series
Boeing 727
Douglas DC-9
Grumman Gulfstream II
Lockheed JetStar
Lockheed C-141
NAA F-100

MAIN PLANT HEADQUARTERS: CHULA VISTA, CALIF./PLANT: RIVERSIDE, CALIF./ASSEMBLY PLANTS: WINDER, GA.; AUBURN, WASH.

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We put new life into dead reckoning

Our interest in navigation goes way back. Now Kearfott builds almost every type of airborne computer. Our experience and capability are underlined by the fact that we are producing the first operational hybrid airborne computers and general-purpose digital computers in military service. These are the computers we're flying today—

*MINAC 5—**For High Performance Aircraft**—Now in service as the AN/ASN-41, it is flying in the A4E, TA4E, RF8G, WC121, and will fly in the A7A. Accepting Doppler generated ground speed/drift angle as well as heading information, it provides position in latitude and longitude coordinates plus distance and bearing to either of two resettable destinations. MINAC 5 employs a great circle solution for distances over 200 miles and planar solutions under 200 miles. Accuracy of the computer is 0.25% of distance travelled.

MINAC 6—**For Surveillance**—A short range version of the MINAC 5, uses Doppler inputs and provides present position information while driving standard BDHI instruments. Digital data representing present position is available for data annotation. Flight tested in Mohawk OV-1.

MINAC 7—**For Helicopters**—A modification of MINAC 5, this computer accepts Doppler data and provides present position in latitude and longitude coordinates, map drive display and digital form. It also provides BDHI data.

MINAC 11—**For High Performance Aircraft**—Accepts inertial platform data and computes and displays present position and destination position in latitude and longitude coordinates plus course and distance to three resettable destinations. It has accumulated many hours of flight test in the F4 aircraft.

AN/ASN 24(V)—**For Logistic Transports**—This is the first operational airborne general purpose digital computer, and it is now in service aboard the C141. It computes and displays present position based on the following sensor inputs—automatic sextant, air data computer, Doppler, gyrocompass, TACAN, LORAN and radar. In addition to navigation, it also performs air drop computations.

GPK-33—**For Space Boosters**—This is a small, compact, ruggedized computer similar to the ASN 24. It is an integral part of the Centaur inertial guidance system and generates steering and engine cut-off signals based on the output of the gyro-stabilized platform.

And there are more—A microelectronic version of the AN/ASN 24 designated L90-1B is in flight test. A DDA computer similar to the MINAC series, utilizing microelectronic circuitry, is being flown. And then there is the new generation now being designed.

We want to tell you more about this lively field of airborne computers, so just drop us a line soon.

NOTE: *MINAC is a family of hybrid computers combining the best features of state-of-the-art analog computers with high accuracy digital integration. Versions have been produced for Doppler and inertial platform inputs and for display in latitude/longitude or UTM coordinates. Digital output for data annotation is also available. All computers in this series include field replaceable modules and self-test features.

KEARFOTT DIVISION
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Little Falls, New Jersey

Speaking of SPACE

BY WILLIAM LEAVITT
Associate Editor, AIR FORCE/SPACE DIGEST

Why the 'Orbital Bomb?'

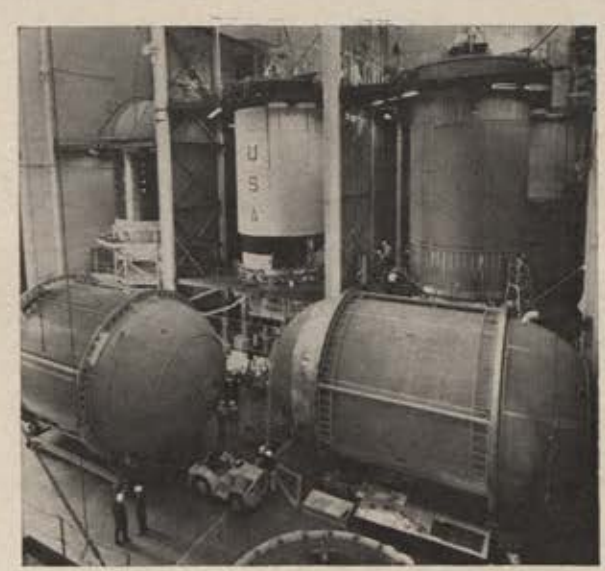
WASHINGTON, D.C., NOVEMBER 9

This week's Soviet claim of an orbital bombing capability is intriguing space observers in the capital. Why, in the face of US and Soviet subscription to the United Nations resolution barring the deployment of weapons of mass destruction in space, did the Russians choose to rattle nuclear space weapons? No one knows for sure, of course, but the likeliest political reason is Russia's current foreign policy dilemma. The Soviets have, since the clear break between themselves and Communist China, been faced with the problem of looking tough enough in the Communist world to compete with the militant men of Peking, while avoiding the extreme provocativeness which could seriously damage Russian relations with the West.

Probably the policy decision to display the "orbital missile" in the October Revolution anniversary parade represented a Soviet propaganda maneuver designed to show the rest of the Communist world that it is Russia, not China, that is the advanced military/technological power, despite the Red Chinese nuclear bomb detonations.

It is also likely that the Russians, in their boasting about spaceborne nuclear weapon capability, were attempting to counteract the recent American announcement of intention to build and deploy the USAF Manned Orbiting Laboratory. The latter argument is strengthened by the fact that the Russians also made a point of claiming to have developed a mobile intercontinental ballistic missile, more immune to observation and reconnaissance than the fixed-site ICBMs that—except for Polaris submarine-carried missiles and their Soviet counterparts—are the mainstays of the strategic arsenals of the two great powers.

The political content of the Russian claim does not, however, give anyone the right to be complacent about the military potential of such weapons as nuclear bombs in orbit. It must not be forgotten that, prior to the atmospheric test ban, the Soviets managed to develop and detonate a fifty-seven-megaton nuclear weapon. A weapon of that magnitude, deployed against fixed targets, whether missile complexes or command and control centers, could be crippling in a nuclear war. Although Soviet military doctrine lately has tended to lessen emphasis on the "minutes and hours" quality of nuclear war, the usefulness of surprise attack has by no means been discarded from the Soviet book. Rapid deployment and detonation of a small number of orbital weapons over major US military and political centers could be devastatingly effective, if such a course were chosen. Indeed, it would be a way to break the nuclear stalemate, to achieve instant superiority, as it were.



Apollo program proceeds apace, with moon-landing target of before 1970 still expected to be met. Above, five Douglas-built S-IVB stages, third stage of Saturn V moon booster, are shown in various phases of production in Douglas plant at Huntington Beach, Calif.

As Dr. Curt Gasteyger of the British Institute

for Strategic Studies pointed out recently in *Survey*, an authoritative English journal of Soviet and East European studies:

"While accusing the Americans of preparing a surprise attack, the Soviets flatly deny that they are themselves thinking of a preemptive strike. There are, however, hints in a number of publications (such as the second edition of the Sokolovsky book) that Soviet doctrine does not exclude the possibility of preemption. It is also pointed out [in Sokolovsky's book] that modern means of detection now make it possible to launch a counter-attack even before the enemy's weapons reach Soviet territory. . . ."

The Sokolovsky book referred to by Dr. Gasteyger is the most recent military-doctrinal tome issued by the Soviet military and translated in the West. Dr. Gasteyger's comment was written primarily in reference to Soviet interest in an extensive Russian civil defense shelter program but is equally applicable to the question of the utility of orbital weapons.

USAF's Titan III-C booster, which has already shown its multimillion-pound thrust, is also progressing well. Above, at Cape Kennedy's Complex 41 a fully assembled launch-ready bird is checked out by Martin Co.

The Administration has been quick to point out, and properly so, the fact that the deployment of nuclear weapons is no special trick these days and that anything the Russians can do we can do too. The difficulties involved in accurate deployment of weapons from orbit were repeated in news stories based on interviews with Pentagon officials. All this is old stuff. Getting a vehicle down from orbit to a pinpointed location on earth or sea is still hard to do with exactness, as witness the problems of manned landings of Mercury and Gemini astronauts. But many-megaton warheads do not require the same kind of accuracy.

For a further analysis of the significance of the Soviet announcement, see "Airpower in the News," page 14.

Scientist's Lament

Science Magazine is the excellent journal of the American Association for the Advancement of Science and about the closest thing to an editorial spokesman for the scientific community. Dr. Philip H. Abelson, a noted geophysicist in his own right, is the outspoken editor of *Science* and a leading opponent of the Apollo manned lunar landing program. Against this background it is not surprising to read the following comment by Dr. Abelson in his editorial in the October 29, 1965, issue of *Science*. Yet, on reading it, we wonder if the good doctor has embraced polemics totally and abandoned all objectivity with statements like this:

"To date, the purely scientific results from our manned space program have not been impressive. With good reason, the engineering and medical aspects have been given overriding priority. In effect, our manned space program has consisted of a series of great technological stunts. One is reminded of an acrobatic act where spectators are awed by a series of difficult feats. The acrobatic team must constantly increase the complexity of its act in order to hold the audience's attention. If the John Glenn mission were repeated today, how much attention would it receive?

"The space agency is now well advanced in its programs toward a lunar landing," Dr. Abelson continues. "Increasingly, planners are considering follow-on programs. These include more grandiose efforts toward manned exploration of the moon and attempts to explore Mars. Will the space agency be able to devise a continuing series of spectaculars of ascending dramatic quality? I think not. The first successful landing on the moon will be a climax. Just as succeeding climbs of Mount Everest, after the first ascent, have drawn diminishing attention, later lunar travel will lose its novelty."

The editor of *Science* then goes on to vent his pique about possible plans to explore Mars:

"As for Mars, how many popular songs have been written about it? On euphonic grounds alone

HOW TO RUN A NUCLEAR OBSTACLE COURSE

A recent breakthrough in materials for hardened heat shields will help ballistic vehicles penetrate harsh environments — ranging from the shock of radiation to fireball traverse.

Lockheed has developed a method of producing composite materials possessing thermal efficiency and structural strength superior to state-of-the-art approaches. It is based on winding and inorganically bonding various types of filaments such as carbon, silica and graphite.

The Lockheed composites offer many advantages. They are tailored to different environments through an interdisciplinary effort involving weapons effects, system design and other key technologies. Example: a gradual transition from carbon filaments on the surface of the shield to silica in the mid-portion increases strength, lowers thermal conductivity. Result: stronger, lighter hardened heat shields - and optimum vehicle design.

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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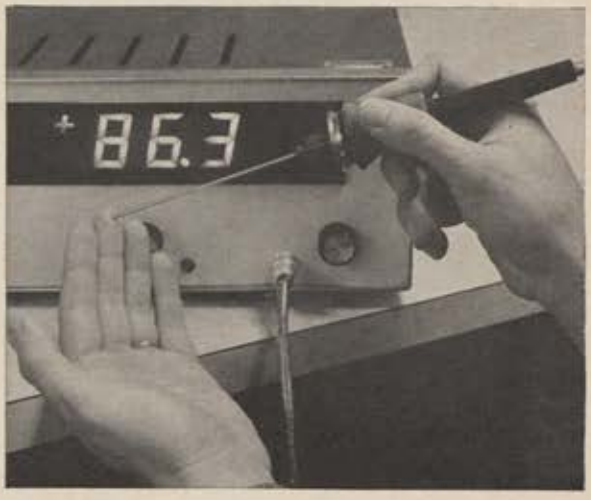
the paucity is not surprising—*bars, chars, jars.* More fundamental is the question, 'How many people know where Mars is, or even care?' Perhaps man will one day go to the planet, but the psychological and emotional impact of the trip will be pale in comparison with that of the first successful landing on the moon."

We are not exactly sure what Dr. Abelson's point is, wittily as it is put. If he is saying that the public does not get as excited as it once did about manned spaceflight, he is, of course, correct. But this does not detract from the significance of the space achievement so dearly bought. He would be just as right about aviation, which is still a marvelous human accomplishment. Or one could point out that the public isn't especially excited about bubonic plague, which, before science and sanitation put an end to the black death, was of enormous popular interest. The same could be said of any number of phenomena.

There is certainly much to criticize in the policies of the National Aeronautics and Space Administration. But it seems to us to serve no useful purpose to demand that NASA be required to sustain public interest at a high peak in connection with all its activities. The national policy is to explore space as peacefully as possible, to extract as much scientific data as possible from space programs, and to give needed attention to national-security aspects of space. On balance, these objectives are being approached. No program in the history of this country has ever been operated in a "learning-by-doing" fashion to the degree observable in the space program and—with the sole exceptions of the World War II atomic bomb project and the missile program of the 1950s—never has so much been accomplished in such a short time.

Dr. Abelson gives the impression in his editorial, and it is a false impression, that NASA is dashing pell-mell toward a manned Martian expedition. No major decision will be taken with more deliberation. The difficulties involved in a manned Martian effort are so obvious that even the most rabid space-exploration enthusiasts see them with clarity. Life-support, propulsion, systems reliability, landing on the planet, surviving on the planet, and getting safely back to earth are all recognized as overwhelmingly difficult technological problems. There is no surety that they can be solved within the present state of the space art. But that fact does not abolish the scientific potential of a manned flight to Mars if, later in this century, it should prove feasible. As to public interest in



Clinical-medical fallout is promised from this unusual temperature-control tool developed for Air Force by Cornell Aeronautical Laboratory, Buffalo, N. Y. It can take fingertip reading and is potentially adaptable to a number of medical requirements, developers say.

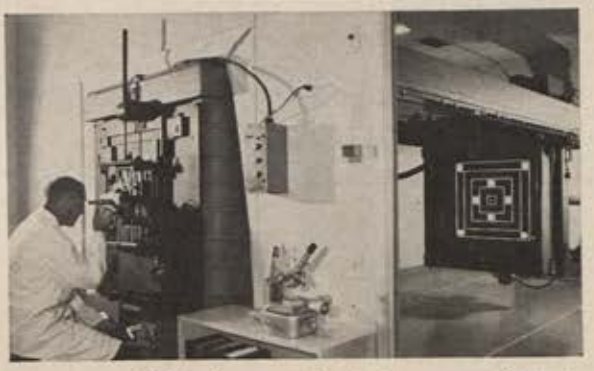
Mars, Dr. Abelson should take into account the already high interest of youngsters, age three and up, in space exploration. They will certainly be watching when and if the manned expedition to Mars lifts off.

It is hard to tell what is really bugging Dr. Abelson and his many scientific colleagues who have taken strong exception to the manned space program. Somehow they seem startled and annoyed that in their lifetimes science and technology have burst out of their cloistered halls with a bang that makes them uncomfortable. They carp about "big science" and ignore the fact that a modern society has to run, for lack of a better term, in a big way. They demand that scientists be given more of a role in decision-making, yet too often they come to the advisory committee with nearly closed minds.

The fact that Dr. Abelson is both a physicist and the editor of such an important journal as *Science* and is able to minimize manned spaceflight as a stunt puzzles this writer. For how are we to understand the nature of the universe we live in if we do not use every reasonable and feasible method of exploring it? This is no simplistic "Columbus argument." It is just plain sense.

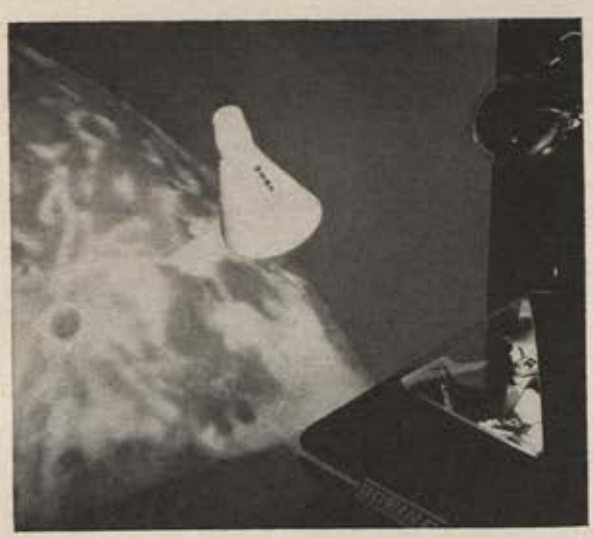
Franco-Soviet Space Entente?

There is speculation here that out of the recent Franco-Soviet talks in Paris and Moscow may emerge a measure of space cooperation between the French and the Russians, possibly a jointly



Major capabilities in space simulation are available in Boeing's new Space Center near Kent, Wash. Above, a section of the Microelectronics Laboratory where technician uses single-step superreduction camera.

It looks like a pumpkin, but it is largest of eleven vacuum chambers in the Boeing Space Center. Fifty feet high and thirty-nine feet wide, the chamber can hold most spacecraft in US inventory, and can produce vacuum equivalent to 400-mile-high condition as well as super-cold temperatures.



This is the Space Center's Visual Spaceflight Simulator. Against projected star-field background, pilots can simulate wide range of space maneuvers. Commands are computer-controlled. Camera images are combined for presentation as unified scene to pilot.

operated European communications satellite program, presumably using Soviet boosters and French payloads.

The Russians already have a low-altitude communications satellite called Molniya, which links Moscow and Vladivostok, and the French are active in comsat research. The French also participate in NASA's international program. The US will launch a French payload this winter.

Unthinkable as such a Franco-Soviet effort might have been a few years ago, it is by no means fantastic today. If there is anything President de Gaulle is serious about in his announced quest for French *grandeur* in the space age, it is a French space capability that will be respected around the world. The French are known to be working hard on their own orbital booster, the Diamant. With the sort of dramatics that have come to be expected from General de Gaulle, it is quite possible that France will attempt to launch her own first orbital payload prior to the coming French presidential election, in which the General has already declared himself a candidate for a second full seven-year term.

A Franco-Russian joint venture would undoubtedly further strain the NATO alliance, already under siege by the intractable French President. That much we all know.

What is intriguing is the question of how the French could, from a practical point of view, effect the kind of cooperation with the Russians that would be required for a communications satellite program. No matter whose payloads and boosters are used, how could the necessary matings occur without cracking the secrecy with which the Russions have always shrouded their space hardware developments?

Anything is possible, of course. But the prospect of hard-headed Frenchmen and impassive Russians sitting down to work out a joint program gets close to incredible. Without intending to stereotype either French or Russian officialdom, it is probably fair to suggest that, if they decided to try to get together on a cooperative space program of one kind or another, they would deserve each other.

And who knows? We might soon be seeing an influx of Russian technicians at France's French Guiana space-launch site. That *would* be fun.

It can be further suggested that if the French were able to pierce irreparably the Soviet space-technology curtain, they would also have earned the sincere thanks of their annoyed Western allies. —END

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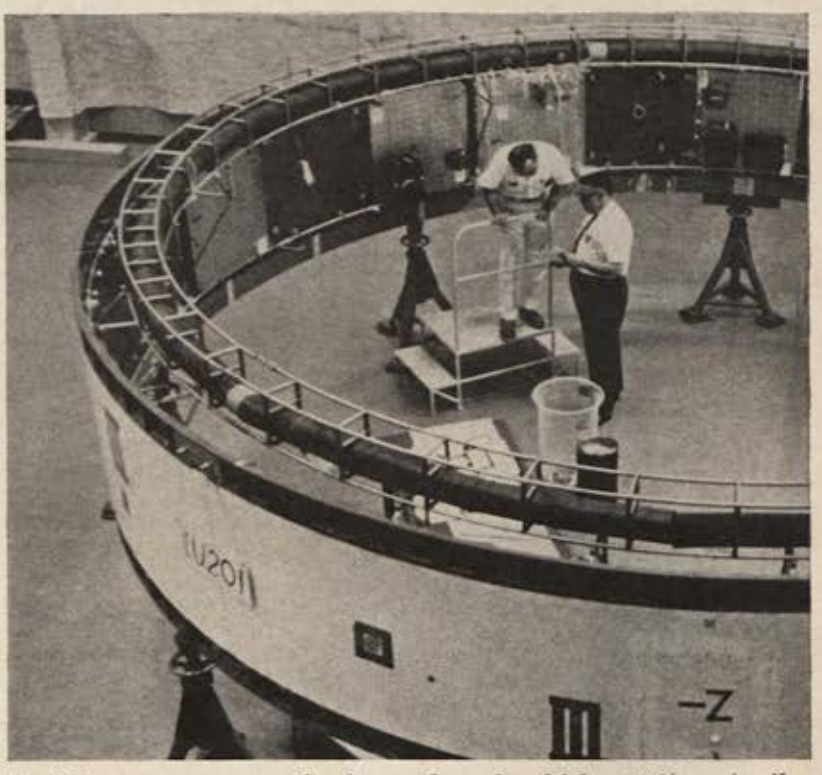

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Whether or not the Viet Cong really planned a major monsoon offensive, they certainly escalated the war in Vietnam in the summer of 1965. At this critical stage airpower played a significant role. North Vietnam was bombed; jet fighter-bombers and, later, modified strategic B-52 bombers were unleashed on Viet Cong targets; and the number of air strikes was increased many times over . . .

The Air War in Countering

THE WAR in Vietnam passed through a critical phase in the spring and summer of 1965. What was involved may or may not have been a planned major summer monsoon offensive by the Viet Cong, but there was certainly an escalation of the war by the Viet Cong. And the US reaction to that escalation changed the whole nature of the US commitment in Vietnam and may also have turned the tide in favor of the Vietnam government.

In the escalated fighting in Vietnam in 1965, airpower played a significant role. In the month of September, as the 2d Air Division neared completion of its fourth year in Vietnam, more air sorties were flown in South Vietnam than were flown in all of 1962, the first full year of US air operations in Vietnam. Some 40,000 sorties of all types were flown in September by aircraft of the US Air Force, Vietnamese Air Force, US Navy, and US Marine Corps. Some 60,000 combat strikes were flown against Viet Cong targets between January and September 1965, considerably more than had been flown in the previous three years. Nearly 12,000 strike sorties were flown in September alone, equaling the total strike sorties flown in 1962. The 2d Air Division, commanded by Lt. Gen. Joseph H. Moore, which had been directing this longest period of air combat in USAF history, was preparing in late 1965 for a continuing rise in air activity.

The vast increase in air sorties flown in the summer months of 1965 was the result of a buildup of USAF and VNAF forces, the use of jet aircraft for combat in February, and the employment of Navy and Marine aircraft beginning in April. It also reflected the increased tempo of the war in Vietnam in mid-1965 as the result of Viet Cong escalation of the fighting and an apparent enemy attempt to cut South Vietnam in half in its mountainous central area.

This steep rise in air activity was in sharp contrast to the picture in early January 1965 when the employment of air-strike power in Vietnam was restricted to the six USAF and VNAF A-1 Skyraider squadrons, operating under fairly restrictive rules of engagement. In February, the

A-1E Skyraiders, although heavily augmented now by jets, are still important for their large payload capability in Vietnam. They are piloted by both US and VNAF pilots.

The author, Mr. Sams, has been in Vietnam, at the heart of the operations he describes, for more than a year as Historian of the 2d Air Division. He is a long-time military historian and has contributed to AIR FORCE/SPACE DIGEST *in the past. His most recent contribution, also on the Vietnam situation, in the August issue, was "Tactical Air Support—Balancing the Scales in Vietnam."*

AIR FORCE
DECEMBER, 1965

By Kenneth Sams

Vietnam: Escalation

South Vietnamese Air Force wings are presented to Gen. Hunter Harris, PACAF Commander, by Air Vice Marshal Cao Ky, RVN Prime Minister and AF Chief. He also awarded wings to Gen. J. P. McConnell, USAF Chief of Staff.

decision to remove these restrictions and to use jet aircraft based in the Republic of Vietnam for air strikes against the Viet Cong was made, followed by the commitment of additional US forces. These decisions were made after Viet Cong attacks on US installations at Pleiku and Qui Nhon, anchor ends to the highly important Route 19—the highway cutting across central Vietnam from the coast to the highlands in the west—and following a period of Viet Cong successes. Considered in terms of a Viet Cong buildup in the highlands area, these successes represented a real threat to government control of the central area of Vietnam.

The success of Communist tactics was due in no small part to the restrictions on US technological might, particularly airpower. USAF forces in South Vietnam, from late 1961 to the summer of 1964, consisted of never more than thirty combat aircraft, and these were involved in training the Vietnamese Air Force. Limited combat missions, in conjunction with VNAF training flights, were conducted in 1964. At one time, in the spring of 1964, after the B-26s were grounded and the T-28s restricted, US strength was down to less than ten combat aircraft. Still, even this tiny air capability was not being used due to existing rules.

Significantly, however, the USAF and the VNAF, since early 1962, had developed a highly effective system for employing air, called the Tactical Air Control System. It basically involved a Tactical Air Control Center at Tan Son Nhut tied in with Direct Air Support Centers (DASCs) at each of the four corps headquarters in Vietnam, which could direct planes on target, using flying forward air controllers to mark the targets. The system was adapted to the needs of the Vietnam environment. A major adaptation was a system started by General Moore in May 1964 requiring requests for air support to be immediately forwarded directly from the ground commander who needed it to the DASC at corps headquarters which could supply it. Previously all requests went through the command echelons with considerable delays.

When the Viet Cong, in late 1964, demonstrated a willingness to press large-scale battalion-sized attacks, a system was available to match this increased intensity of action with greater airpower. Unlike previous years, more lucrative targets were available, making it possible to get more effective use out of available airpower.

Furthermore, in mid-1964, when it began to look as though the US commitment to Vietnam would be a long one, serious attention was given by US commanders in Vietnam to target intelligence and to new weapons for getting at an enemy hidden under layers of jungle canopy sometimes reaching up 200 feet. The results were significant. Infrared reconnaissance intelligence, when correlated with intelligence gathered by other means, was making it possible to pinpoint the increasingly more extensive base areas which the VC were required to build if they wanted to raise the scale of fighting. In late 1964, permission was received to use the "Lazy Dog" bomb, a clamshell device containing some 10,000 tiny missiles which drop at terrific speed and penetrate heavy foliage. Perhaps of even greater significance in view of what lay ahead was the arrival of more of the extremely useful O-1 liaison aircraft to supplement the USAF squadron and four VNAF squadrons flying these aircraft on visual reconnaissance and forward air controller missions.

The stage was therefore set to a large extent for a greater air effort. All that remained was the decision to increase the numbers and types of aircraft in the system. With a jet F-100 squadron at Da Nang and two B-57 squadrons at Bien Hoa, this extra airpower was close at hand. Behind these aircraft on the scene lay the vast arsenal of airpower in the Pacific area, ranging from tiny liaison aircraft to B-52 bombers, and including carrier-based planes and Marine Corps fighters. Any decision in this respect would automatically mean major changes in the rules of engagement, particularly the requirement for a Vietnamese student pilot alongside US pilots.

The early February attacks on US installations at Pleiku and Qui Nhon pointed out the need for increased use of airpower. It was on Highway 19 that the Viet Minh in 1954 severely mauled the crack French Group Mobile 100, composed of some 3,500 men. It looked as though they

(Continued on page 76)

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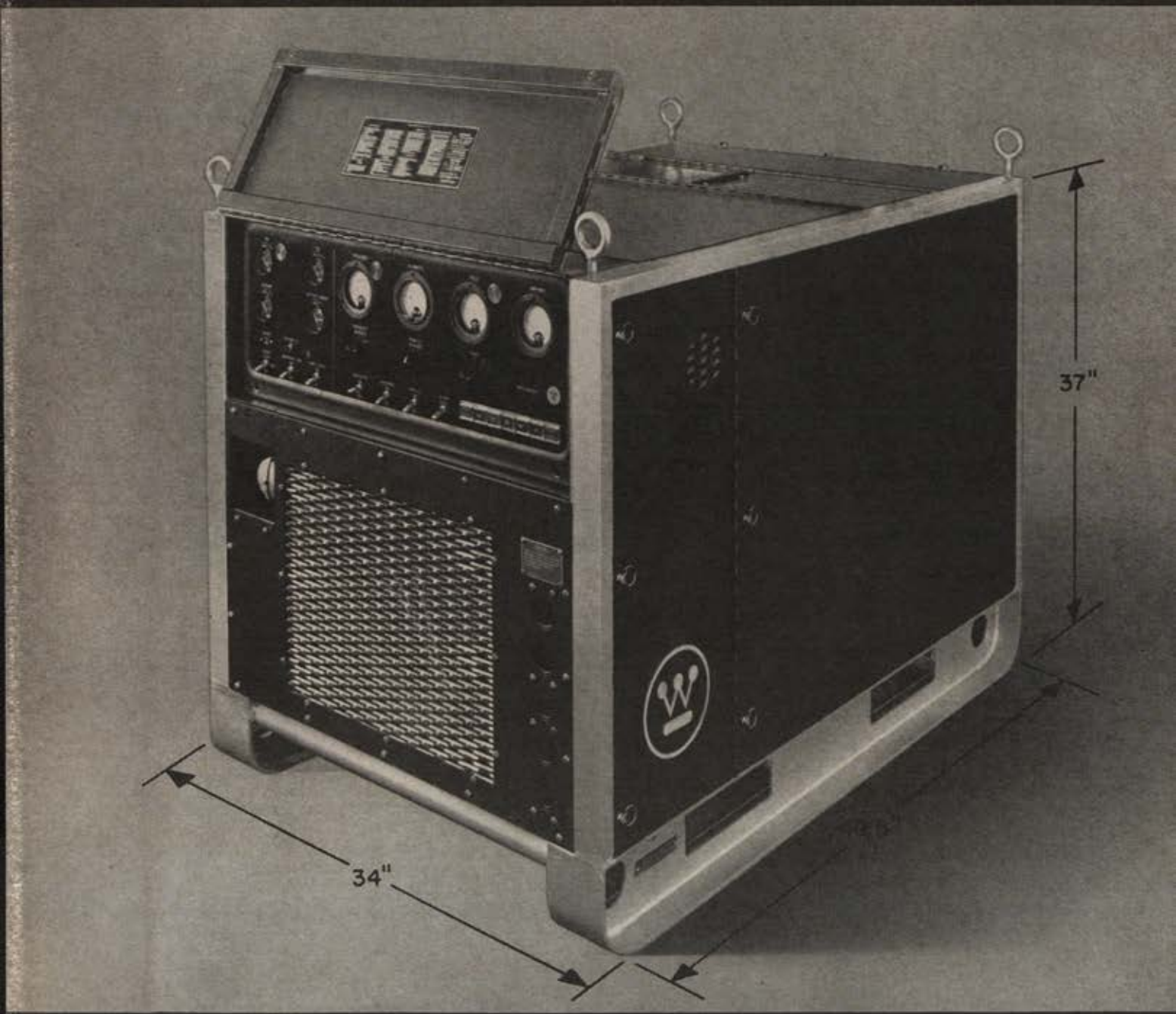

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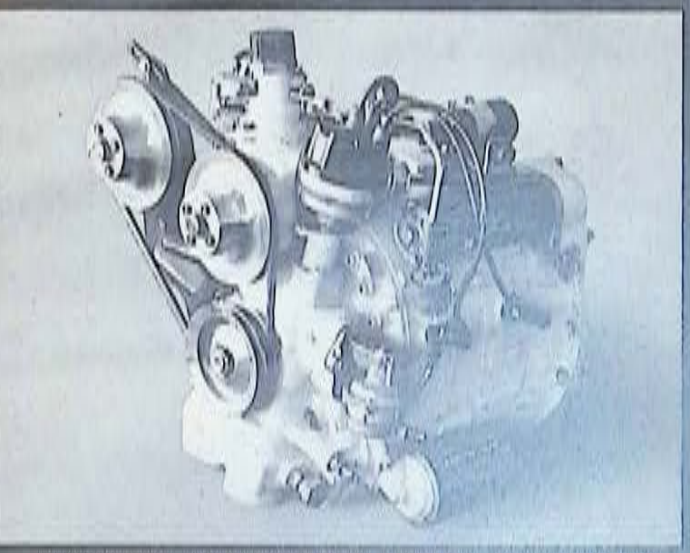

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A flight of four North American F-100 Supersabres of the 481st Tac Fighter Squadron return to their home base from strike against Viet Cong concentration north of Can Tho, which they hit with 750-pound bombs and 20-mm. cannon.

might try the same tactic again. The pattern of road interdiction and attack on outposts and hamlets that usually preceded major VC initiatives was in evidence. Normally tranquil areas in Phu Bon, Pleiku, and Qui Nhon provinces, which cut across the country, were getting VC attention in the form of attacks on outposts and hamlets. Roads were being interdicted and bridges blown, including parts of Highway 19. Intelligence reports coming into Saigon headquarters showed more and more units assigned to this II Corps area, some moving up from the south.

As a result, General Westmoreland pressed Washington for approval to make greater use of airpower, and he got it.

On February 19, another major coup was attempted, and dissident elements of the ARVN succeeded in taking control of the key air base of Tan Son Nhut, thus tying up practically all VNAF resources. VNAF commander, Air Vice Marshal Nguyen Cao Ky, who had successfully stopped a similar attempt in September 1964, once more had to turn his back on the VC enemy and use his airpower to maintain political stability.

Within a week, US jets were released for combat for the first time in South Vietnam, an action which grew to almost a quadrupling of the number of air strikes against the Viet Cong in the next few months. For the Viet Cong, who were moving relatively freely in large formations, it was to mean frighteningly high casualties and a continuing program of harassment and bombing which was to give them little rest for the next few months.

What the Viet Cong may not have understood at the time, but which they gradually came to realize, was that this first step was only the lowest scale of several degrees of escalation of the air effort. Interrogations of prisoners late in the summer revealed some amazement at this constant and rapid increase in the degree of airpower which was used against them. Over the years, they had learned to cope with meager air resources employed by the government, knowing that, once bombed, they could expect to rest safely for extended periods. Many units operating in the northern areas had never been exposed to air attacks.

But, when the VC made a major effort on February 24 to interdict Highway 19 near An Khe, the same area where they had massacred the French, they faced jet attacks for the first time. Following the classic pattern of ambushing a small force and then attempting to decimate relief units, the VC ambushed two Vietnamese Army groups traveling on the highway. At least one enemy battalion was lying in wait on both sides of the highway as the two groups—a Ranger company and a CIDG (Civilian Irregular Defense Group)—linked up in a road-clearing effort. Facing almost certain disaster as the Viet Cong opened fire, the units called for help. Within a very short time, B-57s and F-100s were blasting the enemy positions with bombs, incendijel, and cannon fire, while Army helicopters safely extracted the entire complement of 220 men without the loss of a single man or helicopter. The jets continued operations in Binh Dinh and Quang Tin Provinces, causing heavy casualties to enemy concentrations and disrupting their freedom of movement.

In April, when intelligence revealed a major VC concentration in a section of Zone C in Tay Ninh Province, the greatest armada of aircraft ever assembled in Vietnam made a major interdiction strike. Navy carrier planes and Marine aircraft from the Marine Expeditionary Force, which landed at Da Nang in March, joined the effort. A total of 443 sorties were flown in a single day, and more than 1,000 tons of bombs were dropped, about twice the average tonnage dropped per month in 1964. This secret base contained radio transmitters, supply depots, arms manufacturing plants, training facilities, and a district and provincial headquarters. The massive air attack was only a prelude to what was to come, namely B-52 raids in this and other secret base areas.

In addition to the Navy and Marine aircraft, more USAF aircraft were arriving in the theater and the VNAF was building its strength up to five A-1H squadrons with a sixth to come in late 1965. F-104s arrived at Da Nang in April to join the B-57 and F-100 squadrons and a steady flow of A-1H and A-1E aircraft were being unloaded from Saigon docks for transport to VNAF squadrons throughout the country. The combined US-Vietnamese air strength available for strikes against the Viet Cong just before the May monsoon rains was more than triple what it was at the start of the year.

This favorable air situation was taking place at the same time US and third-country ground forces were building up and moving into position, mainly as a security force for US bases. In April, however, evidence pointed to the fact that elements of the regular North Vietnamese 325th Division had been in South Vietnam since February, operating in the highlands northwest of Kontum.

On May 11, the Viet Cong launched the first major monsoon attack. Three battalions of enemy troops occupied Song Be, the provincial capital of Phuoc Long Province, forty miles northeast of Saigon, and held it for several hours. Five US advisers and forty-two South Vietnamese soldiers were killed. Airpower was called in and directed on enemy gun positions by the USAF forward air controller, who was one of the Americans under attack in the US compound. Some fifty-nine Viet Cong bodies were left behind, most killed by the air strikes, and the senior US Army adviser in the Province, Lt. Col. John G. Hill, Jr., estimated that the enemy suffered between 600 and 1,000 casualties. The USAF B-57, F-100, and A-1 aircraft started attacks on enemy positions at dawn and continued pounding Viet Cong troops and gun positions until they were driven away from the city. Although weather was poor, it did not keep air strikes from being effective.

Song Be was in the southern half of South Vietnam, on the fringe of Zone D, and this was not where the enemy was expected to make his major thrust. The big push was expected in the vast II Corps area of central Vietnam. On May 29, it looked as if this push had begun, on a

(Continued on page 79)

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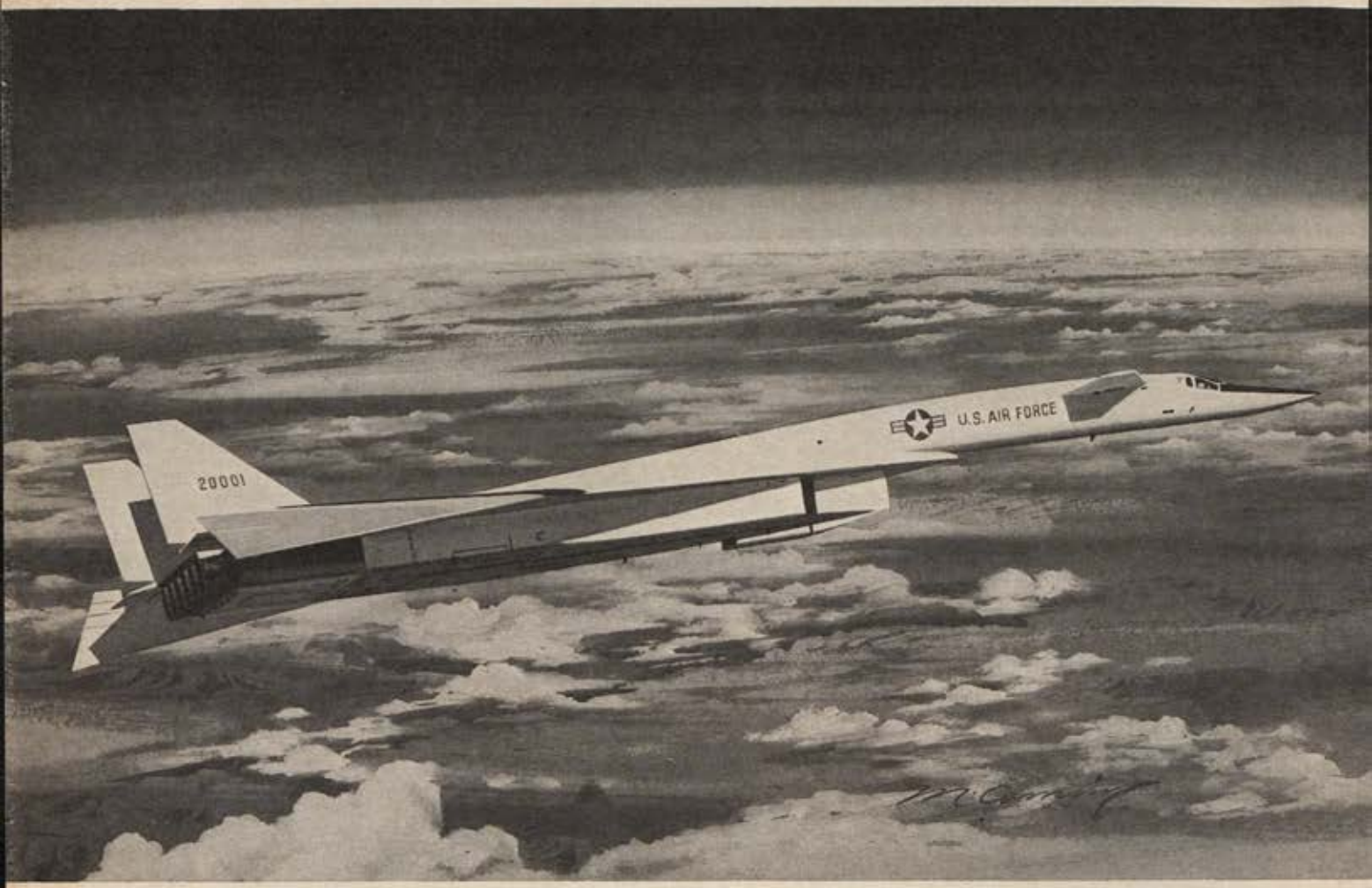

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fifteen-mile stretch of road between the coastal city of Quang Ngai and Ba Gia, a government outpost. Taking advantage of low cloud cover and heavy rains, battalion-size elements of an estimated nine-battalion enemy force, including reported units of the 325th Division, chewed up a government battalion committed piecemeal to an action which began with the ambush of a platoon on a road-clearing operation. In the next few days, heavy fighting raged in the area of the key coastal city of Quang Ngai with a heavy commitment of US airpower. Between May 29 and June 4, when the enemy broke off the attack, 661 sorties were flown and some 750 tons of bombs and incendijel dropped on enemy positions. The air action took place despite a low overcast and it continued during the hours of darkness using the light of some 3,000 flares dropped by C-123 and C-47 aircraft. In these strikes, 1,430 structures were reported destroyed and 423 damaged. Airpower laid waste the area in which the enemy fought and an estimated 826 enemy troops were killed, mostly by air.

Although the Viet Cong forces had inflicted severe casualties on the 51st ARVN Regiment, they took a heavy beating from the air. Most significant, at both Song Be in the southern half of South Vietnam and Quang Ngai in the north, the enemy realized the heavy price he would have to pay when he chose to raise the level and intensity of fighting.

On June 10, the enemy launched another major attack, this time in the southern half of South Vietnam. A regimental-size force overran the government military camp at Dong Xoai, starting in the early morning hours of darkness under a heavy 500-foot ceiling. Again, while he was successful in taking the objective and inflicting heavy casualties on defending forces, the enemy paid heavily for his initiative and he could not hold his objective. Air strikes, starting a few hours after the attack and made at night under the low ceiling, hammered enemy positions with 250 tons of bombs and incendijel and tens of thousands of rounds of cannon fire in two days of intensive air strikes. Some 700 enemy troops were killed in this battle with an unknown number carried off. General Westmoreland credited airpower with turning the tide of the battle. While losses among government forces were the heaviest of any single action since the war began, the Viet Cong suffered even greater casualties, which they could ill-afford in terms of reserves.

The employment of airpower in Vietnam was escalated a step further on June 18 when B-52 bombers, flying out of Guam, dropped some 300 tons of bombs in an attack on a Viet Cong installation near Ben Cat in Binh Duong Province. This was the prelude to a program of continuous interdiction attacks by these bombers, which are capable of heavy pattern bombing throughout Vietnam. Just as the B-57 and F-100 attacks, starting in February, released the A-1 aircraft for more close-support missions, these B-52 attacks allowed the jet fighters and small bombers to concentrate on more immediate support missions. This freeing of the tactical aircraft for increased direct support was a marked contribution to the greater flexibility and capability of airpower in Vietnam, at a time when the number of immediate requests for air support was rising in consonance with intensified VC activity.

Beginning in late June, there was a flurry of enemy activity in the central area of Vietnam. On June 25, the VC took the district capital of Toumorong in Kontum Province and held it. On July 6, they overran Dak To, another district capital in the same province. US forces were being committed to action in other key areas, the 173d Airborne Brigade around Bien Hoa and the Marines around Qui Nhon and Da Nang, to counter increased VC activity in those areas. It appeared that the enemy might be emerging into open combat in hopes of a quick victory before the rainy season ended, and before the US forces could become completely effective.

In July, air activity rose to a new all-time high. Nearly 11,000 combat sorties were flown and more than 12,000 tons of bombs dropped on enemy positions throughout South Vietnam. Aircraft were active in a close-support role for US, Vietnamese, and Australian forces and on interdiction missions. In one action on July 10, which involved what General Moore called the "most successful US Air Force missions yet flown," F-100s hit a major VC base sixty miles north of Bien Hoa with 750-pound bombs and cannon fire. Out of some 1,000 Viet Cong located there, about 350 enemy troops were reported killed.

With Viet Cong attacks continuing throughout the country and with US and Vietnamese forces stepping up their attacks, the month of July became the bloodiest of the war. Viet Cong troop losses for July were equal to the strength of a division, according to US official sources. Some 3,050 were killed and another 500 captured in ground attacks, with another estimated 4,000 killed by air attacks. Friendly losses for the month were 1,335 killed, 1,765 wounded, and 750 missing. The intensity of fighting, both in the air and on the ground, continued into August, when the VC appeared to make a major effort for control of the central highlands. US troop strength reached the 83,000 mark and took a more aggressive role. B-52 raids became routine. F-102s joined in the fighting against the Viet Cong and the VNAF was equipped with its first jet aircraft, B-57s. The number of sorties flown rose to some 11,500, exclusive of B-52s, and tonnage dropped rose accordingly.

Much of the action was centered in the highlands area, particularly around the Special Forces outpost of Duc Co in Pleiku Province, which had been under enemy harassment for several months. Streams of refugees pouring out of the mountainous areas of the Kontum-Pleiku regions near the Cambodian border brought information that the Viet Cong were planning a major offensive, with the objective of capturing and holding a district or provincial capital to make it a provincial government center. Interrogation of a VC prisoner indicated that a major attack would be made in early August. The objective was to sweep across from the plateau to the coast.

(Continued on following page)

Rescue helicopter units furnish much-needed support to fighter-bombers. Above, four airmen, who flew deep into North Vietnam to rescue downed pilot, receive Silver Stars.

Acting on evidence that an attack on Duc Co was planned, government forces launched an operation in the area to destroy the H-15 Main Force battalion. In the six-day battle between August 3-8, which followed the opening of this offensive, the enemy was struck heavily from the air and by ground forces. VNAF and USAF fighters flew about 300 sorties, dropping more than 400 tons of bombs and incendijel on the enemy as well as some 100,000 rounds of cannon and machine-gun fire. In mopping up operations following these air attacks, ARVN forces found 411 enemy bodies. Although friendly losses were forty-seven killed (including two US) and twelve missing (including one US), any Viet Cong ambitions for reaching far beyond this westernmost point of Highway 19 were certainly blunted.

On the opposite end of Vietnam, south of the new Marine air base at Chu Lai, US Marines handed the enemy another defeat. Starting on August 18, Marine forces conducted an operation which trapped an estimated 2,000 Viet Cong on a peninsula south of Chu Lai. The ground forces were supported by nearly 100 sorties flown by Marine jets, which dropped some ninety-two tons of bombs on enemy positions. A total of 563 VC were killed and fifty-two captured in the operation, one of the major victories of the war.

At the same time this was taking place, a Viet Cong battalion in the highlands overran the district capital of Dak Sut in Kontum Province, and held it. Air support could not be effectively employed due to inclement weather. In other parts of the country, the VC were exerting pressure on government positions, with more and more actions being fought in the outskirts of Saigon itself. However, although the Communist pressure continued heavy, there were no indications of the major offensive which had been expected since early May. In fact, Communist activity in September was dropping in correlation with a continually accelerating rate of air operations. On a single day, September 2, a record-breaking 532 sorties were flown with nearly 400 tons of ordnance dropped on VC positions throughout Vietnam.

Air activity in September set a new record, VNAF and USAF flew some 6,500 sorties, compared to 2,500 in February when the jets were first released for combat in Vietnam. Navy and Marine aircraft flew an additional 5,000 sorties against the VC. Air strikes in September killed some 1,500 Viet Cong (confirmed by body count) and destroyed nearly 10,000 structures.

The tenacity of the Viet Cong in the central highlands area was in evidence in late September, when a regimental-size unit engaged government forces around the outpost of Phu Cu in Binh Dinh Province, some forty-five miles northwest of Qui Nhon. This action, which consisted of a series of ambushes and attacks, revealed a continuing enemy capacity to mass, strike, and withdraw at times and places of their own choosing. However, airpower again showed how effective it could be against such massed forces. In air strikes on September 23, the first day of the long weeks of action, an estimated 650 enemy troops died from bombs, incendijel, rockets, and cannon fire. Some ARVN estimates of enemy losses from air strikes in the first few days of fighting were as high as 1,300. At Phu Cu, as at Dong Xoai, Ba Gia, and Song Be, air strikes were made by day and night under unfavorable weather conditions. More important, large numbers of aircraft were available. They were quick to get on target and they were capable of dropping weapons on enemy positions within 100 yards of friendly forces.

Prisoner interrogations attest to the impact of the air effort. A special interrogation program conducted by the Rand Corporation showed that a great majority of military VC personnel interviewed had experienced air attacks. About two-thirds rated aircraft as the most frightening and effective weapon used against them and the most difficult to deal with. Not only strike aircraft, but all US aircraft had a definite psychological impact on enemy morale.

One of the most essential aircraft in Vietnam is the light Cessna O-1 with its forward air controller pilot. FACs find VC in the jungle and then lead forces to them.

The tiny O-1 liaison aircraft, used for forward air control and visual recce, were a constant worry to the VC as an indicator of strikes to follow. Forward air control sorties rose from 350 in January to more than 2,000 in August. On many occasions, sharp-eyed observers in these aircraft saved friendly troop movements and convoys from disaster by spotting ambushes—the VC's most effective tactic.

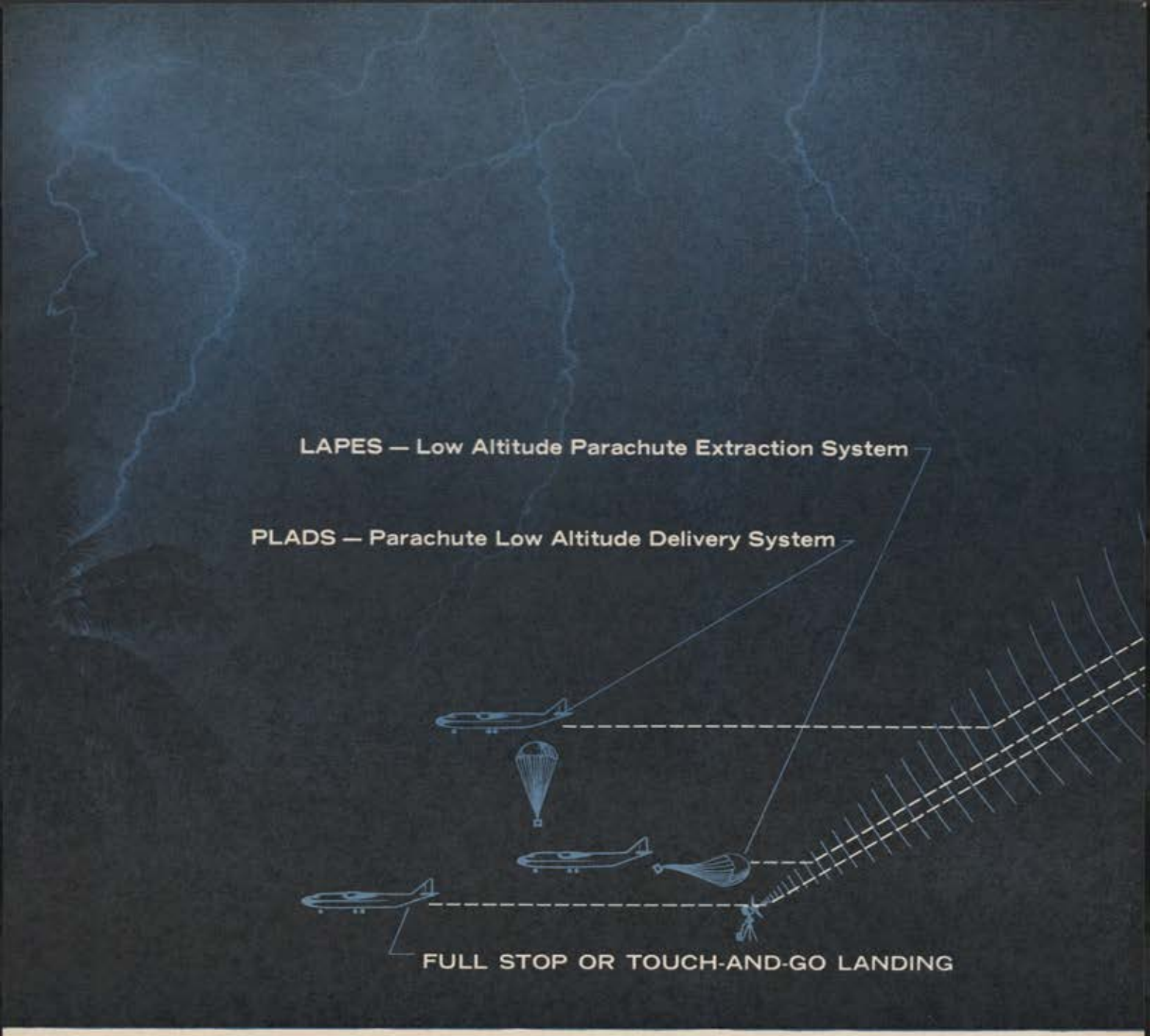
Maj. Gen. Gilbert L. Meyers, Deputy Commander of the 2d Air Division, considered these O-1Fs, with their forward air controllers and observers, a key element in the successful use of airpower in the spring and summer of 1965. "Without these FACs in their O-1s," he said, "our jet capability would be hampered." The jets, he added, "would have difficulty locating the targets and pinpointing their bomb drops without that invaluable smoke marker, particularly in the fluid battle conditions that characterize the Vietnam fighting and the advantage given to the enemy by heavy foliage cover.

"The incident rate would be up and the effectiveness down if the FACs weren't there to put the jets on target," he said.

In 1965, the four C-123 transport squadrons in Vietnam also contributed substantially to the role of airpower as a means of carrying troops into battle, resupplying government facilities, dropping flares at night over outposts under attack, and serving as a primary supply line for a nation with a crippled rail and road system. These aircraft carried some 85,000 passengers in August, double the number in January. Some 24,000 tons of cargo were lifted in August, triple the amount at the beginning of the year. Other USAF aircraft, such as the U-10 psychological warfare planes, which broadcast messages to the enemy and dropped leaflets, also increased their sorties.

The Vietnamese Air Force, with a composite force of fighters, liaison aircraft, and helicopters, was making a greater and greater contribution to air warfare in Vietnam. Not only was the VNAF a factor in the military struggle but it proved on several occasions to be a key element in maintaining government stability. Its commander, Air Vice

(Continued on page 83)



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Aiding Gemini achievements . . . A 900-mile communications expressway, involving virtually every Bell System service, in effect extends the launch site for Project Gemini all the way from Cape Kennedy to NASA's Manned Spacecraft Center near Houston.

With supporting communications and elaborate computing devices, the Gemini Launch Data System permits the Manned Spacecraft Center to check out each spacecraft with Cape Kennedy, control the launch and maintain command and control of the entire mission. The communications portion of this massive information system is a radio and cable complex of data, television, telephone and teletypewriter circuits. The data channels handle more than 97,000 bits of information per second. Two closed-circuit television channels provide face-to-face contact for conferencing and coordination between flight controllers at Houston and Cape Kennedy.

The Cape Kennedy-Houston GLDS is part of a 225,000-mile global tracking and communications network used by NASA to control space missions. It is another example of the vital role communications play in the progress of space exploration.

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A pair of Vietnamese Rangers settle down aboard a Fairchild C-123 light transport of the 309th Air Commando Squadron en route from Bong Son to Tuy Hoa. The Rangers had just come from a pitched battle at Phy Cu Pass.

Marshal Nguyen Cao Ky, now his country's Prime Minister, has built a tremendous *esprit de corps* in his air arm, an all-volunteer force.

Then, of course, there is the tremendous airpower capability represented by the Navy's Seventh Fleet, the Marine element in Vietnam, and the B-52 force on Guam, not to mention the air elements scattered throughout the Pacific and the US which could be quickly deployed to Vietnam.

According to General Meyers, it was not any one aircraft or any one weapon which was responsible for the setback dealt the Viet Cong during the summer monsoon season of 1965. Said General Meyers: "Certainly, we have to try out new weapons, new techniques, but there's no one gimmick that will provide an easy answer.

"It's airpower in general that hurts the enemy. Everything from the B-52 to the light liaison plane with a FAC in it. You put an airplane over the enemy day and night and you keep him on the move, keep him from resting, make him spend more time digging than fighting. At the same time, you're showing the people that the government's still strong. Everytime they look up and see an airplane, whether it's a flareship, a bomber, or a liaison plane, they're seeing the government, and it gives the lie to Viet Cong propaganda that the government's falling apart.

"They've taken a beating this summer," General Meyers added. "Certainly, we don't have all the results we would like on the effects of airpower, but you can't go on hitting enemy targets with a lot of tonnage day and night without hurting him. These attacks are based on intelligence and even if the enemy doesn't happen to be there every time you're dropping bombs, you're making his life a lot rougher. There are long-term effects to this bombing, this day-in and day-out destruction of his bases and supplies—not to mention the psychological effects on the man who can never feel really safe."

Statistics partially tell the story of the impact of airpower on the major Viet Cong push during the summer monsoons of 1965. A plotting of air activity in 1963 and the first ten months of 1964 show a fairly uniform line indicating an average of about 1,000 combat sorties monthly. In January 1965, when the two USAF and four VNAF A-1 Skyraider squadrons were nearing full strength and VC activity was on the upswing, the line goes up sharply to 2,400 sorties. In March, following the introduction of jets, it climbs to about 3,000. The addition of Navy and Marine aircraft in mid-April pushes the line above the 4,000 sorties mark. The beginning of the monsoon season in May takes it to 6,400, in June 7,400, in July 11,000, and in August 11,500. There was almost a tenfold increase in the number of strikes flown between August 1964 and August 1965.

The amount of ammunition dumped on enemy targets shows a corollary increase, going from an average of ten tons a day in January to twenty tons in April, to thirty tons in June, and to forty-five tons in August.

It is practically impossible in the Vietnam environment to get an accurate count on results. Many air strikes are not followed up by ground attack and the enemy always tries to remove his dead and wounded. However, based on conservative estimates, charts show a sharp upward trend in enemy killed by air and structures destroyed by air. In January, there were some 1,000 killed by air, rising to 2,800 in March, and some 3,300 in June. In July, more than 4,000 enemy troops were estimated to have died from air attacks. The number of enemy structures destroyed rose from some 2,000 in January to nearly 9,000 in March, the first full month of jet operations. In July, it climbed to over 10,000 and continued at that number in August and September. This terrific climb in the destruction of Viet Cong workshops, barracks, arms factories, storage areas, aid stations, and buildings which could be used in a dozen ways, certainly disrupted the enemy's capability to organize for large-scale attacks and made his life a lot harder. Many of these structures were located in areas previously free from air attack in Zone C and Zone D north of Saigon, a long-time enemy assembly area.

While statistics reveal an increasing commitment of airpower in 1965, a more personal insight into the effects of this airpower has been obtained from interviews with Viet Cong prisoners and defectors. Leon Gouré of the Rand Corporation, who has been closely involved in these interviews, said that there were signs of cracking enemy morale as a result of air attacks. "Last year," he said, "the Viet Cong were fairly cocky. To many of the younger ones, the war was a lot of fun. They always had a base to go back to after making an attack. Now, with constant air attacks that kill them in the field and destroy their home bases, a lot of the fun has gone out of it. You don't see the cockiness any more.

"The Viet Cong are an attack force and not a defense force," he added. "Keep them on the move, force them to dig and defend, and you use up a lot of their energy that should go into combat. This is what has been happening this summer. For the Viet Cong, life has been hell."

Commenting on the summer offensive, he said: "To make a big effort, the Viet Cong have to build up force and momentum, and in May they started out this way. But they were forced down in June and July and could never regain the initiative necessary to carry out a major offensive."

General Moore does not believe that the terrific pounding given the Viet Cong during the monsoon weather of 1965 means they are defeated. However, he does feel that the decision to employ more airpower in February was a highly significant one, which not only blunted the VC drive, but opened the way for continuous attacks on the formerly safe VC sanctuaries. General Moore feels that better intelligence resulting from the US and third-country ground forces backing up the ARVN, and helping them take a more aggressive role, is greatly helping the air effort, even if the Viet Cong revert to smaller-scale actions.

This, linked with improved technological detection devices and a massive increase in liaison aircraft for visual reconnaissance, gives airpower a much greater potential than it had in the years between 1961 and 1964.

"The Viet Cong will no longer have safe sanctuaries," he said. "And every time they show themselves in strength, they can expect heavy losses from airpower."—End

With some crews fresh from combat missions in Vietnam, and despite bad weather and high winds, the first Strategic Air Command Bombing-Navigation Competition since 1961, and the fourteenth in the series, demonstrated that SAC bomber crews are "better than ever before," as the Commander of SAC said after it was over. And it showed the world that America's manned deterrent continues to be an alert and highly effective force . . .

SAC's 1965 Bombing-Navigation Competition—Where Everybody Won

By Donald R. Smith

The combat crew and wing staff of the 19th Bomb Wing from Homestead AFB, Fla., check their plans the afternoon before a mission. A cubicle for each crew in the competition for planning sessions, plus weather facilities and a processing and support center, were located in the competition headquarters, a sixteen-acre hangar on the flight line at Fairchild AFB.

A prime example of the highly professional maintenance provided at the meet was the fast engine change made by the crew of the 319th Bomb Wing, Grand Forks AFB, N.D. They made the change between first and second missions of their competition crew.

WHILE only one unit, the 454th Bomb Wing of Columbus AFB, Miss., won the Fourteenth Strategic Air Command Bombing-Navigation Competition, it would be hard to say who the losers were. As Gen. John D. Ryan, SAC Commander in Chief, told the audience at the awards ceremony, "The bombing and navigation this year were better than ever before."

This means, in effect, that all the SAC units were winners. And, the biggest winners of all were the citizens of the United States.

The name of the game in deterrence is "credibility." Could anyone doubt that the message implicit in eighty-eight successful bombing sorties flown in four nights of wicked winds and terrible weather was loud and clear in any capital in the world?

Among the aircraft at Fairchild AFB, Wash., where the competition was held last mid-September, were some of the oldest and newest aircraft in the command. There were B-47s, every model B-52 from the "B" to the "H," and a pair of B-58s. Crews ran in age from the early twenties to the late forties.

Each of the forty-four SAC bomb wings sent its best crew, best maintenance team, and best bombing aircraft. All had been given big send-offs by their units, and many carried the deeply felt good wishes of their neighboring civilian communities.

One unit, the 19th Bomb Wing, had been chased from its home base, Homestead AFB, Fla., by Hurricane Betsy. The aircraft, support people, and crew were reunited just in time to fly in to the competition on schedule.

And crews from the 7th, 320th, and 454th Bomb Wings came to the competition still under the tensions of combat missions against targets in South Vietnam.

The bombing competition started in 1948 at Castle AFB, Calif., when actual bombs were dropped on the Wendover bombing range in Utah. Except for 1950,

First Lt. I. D. Robinson, left, navigator, and Capt. Ronnie C. Rice, radar navigator, 91st Bomb Wing, prepare B-52 for second mission. They were leading at this point.

Descending to low altitude, the bombers were to make runs on four targets covered by two SAC radar bomb-scoring units. The first two targets were near Williston, N. D., the second two near Havre, Mont. All targets were geographical coordinates in empty fields. Bombing was by radar alone, tracked by landmarks visible on radar in the general target area selected by crew navigators. After leaving Havre, the aircraft were to climb on course to clear the mountains and return to Fairchild.

Half of the aircraft were scheduled to fly each night, covering the identical route twice in four days. Takeoffs were planned to start about 7:30 p.m. in an order determined by lots drawn by wing commanders at the opening ceremony. No weapons of any kind were to be carried on the flights.

At 7:30 a.m. Monday, according to plan, a weather scout flew the route. Then at 10:30 a.m. another weather run was made. Although some showers and hail were predicted in the area around the low-altitude route, the decision was made to fly the day's schedule.

(*Continued on following page*)

during the Korean War, a competition was held every year until 1961. There were no competitions during the next few years while SAC was integrating the bulk of its potent intercontinental ballistic missile strength into the mixed strategic force. This year, with the mixed force a stable reality, old bombing-navigation competition rivalries were renewed.

The 1965 competition started on September 12 when the bombers began to land at Fairchild AFB with clock-like regularity, exactly ten minutes apart. Takeoff time and flight plans had been set to bring the competitors in on schedule, regardless of home base.

All aircraft were to fly at night on a 2,500-mile mission lasting about six hours. The bombers were directed to fly from Fairchild to the Pendleton, Ore., VHF Omnidirectional Range (VOR) and enter a triangular maneuver area for precise entry timing of a high-altitude navigation course, ending this leg near the Pierre, S. D., VOR. Here, there was another maneuver area for timing the low-level navigation leg and bombing runs.

B-58 Hustler from the 305th Bomb Wing, Bunker Hill AFB, Ind., which took third place in the competition, was the first to take off on third day of meet. At this point it was only a fraction of a point behind leading 91st.

The 465th Wing, Robins AFB, Ga., maintenance team watches its aircraft taxi out to take off on first mission. The 465th was defending champion and had been cheered off at dawn the day before by local community well-wishers.

Led off by a B-58 from the 43d Bomb Wing at Little Rock AFB, Ark., twenty-two aircraft took off into the steady drizzle at Fairchild at ten-minute intervals.

By 1:30 in the morning, the first scores began to come in and were posted on the giant scoreboard in the competition headquarters. As the remote radar-scoring units along the route plotted high-altitude navigation and electronic bomb scoring runs, they telephoned the raw data to the scoring team at competition headquarters, made up of experts from SAC's 1st Combat Evaluation Group. These people, working all night, converted the data into official scores. Low-altitude navigation was scored by radarscope photography from each aircraft's own equipment. All aircraft except the B-58s carried a monitor to make sure all procedures and restrictions were observed.

The weather near the targets started bad and got worse. Finally, the last five aircraft were ordered to abort for safety and return without scores.

Top score that first night went to the 91st Bomb Wing from Glasgow, Mont. They were the youngest crew competing, flying a B-52D, one of the oldest bombers in the competition.

Tuesday there were fewer thunderstorms, but the weather scouts reported winds over 100 knots and high clouds on the high-altitude leg. The decision was: Go.

On schedule, the final twenty-two aircraft, plus the five left from the night before, took off in order. One of these bombers, from the 319th Bomb Wing, had an engine changed that day to make the mission. It was a long night and part of the next morning before all the scores were in. Still tops was the 91st Bomb Wing, nosing out a supersonic B-58 of the 305th Bomb Wing, Bunker Hill AFB, Ind., by a fraction of a point.

The third day was spent in hard work tuning up aircraft, rehashing radar offset points, and correcting minute bombing errors. The next two nights were the payoff.

Focal point at competition headquarters auditorium was 28- by 100-foot scoreboard. This was hot spot on mission nights when support teams, such as this one from 464th Wing, sweated out their crews until early morning hours. Auditorium was also scene of opening ceremony and awarding of trophies.

The 379th Bomb Wing, Wurtsmith AFB, Mich., the team that had the second highest score on the first day of the competition, took the lead on the third night. Now the other units had a final score to shoot at. Out of 1,500 possible points, the 379th had 1,211.5 on the board.

On both the third and fourth nights, jetstream winds and high clouds again covered the high-altitude navigation route and made celestial observations almost impossible. Some crews flew 400 miles without an observation. But the scores were still *improving*. One unit, the 28th Bomb Wing from Ellsworth AFB, S. D., broke a competition record on the final night with two "shacks"—direct hits—in a row on its second pair of

When aircrews weren't flying or sleeping, they were conferring with other members of their teams to work out maintenance problems and plan next missions. At left, 19th Wing crew is met at 4:00 a.m. by maintenance team and staff on ramp after first mission. This crew had Hurricane Betsy to contend with just before competition.

Maj. R. B. Haynes, aircraft commander, 19th Bomb Wing, shows intense interest mixed with fatigue at 5:00 a.m. debriefing after first all-night mission.

First Lt. Albert F. Fowler, copilot on the 19th Bomb Wing crew, debriefs with maintenance team after first mission despite fatigue from long flight.

Capt. Gerald L. Emerald, an Electronic Warfare Officer on one of the crews, slumps with fatigue after first 2,500-mile mission, which lasted six hours.

targets. After the scores were all in, the winner was well out in front—the 454th Bomb Wing of Columbus, Miss. After standing third on their first sortie, on Tuesday, they had beaten the field on their second and taken the Fairchild Trophy with a total score of 1,226 points. The 379th was second and the 305th was third.

The 28th, with their two "shacks," took the honors for the best single mission total. The best B-47 unit was the 380th Strategic Aerospace Wing from Plattsburgh AFB, N. Y. The winning crews, members, and units received trophies from General Ryan.

Afterward, the 454th crew and maintenance team were quietly elated. "It was a team effort from the time they pulled the chocks," said Maj. Max L. Mihura, aircraft commander.

Important to SAC were the ninety-three consecutive on-time takeoffs and twenty-five sorties without a maintenance write-up. The 68th, 379th, and 19th Bomb Wings, and the 92d Strategic Aerospace Wing flew all their missions without a single maintenance discrepancy.

Most important, however, were the excellent bombing scores obtained under adverse conditions and the spirit of comradeship and teamwork that was revealed in every unit in the competition.

The greater part of the nuclear firepower of the free world still rests in the bomb bays of SAC's B-47s, B-52s, and B-58s. SAC's Fourteenth Bombing-Navigation Competition reconfirmed that it is in good hands. —END

All competitors came to the meet with confidence and the will to win. Calm but intense professional concern was the order of the day as shown by this support team interrogating its crew after first mission.

The 454th Bomb Wing from Columbus AFB, Miss., took home Fairchild Trophy. Above, Maj. Max L. Mihura, aircraft commander.

THE BULLETIN BOARD

News and Comment about Air Force People . . .

By Jackson V. Rambeau

AFA DIRECTOR OF MILITARY AND INDUSTRIAL RELATIONS

Mac the Knife

This is the time of the year when the Pentagon must submit to the White House its budget for the next fiscal year. It invariably produces cries of surprise and anguish as many cherished projects and programs are lopped off at the roots. This year, to meet the steeply rising costs of the war in Vietnam, the cuts will be deeper than ever.

Since the 1966 budget went into effect in July, Congress has appropriated $1.7 billion in supplemental funds to support military operations in Vietnam. But Sen. John Stennis, the Mississippi Democrat on the Senate Armed Services Committee, estimates that when the cost of replacing supplies and equipment stripped from other units are added on, the total may reach $10 billion or more.

Congress is apparently ready to pay the bills, whatever they may be. But President Johnson and Secretary of Defense McNamara, with an eye toward the political repercussions, are determined to present a budget that reflects all possible economies to offset the increases required for Vietnam.

The list of base closings soon to be announced, for example, will reportedly equal or exceed last year's.

The Air Reserve Forces are apparently in for some severe cuts. One measure being seriously considered as we went to press is to transfer 144 Air National Guard F-100C fighters to the Tactical Air Command and to dissolve the ANG groups now flying them. These are among the nine groups which had been directed to achieve peak combat readiness, with one hundred percent manning and equipping, to be ready for possible mobilization by the end of the year.

But now, instead of calling up Guardsmen, personnel to operate the Supersabres will apparently come, directly or indirectly, from SAC B-47 units whose deactivation is being accelerated. USAF has announced that TAC will get 401 pilots from this source in the next eight months. Some will go into troop carrier units, along with 191 navigators, to meet the increased aircrew requirements in stepping up TAC's C-130 utilization rate from one and a half to five hours a day. MATS, whose transport utilization rate is being boosted from five hours a day to eight, is being assigned 493 pilots and 100 navigators from SAC, and Air Training Command will get fifty-eight pilots as instructors for its accelerated pilot training program.

Hq. USAF and TAC are resisting the move to build up the Supersabre force. They want to replace the present F-100s with more modern fighters, not add more. But DoD apparently reasons that F-100s are adequate to meet the immediate need for fighters and would postpone the expenditure of $200 million or more for equivalent new aircraft.

In other economy moves, meanwhile, DoD is expected to order elimination of fifteen troop carrier units in the Air Force Reserve during the next fiscal year, and three transport groups from the Air Guard. More cuts in these mis-

Gen. Curtis LeMay (second from left) receives congratulations from Vice President Hubert Humphrey after receiving the Collier Trophy from the Vice President in a ceremony at the Executive Office Building on October 21. At right are Mrs. LeMay and Vernon C. Myers, Publisher of *Look* magazine. The trophy, awarded annually for "outstanding contributions to aeronautics or astronautics," is cosponsored by *Look* magazine and the National Aeronautic Association.

Col. Robert L. Stephens, left, and Lt. Col. Daniel André are shown receiving the 1965 Thompson Trophy Award from Horace A. Shepard, President of Thompson Ramo Wooldridge Inc., in a ceremony at the Mayflower Hotel, Washington, D. C., on October 29. Colonel Stephens, pilot, and Colonel André, fire-control officer in the YF-12A, set a new world absolute speed record. The two men were also awarded the Distinguished Flying Cross earlier in the day.

sion areas are in prospect, until the Guard and Reserve are left with sixteen transport units each. The Air Force Reserve will also lose all its sector headquarters, and the headquarters of the 1st and 2d Reserve Regions, now at Stewart AFB, N. Y., and Andrews AFB, Md., respectively, will be consolidated.

These plans would indicate that the Defense Department is embarked on a course to whittle down the size of the Air Reserve Forces as it is already doing in the Army Reserve components. In Mr. McNamara's view, speedy action is essential, for Rep. F. Edward Hébert (D.-La.), Chairman of the Reserve Forces Subcommittee of the House Armed Services Committee, has threatened to introduce legislation early next year which will spell out in law the size and structure of the Reserve Forces.

If Mr. McNamara does lop off troop carrier and transport units, he will have to answer, too, to another House Armed Services subcommittee under Rep. Mel Price of Illinois, which is reviewing military airlift capability.

Retirement: Costs and Taxes

Proposals for a contributory retirement system for members of the armed forces have been vetoed by a cabinet-level group studying all federal retirement programs.

The group discussed suggestions that the military retirement program be put on a self-sustaining basis by regular payroll deductions to be paid into a retirement fund. A raise in military pay equivalent to the annual payment would have accompanied the action.

Civil service personnel, for example, contribute six and a half percent of their annual gross pay toward their retirement. When an employee leaves government service, his contributions are returned to him, unless he has already qualified for retirement pay.

The study group concluded, however, that because less than one out of ten military men stay in the service until they are eligible to retire, the job of collecting and then refunding retirement deductions would cost the government more than the present noncontributory system.

The group did recommend, however, that Reserve officers should be retired in the highest grade in which they actually served, which would eliminate the monetary benefits of the present "hip-pocket" ROPA promotion for Reservists on active duty. It also urged that the military survivors' benefits program be amended to make it more parallel to civil service provisions.

In that connection, the House of Representatives passed unanimously, on the last day of its session this fall, a bill which would eliminate the federal tax on that portion of retirement pay deducted to provide for survivors' benefits. The bill was introduced by Rep. Wilbur Mills (D-Ark.), Chairman of the House Ways and Means Committee, to correct what he termed an "oversight" in the original legislation setting up the 1954 Uniformed Services Contingency Option Act, now called the Retired Serviceman's Family Protection Plan.

At present, a serviceman who elects to take a reduced annuity in order to assure an income for his family in event of his death must pay income tax on the full amount of his retired pay before the deduction. The bill would tax only the amount he actually receives, making it comparable to taxes paid by civil service retirees and their families.

The bill's provisions would be retroactive to the beginning of the program in 1954. Thus, its passage will result in a substantial tax refund, or credit on future taxes, for those retired personnel or their survivors participating in the plan.

When Congress reconvenes in January, AFA will join in urging the Senate to move as quickly as possible to enact this legislation. There should be no opposition.

Secretary of the Air Force Harold Brown congratulates Gen. John D. Ryan at Second Annual USAF Cost Reduction Program Award ceremonies at Offutt AFB, Neb., on October 27. The SAC Commander received his command's award for reporting more than $200 million in savings in FY 1965.

Why Cool Them Off?

Members of AFA's Retired Council are working with the Defense Department and Congress to seek amendments to the dual-compensation act, which would eliminate the six-months' "cooling-off" period before a retired serviceman can take a civilian job with the armed forces, and to end discrimination against retired Regulars who must take a cut in retired pay if they accept a federal civil service position. As we noted last month, these provisions are seriously hampering the Defense Department in its program to hire 60,000 qualified civilians to replace 75,000 military personnel in noncombat jobs. Unquestionably, the best source of qualified men to fill these jobs is the growing pool of retired military personnel.

Comeback

Personnel administration in the armed forces has been given a boost with establishment of a Deputy Undersecretary for Manpower, Personnel, and Reserve Forces in each of the services. In 1958, when each service was directed to cut the number of its Assistant Secretaries, USAF chose to reduce the post of Assistant Secretary for

(Continued on following page)

For outstanding contributions to Air Force officers' education in frequent lectures at the Air War College, Dean G. Acheson, former Secretary of State, received the Air University Award from Lt. Gen. John W. Carpenter, III, right, AU Commander, and Maj. Gen. Arno Luehman, head of AWC.

Personnel to that of a Special Assistant to the Secretary of the Air Force. The recent DoD action standardizes personnel activities in the office of the Undersecretary, with the manpower deputy on the same pay and protocol level as Assistant Secretaries. In the Air Force, the post is presently held in an acting capacity by John A. Lang, Jr., who is also Administrative Assistant to the Secretary.

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AWARDS—To **General Curtis E. LeMay,** USAF (Ret.), former USAF Chief of Staff, the Collier Trophy, cosponsored by the National Aeronautic Association and *Look* magazine, for "outstanding contributions to aeronautics or astronautics," presented by Vice President Hubert Humphrey in Washington, October 21.... To **Col. Robert L. Stephens and Lt. Col. Daniel André,** Director and Deputy Director of USAF's YF-12A task force, Edwards AFB, Calif., the Thompson Trophy, for setting the world speed record of

Maj. Gen. Rollen H. Anthis, former Commander of the 2d Air Division in Vietnam, has been named Commander of USAF's Headquarters Command at Bolling AFB, D. C. He succeeds Maj. Gen. Brooke E. Allen, HEDCOM Commander since 1959, who has retired.

2,062 mph in a YF-12A last May. The trophy was presented in Washington D. C., October 29. On the same day, the Distinguished Flying Cross was presented by USAF Chief of Staff J. P. McConnell to Colonels Stephens and André, and three other members of the YF-12A task force who set additional world marks—**Lt. Col. Walter F. Daniel** and **Majors James P. Cooney and Noel T. Warner.**

To the **317th Fighter Interceptor Sq.,** Elmendorf AFB, Alaska, the Hughes Trophy, emblematic of USAF's top air defense squadron, presented in Anchorage, November 6, to 317th Squadron Commander Col. Marvin N. Good. . . . To **Dean G. Acheson,** former Secretary of State, the Air University Award for outstanding contributions to Air Force officer education, presented at Maxwell AFB, Ala., October 29 by Lt. Gen. John W. Carpenter, III, AU Commander.

Twelve military and civilian personnel were honored at the Second Annual USAF Cost Reductions Award Ceremony at Offutt AFB, Neb., late in October, receiving certificates of achievement from General McConnell. Dr. Harold Brown, Secretary of the Air Force, presented plaques to fourteen major commands for outstanding cost reduction program management. Individuals receiving awards were **Norris G. Adams** and **Walter E. Henzi,** Ogden AMA, Hill AFB, Utah; **TSgt. Richard J. Berry,** Yokota AB, Japan (now retired); **MSgts. Wayne R. Carle** and **Robert L. Steward** and **TSgt. Frederick H. C. Brenner,** MacDill AFB, Fla.; **Clarence W. Meyer,** Mobile AMA, Brookley AFB, Ala.; **Lt. Col. Glenn E. McClure,** Hq. ATC, Randolph AFB, Tex.; **TSgt. John Navitsky,** Wheelus AB, Libya (now of Barksdale AFB, La.); **Barton D. Neal, Jr.,** San Antonio AMA, Kelly AFB, Tex.; **SSgt. Thomas E. Ragan,** USAF Academy, Colo.; and **Roger D. Umland,** Truax Field, Wis.

PARTING SHOTS—Quotas for full-time studies at civilian colleges and universities under auspices of the **Air Force Institute of Technology** are only fifty-eight percent filled. AFIT can place 700 more candidates, Air University reports. To stimulate applications, fifty spaces will be made available to candidates to attend universities near their home stations, to which they would return upon completing their studies.

Contracts will soon be let for **3,390 more family housing units** at eighteen USAF installations, totaling more than $64 million. **Clark AB in the Philippines** will get 400 units; 300 each will go to **Beale AFB, Calif.,** and **Eglin AFB, Fla.,** and 250 to **Andrews AFB, Md., Albrook AFB, Canal Zone,** and the **Hickam-Wheeler complex in Hawaii.**

Design and criteria for award of the **Vietnam Service Medal** have been approved by DoD. The ribbon, yellow with green borders and three red vertical stripes, will go to members of the armed forces who have served in Vietnam **since July 3, 1962.** Those who served there before that date may choose either the new medal or the **Armed Forces Expeditionary Medal.**

Maj. Gen. Robert E. L. Eaton, USAF (Ret.), whose last post before he retired in 1962 was as Assistant Chief of Staff for Reserve Forces in the Pentagon, has been appointed by AFA President Jess Larson to the Reserve Council. General Eaton, who also serves AFA as adviser to the Airmen's Council, brings a wealth of experience to the Reserve Council. In addition to his background in planning and directing Reserve Forces programs, he is well known in Congress, having served as USAF's Director of Legislative Liaison in the mid-1950s.

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SENIOR STAFF CHANGES . . . Maj. Gen. Rollen H. Anthis, from Special Asst. for Counterinsurgency and Special Activities, The Joint Staff, JCS, to Cmdr., Hq. Cmd., USAF, Bolling AFB, Washington, D.C., replacing Maj. Gen. Brooke E. Allen, who is retiring . . . **Brig. Gen. William T. Daly,** Dep. Cmdr. for Direct Air Support, Hq. 9th AF, TAC, Shaw AFB, S.C., assigned additional duty as Dep. for Operations, 9th AF . . . **Brig. Gen. William D. Dunham,** Dep. Cmdr. for Direct Air Support, Hq. 12th AF, TAC, Waco, Tex., assigned additional duty as Dep. for Operations, 12th AF.

Brig. Gen. Robert J. Gibbons, from DCS/Intelligence, USAFE, to Director, J-2, USSTRICOM, MacDill AFB, Fla., replacing Brig. Gen. Chesley G. Peterson . . . **Maj. Gen. Jamie Gough,** from Director, J-5, USSTRICOM, MacDill AFB, Fla., to DSC/Operations, USAFE, replacing Brig. Gen. Luther H. Richmond . . . **Brig. Gen. David C. Jones,** Cmdr., 33d Tac Fighter Wg., TAC, Eglin AFB, Fla., reassignment orders amended to IG, Hq. USAFE, Wiesbaden, Germany . . . **Brig. Gen. Henry B. Kucheman, Jr.,** from Dep. for Unmanned Systems and additional duty as Dir. for Communications Satellite Systems, Hq. SSD, AFCS, Los Angeles, Calif., to Dep. for Limited War, Hq. ASD, AFSC, Wright-Patterson AFB, Ohio . . . **Brig. Gen. Chesley G. Peterson,** from Dir., J-2, USSTRICOM, MacDill AFB, Fla., to Dir., J-5, USSTRICOM, replacing Maj. Gen. Jamie Gough . . . **Brig. Gen. Luther H. Richmond,** from DSC/Operations, USAFE, to Dep. Cmdr., 17th AF, USAFE, Ramstein AB, Germany . . . **Brig. Gen. Eugene L. Strickland,** from Asst. to DCS/Personnel, Hq. USAF, Washington, D.C., to Dir., International Staff, Inter-American Defense Board, Washington, D.C.

Brig. Gen. James H. Thompson, Dep. for Base Activation, Hq. 2d Air Div., PACAF, Vietnam, is also Dep. for Materiel, 2d Air Div. . . . **Brig. Gen. William A. Tope,** from Dir. for Personnel, J-1, The Joint Staff, JCS, to Dir., J-5, US Southern Cmd., Albrook AFB, C. Z.

PROMOTIONS . . . To **brigadier general:** Richard S. **Abbey,** Henry B. **Kucheman,** Jr., Francis W. **Nye,** and John A. **Des Portes.** To **major general:** William D. **Greenfield.**

RETIREMENTS . . . Maj. Gen. Brooke E. **Allen,** Brig. Gen. Milton H. **Ashkins,** Maj. Gen. Robert S. **Brau,** Brig. Gen. James W. **Chapman, Jr.,** Maj. Gen. H. C. **Kristofferson.** —END

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DESIGN FOR SURVIVAL. By Gen. Thomas S. Power. Best-seller by the former Commander in Chief of SAC, published after his retirement. A crucial analysis of our nuclear strength and its role in preserving peace. Publisher's list price $5. **MEMBER'S PRICE $4.50.**

SOVIET STRATEGY AT THE CROSSROADS. By Thomas R. Wolfe, a retired Air Force colonel, formerly our Air Attaché in Moscow. Publisher's list price $5.95. **MEMBER'S PRICE $4.95.**

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PLAN NOW TO ATTEND AIR FORCE NATIONAL CONVENTION MARCH 22

GENERAL INFORMATION

Air Force Association's 1966 National Convention will be an anniversary affair, with a reunion atmosphere prevailing, in recognition of AFA's 20th year and, more important, in tribute to the 20th anniversaries of the Air Force combat commands—SAC, TAC, and ADC.

Major Convention events will include Aerospace Day at Carswell AFB, a SAC B-52 base near Fort Worth. Here, on Thursday, March 24, the annual Chief of Staff's Luncheon will be held in a huge B-36 hangar surrounded, inside and out, by Air Force displays of the latest aerospace equipment. And here Convention delegates will visit the flight line to view action-packed air demonstrations.

The dramatic Air Force Honors Night program, featuring the annual presentation of major Air Force awards, will be held in the magnificent new Great Hall of the Apparel Mart near Dallas on Friday, March 25.

All other events will be held at the Sheraton-Dallas and Statler Hilton Hotels in Dallas, two of the six Convention hotels.

AFA HOTELS - MOTOR HOTELS AND ROOM RATES

HOTEL	Single	Twin & Double	1-B/R Suite	2-B/R Suite
Adolphus	$ 6.50-12.50	$10.00-19.00	$20.00-29.00	$34.50-85.00
Baker	$ 6.50-11.00	$ 9.50-15.00	$25.00-28.00	$36.00-66.00
*Cabana	$13.00-14.00	$17.00-19.00	$43.00	$100.00
*Marriott	$10.00-14.00	$13.00-18.00	$35.00-75.00	$60.00-90.00
Sheraton	$10.50-15.00	$15.00-20.00	$38.00	$53.00-100.00
Statler	$ 8.00-10.00	$13.50-20.00	$29.50-42.50	$49.50-59.50

*Motor hotels. **NOTE:** All of the hotels and motor hotels listed offer free parking for registered guests.

Main gate, Carswell AFB, Fort Worth, Texas

B-36 hangar, Carswell AFB, location of Memorial Service, Chief of Staff Luncheon, and Air Force displays

HOTEL RESERVATION FORM • 1966 AIR FORCE ASSOCIATION CONVENTION

DALLAS - FORT WORTH, TEXAS · MARCH 22-25

TYPE OR PRINT

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FIRM/ORGANIZATION _____

MAIL ADDRESS _____

CITY & STATE _____

1st Choice Hotel _____ 2nd Choice Hotel _____ 3rd Choice Hotel _____

Type Room—Be specific for double-bed or twin-bed room. _____ Desired Rate _____

Others Sharing Room _____

Arrival Date and Hour _____ Departure Date _____

IMPORTANT

Please complete this form in FULL and mail to the following address:

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HOUSING OFFICE
1507 Pacific Street
Dallas, Texas 75201

Be sure to list first, second and third choices of hotels, and arrival DATE and TIME. If room is not available at rate requested, next nearest available rate will be assigned. For arrivals after 6:00 p.m., reservations must be guaranteed.

ASSOCIATION'S 20th ANNIVERSARY
DALLAS-FT. WORTH, TEXAS
-25, 1966

TENTATIVE PROGRAM

Tuesday, March 22

Reunion Fly-in of Former Air Force Pilots

Wednesday, March 23

Opening Ceremonies and AFA Award Presentations
Chief Executives' Event (Invitation Only)
AFA Business Sessions
Outstanding Airmen Reception and Dinner

Thursday, March 24

Aerospace Day at Carswell AFB
- Memorial Service
- Air Force Displays
- Chief of Staff's Luncheon
- Air Demonstrations

Reception for Air Force Secretary and Chief of Staff

Friday, March 25

Secretary of the Air Force's Luncheon
Aerospace Symposium
Air Force Honors Night Program

Dallas Apparel Mart, location of Air Force Honors Night program

ADVANCE REGISTRATION FORM FOR 1966 AFA NATIONAL CONVENTION

Dallas-Fort Worth, Texas • March 22-25

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Check the categories with which you are identified:

☐ **Military** ☐ **Industry** ☐ **AFA Member**
☐ **Government** ☐ **Education** ☐ **Other**

NOTE: Everyone is requested to register **IN ADVANCE** to facilitate planning and the processing of registrants in Dallas.

Make checks payable to Air Force Association, and mail to AFA, 1750 Pennsylvania Avenue, N.W., Washington, D.C. 20006.

☐ REGULAR REGISTRATION $50.00
($60 at Convention).

☐ MILITARY REGISTRATION $40.00
($50 at Convention).

☐ DELEGATE REGISTRATION $40.00
(Official AFA Delegates Only).

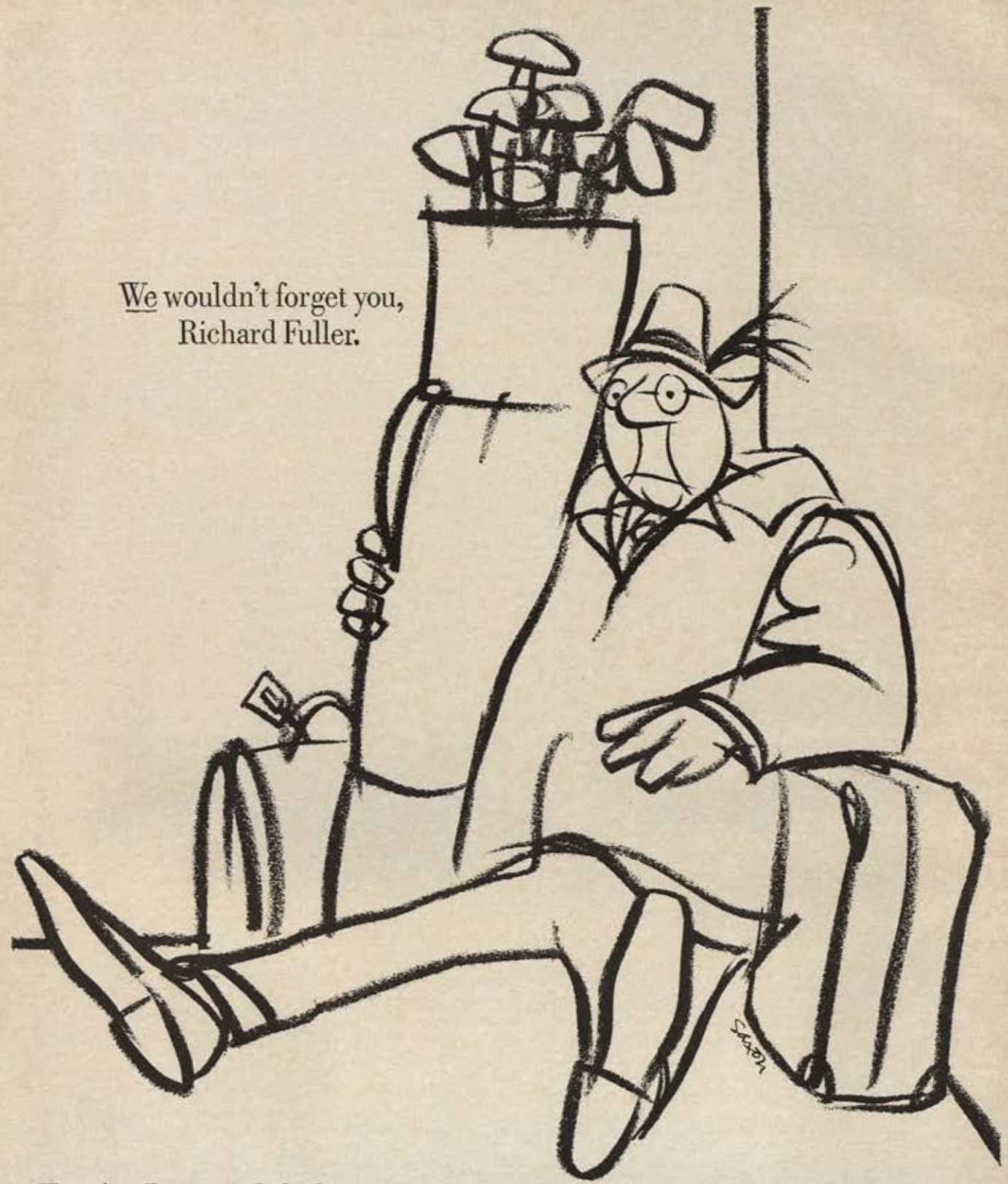
Includes tickets and credentials to all Convention events including Aerospace Luncheon, Anniversary Luncheon, Reception for AF Secretary and Chief of Staff, Aerospace Day at Carswell AFB, meetings, and Air Force Honors Night Banquet.

☐ Additional tickets for AF Honors Night Banquet ... $25.00

☐ Charter Bus Service to Aerospace Day at Carswell AFB and return ..... $ 2.00

ADVANCE REGISTRATIONS CLOSE MARCH 18

Do not mail after March 16. Military registration after March 18 will be $50.00.
Regular registration after March 18 will be $60.00.



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(And even the order they're waiting in. That's how we know you were first.)

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AFA NEWS

ORGANIZATION OF THE MONTH

The Utah State Organization, cited for consistent and effective programming which has focused widespread community attention on the Air Force Association mission.

More than 2,000 **Air Force Logistics Command employees** and their families were guests at the recent **Utah State AFA Organization's "Howdy Pardner Day."**

The event climaxed "Howdy Pardner Week" proclaimed by **Utah Governor Calvin L. Rampton** to welcome all AFLC transferees to the Ogden Air Materiel Area from AMAs at Middletown, Pa.; Mobile, Ala.; Rome, N.Y.; and San Bernardino, Calif. Each new employee or transferee was sponsored by an AFA member.

The "Howdy Pardner Day" program began with a welcome by **Maj. Gen. T. Alan Bennett,** Ogden AMA Commander. Following a Western chuckwagon brunch of ham, eggs, and hot cakes, the program continued with foot races, sack races, rides, dancing, and a cartoon theater. More than 100 prizes and several thousand balloons and soft drinks were distributed to children who attended the celebration.

Ray Yates, Utah State AFA President, credited much of the program's success to officials of several local Chambers of Commerce, the Jaycees, the Ogden Men's Civic and Social Association, and the "Hello Dollies" of the Beta Sigma Phi Sorority, who assisted members of the Utah Chapters in handling the event.

* * *

In conjunction with the Eighteenth Anniversary of the Air Force, AFA's **Chateauroux, France, Chapter** and the personnel of Chateauroux AS played host to sixty-five French orphans and six of the orphanage staff for a "Visit with the Air Force" day on the base. The children, all boys, were from the Maison d'Enfants Notre Dame de Beaulieu and ranged from four to fourteen years of age.

The boys were met at the base by **Col. Francis J. Pope,** base Commander; **Wharton C. Cochrane,** Chapter President; **Col. Eugene Ecklund,** base Vice Commander; and **Arnold Teunon,** Chapter Treasurer.

After a tour through the fighter repair facility, where they saw RF-101 Voodoos and F-100 Supersabres on the repair line, the boys were given a walk-around tour of the C-133 Cargomaster and C-124 Globemaster and a walk-through tour of a C-130 Hercules.

Following a traditional American picnic lunch of hot dogs, soda pop, baked beans, and potato chips, they were taken to the base recreation center for the entertainment portion of the program. This consisted of selected Air Force films on US airpower, and thirty minutes of "rock-and-roll" music by the Airmen's Annex Combo.

While the boys enjoyed a treat of ice-cream bars, they witnessed a one-man air show by **Capt. Samuel Van Dyke, Jr.,** base operations officer, in a T-33.

The Chateauroux Chapter and the base personnel are to be commended for this excellent program, which was both educational and good community relations.

* * *

The **Fresno, Calif., Chapter's** recent **Air Force Honors Night Banquet,** held to commemorate the Eighteenth Anniversary of the Air Force, also provided a platform for the Chapter and other

(Continued on following page)

Maj. Gen. T. Allan Bennett, Commander of the Ogden Air Materiel Area, AFLC, displays the "Howdy Pardner" apron presented him by Utah AFA President Ray Yates, right, and Bert Blodgett, Ogden Chapter Vice President, at left.

Chateauroux, France, Chapter President Wharton Cochrane escorts French orphans and orphanage staff members on a tour of Chateauroux Air Station. The sixty-five boys are from the Maison d'Enfants Notre Dame de Beaulieu. The visit was part of the Chapter's AF Anniversary observance.

At the Fresno, Calif., Chapter's recent Air Force Honors Night Banquet, Col. Edward F. Roddy, left, receives the Fresno Chapter's "Man of the Year" award from Lt. Gen. Herbert B. Thatcher, ADC Commander. At right is Chapter President S. Samuel Boghosian, who also received an award.

local Air Force units to honor their outstanding members.

Lt. Gen. Herbert B. Thatcher, Commander of the Air Defense Command, Ent AFB, Colo., and principal speaker of the evening, spoke proudly of ADC's part in keeping America strong. General Thatcher also presented the Fresno Chapter's "Man of the Year" award to **Col. Edward F. Roddy,** Senior Adviser to the California ANG.

S. Samuel Boghosian, Fresno Chapter President, received a plaque for his effort in arranging the outstanding program.

More than 400 persons attended the banquet, including **Lt. Gen. Roderic Hill,** California Adjutant General; **Maj. Gen. Carroll W. McColpin,** Commander, 28th Air Division (ADC), Hamilton AFB; **Brig. Gen. I. G. Brown,** Assistant Chief, National Guard Bureau for ANG; and **Brig. Gen. George W. Edmonds,** Air Deputy, Office of the California Adjutant General.

Jack Withers, President of AFA's **California Organization,** served as Master of Ceremonies. Music for the evening was supplied by the 28th Air Division Band.

In proclaiming Air Force Week in Fresno, **Mayor Floyd H. Hyde** urged all citizens to observe the Anniversary by visiting local Air Force units and displays.

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In keeping with the change in the annual calendar adopted at the National Convention, AFA's State Organizations will now hold their conventions in the fall. The first of these was held during October.

The **Louisiana Organization** held its convention at the Belmont Motor Hotel in Baton Rouge. A reception and luncheon preceded the convention business sessions. Highlight of the luncheon program was the presentation of a report on Vietnam by **Capts. David Sands** and **Donald Kilgus.** Both of these officers recently returned from duty in Vietnam and are now stationed at England AFB, La. They combined the use of color slides and motion pictures with excellent commentary for an outstanding presentation.

Kelley Womack presided over the business session at which the following officers were elected for 1966: **Mike Bearden,** President; **John Miller** and **Alec Kovacs,** Vice Presidents; and **Charles D. Fine,** Secretary-Treasurer.

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New Jersey's State AFA Organization held its convention at the Empress Motel in Asbury Park.

The evening cocktail party honored **Maj. Gen. Emmett M. Tally, Jr.,** who represented **Hq., Air Force Logistics Command,** Wright-Patterson AFB, Ohio. General Tally gave the principal address at the Awards Banquet.

Among those attending the Santa Monica, Calif., Chapter's recent brunch were, from left, Gen. Jimmy Doolittle, a former AFA President; Robert Lawson, Chapter Second Vice President; Vera B. Wright, Chapter First Vice President; Col. James D. Hunter, Chief, SAFOI Los Angeles, and guest of honor; Mrs. Doolittle; and Chapter President T. W. "Si" Simons.

The State Organization's highest annual award, the **Airpower Trophy,** was presented to the **Newark Contract Management District, Eastern Contract Management Region, Air Force Systems Command.** Earlier in the day, **Col. Leo F. Deegan,** Commander of the Newark Contract Management District, presented a briefing on its activities.

Awards for outstanding achievement in their respective fields went to **Arde-Portland, Inc.,** of Paramus; **Monmouth Electric Co.** of Neptune; **Airtron, Inc.,** of Morris Plains, a division of Litton Industries; **Captive Seal, Inc.;** and **Aerospace Group, General Precision, Inc.**

At the closing business session, **Salvatore Capriglione** was reelected President. Also reelected were **William Caputo,** First Vice President, and **Lloyd Nelson,** Secretary. Other officers elected were: **Amos Chalif,** Second Vice President; **Mrs. Mamie Kingsley,** Treasurer; **William L. Bormirski** and **Enrico Carnicelli,** Organizational Directors; and **John Russo,** Sergeant-at-Arms.

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The **Ponderosa Inn, Burley, Idaho,** site of the very successful **"First Aerospace Day of Idaho"** program, was also the site of the recent **Idaho State AFA Convention.**

The convention luncheon featured a film of activities of the **Flight Test Center, Edwards AFB, Calif.,** with commentary by **Capt. Joe Engle,** X-15 pilot and youngest US astronaut.

Captain Engle also served as Toastmaster at the **Annual Awards Dinner,** at which **Maj. Gen. Robert G. Ruegg,** Assistant Deputy Chief of Staff, Systems and Logistics, Hq. USAF, spoke on the dramatic changes USAF has undergone in the last twenty-five years.

George Forschler, State President, presented **President's Awards** to **R. C. Ostrander, James Bagwell, Edward Morgan, W. R. Taylor, Dr. Donald F. Kline, Warren B. Murphy, Bruce Young,** and **Haven Gierisch.** Awards of appreciation were presented to **C. R. Taylor, Robert Cooper,** the **Rev. John Pickrell, Dorlene Ostrander, Wayne Konrad,** and **Thomas Church.**

The convention delegates reelected President Forschler and First Vice President Kline. Other officers elected to serve for 1966 were: **James Bagwell,** Second Vice President; **Charles Barnes,** Third Vice President; **Donna Rae Anderson,** Secretary; and **Bruce Young,** Treasurer.

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CROSS COUNTRY . . . The **New York City Chapter No. 1** has contributed funds to the Manhattan CAP Cadet Squadron IV for the establishment of a rifle club and a model airplane club. Also, in support of the CAP recruiting program, the Chapter will award two watches, one to the cadet who achieves the highest grades, and one to the cadet who recruits the most cadets during the year. . . . AFA's **Northwest Regional Vice President Dale Hendry** announced the appointment of **Clarence E. Hall,** a captain with West Coast Airlines, as Organizational Director for the State of Washington. . . . An AFA love story—**Ed Howard,** a Past Commander of the **Greater St. Louis Squadron,** and **Riki Wilson,** Secretary of the **Greater St. Louis Chapter,** who met at a meeting of the Chapter, were married recently. To make it AFA'cial, **Monsignor William F. Mullally,** former AFA National Chaplain and National Director, performed the ceremony. —DON STEELE

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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TWO LIFE PROGRAMS . . . .

New Servicemen's Group Life Insurance Act Provides You $10,000 Basic Protection for only $2 Per Month

The Servicemen's Group Life Insurance Act, strongly supported by AFA both before the President's Cabinet Committee and the Congress, was signed into law on September 29, 1965. The Act automatically insures, as of that date, all active-duty members of the Uniformed Services in the amount of $10,000 unless they elect, in writing, either not to be insured, or to be insured for only $5,000. AFA supported this legislation because we knew that most servicemen needed more protection and, because of the size of the group, the cost would be significantly lower than any other plan of group insurance that could possibly be made available to our military forces. AFA has prepared a folder outlining provisions of the plan in detail. For a free copy, simply write AFA's Insurance Division.

1

Now, when you ADD AFA Military Group Life Coverage to your insurance estate, you can probably CLOSE THE REMAINING GAP in your Family's Insurance Protection

AFA Military Group Life Insurance provides you with up to $20,000 protection at a premium of $10 per month (reduced by payment of dividends for three consecutive years). It offers these valuable benefits:

2

NEW, BIGGER BENEFITS AT THE SAME LOW COST

AGE	NEW BENEFIT SCHEDULE*	EXTRA ACCIDENTAL DEATH BENEFIT*
20-39	$20,000	$12,500
40-44	$17,500	
45-49	$13,500	
50-59	$10,000	
60-64	$ 7,500	

** A flat sum of $15,000 is paid for all deaths which are caused by an aviation accident (civilian or military) in which the insured is serving as pilot or crew member of the aircraft involved. In this case, the additional accidental death benefit does not apply.*

Exclusions—For Your Protection

In order to provide maximum coverage at minimum cost for all participants, there are a few exclusions which apply to this insurance. They are:

Death benefits for suicide or death from injuries intentionally self-inflicted while sane or insane shall not be effective until your policy has been in force for twelve months. The Accidental Death Benefit shall not be effective if death results: (1) from injuries intentionally self-inflicted while sane or insane, or (2) from injuries sustained while committing a felony, or (3) either directly or indirectly from bodily or mental infirmity or poisoning or asphyxiation from carbon monoxide, or (4) during any period while the policy is in force under the waiver of premium provision of the master policy, or (5) from an aviation accident (civilian or military) in which the insured was acting as pilot or crew member of the aircraft involved.

. . . TO PROVIDE THE PROTECTION YOUR FAMILY NEEDS . . .

EQUAL COVERAGE FOR FLYING AND NON-FLYING PERSONNEL*

All participants are now insured for the same basic amounts whether or not they are on flying status.* *This eliminates the penalty of lower coverage for the man on flying status* whose death is caused by illness or ordinary accident. The only exception* to this provision is that a flat sum of $15,000, regardless of age, will be paid for deaths caused by aviation accident (military or civilian) while the insured is serving as pilot or crew member of the aircraft involved.

NO WAR CLAUSE!

There is no war clause, hazardous duty restriction, geographical limitation, or "combat zone waiting period," applied to your coverage. AFA believes that its policyholders should be protected wherever they are assigned for duty.

$12,500 EXTRA FOR ACCIDENTAL DEATH

An additional benefit of $12,500 will now be paid for accidental deaths—*even those caused by aviation accidents* except when the insured is serving as pilot or crew member of the aircraft involved. This is a *substantial increase* in the accidental death benefit for every age group.

NET COST REDUCED BY DIVIDENDS FOR THREE CONSECUTIVE YEARS

A 20% DIVIDEND paid to all 1964 participants reduces net cost of their insurance to $8 per month. This dividend was paid *in addition* to the major benefit increases described above, and marked the third consecutive year of dividends on AFA Group Life Insurance.

Other Major Advantages of AFA MILITARY GROUP LIFE INSURANCE

• KEEP YOUR COVERAGE AT THE LOW GROUP RATE (up to age 65) even if you leave the service, provided your insurance has been in force for one year prior to leaving extended active duty, or three years prior to leaving the National Guard or Ready Reserve.

• ELIGIBILITY. All active-duty personnel of the U.S. Armed Forces (under age 60) and all members of Ready Reserve or National Guard (under 50) are eligible for this insurance.

• GUARANTEED CONVERSION PRIVILEGE regardless of your health.

• NO SPECIAL MEDICAL EXAMINATION is required.

long as you remain totally disabled.

• WAIVER OF PREMIUM FOR DISABILITY prior to age 60, continuing as

• FULL CHOICE OF SETTLEMENT OPTIONS.

Give Your Family NEW, BIGGER AFA GROUP LIFE PROTECTION!

MAIL THIS APPLICATION TODAY!

OTHER FACTS ABOUT YOUR COVERAGE

All certificates are dated and take effect on the last day of the month in which your application for coverage is postmarked. Coverage runs concurrently with AFA membership. AFA Military Group Life Insurance is written in conformity with the insurance regulations of the District of Columbia.

The insurance will be provided under the group insurance policy issued by United Benefit Life Insurance Company to the Air Force Association. However, National Guard and Reserve members who are permanent residents of Ohio, Texas, Wisconsin, and New Jersey will not be covered under the group policy, but will be eligible under individual policies providing somewhat similar benefits.

AIR FORCE ASSOCIATION GROUP LIFE INSURANCE

(UNDERWRITTEN BY UNITED OF OMAHA)

Rank (*please print*) Name

Address (*please indicate permanent address if paying by allotment*)

City State Zip Code

Date of Birth Serial Number

Beneficiary Relationship

Please indicate below the form of payment you elect:

☐ Monthly government allotment (I enclose $20 to cover the period necessary for my allotment to be processed.)
☐ Quarterly (I enclose $30)
☐ Semiannually (I enclose $60)
☐ Annually (I enclose $120)

Category of eligibility:
☐ Active Duty
☐ Ready Reserve
☐ National Guard
☐ Air Force

This insurance is available only to AFA members: 12-65
☐ I enclose $6 for annual AFA dues (includes subscription ($5) to AIR FORCE/SPACE DIGEST).
☐ I am an AFA member.

I understand the conditions governing AFA's Group Life Insurance Plan. I certify that I am eligible for this insurance under the category indicated, that I am currently in good health, and that I have successfully passed, within the past two-year period, the last physical examination required by my branch of service. (Reserve and Guard personnel not on extended active duty must include with this application a copy of their most recently completed SF88.)

Signature of Applicant Date

Application must be accompanied by check or money order.

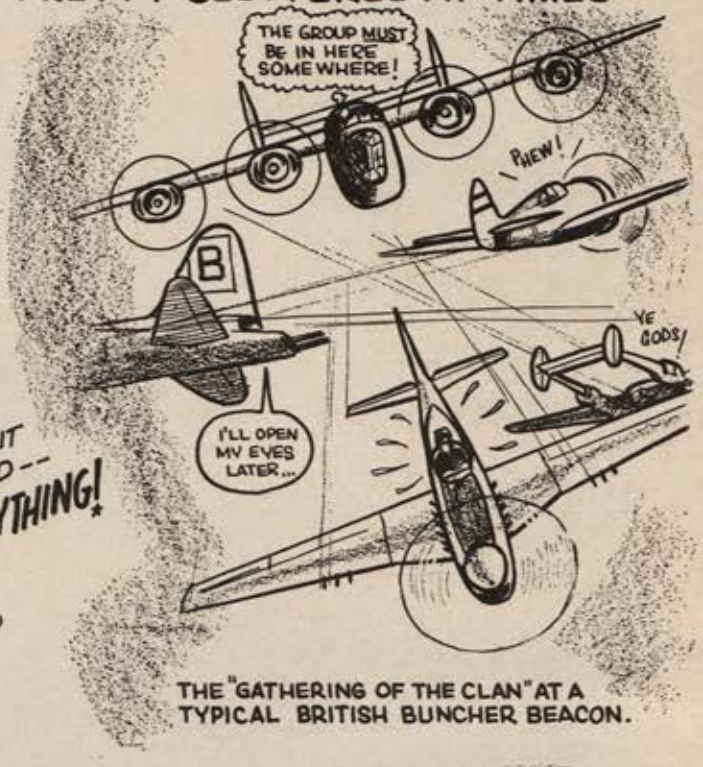
Send remittance to INSURANCE DIVISION, AFA, 1750 PENNSYLVANIA AVE., N.W., WASH., D. C. 20006

Bob Stevens'

"There I was..."

Bouncing along over Europe in a late-model B-17 Flying Fort or B-24 Liberator on air highways paved with flak, while friendly and bogey fighters played tag through the formations. . . .

THE AIR OVER EUROPE COULD GET PRETTY CLUTTERED AT TIMES:



THE "GATHERING OF THE CLAN" AT A TYPICAL BRITISH BUNCHER BEACON.

THE UNSEEN AUDIENCE -

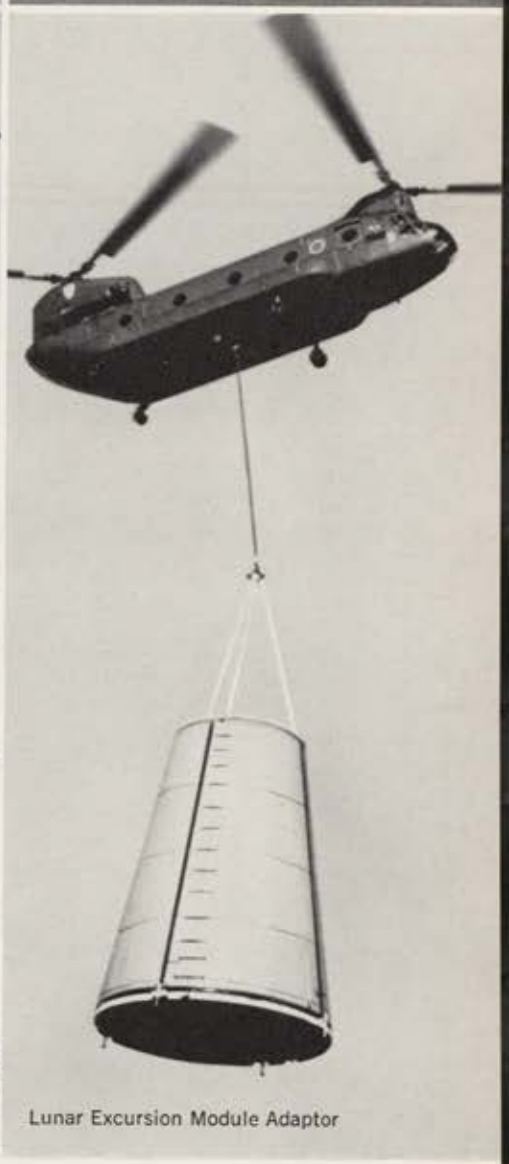
Aircraft


Medical Unit, Self-Transportable

Scorpion Anti-Tank Weapon


Lifts Its Own Weight

Personnel Carrier


Lunar Excursion Module Adaptor


155 mm. Howitzer


500 Gallon Collapsible Fuel Cells

What to call for when you need a lift.

Call for a Chinook.

Chinook helicopters specialize in picking you up and settling you into places that ground vehicles find impossible to reach. A steep, wooded slope. The far side of a flooding stream. The edge of a cliff.

And the bigger the load, the better it suits the Chinook. Designed by Boeing's Vertol Division, the U.S. Army CH-47A Chinook helicopter has a 16,000 lb. hook capacity. So when you need fire support, or vehicles, or a salvage operation, or retrieval, just think of the photographs you see above.

What you don't see here is the capability of the 30-foot payload compartment. It accepts the latest combat vehicles. Or infantry support weapons. Or components of the Pershing missile system. In fact, it carries almost every tactical or logistic item.

But don't let your thinking be limited by what you see. Chinooks have been doing many more jobs than they were originally designed for. As the needs of combat operations change and develop, the unique flexibility and versatility of the Chinook becomes ever clearer.

So next time you need a lift, call for a Chinook.

BOEING Helicopters

VERTOL DIVISION / MORTON, PENNSYLVANIA, U.S.A.

Gemini Spacecraft

Whether launched before a watching world . . .

Phantom II Aircraft

. . . or from a carrier deck in the China Sea,

it has become a characteristic
of products built by **MCDONNELL**
that they work.